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

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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 standard OLS regression model, which looks for the effects of the size of the daily traders net position in twenty-three 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. We find that, close-end price manipulation through big buyers and big sellers is possible in the ISE.

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

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

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1 - Introduction

Extensive research has shown that stock markets are more active at the beginning and the ending of the trading session. Trading volume, price volatility and the 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 including Wood, Mc Inish and Ord (1985), Harris (1986, 1989), Smirlock and Starks (1986), Jain and Joh (1988), McInish and Wood (1990a), Lockwood and Linn (1990), Gerethy and Mulherin (1991), Wei (1992), Foster and Viswanathan (1993), Jang and Lee (1993), Berry and Howe (1994), Chan et. al. (1996) in the New York Stock Exchange, Chan, Christie and Schultz (1995) in NASDAQ, McInish and Wood (1990b) in the Toronto Stock Exchange, Chang et. al. (1993), Andersen, Bollerslev and Cai (2000) in the Japanese Stock Market, Choe and Shin (1993) in the Korean 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, Hillion and Suominen (1998) in the Paris Bourse, and Bildik (2001) in the Turkish Stock Market.

In terms of Turkish Stock Market, Bildik (2001) examines the intra-daily seasonalities of the Istanbul Stock Exchange (ISE) using the ISE National-100 index data between January 2, 1996 and January 15, 1999. He finds that stock returns follow a U-shaped pattern (open to close) in both of the separate morning and afternoon trading sessions, with opening and closing returns being large and positive. Volatility is higher at the open and follows an L-shape pattern during the morning and afternoon sessions.

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 amounts of money to change closing prices. For example, if a fund manager takes a big net position

for his client over the trading day, there is a possibility that he will attempt to change the closing price in his client's favor. He could place a buy order at seconds before close to increase the closing price of a stock. This attempt to change the closing price is manipulation, and this kind of activity at close is expected to last for a short period until the opening of the next trading day.

The Capital Markets Board of Turkey (2002) defines two types of manipulation: 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 rely on his information, they could drive up or down the stock price, thus the manipulator can profit by selling high or buying low to 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, because 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 would not have to be wealthy necessarily. According to the Capital Markets Board of Turkey (2002), a trader with a purchasing power of buying a minimum of 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 because 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. Further, closing prices are important indicators of stock market performance. They are used in a variety of contexts such as a benchmark of stocks, traders and market performance.

Stock price manipulation has received a lot of attention in the literature. Researchers and academicians have widely studied the different characteristics of manipulation practices. Allen and Gorton (1992), and Allen and Gale (1992) present models of 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), Jarrow (1994), and Kumar and Seppi (1992) study manipulation in derivative security markets, investigating the relationship between prices, trading strategies, and their possible effects to traders and markets. Benabou and Laroque (1992), and Bagnoli and Lipman (1996) study action-based manipulation through insider trading and takeover bids. Chatterjea and Joseph (1993) examine the actions undertaken by corporations to prevent its shares from being manipulated by others. Fried (2000) discusses the economic consequences, the motive and the effect of high closing prices.

When Felixson and Pelli (1999) studied the manipulation of closing prices by the traders in an organized exchange, 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 manipulating the closing prices. This person could be a broker or a fund manager. The broker is a representative of a brokerage house on the trading floor and is 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 satisfied with his performance. Fund managers 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 ISE National 30 index companies between 1st January 2000 – 29th March 2002 where there are some major changes in terms of order palacement. 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 (ISE)

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, where the 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)[1]. Session hours were 10:00 a.m. to 12:00 a.m., and 14:00 p.m. to 16:00 p.m., but fully changed into new hours after August 13, 2001. After the change in session hours, the members of the stock market were given the ability to send their orders directly to the trading system of the ISE by using their own computer systems and get responses immediately. This feature is being used together with the manual order entry through workstations and order transfers via floppy diskettes and aims to prevent time losses in the transfer of customer orders collected via the internet and/or other order collecting systems.

Morning orders received by the ISE members by electronic means prior to the first session are entered into 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. and 9:30 a.m. 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 Express-API orders can be accepted for an execution until the end of the first session. Express-API order executions gives ability to

[1] In February 2007, Istanbul Stock Exchange Board has changed the opening procedure of the trading system and adopted a call market procedure before the normal session where the Keyboard and Express-API orders are accepted for an execution, however, there are no signs of adopting a call procedure to the market closing. As this study was conducted before February 2007 and mainly focused on the close end price manipulation, this section of the study explains the trading hours and the trading activities of the Istanbul Stock Exchange prior to February 2007 implementation.

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 responses immediately[2].

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. and 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 Express-API orders can be accepted for an execution until the end of the second session.

The order entrance procedure via floppy diskettes is subject to 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.

[2] Electronic Orders sent via Express-API started January 4th 2002.

Table 1 **Trading Hours in the Istanbul Stock Exchange between January 2002 - February 2007**

SESSIONS			TIME	EXPLANATION
1st SESSION	Electronic Orders are sent via Floppy Diskette and Express-API	Floppy Diskette Pre-test Level	09:15-09:30	Floppy Diskette orders are tested in this level
		Floppy Diskette and Express-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 Express-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 Express-API orders can be accepted for an execution.
BREAK			12:00-13:45	
2nd SESSION	Electronic Orders are sent via Floppy Diskette and Express-API	Floppy Diskette Pre-test Level	13:45-14:00	Floppy Diskette orders are tested in this level.
		Floppy Diskette and Express-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 Express-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 Express-API orders can be accepted for an execution.

Source: Istanbul Stock Exchange

2.2 Data Set

The data set in this study is obtained from the Istanbul Stock Exchange and contains the daily transaction data of each company, which consists of the time of the execution, the price, the number of shares traded, and the code/name for the brokerage houses who is active in buying and selling. The data is composed of 23 stocks from the ISE National-30 index companies[3]. 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, where the first sub-period

[3] The ISE National-30 index consists of 30 companies, but we remove 7 companies due to lack of data.

includes 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

Twenty-three stocks have been selected for the current study from the ISE National-30 index companies listed in Istanbul Stock Exchange. The names of the companies are listed in Table 2, but the names of the brokerage houses have been kept confidential.

Table 2. **Twenty-three stocks selected from the ISE National-30 index companies**

ISE NATIONAL-30 INDEX COMPANIES	SHARE CODE
AKCANSA CIMENTO SANAYI VE TICARET A.S.	AKCNS
AKSIGORTA A.S.	AKGRT
ALARKO HOLDING A.S.	ALARK
ALCATEL TELETAS TELEKOM. END. TIC. A.S.	ALCTL
ARCELIK A.S.	ARCLK
BAGFAS BANDIRMA GUBRE FABRIKALARI A.S.	BAGFS
DOGAN SIRKETLER GRUBU HOLDING A.S.	DOHOL
ANADOLU EFES BIRACILIK VE MALT SANAYI A.S.	EFES
ENKA HOLDING YATIRIM A.S.	ENKA
EREGLI DEMIR VE CELIK FABRIKALARI T.A.S.	EREGL
FORD OTOMOTIV SANAYI A.S.	FROTO
HURRIYET GAZETECILIK VE MATBAACILIK A.S.	HURGZ
TURKIYE IS BANKASI A.S.	ISCTR
MIGROS TURK T.A.S.	MIGRS
NETAS NORTHERN ELECTRIC TELEKOM. A.S.	NETAS
PETKIM PETROKIMYA HOLDING A.S.	PETKM
PETROL OFISI A.S.	PTOFS
TURKIYE SISE VE CAM FABRIKALARI A.S.	SISE
TURK HAVA YOLLARI ANONIM ORTAKLIGI	THYAO
TANSAS PERAKENDE MAGAZACILIK TIC. A.S.	TNSAS
TUPRAS - TURKIYE PETROLLERI RAFINERILERI A.S.	TUPRS
VESTEL ELEKTRONIK SANAYI VE TICARET A.S.	VESTL
YAPI VE KREDI BANKASI A.S.	YKBNK

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 observe the day-end returns of the selected companies. If these returns are large and positive (negative), we infer that traders who buy (sell) large sum of shares over the trading day may be attempting to influence the closing price.

