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THE EFFECTS OF POLITICAL AND ECONOMIC NEWS ON THE INTRADAILY
PERFORMANCE OF THE ISTANBUL STOCK EXCHANGE

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September 2004

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ABSTRACT

THE EFFECTS OF POLITICAL AND ECONOMIC NEWS ON THE INTRADAILY PERFORMANCE OF THE ISTANBUL STOCK EXCHANGE

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This study aims to analyze the immediate effects of political and economic news on the intradaily performance of the ISE100 stock index. For the period between August 1, 2002 and March 31, 2003, both domestic and foreign news are collected from the Reuters Turkish language news service and divided into four main categories and 44 sub-categories. First using an event study methodology, parametric and non-parametric tests are employed to compare the ISE100 index returns in the 5-minute frequency during the event window of the news to a control sample, which contains returns of intervals with no news. Second, six GARCH (1,1) models are estimated using returns in the 15-minute frequency, with dummy variables representing seasonal factors and news categories. Overall, political news are found to increase significantly both mean and variability of returns. Among the individual sub-categories, the findings indicate that news about the Iraq Crisis/War, November 2002 elections and Cyprus peace negotiations influence intradaily index returns significantly. Although no significant impact of domestic economic news is found on mean and variability of returns using the broad classification of news, specifically, news about employment, forced savings, production, budget, taxes and CBRT auctions and economic news from other countries are found to affect the returns.

Keywords: Political news, economic news, event study, intradaily returns, Istanbul Stock Exchange, seasonality, Iraq Crisis, Reuters

ÖZET

POLİTİK VE EKONOMİK HABERLERİN İSTANBUL MENKUL KIYMETLER BORSASI'NIN GÜNİÇİ PERFORMANSINA ETKİLERİ

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Bu araştırma politik ve ekonomik haberlerin İMKB100 endeksine yaptığı anlık etkileri araştırmaktadır. Reuters Türkçe haber servisinde 1 Ağustos 2002 ve 31 Mart 2003 tarihleri arasında yayınlanan yerli ve yabancı kaynaklı haberler 5 ana ve 44 alt kategoriye ayrılmış ve bu haber kategorilerinin İMKB endeksinin ortalama getirisine ve getirilerin değişkenliğine olan etkileri incelenmiştir. İlk olarak haberlerin yayınlandığı dönemi içeren 25 dakikalık olay penceresindeki getirileri, aynı sürede hiç haberin yayınlanmadığı kontrol örnek serisi ile karşılaştıran olay incelemesi metodu kullanılmıştır. İkinci metod ise 15 dakikalık endeks getirileri ile hesaplanan ve mevsimsellik ve haber kukla değişkenlerini içeren GARCH (1,1) modelleridir. Genel olarak, yabancı ve yerel politik haberlerin endeksin hem ortalama getirisine hem de de değişkenliğine artırıcı bir etkisi olduğu bulunmuştur. Alt kategoriler arasında Irak krizi, genel seçimler ve Kıbrıs barış görüşmeleriyle ilgili haberlerin günüçi endeks hareketlerine önemli bir etkisi olduğu saptanmıştır. İncelenen dönemde yabancı ve yerel ekonomik ana başlığındaki haberlerin İMKB'deki getirilere önemli bir etkisi görülmemesine rağmen, üretim, bütçe, TCMB ihaleleri ve vergi ile ilgili ekonomik haberlerin hem getirileri hem de getirilerin değişkenliğini etkiledikleri bulunmuştur. İMKB100 endeksinin yurtdışından gelen ekonomik haberlere de tepki verdiği bu çalışmada ortaya çıkan sonuçlardan bir diğeridir.

Anahtar kelimeler: Politik haberler, ekonomik haberler, olay incelemesi, günüçi getiriler, İstanbul Menkul Kıymetler Borsası, mevsimsellik, Irak krizi, Reuters

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CHAPTER 1

INTRODUCTION

Many researchers have tried to explain stock price movements with firm-specific and general economic factors. Despite some earlier studies, such as Niederhoffer (1971) and Cutler, Poterba and Summers (1989), the impact of political events on stock values has not received much attention. This may be caused by the fact that many developed countries have not experienced huge fluctuations in their financial markets in response to political predicaments. However, the research on the political factors affecting stock markets has recently been developing for politically turbulent countries like Hong Kong and Argentina (Chan and Wei, 1996; Chan, Chui and Kwok, 2001; Kim and Mei, 2001; Ganapolsky and Schmukler, 1998). The growing interest of foreign investors in emerging countries and the political risk that some of these countries pose to foreign investors have increased the interest in the impact of political factors on financial markets.

The purpose of this study is twofold: first, it is to examine the immediate effects of political and economic news on the mean and volatility of stock returns in the

Istanbul Stock Exchange (ISE) using intradaily ISE100 index returns and time-stamped news stories obtained from the Reuters Turkish News Service. The motivation for this study has been the widespread practice of linking excessive movements in the ISE to political events by the Turkish media. Are stock prices indeed vulnerable to daily political events or are these comments based on nothing? Do the investors react more to economic news or political news? If the market reacts to news, which events induce a greater impact on stock prices?

The second, purpose of this study is to see the extent to which the market's response to foreign news differs from its response to domestic news. Therefore, in addition to the economic-political distinction, the news are also classified according to whether they originate from Turkey or from foreign countries. For example, a major event like the Iraq war is expected to influence Turkey. However, since the main issue is whether the war will break out or not, we may expect that the news about Iraq from either the United States or the United Kingdom to have an impact on the ISE.

An intradaily frequency is chosen in order to identify the immediate response of the ISE stocks to news. A 15-minute frequency is chosen since many previous studies have documented that financial markets react to news within less than 15 minutes (for example Becker, Finnerty and Kopecky, 1993; Chang and Taylor, 2003; Ederington and Lee, 1993). Moreover, since the technological developments enable investors to

access news anywhere anytime, it is reasonable to assume a response in a short period. The impact of news is analyzed first using the event study methodology. However, this methodology has some shortcomings in an intradaily context since the returns data display signs of autocorrelation, volatility clustering and intradaily seasonality. Therefore, the analysis is complemented with a GARCH model estimation, which takes into account seasonality, autocorrelation and heteroskedasticity in the data.