All stock prices are the actual transaction values and their returns are computed as the percentage change in the value of a company over 15-minute intervals.

$$R_{e,t} = (price_{t+15} - price_t)/ price_t \quad (1)$$

Thus, 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 results in 16 return observations per day for each stock. 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 results in 20 return observations per day for each stock.

We also compute close-to-open returns by using 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

In this section, we examine whether the return and standard deviation patterns documented by Bildik (2001) exists in the individual stocks rather than the collective ISE National-100 index.

The following tables and figures set out the results of the analysis of return and standard deviation for the twenty-three stocks before and after the change in the trading hours and the trading method.

Table 3, shows the intra-day returns of the twenty-three stocks' 15-minute overall patterns for the first period (04.01.2000 - 10.08.2001) and the second period (13.08.2001 - 29.03.2002). Results for the first period indicate that 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. Consistent with Bildik's (2001) findings, a typical U-shape or more precisely W-shape pattern in stock prices is detected in the first period. Results for the second period indicate that mean returns at the opening confirm that there is a significant decrease in pattern following the change in the trading method and hours. However, day-end returns at the closing are still large and positive. Figure 1 exhibits the movements of the twenty-three stocks' 15-minute overall returns throughout the day for the first and the second period.

Table 3 **Intra-day Stock Returns for the First (04.01.2000 - 10.08.2001) and the Second (13.08.2001 - 29.03.2002) Period**

Time	First Period (04.01.2000 - 10.08.2001)	Second Period (13.08.2001 - 29.03.2002)
09:45		-0,00003
10:00		-0,00045
10:15	0,00119	-0,00130
10:30	-0,00014	-0,00063
10:45	-0,00039	-0,00006
11:00	-0,00045	0,00000
11:15	-0,00085	-0,00027
11:30	-0,00001	0,00045
11:45	-0,00087	0,00010
12:00	0,00010	0,00138
14:15	-0,00189	-0,00223
14:30	0,00034	-0,00012
14:45	-0,00038	-0,00018
15:00	-0,00001	0,00036
15:15	0,00035	-0,00008
15:30	-0,00019	0,00091
15:45	-0,00044	0,00127
16:00	0,00338	0,00006
16:15		-0,00082
16:30		0,00468

Figure 1 **Intra-day Stock Returns for the First (04.01.2000 - 10.08.2001) and the Second (13.08.2001 - 29.03.2002) Period**

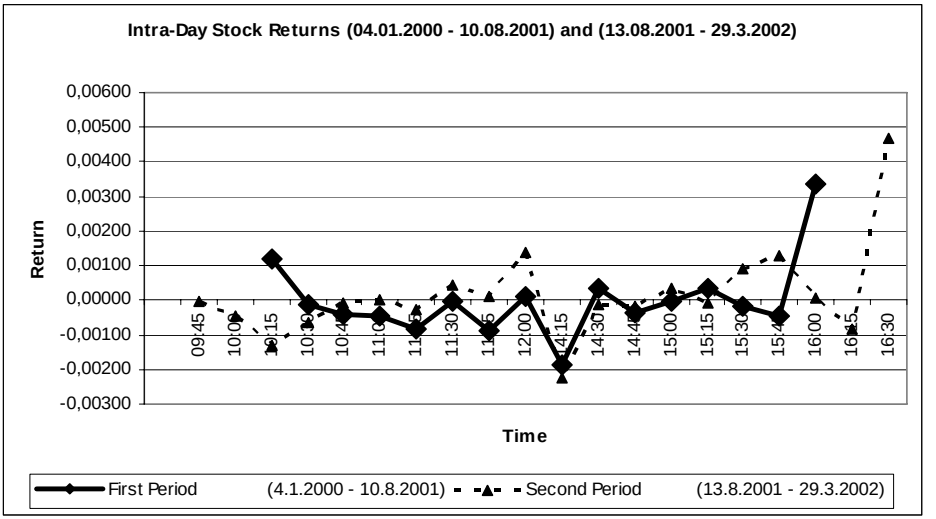
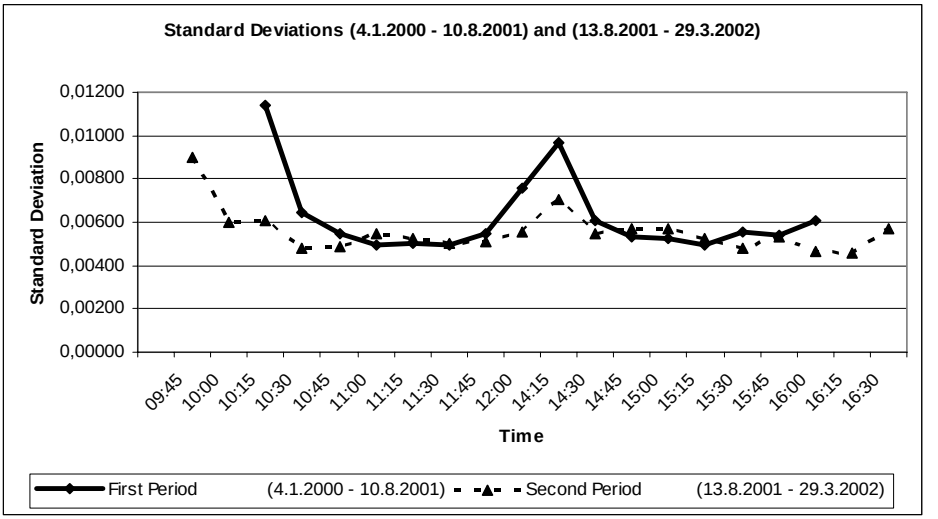


Table 4, shows the standard deviations of the twenty-three stocks' 15-minute overall patterns for the first period (04.01.2000 – 10.08.2001) and the second period (13.08.2001 – 29.03.2002). Results for the first period indicate that the magnitude of the standard deviations follows an L-shape pattern, higher at the beginning, peaked at lunch break, and lower at the closing. As expected, there is a remarkable similarity in the standard deviation patterns with Bildik's (2001) findings for the first period. Results for the second period indicate that the magnitude of the standard deviations changed into a new, flatter L-shaped pattern, slightly higher at the beginning, lower at the break and flat again at the closing. It is interesting to note that the use of floppy diskette order system at the beginning of the each trading session decreases the volatility in stocks. "Limit orders" with a "multiple price-continuous auction" method reduces the ability of traders to set the opening price. Figure 2 exhibits the movements of the twenty-three stocks' 15-minute overall standard deviations throughout the day for the first and the second period.

Table 4 **Standard Deviations for the First (04.01.2000 - 10.08.2001) and the Second (13.08.2001 - 29.03.2002) Period**

Time	First Period (04.01.2000 - 10.08.2001)	Second Period (13.08.2001 - 29.03.2002)
09:45		0,00903
10:00		0,00600
10:15	0,01139	0,00610
10:30	0,00649	0,00481
10:45	0,00546	0,00484
11:00	0,00492	0,00548
11:15	0,00501	0,00521
11:30	0,00493	0,00505
11:45	0,00548	0,00510
12:00	0,00759	0,00557
14:15	0,00968	0,00703
14:30	0,00611	0,00544
14:45	0,00536	0,00568
15:00	0,00526	0,00567
15:15	0,00492	0,00523
15:30	0,00555	0,00479
15:45	0,00541	0,00532
16:00	0,00608	0,00467
16:15		0,00456
16:30		0,00569

Figure 2 **Standard Deviations for the First (04.01.2000 - 10.08.2001) and the Second (13.08.2001 - 29.03.2002) Period**



The new trading system at the 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 correlated but not highly with the opening returns in the morning. The magnitude of the standard deviations declined on average.

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 returns and L-shaped pattern of volatility observed in the selected stocks between January 4th, 2000 –August 10th, 2001. This was expected 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 start sending 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. Under this system the morning volatility peak in returns and standard deviation observed before August 13th, 2001 significantly decreased. Our final observation on intra-day patterns of stocks for both periods is, the day-end closing

returns are still large and positive. In the next section, we explore one of the causes of this systematic increase in closing prices. We try to answer whether these prices are artificially influenced by the activities of brokerage houses or the traders with large positions over the trading day.

4 - Close-End Price Manipulation

Stock price manipulation associated with day-end returns is studied by Felixson and Pelli (1999) in Helsinki Stock Exchange. Felixson and Pelli (1999) build a regression model to test for closing price manipulation by daily traders in the Finnish stock market. They examine whether closing prices are manipulated by these traders who buy (sell) large sum of shares throughout the trading day. Their results show that there is weak evidence that these traders manipulate closing prices. Using the insights developed in Felixson and Pelli (1999), we test whether the largest traders in the ISE manipulate 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 (i.e., the benefits of manipulation outweigh the expected costs).

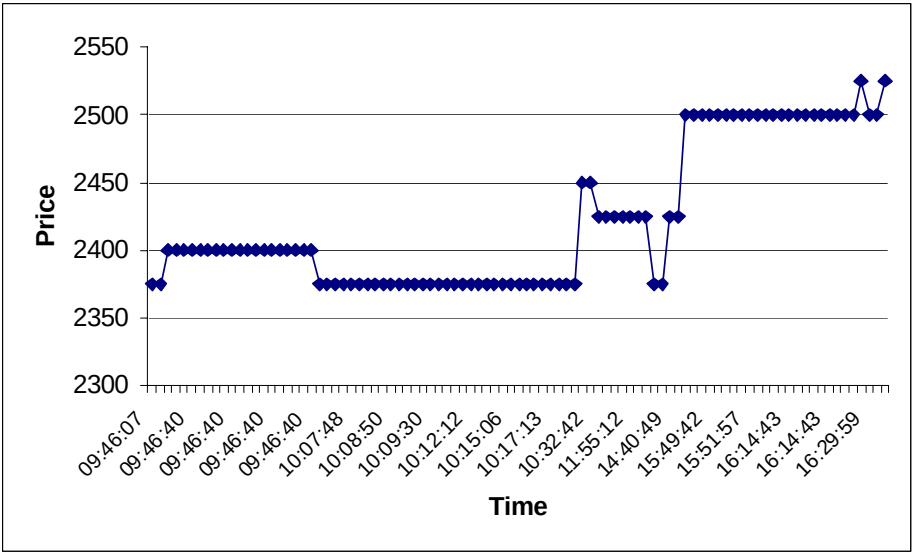
An example can be shown with real data from the ISE in Tables 5a and 5b. The stock price for Company A opens at 2,400 Turkish Lira (TL) when the trading starts at 09:30:00. At 09:34:31, Broker 1 makes the first trade of the day and buys 2 lots (1 Lot =1000 Shares) at 2,400 TL per share (Table 5a), then 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 per share, a total of 3,882,000 shares with a total market value of 9.219 Billion TL (Table 5a).

Table 5a. **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	4,800	4,800,000
09:35:35	2375	700	BROKER 1	BROKER 3	1,662,500	1,662,500,000
09:36:38	2400	53	BROKER 1	BROKER 2	127,200	127,200,000
09:37:44	2400	200	BROKER 4	BROKER 2	480,000	480,000,000
09:37:54	2375	42	BROKER 1	BROKER 5	99,750	99,750,000
09:43:58	2400	25	BROKER 1	BROKER 2	60,000	60,000,000
09:45:05	2375	1500	BROKER 1	BROKER 4	3,562,500	3,562,500,000
09:45:37	2400	25	BROKER 1	BROKER 2	60,000	60,000,000
09:45:53	2375	65	BROKER 8	BROKER 1	154,375	154,375,000
09:45:53	2375	66	BROKER 1	BROKER 1	156,750	156,750,000
09:46:06	2375	500	BROKER 8	BROKER 4	1,187,500	1,187,500,000
09:46:07	2375	3882	*BROKER 10*	BROKER 1	9,219,750	9,219,750,000

In the 1st session, *Broker 10* makes most of his buys between 09:46:40 to 10:32:42 and paid an average price of 2,386 TL per share (Figure 3). In the 2nd session, he makes most of his buys between 15:47:25 to 16:14:43 and paid an average price of 2,500 TL per share (Figure 3).

Figure 3 **Trading times and prices of Broker 10**



At 16:15:00, fifteen minutes before the official close and right before he starts to manipulate the closing price, he has bought a total of 161,601 lots and paid an average price of 2,417 TL with a total value 395.348 Billion TL. His shares' total market value with a market price of 2,500 TL is 404.003 Billion TL. If the session closes with this price, he could be better off than with an average price of 2,417 TL, and could make a profit of 404.003 – 395.348 = 8.655 Billion TL, but right before the official close he makes his last move to set the closing price to a higher level. He puts a buy order at 16:29:31 and has bought 300 lots at a price of 2,500 (Table 5b), then at 16:29:34 he has bought another 300 lots at a price of 2,525 TL (this price could make him better off than the 2,500 TL per share price), but 1 second before close Broker 16 places 4,590 lots to sell at 2,500 TL and moves down the price from 2,525 TL, in any order Broker 10, who is eager to close the official price at 2,525 TL buys all the shares and empties the sell orders of Broker 16, and Broker 74 at 2,500 TL, and makes the last buy at 2,525 TL from Broker 25. Only 1 lot would be enough for him to close the stock price at 2,525 TL (Table 5b).

At close (16:30:00), Broker 10 has accumulated a total of 166,793 lots and paid a total market value of 408.335 Billion TL, the average price for the shares he has bought over the trading day is 2,422 TL. But now, the official closing price is 2,525 TL and at this price his shares' total market value is 421.153 Billion TL. By setting the closing price at 2,525 TL, he has gained 421.153 – 408.335 = 12.818 Billion TL, which is 4.163 Billion TL higher than the 16:15:00's accumulated profit of 8.655 Billion TL. If the price were to close at 2,500 TL and if he does not make the buys after 16:15:00, he could end up with a profit of 8.655 Billion TL, but now at 16:30:00, after setting the closing price at 2,525 TL, his total wealth is equal to 421.153 Billion TL with a total profit of 12.818 Billion TL.