Despite the general belief that some political developments cause excessive movements in the stock market, this study is the first intradaily analysis of the relationship between political events and the stock returns in Turkey. In addition, this study has three major attributes: first, the news classification is very detailed to capture the effects of narrower classes of news. Since not all news have an equal impact on the market, this detailed categorization enables the identification of the impact of the important news. Second, intradaily data is used to study the immediate changes in both the mean and volatility of returns in reaction to specific news categories. And thirdly, two methods are used in the analysis: an event study and a GARCH model estimation, which are used to combine their advantages and provide completeness to the analysis.

The findings suggest that political news have greater impact on mean returns than economic news. Specifically, news about the Iraq crisis/war, Cyprus and elections are found to have a significant impact on the ISE returns. In addition, the events that threaten world peace are found to be a concern for the ISE. Macroeconomic announcements and other economic news from the world also influence the stock returns in a very short period of time. Economic news about the budget, taxes and central bank auctions are identified as having a significant impact of the ISE100 index.

In the next chapter, a review of the relevant studies that examined the reaction of financial markets to various economic and political events are reviewed. The details of the ISE100 index returns and news data, and the procedure for news classification are presented Chapter 3. The event study methodology is explained and the results are discussed in Chapter 4. The seasonal characteristics of news and returns data are examined in Chapter 5. The GARCH methodology is explained and the results are discussed in Chapter 6. The results are summarized and some conclusions are presented in Chapter 7.

CHAPTER 2

LITERATURE REVIEW

Identifying the market-wide factors affecting financial markets returns has been a motivation for many empirical studies. These factors can be grouped into two: economic and non-economic. Some researchers have focused on the causal relationship between economic factors, such as growth rates and inflation, and the valuation in financial markets; some have focused on the impact of macroeconomic announcements rather than the levels of the variables themselves. Many studies have examined the instantaneous impact of these announcements on the financial markets with the availability of intradaily data. A group of researchers has turned to non-economic factors, such as political factors, to explain the movements in financial markets because of the inadequacy of macroeconomic announcements in explaining market behaviors, especially in emerging economies.

This literature review is presented under two sections, depending on whether the announcements/news under examination are economic or political. In the first section, the studies focusing on macroeconomic announcements are presented. In the

second section, the research on the effects of political and other non-economic events on the financial markets is summarized.

2.1. Economic News/Variables

There is a great body of research on the daily or hourly impact of regular macroeconomic announcements on the financial markets. These studies provide evidence regarding the market's initial reaction to these announcements rather than the long-run relationships between macroeconomic and financial variables. Such studies will be reviewed in this section.

Castanias (1979) is one of the earliest studies that examine the impact of several macroeconomic announcements, such as Federal Reserve policy, inflation and trade, on the US stock market. He finds that the arrival of information affects variability more than the mean of returns on the Standard and Poor's composite index. Furthermore, he observes that the index reacts differently to several types of economic variables. For example, variance increases on the days with Federal Reserve policy and Department of Commerce announcements but it is not affected by the Wholesale (WPI) and Consumer Price Index (CPI) announcements. He suggests that this difference can be explained by the information content of these announcements.

Cutler, Poterba and Summers (1989) analyze the impact of a larger set of macroeconomic announcements on monthly and annual stock returns. They find positive effects of real dividend surprise and industrial production on stock prices, and a negative effect of inflation announcement on market volatility. Although including lagged and led values of the macroeconomic variables in addition to their contemporaneous values in the model increases the adjusted R^2 from a maximum of 0.188 (with 12 lags) to 0.393 (with 24 lags) for the monthly regressions, they explain less than 50 percent of the variability in stock prices by public information, either economic or non-economic.

The low explanatory power of these announcements can be explained by the efficiency of the markets since the information might be incorporated into prices before their announcements. Hence, instead of actual news announcements, both Pearce and Roley (1985) and Jain (1988) examine the effect of the surprise component of macroeconomic announcements on the stock market. Using daily data, Pearce and Roley (1985) study the period 1977-1982 and find that surprises in money supply, basic discount rate and the Producer Price Index (PPI) are associated with a negative change in the stock prices. The analysis also provides evidence that the adjustment process extends to more than one business day. Using hourly data, Jain (1988) examines the period between 1978 and 1984, and finds that only the money supply and the CPI announcements are associated with a significant fall in stock

prices in the hour of the announcement, whereas the PPI, the Industrial Production and the unemployment rate announcements are found to be insignificant. The impact of money supply announcements is found to continue for more than one hour. Therefore, he concludes that the market adjusts prices within one hour after the announcements. The difference in their findings with respect to the impact of inflation announcements can be attributed to the higher variability of daily prices than that of hourly prices.

Another economic factor examined in the literature is the Federal Funds Rate, which is the main monetary policy instrument of the Federal Reserve in the United States. Bomfim (2003) finds a slight increase in stock market volatility on days when the Federal Open Market Committee (FOMC) meets to change the Federal Funds Rate. However in another study, Graham, Nikkien and Sahlstrom (2003) show that the implied volatilities calculated from daily closing values of Chicago Board of Exchange (CBOE) market volatility index (VIX) decrease significantly on FOMC announcement days. They also analyze the effects of 11 macroeconomic announcements in the United States, including CPI, PPI, employment report, productivity and cost measure, import and export price indexes and gross domestic product, on implied volatilities. They find a significant negative relationship between implied volatilities and the following announcements: employment, PPI, import and export price indexes, and productivity and cost measures. The other macroeconomic

announcements are not found to have any significant impact on the implied volatilities.