Table 5b **Time and Trade Log for Company A (2nd Session)**

TIME	PRICE	LOT	BUYER	SELLER	PRICE*LOT	TOTAL VALUE
16:29:31	2500	300	*BROKER 10*	BROKER 29	750,000	750,000,000
16:29:34	2525	300	*BROKER 10*	BROKER 4	757,500	757,500,000
16:29:59	2525	5000	BROKER 6	BROKER 25	12,625,000	12,625,000,000
16:29:59	2525	5000	BROKER 6	BROKER 25	12,625,000	12,625,000,000
16:29:59	2525	658	BROKER 6	BROKER 25	1,661,450	1,661,450,000
16:29:59	2500	4590	*BROKER 10*	BROKER 16	11,475,000	11,475,000,000
16:29:59	2500	1	*BROKER 10*	BROKER 74	2,500	2,500,000
16:29:59	2525	1	*BROKER 10*	BROKER 25	2,525	2,525,000

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) any manipulation attempt by traders can not succeed by making trades unless they use false statements and/or fictitious trades.

5 - Model and Results

5.1 Model

The model we use in this study is a replication of the Felixson and Pelli's (1999) first model. When they build 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 on the manipulator side in this equation, where the buyer will try to influence the closing price by adding extra return to the normal return, and the 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 succeeds by increasing (decreasing) the price 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.

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

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

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

and

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

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

H_1 : b_1, $c_2>0$ and c_1, $b_2<0$

In this model, it is assumed 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 zero[4]. 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.

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 then 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

[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.

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.

Our data in Table 6 reveal that, almost all of the time, comparing to the transactions of the seller side (D_{Sell}), the buyer side, D_{Buy} column, dominates the closing price. For example, from a total of 554 trading days big buyers (D_{Buy}) actively trade in the last minute of the 114 trading days and big sellers (D_{Sell}) actively trade in the last minute of the 71 trading days of AKCNS stock. The big buyers of the selected stocks set the closing price at above the true price where the returns within the last 15 minutes of the close ($Return_{Close-15}$) are always positive. The artificial prices set by the big buyers at market close returns to their true market values after the close ($Return_{Close+15}$). Table 6 also shows that, $D_{Buy}+D_{Sell}+D_{Both}$ column, about half of the 554 trading days, D_{Buy}, D_{Sell}, and D_{Both} are actively trade in the last minute of the close.

Table 6 **Trade log of the big buyers' and big sellers' order palacement attempt in the last minute of trading**

	Return $_{Close-15}$	Return $_{Close+15}$	D_{Buy}	D_{Sell}	D_{Both}	$D_{Buy}+D_{Sell}+D_{Both}$
AKCNS	0.002000	0.002105	114	71	80	265
AKGRT	0.006095	-0.001278	94	67	66	227
ALARK	0.003633	-0.000123	100	82	63	245
ALCTL	0.003593	0.002078	82	68	74	224
ARCLK	0.004581	-0.000677	96	85	78	259
BAGFS	0.002556	0.002905	106	36	60	202
DOHOL	0.005192	-0.002439	121	68	199	388
EFES	0.002561	0.002249	119	77	61	257
ENKA	0.005725	-0.001248	82	71	56	209
EREGL	0.005364	-0.001928	110	66	116	292
FROTO	0.003893	0.000463	98	78	68	244
HURGZ	0.003794	0.000540	120	82	94	296
ISCTR	-0.001504	0.005515	119	88	236	443
MIGRS	0.002811	0.000766	105	96	103	304
NETAS	0.003867	0.001773	125	74	98	297
PETKM	0.005410	-0.000309	91	73	73	237
PTOFS	0.004583	-0.001180	105	66	87	258
SISE	0.005262	0.001004	102	87	76	265
THYAO	0.001427	0.004106	93	61	60	214
TNSAS	0.003137	0.001964	101	86	69	256
TUPRS	0.004459	-0.001419	85	98	116	299
VESTL	0.005148	0.000377	106	102	151	359
YKBNK	0.002256	-0.000008	96	97	142	335

5.2 Results

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

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

The intercept for most of the stocks, except for BAGFS, ISCTR, THYAO 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.

Positive signs for D_{buy} are observed in stocks AKCNS, AKGRT, ALARK, BAGFS, DOHOL, EFES, ENKA, FROTO, HURGZ, ISCTR, MIGRS, PETKM, THYAO, TNSAS, TUPRS, VESTL. Negative signs for D_{Sell} are observed in stocks AKCNS, AKGRT, ENKA, EREGL, MIGRS, PETKM, PTOFS, TNSAS, TUPRS, VESTL. Positive signs for D_{Both} are observed in stocks AKCNS, ALARK, ALCTL, BAGFS, EFES, FROTO, HURGZ, ISCTR, MIGRS, PETKM, PTOFS, THYAO, TNSAS, VESTL, YKBNK.

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

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
AKCNS		0,0008174	0,0031396	-0,0006888	0,0021526	0,0098	1,3072	398
	t Stat	(0,8348)	(1,6764)	(-0,3227)	(0,9943)			
	P-value	(0,4043)	(0,0945)	(0,7471)	(0,3207)			
AKGRT		0,0066580	0,0009516	-0,0002003	-0,0018600	0,0028	0,3646	398
	t Stat	(5,6590)	(0,4533)	(-0,0839)	(-0,7794)			
	P-value	(0,0000)	(0,6506)	(0,9331)	(0,4362)			
ALARK		0,0024079	0,0016648	0,0003757	0,0016585	0,0037	0,4948	398
	t Stat	(2,5299)	(1,0325)	(0,2195)	(0,8750)			
	P-value	(0,0118)	(0,3024)	(0,8264)	(0,3821)			
ALCTL		0,0030332	-0,0031985	0,0001775	0,0041097	0,0203	2,7317	398
	t Stat	(2,8336)	(-1,5374)	(0,0792)	(1,9339)			
	P-value	(0,0048)	(0,1250)	(0,9370)	(0,0538)			
ARCLK		0,0042983	-0,0007186	0,0007882	-0,0011897	0,0021	0,2758	398
	t Stat	(3,7507)	(-0,3620	(0,3938)	(-0,5761)			
	P-value	(0,0002)	(0,7175)	(0,6939)	(0,5648)			
BAGFS		-0,0003024	0,0030623	0,0034895	0,0035685	0,0160	2,1400	398
	t Stat	(-0,3356)	(1,9492)	(1,4695)	(1,7977)			
	P-value	(0,7374)	(0,0520)	(0,1425)	(0,0730)			
DOHOL		0,0048981	0,0000897	0,0013716	-0,0002986	0,0012	0,1544	398
	t Stat	(3,4696)	(0,0409)	(0,5413)	(-0,1552)			
	P-value	(0,0006)	(0,9674)	(0,5886)	(0,8767)			
EFES		0,0017692	0,0008592	0,0014224	0,0012288	0,0017	0,2284	398
	t Stat	(1,8099)	(0,4847)	(0,6680)	(0,5465)			
	P-value	(0,0711)	(0,6281)	(0,5045)	(0,5850)			
ENKA		0,0045925	0,0018029	-0,0009387	-0,0017657	0,0059	0,7852	398
	t Stat	(4,7277)	(0,9647)	(-0,4688)	(-0,8002)			
	P-value	(0,0000)	(0,3353)	(0,6395)	(0,4241)			
EREGL		0,0060575	-0,0010481	-0,0034213	-0,0019834	0,0075	0,9924	398
	t Stat	(5,0268)	(-0,5732)	(-1,6263)	(-1,1111)			
	P-value	(0,0000)	(0,5669)	(0,1047)	(0,2672)			
FROTO		0,0009754	0,0012337	0,0003199	0,0062344	0,0254	3,4292	398
	t Stat	(0,9682)	(0,6840)	(0,1670)	(3,1316)			
	P-value	(0,3336)	(0,4944)	(0,8675)	(0,0019)			

(continues)

Table 7a. (continued)

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
HURGZ		0,0021827	0,0029767	0,0033700	0,0001009	0,0095	1,2616	398
	t Stat	(1,8347)	(1,4874)	(1,4581)	(0,0458)			
	P-value	(0,0673)	(0,1377)	(0,1456)	(0,9635)			
ISCTR		-0,0056647	0,0036274	0,0077899	0,0062061	0,0272	3,6875	398
	t Stat	(-3,1006)	(1,4871)	(2,8615)	(2,8616)			
	P-value	(0,0021)	(0,1378)	(0,0044)	(0,0044)			
MIGRS		0,0023353	0,0012432	-0,0025308	0,0014460	0,0139	1,8587	398
	t Stat	(2,5832)	(0,7568)	(-1,5553)	(0,9198)			
	P-value	(0,0101)	(0,4496)	(0,1207)	(0,3583)			
NETAS		0,0037597	-0,0002934	0,0005518	-0,0008115	0,0008	0,1104	398
	t Stat	(3,6525)	(-0,1606)	(0,2584)	(-0,4173)			
	P-value	(0,0003)	(0,8725)	(0,7962)	(0,6767)			
PETKM		0,0052947	0,0005850	-0,0003247	0,0013152	0,0011	0,1457	398
	t Stat	(4,4233)	(0,2753)	(-0,1359)	(0,5634)			
	P-value	(0,0000)	(0,7832)	(0,8920)	(0,5735)			
PTOFS		0,0053370	-0,0018494	-0,0006304	0,0004052	0,0036	0,4770	398
	t Stat	(4,8155	(-1,0205)	(-0,3013)	(0,2124)			
	P-value	(0,0000)	(0,3081)	(0,7634)	(0,8319)			
SISE		0,0051669	-0,0007130	0,0000927	-0,0008947	0,0009	0,1230	398
	t Stat	(4,9975)	(-0,4110)	(0,0492)	(-0,4655)			
	P-value	(0,0000)	(0,6813)	(0,9608)	(0,6418)			
THYAO		-0,0003884	0,0014279	0,0044034	0,0039797	0,0089	1,1888	398
	t Stat	(-0,2933)	(0,5763)	(1,5614)	(1,3721)			
	P-value	(0,7694)	(0,5647)	(0,1192)	(0,1708)			
TNSAS		0,0024728	0,0026421	-0,0023998	0,0009731	0,0117	1,5576	398
	t Stat	(2,2359)	(1,3715)	(-1,1385)	(0,4516)			
	P-value	(0,0259)	(0,1710)	(0,2556)	(0,6518)			
TUPRS		0,0046580	0,0013651	-0,0013673	-0,0013896	0,0071	0,8965	398
	t Stat	(3,9232)	(0,7184)	(-0,7527)	(-0,8202)			
	P-value	(0,0001)	(0,4730)	(0,4521)	(0,4126)			
VESTL		0,0043688	0,0007398	-0,0014406	0,0016503	0,0045	0,5941	398
	t Stat	(3,2315)	(0,3315)	(-0,6350)	(0,8024)			
	P-value	(0,0013)	(0,7405)	(0,5258)	(0,4228)			
YKBNK		0,0025619	-0,0002843	0,0005245	0,0003857	0,0005	0,0653	398
	t Stat	(1,9021)	(-0,1404)	(0,2608)	(0,2154)			
	P-value	(0,0579)	(0,8884)	(0,7944)	(0,8296)			

[a] The null hypothesis can not be rejected at α= %5 significance level. T-stats and P-values are reported under the coefficient estimates in paranthesis. Also reported are the adjusted R-square, the F-statistics, the number of observations and the degrees of freedom.

5.2.2 Results 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).

Stocks that have positive coefficients for D_{buy} at R_{c-15} should have negative coefficients at R_{c+15}. We find this in stocks AKCNS, AKGRT, ALARK, BAGFS, ENKA, HURGZ, ISCTR, PETKM, TNSAS, TUPRS, VESTL. Negative signs of D_{sell} observed in stocks at R_{c-15} is expected to be positive at R_{c+15}. Change in signs is observed in stocks AKCNS, EREGL, MIGRS, PETKM, PTOFS, TNSAS, TUPRS. Positive signs of D_{both} observed in stocks at R_{c-15} is expected to be negative at R_{c+15}. Change in signs is observed in stocks AKCNS, BAGFS, FROTO, HURGZ, ISCTR, MIGRS, PETKM, PTOFS, THYAO, VESTL, YKBNK.

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

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
AKCNS		0,0034848	-0,0030601	0,0005367	-0,0030456	0,0044	0,5760	398
	t Stat	(2,2102)	(-1,0147)	(0,1562)	(-0,8736)			
	P-value	(0,0277)	(0,3109)	(0,8760)	(0,3829)			
AKGRT		0,0015559	-0,0070107	-0,0036216	-0,0047763	0,0136	1,8191	398
	t Stat	(0,8706)	(-2,1985)	(-0,9990)	(-1,3175)			
	P-value	(0,3845)	(0,0285)	(0,3184)	(0,1884)			
ALARK		-0,0005830	-0,0007652	0,0018367	0,0034694	0,0035	0,4655	398
	t Stat	(-0,3144)	(-0,2436)	(0,5508)	(0,9395)			
	P-value	(0,7534)	(0,8077)	(0,5821)	(0,3481)			
ALCTL		0,0021723	0,0015588	-0,0043841	0,0004832	0,0049	0,6484	398
	t Stat	(1,1918)	(0,4400)	(-1,1480)	(0,1335)			
	P-value	(0,2341)	(0,6602)	(0,2517)	(0,8938)			
ARCLK		0,0002209	-0,0025035	-0,0036298	0,0003845	0,0023	0,2976	398
	t Stat	(0,0832)	(-0,5447)	(-0,7833)	(0,0804)			
	P-value	(0,9337)	(0,5862)	(0,4339)	(0,9359)			
BAGFS		0,0053840	-0,0052121	-0,0026323	-0,0006260	0,0111	1,4788	398
	t Stat	(3,7028)	(-2,0561)	(-0,6871)	(-0,1955)			
	P-value	(0,0002)	(0,0404)	(0,4924)	(0,8451)			
DOHOL		-0,0041668	0,0027474	0,0063835	0,0002606	0,0050	0,6589	398
	t Stat	(-1,4705)	(0,6243)	(1,2550)	(0,0675)			
	P-value	(0,1422)	(0,5328)	(0,2102)	(0,9462)			
EFES		0,0011328	0,0051468	0,0028741	0,0010063	0,0098	1,3093	398
	t Stat	(0,7673)	(1,9224)	(0,8937)	(0,2963)			
	P-value	(0,4433)	(0,0553)	(0,3720)	(0,7671)			
ENKA		0,0025185	-0,0027729	-0,0081703	-0,0039030	0,0114	1,5234	398
	t Stat	(1,3218)	(-0,7565)	(-2,0800)	(-0,9018)			
	P-value	(0,1870)	(0,4498)	(0,0382)	(0,3677)			
EREGL		-0,0026401	0,0039515	0,0015919	-0,0008765	0,0063	0,8376	398
	t Stat	(-1,2732)	(1,2557)	(0,4397)	(-0,2853)			
	P-value	(0,2037)	(0,2100)	(0,6604)	(0,7755)			
FROTO		0,0006994	0,0046876	0,0033695	-0,0036057	0,0126	1,6841	398
	t Stat	(0,3856)	(1,4438)	(0,9773)	(-1,0061)			
	P-value	(0,7000)	(0,1496)	(0,3290)	(0,3150)			