A common problem in studying the impact of macroeconomic announcements in the U.S. stock markets using intradaily data is that many of these announcements are made at 8:30 before the opening of the stock markets. Therefore, it is not possible to test this impact directly using intradaily data. Several researchers analyze foreign exchange and foreign exchange futures markets to examine the immediate effects of these announcements on financial markets. For example, Harvey and Huang (1991) examine the volatility of foreign currency futures market for the period 1986-1987 and find that higher volatilities observed on Fridays, especially at the opening, and Thursdays coincide with the timing of U.S. macroeconomic announcements. Similarly, Ederington and Lee (1993) observe volatility spikes in the T-bond, Eurodollar and DM futures markets at the 8:30 - 8:35 period only on days with any of the 19 pre-scheduled macroeconomic announcements by the US government institutions. They argue that the volatility increases cannot be explained by the opening procedure since the futures markets are already open. Therefore, their findings suggest that high volatility at the opening of the stock markets documented by previous studies (for example, French and Roll, 1986) may be caused by the macroeconomic announcements rather than the differences in the opening procedures. They also report that not all of the macroeconomic factors equally affect all of the

financial markets. For example, announcements of employment, PPI, CPI and durable goods orders are found to be significant in the interest rate futures markets and CPI, PPI, durable goods orders, retail sales, GNP and the merchandise trade announcements are found to be significant in the foreign exchange futures markets. They also observe that prices adjust to these announcements within one minute. They argue that these results may be generalized to the spot exchange rates since they are perfect substitutes.

In addition to some of the previously studied economic variables such as CPI, Tanner (1997) also examines the impact of the trade deficit on the spot Deutsche Mark/US dollar (DEM/\$) rate using both daily and hourly data for almost the same period as Ederington and Lee (1993). He finds that spot DEM/\$ rates respond to the announcements of both trade deficit and the CPI, but the reaction to the trade deficit is immediate and incorporated into prices in one hour after its release whereas it takes 3-4 hours for the CPI announcements to be incorporated into prices. The author conjectures that this delayed reaction may be caused by the lengthiness of the CPI report, which may take some time for investors to interpret.

DeGennaro and Shrieves (1997) investigate the link between macroeconomic news and exchange rate volatility for the Japanese Yen/US dollar (JPY/\$) exchange rate market, using a GARCH methodology. They classify news into three groups: (1)

regularly scheduled macroeconomic news, (2) unscheduled economic policy news and (3) unscheduled interest rate reports. They find that scheduled news are associated with an increase in exchange rate volatility for the 20-minute period following the announcement. On the other hand, unscheduled policy announcements are associated with a small but statistically significant decrease in the volatility for the 20-minutes following the announcement. This finding is consistent with Almeida, Goodhart and Payne (1998) who find a weaker relationship between the DEM/\$ exchange rate and unscheduled announcements by Bundesbank. Furthermore, they also analyze the impact of German and U.S. macroeconomic announcement surprises on the DEM/\$ exchange rate for the period between January 1992 and December 1994. They define the surprise component in announcements as the difference between the announced figures and the expectations obtained from the Money Market Services International (MMS). They find that the effects of surprises in payroll and consumer confidence announcements seem to last for up to 12 hours. They find no significant relationship between the surprises in CPI announcements and the DEM/\$ rate. On the other hand, the surprises in PPI and the unemployment announcements in Germany seem to have an impact on the DEM/\$ exchange rate after 15 minutes or later. They suggest that this late impact may be due to the Bundesbank's policy to make unscheduled announcements.

Instead of announcement surprises, Chang and Taylor (2003) investigate the effects of the number of macroeconomic announcements reported by the Reuters News Services on the volatility of DEM/\$ rate using high-frequency data for the period between October 1992 and September 1993. They classify news into four major categories: U.S. and German macroeconomic announcements, monetary policy news by the Bundesbank and US Federal Reserve, such as open market operations, the changes in German and US discount rates. After adjusting for seasonality in the intradaily foreign exchange data, they estimate a total of five GARCH (1,1) models, one with total news as the information proxy and with the rest of the four categories separately. The analysis is carried out with various intradaily intervals, namely 5, 10, 15, 30 minutes and 1 hour in order to assess the effects of news over different periods. They find that total news has a significant impact on the DEM/\$ exchange rate volatility for 5 minute intervals. Overall, macroeconomic announcements by both Bundesbank and the Federal Reserve are significant in explaining the volatility of the DEM/\$ exchange rate for the 15-minute intervals whereas only monetary policy news related to the Bundesbank seem to have an impact on the DEM/\$ rate volatility for 10, 15 and 5-minute intervals.

Melvin and Yin (1998) show the importance of adjusting for seasonality to obtain reliable results. They examine the impact of news headlines about the U.S, Germany and Japan reported by the Reuters Money Market Headline news screen on the

volatility of DEM/\$ and JPY/\$ exchange rates. They estimate a GARCH (1,1) model with information arrival. They find that although a significant relationship between volatility and information arrival is observed in the seasonality unadjusted model, no significant relationship is obtained with seasonal adjustment.

In addition to scheduled macroeconomic announcements, Ederington and Lee (2001) consider recent past volatilities (ARCH effects) and seasonality patterns to explain the intraday volatility of the DEM/\$ exchange rate, Eurodollar and Treasury bond markets. They find that intraday predictive power is significantly improved when these sources of volatility are employed as additional variables. However, scheduled macroeconomic announcements turn out to be the most important factors in explaining intradaily volatility in all three markets.

The impact of macroeconomic announcements is also examined for the bond and bond futures markets. The change in the trading hours of the Chicago Board of Trade (CBOT) for T-bonds, from 9:00 a.m. to 8:20 a.m. enables Becker, Finnerty and Kopecky (1993) to test whether high volatility at the opening is caused by the opening procedure or by the U.S. macroeconomic announcements. When the trading hours were extended to include the 8:30 announcement period, the high volatility at the opening of the bond market disappears but a period of significantly high volatility is observed for the 8:30-8:45 interval. So, their findings support Ederington and Lee

(1993): the announcements of macroeconomic variables and not the opening procedure is the cause of high opening volatility. Furthermore, they find an increase in the volatility of the Gilt futures returns in the U.K during the 11:30-11:45 interval, the period at which U.K macroeconomic announcements are usually made.

There are also some studies that examine the effects of macroeconomic announcements for the other markets, in addition to the U.S. and U.K. Most of these studies have taken into account both domestic and foreign announcements. For example, Kim and In (2002) study the impact of foreign (U.K., U.S., and Japan) and Australian macroeconomic announcements on the volatility of Australian stock and futures markets. Only the U.S. CPI and Australian GDP announcements are found to have significant impact on mean returns in the futures market. They document that the volatility of the futures and stock markets increase in reaction to different types of news. Although the conditional volatility of the futures market increases in response to the Australian employment announcement, the U.S. and Australian GDP announcements increase the volatility in the stock market.

A distinct study about the impact of a certain class of economic news is by Hayo and Kutan (2001). They examine the reaction of stock returns to IMF related events in six emerging countries (not including Turkey) using panel data. They categorize IMF news into 13 classes, such as loan approvals and IMF visits. They find that none of

the individual categories has a significant impact on either returns or volatility, except “delays in loans” which has a significantly negative impact.

In addition to the behavior of returns, the impact of macroeconomic announcements on the investor behavior is also examined. Nofsinger (2001) aims to identify the differences between the trading behaviors of individual and institutional investors in response to good and bad firm-specific and macroeconomic news. He observes a slightly different reaction by individual and institutional investors in the NYSE. Good macroeconomic announcements are found to induce higher purchases by both individual and institutional investors, but individual investors purchase significantly more than institutional investors. However, in the case of bad news, increase in sales is only observed for institutional investors. This difference may be explained by the time and expertise required for interpreting economic news. Institutional investors can be considered as professional investors and they can judge good or bad news better and faster than individuals.

2.2. Political News

Despite the literature’s emphasis on macroeconomic news in the determination of asset prices, some studies have taken a different approach and included political news and world events in their analysis to see whether these variables influence financial

markets. An earlier study is by Niederhoffer (1971). He employs a content analysis to identify the distributional characteristics of large headlines in major newspapers. He examines how these headlines affect the stock market index in the U.S. for the period 1950-1966. He groups New York Times headlines into 19 categories, such as “peace meeting”, “change in foreign leadership”, and “election”. He observes seasonality in the daily and monthly distribution of large headlines: there are more headlines than expected in July through November and less than expected in the other months of the year. There are less news than expected on Monday and during weekends, whereas the highest number of large headlines is observed on Wednesdays. He also detects an autocorrelation in the number of large headlines on consecutive days. When the events are coded on a 7-point good-bad scale, the results indicate that good and bad news cluster on consecutive days. Another finding is the tendency of large price increases (decreases) to be followed by large price increases (decreases) rather than large price decreases (increases). This pattern seems to persist for days with world events. Furthermore, prices are found to increase on the second day following “bad” world events. The same behavior is observed when the presidential illnesses are analyzed separately as an example of “bad news.” The market seems to react negatively to bad news on the first day and to recover in the five days following the event. He concludes that the market overreacts to bad news. He finds no relationship between the other classes of news and the changes in the stock index.

Reilly and Drzycimski (1975) analyze the reaction of close-to-open and open-to-close volatility in the Dow Jones Industrial Average to favorable and unfavorable political events, such as the assassination of President Kennedy, for the period between 1955 and 1973. The results show that close-to-open price changes following favorable (unfavorable) events are positive (negative), however, the open-to-close price changes on the day after the events are negative (positive). That is, price increases/decreases following favorable/unfavorable news are reversed in the following day, suggesting overreaction by investors. They conclude that hasty investors bear losses by buying high when favorable events occur and selling low when unfavorable events take place. They also document that the initial reaction and price adjustment actually take less than a couple of days for both favorable and unfavorable events.

Cutler, Poterba and Summers (1989) investigate whether non-economic events (military and international conflicts) explain the variability of monthly stock returns for the 1926-1985 period and that of annual returns for the 1871-1986 period. The sample of world events is obtained from "Chronology of Important World Events" listed in the World Almanac. They observe little change in mean returns following world events, but the standard deviation is found to be considerably higher. However, when large price changes are matched to an event, they find that most of the large price changes occurred on the days with no significant news. They conclude that only

less than half of the variability in stock prices can be explained by public information, economic or non-economic.

In addition to the U.S. stock markets, the effects of specific types of political events are analyzed for the Hong Kong market by several researchers. Hong Kong is an “ideal ground” to examine the relationship between political events and stock prices, probably because Hong Kong is, like Turkey, a politically active country. Chan and Wei (1996) focus on the Sino-British confrontation news and investigate the effects of these news on the volatility of the stock market using a GARCH-M model. They find that event days are associated with higher volatility and higher return for the Hang Seng index. Kim and Mei (2001) choose three political news categories, namely democracy issues in Hong Kong, human rights developments and most favored-nation trade status of China, and investigate whether these events have an effect on the stock market volatility. They identify jump dates using a components-jump volatility filter and attempt to match these jump dates with the occurrence of political events. They define political risk dummy variables that take the value one when there is a news story in the Wall Street Journal or the New York Times, about one of the three designated news classes and zero otherwise. Out of 71 jump dates, 32 of them are significantly associated with a political risk dummy variable. The regression analysis shows a significant relationship between political risk variables

and volatility in the stock market. Furthermore, bad news are found to increase volatility more than good news.

Whether economic and political news have different impacts on the trading activity in the Hong Kong market is examined by Chan, Chui and Kwok (2001). They define salient news as those appearing on the front pages of the four major newspapers in Hong Kong. Their sample includes a total of 34 pieces of salient news of which 23 are political and the rest are economic. They find that market volatility is lowest on the days with political events compared to the volatility in the economic events and no-event days. On the next days of political events, volatility is still lower than a no-event day. On the other hand, volatility is similar to a no-event day on the next day of economic events. These findings indicate that it takes more time for investors to interpret the implications of political news than economic news. They propose an information quality argument to explain these findings: the information quality of the economic news is better than that of political news, therefore economic news generate more trading activity on the event day. However, they do not make any seasonal adjustment even though strong intraday seasonality is documented.

The effects of news is also examined during the crisis periods. For example, Kaminsky and Schmukler (1999) identify the market jitters (large price changes) in nine Asian countries during the 1997-1998 Asian crisis and detect the kinds of news

that have the highest impact on the stock market. They find that of the news that can be associated with a market jitter, 18% are political and 16% are economic whereas 34% of the market jitters are not associated with any major news item. In terms of individual categories, news about international agreements, credit ratings and political news seem to have the highest (positive) impact. Days with no news are found to be associated with a significantly negative return. On the other hand, Ganapolsky and Schmukler (1998) study the reaction of the Argentine capital markets to the policy news by the government in order to alleviate the spillover effects following the “Tequila crisis” in Mexico in 1994. They find that the agreement with the IMF, the dollarization of reserve deposits in the central bank and changes in the reserve requirements had a positive and significant impact on mean stock market returns. In addition, the change of a minister in the government was found to reduce the volatility of the stock market in Argentina.