(continues)

Table 7b. (continued)

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
HURGZ		0,0004986	-0,0016813	0,0025274	-0,0000519	0,0021	0,2755	398
	t Stat	(0,2311)	(-0,4632)	(0,6029)	(-0,0130)			
	P-value	(0,8174)	(0,6435)	(0,5469)	(0,9896)			
ISCTR		0,0073023	-0,0010291	-0,0081328	-0,0018386	0,0075	0,9995	398
	t Stat	(2,1151)	(-0,2233)	(-1,5809)	(-0,4486)			
	P-value	(0,0350)	(0,8234)	(0,1147)	(0,6539)			
MIGRS		0,0001388	0,0037862	0,0020458	-0,0005977	0,0016	0,2099	398
	t Stat	(0,0445)	(0,6685)	(0,3646)	(-0,1103)			
	P-value	(0,9645)	(0,5042)	(0,7156)	(0,9123)			
NETAS		0,0030764	-0,0030335	-0,0014501	-0,0002909	0,0021	0,2810	398
	t Stat	(1,5885)	(-0,8824)	(-0,3609)	(-0,0795)			
	P-value	(0,1130)	(0,3781)	(0,7184)	(0,9367)			
PETKM		0,0003410	-0,0024120	0,0007130	-0,0029719	0,0026	0,3419	398
	t Stat	(0,1670)	(-0,6655)	(0,1750)	(-0,7464)			
	P-value	(0,8675)	(0,5061)	(0,8612)	(0,4559)			
PTOFS		-0,0021814	0,0015531	0,0019877	-0,0018206	0,0029	0,3868	398
	t Stat	(-1,1165)	(0,4862)	(0,5389)	(-0,5414)			
	P-value	(0,2649)	(0,6271)	(0,5903)	(0,5886)			
SISE		-0,0001080	0,0003576	0,0065225	0,0048665	0,0095	1,2604	398
	t Stat	(-0,0500)	(0,0987)	(1,6579)	(1,2123)			
	P-value	(0,9601)	(0,9214)	(0,0981)	(0,2261)			
THYAO		0,0035609	0,0029087	0,0052921	-0,0016637	0,0053	0,6982	398
	t Stat	(1,6721)	(0,7301)	(1,1670)	(-0,3567)			
	P-value	(0,0953)	(0,4658)	(0,2439)	(0,7215)			
TNSAS		0,0019742	-0,0012939	0,0010316	0,0005945	0,0007	0,0933	398
	t Stat	(0,8980)	(-0,3379)	(0,2462)	(0,1388)			
	P-value	(0,3698)	(0,7356)	(0,8056)	(0,8897)			
TUPRS		-0,0029402	-0,0029880	0,0039802	0,0029176	0,0086	1,0883	398
	t Stat	(-1,1518)	(-0,7313)	(1,0190)	(0,8010)			
	P-value	(0,2501)	(0,4650)	(0,3088)	(0,4237)			
VESTL		0,0027876	-0,0032909	-0,0003247	-0,0040194	0,0047	0,6168	398
	t Stat	(1,2320)	(-0,8811)	(-0,0855)	(-1,1677)			
	P-value	(0,2187)	(0,3788)	(0,9319)	(0,2436)			
YKBNK		0,0001969	-0,0048000	0,0020298	-0,0012357	0,0049	0,6535	398
	t Stat	(0,0617)	(-0,9997)	(0,4256)	(-0,2910)			
	P-value	(0,9509)	(0,3181)	(0,6706)	(0,7712)			

[a] The null hypothesis can not be rejected at α= %5 significance level. T-stats and P-values are reported under the coefficient estimates in paranthesis. Also reported are the adjusted R-square, the F-statistics, 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 adjusted R-square, low F-values and high P-values are observed in this period.

However, using the coefficients of the variables for some stocks presented in Tables 7a and 7b, we can comment on possible indications of close-end price manipulation. Expected positive signs of D_{buy} before the close and negative signs of D_{buy} after the close, expected negative signs of D_{sell} before the close and positive signs of D_{sell} after the close, expected positive signs of D_{both} before the close and negative signs of D_{both} after the close largely observed in the ISE National-30 Index Stocks.

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 Results before the close for the second period (13.8.2001 – 29.3.2002)

These results appear in Table 8a. The intercept for most of the stocks, except for ISCTR, is positive. 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.

Positive signs D_{buy} is observed in stocks AKCNS, ALARK, DOHOL, EFES, FROTO, MIGRS, NETAS, PETKM, PTOFS, TNSAS, YKBNK. Negative signs of D_{Sell} is observed in stocks AKCNS, ALCTL, ARCLK, BAGFS, EFES, ENKA, EREGL, FROTO, ISCTR, PTOFS, SISE, TNSAS, TUPRS. Positive signs of D_{Both} is observed in stocks AKCNS, AKGRT, ARCLK, DOHOL, EREGL, HURGZ, MIGRS, PETKM, TUPRS.

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

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
AKCNS		0,0018911	0,0034350	-0,0008716	0,0021385	0,0229	1,1579	151
	t Stat	(1,5996)	(1,6315)	(-0,2993)	(0,9132)			
	P-value	(0,1118)	(0,1049)	(0,7651)	(0,3626)			
AKGRT		0,0047483	-0,0033307	0,0030010	0,0059339	0,0181	0,9151	151
	t Stat	(5,2441)	(-0,8167)	(0,6837)	(1,2385)			
	P-value	(0,0000)	(0,4154)	(0,4952)	(0,2175)			
ALARK		0,0052206	0,0025218	0,0030156	-0,0137961	0,0476	2,4983	151
	t Stat	(5,1668)	(0,5883)	(0,5620)	(-2,5712)			
	P-value	(0,0000)	(0,5572)	(0,5749)	(0,0111)			
ALCTL		0,0051137	-0,0030401	-0,0043541	-0,0001375	0,0088	0,4443	151
	t Stat	(4,4122)	(-0,7035)	(-0,9594)	(-0,0250)			
	P-value	(0,0000)	(0,4828)	(0,3389)	(0,9801)			
ARCLK		0,0061763	-0,0048500	-0,0113705	0,0149554	0,0577	3,0589	151
	t Stat	(4,6799)	(-1,1459)	(-1,6581)	(2,1808)			
	P-value	(0,0000)	(0,2537)	(0,0994)	(0,0308)			
BAGFS		0,0066170	-0,0004866	-0,0066170	-0,0030572	0,0062	0,2679	151
	t Stat	(6,7092)	(-0,0879)	(-0,6049)	(-0,6711)			
	P-value	(0,0000)	(0,9301)	(0,5463)	(0,5033)			
DOHOL		0,0036471	0,0041061	0,0019158	0,0017569	0,0082	0,3474	151
	t Stat	(1,0908)	(0,9760)	(0,3624)	(0,4512)			
	P-value	(0,2774)	(0,3309)	(0,7177)	(0,6526)			
EFES		0,0038468	0,0005385	-0,0021976	-0,0029340	0,0092	0,4027	151
	t Stat	(2,5726)	(0,1949)	(-0,7187)	(-0,7766)			
	P-value	(0,0112)	(0,8458)	(0,4736)	(0,4388)			
ENKA		0,0090298	-0,0021402	-0,0050302	-0,0002669	0,0068	0,3408	151
	t Stat	(7,8113)	(-0,3486)	(-0,9627)	(-0,0475)			
	P-value	(0,0000)	(0,7278)	(0,3372)	(0,9622)			
EREGL		0,0071821	-0,0001279	-0,0002979	0,0021567	0,0018	0,0791	151
	t Stat	(6,1471)	(-0,0329)	(-0,0414)	(0,4786)			
	P-value	(0,0000)	(0,9738)	(0,9671)	(0,6330)			
FROTO		0,0083260	0,0006234	-0,0042845	-0,0022304	0,0074	0,3731	151
	t Stat	(7,6037)	(0,1857)	(-0,9561)	(-0,3979)			
	P-value	(0,0000)	(0,8529)	(0,3406)	(0,6912)			