In addition to the stock markets, the impact of important world events on the bond market is examined for the United Kingdom, by Elmendorf, Hirschfeld and Weil (1996). They find that the variance of the bond returns on weeks with important news is higher than the variance on weeks with no major events for the period between 1900 and 1920. They also find that the probability of a very large return is higher in news weeks than no-news weeks. However, the results are not very consistent: none

of the highest return movements happened on the news week during their sample period.

Despite the frequency with which our world experiences war, there are very few studies that examine the effects of wars on financial markets. Two recent studies published around the Iraq war deal with this issue. Rigobon and Sack (2003) use news items as a proxy for the probability of war, whereas Leigh, Wolfers and Zitzewitz (2003) choose a more innovative approach and use an asset called Saddam security¹, which pays off only if Saddam Hussain is taken from power, as the proxy for the probability of war. Both studies investigate the relationship between the war probability and a number of economic variables including the stock market index (S&P 500). Rigobon and Sack (2003) find that the variances of financial variables, like S&P 500, 10-year Treasury yield and gold price, increase during “war news dates.” The variance of equity prices on the high-risk days is almost twice the variance on the low-risk days. They predict a 4% decrease in the S&P500 and 25 basis points drop in the two-year Treasury yield as a result of an increase in the war risk. Similarly, Leigh, Wolfers and Zitzewitz (2003) estimate that the S&P 500 index decreases by 1.5% in response to a 10% increase in the war risk, which means that the market will drop by 15% with the war. They find that over 30% of the variation in the S&P 500 during this period can be explained by the variation in the probability of

¹ Saddam security is traded on an online market whose participants include Wall Street investors.

war. They also investigate the relationship between the Saddam security and the returns in 44 stock markets including ISE. Turkey is found to be the country that will be affected most by the war in Iraq. Furthermore, the Turkish stock market is anticipated to decline by 6.6 percent in reaction to a 10 percent increase in the probability of war. The authors explain this reaction by Turkey's position as a United States ally and its geographical proximity to Iraq. They propose that an increase in the war risk has a negative impact on the stock markets through expectations on future earnings rather than discount rates.

A couple of studies examine the impacts of political and/or macroeconomic news as well as firm-specific news². For example, Mitchell and Mulherin (1994) use the number of firm-specific and macroeconomic news stories by Dow Jones as a proxy for public information and try to explain financial market seasonalities by the flow of information. They analyze the correlation between market activity variables and the total number of news. They find that not only returns and volatility but also the trading volume is influenced by the news arrival: The highest and statistically significant correlation of total number of news stories is observed with trading volume (0.367). The correlations between total news stories (and sub-categories of news) and other market activity variables, i.e., absolute value of market returns and

² Since this study is concerned with the market-wide impacts of news, the research that focuses on the effects of firm-specific announcements/news is not included in the literature review unless the impacts of political and or/macroeconomic news are also included as the news variables.

summed absolute value of firm-specific returns, are smaller than the correlation between news and trading volume. Regression analyses confirm the correlation results regarding the relationship between information and market activities. Overall, they fail to find a noteworthy relationship between the trading activity variables and the number of Dow Jones news stories. Therefore, they run further regressions including dummy variables (one for large New York Times headlines and one for the presence of macroeconomic announcements) to account for the importance of the news item. These two dummy variables turn out to be insignificant for the trading volume but the New York Times headline dummy variable is significant in the returns model. Overall, the relationship between total number of news items and market activity is found to be weak.

Berry and Howe (1994) conduct a similar study with intradaily trading volume and price volatility. Their information proxy is the number of news stories transmitted via Reuter's News Service, which includes macroeconomic and political news as well as firm-specific news. They fragment the trading day into 48 half-hour intervals. Overall, the intradaily pattern of information flow seems to correspond to the pattern in intradaily volatility. However, when they regress the number of information events per interval on the measure of price volatility for that interval, the coefficients are not found to be significant for any of the intervals. Including leads and lags of the information variables do not improve the results. In summary, the studies that used

the number of news events on the Reuters or Dow Jones databases as a proxy for information arrival have found a moderate to weak impact on the stock markets. One reason for these results could be the fact that there are many stale news stories on these databases, which may create a bias toward finding no relationship between the news and market activities unless stale news are sorted out.

In summary, both political and economic factors may influence the returns and volatility in the financial markets and there is no generalization about which news affect the stock markets more. However, Turkey is expected to be affected most in case of the Iraq war (Leigh, Wolfers and Zitzewitz, 2003). This study aims to analyze how the possibility of Iraq war and other political news as well as economic news affect the Turkish stock market.

CHAPTER 3

DATA

This study combines two data sets, the intradaily ISE100 index series and the news obtained from the Reuters database, to examine the impact of news on the Turkish stock market. The details of the return series and some information about the Istanbul Stock Exchange are presented in the first part of this chapter. The second part of the chapter gives the details of the procedure used to collect the news from the Reuters database and their classification.

3.1. Istanbul Stock Exchange and the ISE100 Index

The ISE100 index increased by 79.6% in 2003. The average daily trading volume also increased by 45% and market capitalization increased by 100% in 2003 as reported by the Federation of Euro-Asian Stock Exchanges (Yearbook 2003/2004). The total trading volume reached US\$ 100 billion in 2003 and the average daily volume was US\$ 407 million. As of December 2003, the total market capitalization

for the 285 listed companies in the ISE was US\$ 69 billion, out of which foreign investment constituted 13%. There is no limitation on foreign investment in ISE.

The ISE is an order-driven, continuous auction market with no market maker or specialist. Trading process is carried out through the computerized trading system. There is no pre-opening procedure. There are two trading sessions per day. The morning session is between 9:30 and 12:00. The afternoon session starts at 14:00 and trading continues until 16:30. Hence, there is a midday break between 12:00 and 14:00.