(continues)

Table 8a. (continued)

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
HURGZ		0,0039625	-0,0012465	0,0016395	0,0055610	0,0254	0,9310	151
	t Stat	(1,6742)	(-0,3256)	(0,3934)	(1,3976)			
	P-value	(0,0970)	(0,7453)	(0,6948)	(0,1651)			
ISCTR		-0,001107	-0,0033058	-0,0010316	-0,0026479	0,0104	0,4502	151
	t Stat	(-0,4127)	(-0,9651)	(-0,3052)	(-0,8711)			
	P-value	(0,6805)	(0,3363)	(0,7607)	(0,3853)			
MIGRS		0,0019627	0,0029799	0,0073517	0,0024767	0,0442	2,3135	151
	t Stat	(1,5018)	(1,2134)	(2,5524)	(0,8433)			
	P-value	(0,1352)	(0,2269)	(0,0117)	(0,4004)			
NETAS		0,0036473	0,0018633	0,0040438	-0,0006250	0,0150	0,7597	151
	t Stat	(2,5483)	(0,7752)	(1,2706)	(-0,2261)			
	P-value	(0,0118)	(0,4395)	(0,2058)	(0,8215)			
PETKM		0,0038648	0,0063892	0,0060759	0,0051073	0,0361	1,6113	151
	t Stat	(3,4777)	(1,1988)	(1,6484)	(1,1241)			
	P-value	(0,0007)	(0,2328)	(0,1017)	(0,2631)			
PTOFS		0,0038389	0,0064348	-0,0146451	-0,0040204	0,0604	2,7629	151
	t Stat	(3,1783)	(1,5190)	(-2,2419)	(-0,7474)			
	P-value	(0,0019)	(0,1312)	(0,0267)	(0,4562)			
SISE		0,0069790	-0,0016932	-0,0047028	-0,0024144	0,0080	0,4033	151
	t Stat	(4,6276)	(-0,3102)	(-1,0356)	(-0,3987)			
	P-value	(0,0000)	(0,7568)	(0,3021)	(0,6907)			
THYAO		0,0028273	-0,0028968	0,0067775	-0,0063117	0,0258	1,1381	151
	t Stat	(2,6157)	(-0,7982)	(1,0083)	(-1,3112)			
	P-value	(0,0100)	(0,4262)	(0,3152)	(0,1921)			
TNSAS		0,0042759	0,0049271	-0,0044971	-0,0049945	0,0197	1,0045	151
	t Stat	(2,8634)	(1,0394)	(-1,0956)	(-0,6743)			
	P-value	(0,0048)	(0,3003)	(0,2750)	(0,5011)			
TUPRS		0,0057615	-0,0040449	-0,0030117	0,0012755	0,0093	0,4055	151
	t Stat	(3,8641)	(-0,8802)	(-0,6791)	(0,2016)			
	P-value	(0,0002)	(0,3804)	(0,4983)	(0,8405)			
VESTL		0,0075641	-0,0027670	0,0003726	-0,0014975	0,0094	0,4070	151
	t Stat	(3,6783)	(-0,8857)	(0,1193)	(-0,5522)			
	P-value	(0,0003)	(0,3774)	(0,9052)	(0,5818)			
YKBNK		0,0000411	0,0092542	0,0018455	-0,0071117	0,0644	2,9600	151
	t Stat	(0,0288)	(2,3993)	(0,4644)	(-1,4689)			
	P-value	(0,9770)	(0,0179)	(0,6432)	(0,1443)			

[a] The null hypothesis can not be rejected at α= %5 significance level. T-stats and P-values are reported under the coefficient estimates in paranthesis. Also reported are the adjusted R-square, the F-statistics, the number of observations and the degrees of freedom.

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

Our post-close results for the second period are in Table 8b. The negative intercepts on stocks AKCNS, AKGRT, ALARK, ARCLK, DOHOL, EFES, ENKA, EREGL, FROTO, HURGZ, ISCTR, MIGRS, SISE, TUPRS, VESTL observed after the close, may possibly result from the new trading system adopted by ISE after 13.8.2001. The floppy diskette order system corrects the high closing prices of the previous trading day.

Positive signs of D_{buy} observed in stocks at R_{c-15} is expected to be negative at R_{c+15}. Change in signs is observed in stocks DOHOL, MIGRS, NETAS, PTOFS, YKBNK. Negative signs of D_{sell} observed in stocks at R_{c-15} is expected to be positive at R_{c+15}. Change in signs is observed in stocks AKCNS, ALCTL, EFES, ENKA, FROTO, ISCTR, SISE, TNSAS. Positive signs of D_{both} observed in stocks at R_{c-15} is expected to be negative at R_{c+15}. Change in signs is observed in stocks AKGRT, ARCLK, DOHOL, EREGL, PETKM.

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

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
AKCNS		-0,0005280	0,0035306	0,0000579	0,0038967	0,0144	0,7187	151
	t Stat	(-0,3036)	(1,1397)	(0,0135)	(1,1310)			
	P-value	(0,7619)	(0,2562)	(0,9892)	(0,2599)			
AKGRT		-0,0017867	0,0061806	0,0054103	-0,0013094	0,0100	0,4999	151
	t Stat	(-1,2401)	(0,9524)	(0,7746)	(-0,1718)			
	P-value	(0,2169)	(0,3424)	(0,4398)	(0,8639)			
ALARK		-0,0012887	0,0014452	0,0047046	0,0111914	0,0180	0,9181	151
	t Stat	(-0,9429)	(0,2492)	(0,6482)	(1,5419)			
	P-value	(0,3473)	(0,8035)	(0,5179)	(0,1252)			
ALCTL		0,0024601	-0,0065441	0,0052889	0,0057856	0,0167	0,8492	151
	t Stat	(1,5042)	(-1,0733)	(0,8259)	(0,7458)			
	P-value	(0,1346)	(0,2849)	(0,4102)	(0,4569)			
ARCLK		-0,0008746	0,0077094	0,0082868	-0,0019293	0,0194	0,9895	151
	t Stat	(-0,5259)	(1,4454)	(0,9590)	(-0,2233)			
	P-value	(0,5997)	(0,1504)	(0,3391)	(0,8236)			
BAGFS		0,0003111	0,0080925	-0,0003111	-0,0031447	0,0114	0,4963	151
	t Stat	(0,2344)	(1,0863)	(-0,0211)	(-0,5129)			
	P-value	(0,8151)	(0,2794)	(0,9832)	(0,6089)			
DOHOL		-0,0015164	-0,0011939	0,0029524	-0,0007362	0,0033	0,1374	151
	t Stat	(-0,3240)	(-0,2027)	(0,3989)	(-0,1351)			
	P-value	(0,7465)	(0,8397)	(0,6906)	(0,8928)			
EFES		-0,0034500	0,0035997	0,0111998	0,0145039	0,0562	2,5781	151
	t Stat	(-1,3198)	(0,7453)	(2,0952)	(2,1959)			
	P-value	(0,1892)	(0,4574)	(0,0381)	(0,0299)			
ENKA		-0,0053822	-0,0095348	0,0052449	0,0127090	0,0126	0,6358	151
	t Stat	(-2,1749)	(-0,7256)	(0,4689)	(1,0557)			
	P-value	(0,0312)	(0,4692)	(0,6398)	(0,2928)			
EREGL		-0,0028023	0,0020149	-0,0025130	-0,0013576	0,0020	0,0850	151
	t Stat	(-1,6854)	(0,3639)	(-0,2452)	(-0,2117)			
	P-value	(0,0943)	(0,7165)	(0,8067)	(0,8327)			
FROTO		-0,0033224	0,0001006	0,0067427	0,0070430	0,0109	0,5525	151
	t Stat	(-2,0317)	(0,0201)	(1,0075)	(0,8414)			
	P-value	(0,0440)	(0,9840)	(0,3153)	(0,4015)			