The period between August 1, 2002 and March 31, 2003 is analyzed in this study. The beginning of the sample period is determined by the availability of the intradaily ISE100 index values. The raw ISE100 index data are obtained from the ISE. The tick data consist of the values in an irregular frequency. In order to make the data usable for statistical analysis, it was converted to 5 and 15-minute frequencies.

The return for interval $j+1$ on day t , $R_{j+1,t}$, is defined as the logarithm difference of ISE100 index values between two intervals:

$$R_{j+1,t} = \ln(P_{j+1,t}) - \ln(P_{j,t})$$

where P_{jt} is the value of the ISE 100 index in interval j on day t . j takes values between 0 and 59 for the returns over 5-minute intervals and between 0 and 19 for the

returns over 15-minute intervals. In order to calculate the return on the first interval of the day, the ISE100 value at the opening is used. The preliminary tests indicate that the 5- and 15-minute returns and absolute returns of the ISE100 index are stationary but not normally distributed (see Appendix A).

Good and bad news may create opposing changes in the returns, which may cancel out each other in the analysis if no distinction is made between them. Therefore, in order to capture variations in the magnitude of the price changes, as well as their direction, the analysis is also carried out using absolute returns, which is the absolute value of the returns calculated as above.

3.2. News

Our study uses news items released by the Reuters Turkish language news service, accessed through Factiva which is available from the Bilkent University library web page. The service gives full coverage of the news stories, with the exact time stamp including the hour and the minute. Factiva classifies news items under eight headings as Economic news, Political/General news, Commodity/Financial Market news, Content Types, Corporate/Industrial news, Editor's Choice-Industrial Trends and Analysis, International Political Economic Organizations, and Sports/Recreation.

Only the first two of these headings, Political/General News and Economic News are analyzed in this study. This choice is based on the decision to focus on news that are related to the whole market instead of an individual sector or a firm.

Table 3.1. The monthly distribution of the economic and political news³

	Before Filtering		After Filtering	
	Economic News	Political News	Economic News	Political News
August 2002	219	556	124	178
September 2002	216	559	134	227
October 2002	243	485	123	207
November 2002	266	629	146	271
December 2002	286	584	163	216
January 2003	304	663	188	242
February 2003	189	531	124	208
March 2003	302	891	188	386
Total	2025	4898	1190	1935

The initial sample of news consists of all of the news stories in the Political/General and Economic news categories reported by the Reuters Turkish News Service. There were a total of 6923 news items in the sample period between August 2002 and

³ News in the “Accidents and Natural Disasters Category” are under Political news in this table.

March 2003. The monthly distribution of the news items under each category is given in Table 3.1.

Since the aim of this study is to examine the initial impact of the news items on the behavior of the ISE100 index, several restrictions are imposed on the news to be considered for analysis. First, only the original news reported by Reuters are retained. News in the Reuters service are obtained from several sources. Some of them are first-hand news such as news conferences, press releases or witnesses encountered by the Reuters reporters. However, some news are obtained from the second hand sources such as newspapers, TV, radio, or other news agencies. In this study, only the first-hand news are analyzed because the news from second hand sources may have been seen or heard by the public before their transmission by the Reuters News Service. Hence, these news might have already been incorporated into the prices.

Second, routine stories reported by Reuters that do not have an original news content are excluded from the analysis. These include restatement or wrap-up of previous events, such as news updates, “Today in Press” and “Reuters Political/Economic Agenda” sections.

Third, some interviews are excluded if they consist only of opinions about the economic facts and outcomes in Turkey. However, interviews with government

officials or spokespeople from such institutions as IMF, the World Bank or labor unions are included in the news sample. On the other hand, analysts' comments about macroeconomic announcements or various events are excluded since the focus of the study is not the examination of the impact of analysts' recommendations or interpretations.

The total number of news items in the sample is reduced from 6923 to 3125 after eliminating the stale news. Furthermore, the news that occur during the non-trading hours cannot be used in the analysis. After their exclusion, the total number of remaining news items declines to 1478.

3.3. Classification of News Items

In order to examine the impact of foreign and domestic as well as political and economic news on the behavior of ISE returns, the remaining news items were classified according to two main criteria, origin and content. Two groups are formed according to their origin: those that are originated from Turkey and those that occurred in a foreign country, related to an international organization such as NATO or United Nations (UN), and not directly related to Turkey. According to their content, the news were categorized as economic and political. Hence, these classifications result in four main types of news: "Domestic Political," "Foreign

Political,” “Domestic Economic” and “Foreign Economic.” In addition to these four main groups, there is “Accidents and Natural Disasters” category, formed for both Turkey and the rest of the world.

The distribution of news across the main categories can be better seen from the pie chart (Figure 3.1). Almost one-third of the news items in the sample are “Domestic Economic” news. “Foreign Political” and “Domestic Political” news constitute 29 percent and 27 percent of the news respectively. Less than 10 percent of the news items are classified as “Foreign Economic”. The category “Accidents and Natural Disasters” (both Turkey and Other) comprises only 2 percent of the news.

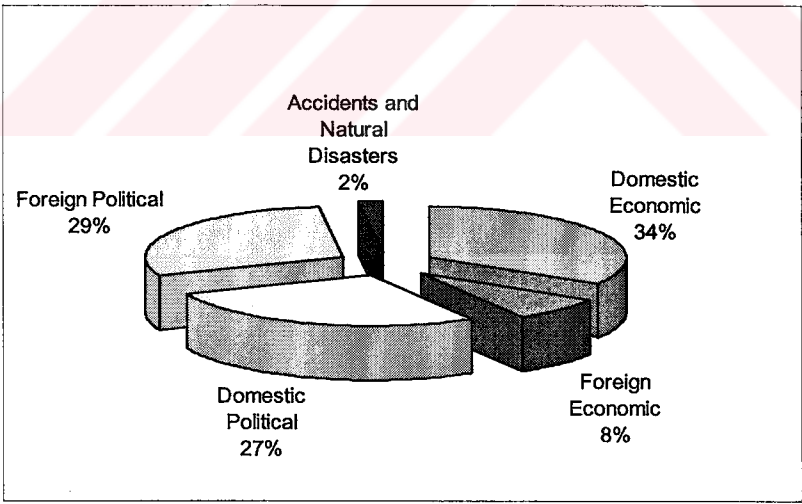


Figure 3.1. Distribution of news across categories

The news items under any of these main headings can still be quite distinct from each other and have a different impact on the market as reported in the literature review section. It is quite reasonable to expect that news about the Iraq war to affect the Turkish stock market more than the elections in Pakistan (Leigh, Wolfers and Zitzewitz, 2003), although both news classes are under the “Foreign Political” main heading. Therefore, in order to capture the diversities in the news data, the news items were further categorized according to their content. Since the literature contains very few similar studies, the classification scheme at this stage has been quite subjective in nature. The main idea is to construct categories that are small enough to be meaningful and large enough to allow statistical testing. Overall there are 44 news categories constructed out of the five major news categories. The details of each of the individual categories under the main headings are given below. The numbers of news in each of the categories and the percentage of news corresponding to the trading hours of the ISE are presented in Tables 3.2 through 3.6.

3.3.1. Domestic Economic news

Since there are previous studies that focus on macroeconomic announcements, a similar classification for the economic news is also implemented in this study. The economic news that originate from Turkey are divided into 21 categories based on their subject (Table 3.2). These sub-categories are explained as follows:

Table 3.2. The number of news items under “Domestic Economic” news category

DOMESTIC ECONOMIC NEWS				
Sub-category	Total Number of News Events	Number of News during the Non-trading hours	Final sample	Percentage of news in the final sample to the initial sample
Budget	109	47	62	57%
CBRT Auctions	27	2	25	93%
CBRT Reserves	12	0	12	100%
Credits	36	21	15	42%
Debts	39	28	11	28%
Employment	33	14	19	58%
Forced Savings	16	10	6	38%
Foreign Exchange	19	5	14	74%
General State of the Economy	43	28	15	35%
Grading	21	13	8	38%
Growth	35	16	19	54%
IMF	95	53	42	44%
Inflation	68	42	26	38%
Interest Rates	14	5	9	64%
Iraq Crisis	51	27	24	47%
Net Exports and Current Account	67	34	33	49%
Production	32	7	25	78%
Taxes	62	32	30	48%
Treasury Auctions	138	73	65	47%
Wage/Salary Determination	32	13	19	59%
Other	34	18	16	47%
Total	983	488	495	50%

- (i) Budget – news about the preparation of the new budget, additional or temporary budgets, statement of the targets for the individual elements in the budget, negotiations in the commission, budget proposals and deficits.
- (ii) Central Bank of the Republic of Turkey (CBRT) Auctions – announcements of CBRT foreign exchange and TL deposit auctions, maximum interest rates determined in these auctions.
- (iii) CBRT Reserves – news announcing the current level of U.S. Dollar, TL and international reserves maintained by the CBRT.
- (iv) Credit – news about the status of credits from the World Bank, European Union or other foreign institutions, American aid to Turkey conditional on her involvement in the operation in Iraq.
- (v) Debts – news about the status of domestic/foreign debt stock, domestic/foreign debt service, domestic/foreign debt redemption schedule, treasury financing balance, government statements regarding the structure of debts.
- (vi) Employment – news about the employment law, arrangements in the retirement pensions, changes in the retirement age, social security and unemployment announcements by the State Institute of Statistics (SIS).
- (vii) Forced Savings – news of the current amount of forced savings and the plan of their repayment by the government.

- (viii) Foreign Exchange –survey results on the expectations about TL/\$ exchange rate, official statements and comments regarding the movements in foreign exchange rates, CBRT intervention in the foreign exchange markets and other foreign exchange operations.
- (ix) General state of the economy – comments and news about the general state of the economy and some specific aspects of the economy. News about the possible effects of the elections on the Turkish economy are also included in this category.
- (x) Grading – re-evaluations of Turkey by international grading institutions, their comments and expectations regarding the possible reaction of Turkish economy to the crisis in Iraq.
- (xi) Growth – growth related announcements such as GNP by the SIS, and results of CBRT expectation surveys.
- (xii) IMF – IMF related news such as meetings and negotiations with the IMF, revisions in the program, IMF reviews, program targets, requirements and their achievement, statements by Turkish and IMF officials about the current and future economic performance in Turkey.
- (xiii) Inflation – announcement of WPI and CPI by the SIS, details of the changes in these indices, results of the CBRT expectations survey on inflation, statements about target inflation rate and its achievement, factors that might influence inflation rate.

- (xiv) Interest Rates – announcements of changes in interest rates by the CBRT, results of expectation surveys on the interest rates on both domestic and foreign currency deposits and comments on interest rate movements by government officials.
- (xv) Iraq Crisis – news about the possible impacts of the operation in Iraq on the Turkish economy, oil supply from Iraq, the cost of the operation to Turkey, negotiations with the US on the aid package in the event of the operation in Iraq.
- (xvi) Net Exports and Current Account – news about foreign investment in Turkey, trade negotiations, announcements of foreign trade figures, such as actual and expected imports and exports, foreign trade deficit and current accounts balance by the CBRT.
- (xvii) Production – Announcements of total industrial production, employment in the manufacturing sector, number of employees in production by the SIS, statements about the actual production figures.
- (xviii) Taxes – news about new tax laws, additional taxes, tax refund, auditing, tax reform and inflationary accounting.
- (xix) Treasury Auctions and Bond Issues – news of Treasury bill auctions, government bond issues, forecasted and actual interest rates on T-bills, treasury bond sales, net sales from non-competitive bid sales, amount of public offering, dates of coupon payments on the government bonds.

- (xx) Wage/Salary Determination – news about the determination of increases in the salaries of civil servants, negotiations with unions, the determination of minimum wage rate by the government.
- (xxi) Other Macroeconomic Indicators and News – economic news that are not classified into any of the above categories, such as announcements of the number of newly established firms and the number of automobiles sold, etc.

3.3.2. Foreign Economic News

Economic news originating from foreign countries, international organizations such as the IMF that are not directly related to Turkey are classified as “Foreign Economic” News category. The news items include major macroeconomic announcements, the state of the economy in foreign countries and the movements in their stock markets. There is also a sub-category named “General” that includes news about the world economy such as gold value, or oil prices.