(continues)

Table 8b. (continued)

Stocks		Intercept	D-Buy	D-Sell	D-Both	Adj.R. Sqr.	F Value	N/df
HURGZ		-0,0001842	0,0027169	-0,0000281	0,0013856	0,0046	0,1653	151
	t Stat	(-0,0704)	(0,6424)	(-0,0061)	(0,3152)			
	P-value	(0,9440)	(0,5220)	(0,9951)	(0,7532)			
ISCTR		-0,0046592	0,0100609	0,0115164	0,0155401	0,0527	2,3909	151
	t Stat	(-0,8979)	(1,5189)	(1,7623)	(2,6437)			
	P-value	(0,3709)	(0,1312)	(0,0804)	(0,0092)			
MIGRS		-0,0007061	-0,0003824	0,0017836	0,0035826	0,0074	0,3745	151
	t Stat	(-0,4120)	(-0,1187)	(0,4722)	(0,9302)			
	P-value	(0,6809)	(0,9056)	(0,6374)	(0,3537)			
NETAS		0,0030942	-0,0060236	-0,0000494	-0,0047859	0,0282	1,4490	151
	t Stat	(1,5906)	(-1,8438)	(-0,0114)	(-1,2737)			
	P-value	(0,1138)	(0,0672)	(0,9909)	(0,2047)			
PETKM		0,0002787	0,0002444	0,0024063	-0,0008393	0,0017	0,0743	151
	t Stat	(0,1708)	(0,0312)	(0,4446)	(-0,1258)			
	P-value	(0,8647)	(0,9751)	(0,6574)	(0,9001)			
PTOFS		0,0019516	-0,0109617	-0,0068156	-0,0009187	0,0337	1,5016	151
	t Stat	(1,2504)	(-2,0026)	(-0,8074)	(-0,1322)			
	P-value	(0,2134)	(0,0473)	(0,4209)	(0,8951)			
SISE		-0,0029209	0,0049900	0,0084466	0,0047898	0,0169	0,8579	151
	t Stat	(-1,4863)	(0,7015)	(1,4273)	(0,6069)			
	P-value	(0,1393)	(0,4841)	(0,1556)	(0,5448)			
THYAO		0,0013639	0,0044690	-0,0010281	0,0133947	0,0250	1,1048	151
	t Stat	(0,7686)	(0,7501)	(-0,0932)	(1,6951)			
	P-value	(0,4435)	(0,4545)	(0,9259)	(0,0925)			
TNSAS		0,0005219	0,0065129	0,0059101	0,0064937	0,0038	0,1897	151
	t Stat	(0,1309)	(0,5148)	(0,5395)	(0,3285)			
	P-value	(0,8960)	(0,6075)	(0,5904)	(0,7430)			
TUPRS		-0,0001771	0,0027066	-0,0059749	0,0033680	0,0138	0,5996	151
	t Stat	(-0,0967)	(0,4795)	(-1,0970)	(0,4335)			
	P-value	(0,9231)	(0,6324)	(0,2747)	(0,6654)			
VESTL		-0,0032548	0,0034757	-0,0004692	0,0032431	0,0091	0,3933	151
	t Stat	(-1,0156)	(0,7139)	(-0,0964)	(0,7674)			
	P-value	(0,3117)	(0,4766)	(0,9234)	(0,4443)			
YKBNK		0,0026344	-0,0123075	0,0047813	0,0076603	0,0521	2,3646	151
	t Stat	(1,2278)	(-2,1182)	(0,7986)	(1,0503)			
	P-value	(0,2218)	(0,0361)	(0,4260)	(0,2956)			

[a] The null hypothesis can not be rejected at α= %5 significance level. T-stats and P-values are reported under the coefficient estimates in paranthesis. Also reported are the adjusted R-square, the F-statistics, 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 adjusted R-square, low F-values and insignificant coefficients are 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 price manipulation. Expected positive sings of D_{buy} before the close and negative signs of D_{buy} after the close, expected negative sings of D_{sell} before the close and positive signs of D_{sell} after the close, expected positive sings of D_{both} before the close and negative signs of D_{both} after the close largely observed in the ISE National-30 Index Stocks.

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 manipulation appears to occur on the sell side. One of the reasonable explanation of this change could be the Financial Crisis of November, 2000 and February, 2001 in the Turkish Economy, where the speculative attacks on listed shares with in this crisis period decrease the percentage of shares owned by foreigners in the ISE. Furthermore, the general index of stock market prices lost more than half of its value in a very short time. Hot money outflows plummeted the share prices and sudden capital outflow that creates financial crisis, which results in a part of the macroeconomic crisis.

6 - Conclusion

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

Day-end prices of the selected stocks increase at close in the ISE. Mean returns at close started to reverse after the change in the trading system of the 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 decrease 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 even after the trading system change.

This is the first close-end price manipulation study in the ISE. We also try to find out whether the daily largest traders in the ISE attempt to manipulate the closing prices in the last minute of trade. We use 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 considered.

Even though the statistical results are weak and insignificant in many stocks, close-end price manipulation through big buyers and big sellers appears possible in the ISE. High close-end returns, some significant 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 attempts at the close could be masked by the large volumes of buy and sell orders effected by 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 selected stocks.

There may also be some other explanations rather than close-end price manipulation for this price movement, according to Madhavan, Richardson and Roomans (1997), the reasons for the increase in prices at the end of the day; may be the announcement of new information to public, information based order flow, accumulated orders during the day, market makers effort to control the price of the stocks they posses, insider information, arrival of date of maturity for time deposits and cancellation of contracts, concentration of brokers on buy-sell transaction at the closing time of the market.

According to Block, French and Maberly (2000) institutional investors are the reason for the high return at the start and close of the market. Institutional investors give their orders more frequently in the following 30 minutes after the open and 30 minutes before the close of the market.

As mentioned in Section 5, some trading investors in the ISE try to manipulate movements on closing price by using brokers or through their mediation. As long as the closing price is used as a performance measure, the continuation of such movements is inevitable.

In order to prevent the realized unsystematic and extreme price movements in closing sessions and decrease the volatility supporting these increases when considering the above mentioned findings it is beneficial to go through how closing price mechanism is needed to be arranged in the ISE. In this subject the most suitable and radical solution method would be to put a closing session method into action that arrange closing price formation.

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