These news are classified according to their region and not according to the type of the announcement. Initially, five subcategories are formed: Europe, United States, Latin America (mostly Brazil and Argentina) and Far East (Japan and China) and General. However, the elimination of news during the non-trading hours reduced the number of news items in the last two regions and the general category significantly.

Hence, news under Latin America and Far East and general sub-categories are included under the “Other” sub-category. Table 3.3 shows the distribution of “Foreign Economic” news under the three sub-categories.

Table 3.3. The number of news items under “Foreign Economic” news category

FOREIGN ECONOMIC NEWS				
Sub-category	Total Number of News Events	Number of News during the Non-trading hours	Final sample	Percentage of news in the final sample to the initial sample
Europe	77	37	40	52%
US	107	42	65	61%
Other (Far East, Latin America, General)	23 (7,6,10)	12 (2,3,7)	11 (5,3,3)	48%
Total	207	91	116	56%

3.3.3. Domestic Political News

News about Turkish politics are classified as “Domestic Political” news. The sample period was rich in terms of political events because of conflicts in the coalition government, new elections, operation in Iraq, and involvement with European Union. “Domestic Political” news are grouped into 12 sub-categories (Table 3.4):

Table 3.4. The number of news items under “Domestic Political” news category

DOMESTIC POLITICAL NEWS				
Sub-category	Total Number of News Events	Number of News during the Non-trading hours	Final sample	Percentage of news in the final sample to the initial sample
After-Elections	71	41	30	42%
Cyprus	130	77	53	41%
Elections	94	53	41	44%
European Union	167	84	83	50%
Foreign relations	33	20	13	39%
Government Conflicts	33	16	17	52%
Government Formation	44	25	19	43%
Iraq Crisis	217	131	86	40%
Iraq War	47	31	16	34%
Union of the Left-Wing Parties	38	22	16	42%
Other (Terror)	67 (6)	35 (3)	32 (3)	48%
Total	941	535	406	43%

- (i) Cyprus –announcements of peace negotiations in Cyprus as well as comments and statements of officials from Turkey, Greece, Cyprus, European Union and UN.
- (ii) Elections – pre-election news and announcements about the election process, the activities of various groups in the Parliament to postpone the elections, possible outcomes if elections are not held.

- (iii) After-Elections – results of the general elections held on November 4, 2003, comments on these results by the elected political party members, the reactions of foreign countries and political actors to the election results.
- (iv) European Union – changes in constitutional amendments needed for the membership to the EU, negotiations for admission, meetings with the EU officials, comments and reports by Turkish and EU officials about Turkey's likelihood to become a member.
- (v) Foreign Relations – news about the state of foreign affairs.
- (vi) Government Conflicts – news about debates among the members of the coalition, resignation of some people in important positions, such as Kemal Derviş, situations that threaten the coalition.
- (vii) Government Formation - news about the formation of the government in two instances: the first is after the elections and the second is after Tayyip Erdoğan became the Prime Minister.
- (viii) Iraq Crisis/War –news about Turkey's active and passive role in a possible military operation in Iraq, possible state of refugees in case of war, the establishment of US military bases in Turkey, the voting for the permission to let the US establish their bases in Turkey. The name of this sub-category changes to Iraq War after the operation starts on March 20, 2003.

- (ix) Terror – news about terrorist attacks in Turkey by illegal groups. Because of the limited number of news during the trading hours, news in this category are combined with those under the “Other” category.
- (x) Union of Left–Wing Parties – news of efforts to unify the major left–wing parties by Kemal Derviş
- (xi) Other – includes political news that could not be classified into one of the above categories, such as cabinet meetings with no specific agenda.

3.3.4. Foreign Political News

Political events that are not initiated in Turkey are grouped under “Foreign Political News” category. Even though some of these events are directly related to Turkey, such as Iraq crisis/war, they are included in this category since these events happened outside of Turkey. Hence, the news in this category are the international political developments that happened during the sample period. Originally there are 8 sub-categories under this heading:

- (i) European Union – news about the European Union, such as its enlargement, its current members and candidates other than Turkey.
- (ii) Iraq Crisis/Iraq War – news about the Iraq crisis that are not directly related to Turkey, such as the announcements of US government about the probability and conditions of the operation, Iraq government’s challenging

responses, efforts of other countries and the UN to prevent the operation. The news related to Iraq was classified as “Iraq War” after the war started and the new category includes news about the operations in Iraq by the Allied Forces.

- (iii) Israel – Palestine Conflicts – news of the ongoing conflicts between Israel and Palestine, especially the mutual attacks against each other.
- (iv) NATO – news about NATO’s actions and decisions.
- (v) North Korea – United States Conflicts – the disagreements between North Korea and the U.S. on the nuclear weapons issue, i.e., US efforts to disarm North Korea and North Korea’s persistent rejection of any international treaty.
- (vi) Terror – news on international terrorist actions and their repercussions.
- (vii) Other confrontations – United States army air attacks on targets in Iraq (before the operation began) and Afghanistan and their reciprocal attacks.
- (viii) Other Political Events –news that do not fall into any one of the major categories, such as elections in Austria, political uncertainty in Japan.

The events in the sub-categories “European Union” and “NATO” are combined with the “Other Political Events” because of insufficient number of observations in each sub-category for statistical analysis. Hence, seven sub-categories under “Foreign Political” news are used in the analysis (Table 3.5). Some of the sub-categories, for

example Iraq Crisis/War and European Union, appear under different “Domestic Political” and “Foreign Political” main categories. This separation reflects the expectations that the news in a particular sub-category that are originated from Turkish and foreign sources may have different effects on the stock market.

Table 3.5. The number of news items under “Foreign Political” news category

FOREIGN POLITICAL NEWS				
Sub-category	Total Number of News Events	Number of News during the Non-trading hours	Final sample	Percentage of news in the final sample to the initial sample
Iraq Crisis	613	340	273	45%
Iraq War	111	78	33	30%
Israel–Palestine Conflicts	40	9	31	78%
North Korea – US Conflicts	27	9	18	67%
Terror	66	26	40	61%
Other confrontations	37	24	13	35%
Other political events (EU, NATO)	49 (10,7)	25 (7,4)	24 (3,3)	50%
Total	940	509	431	46%

3.3.5. Accidents and Natural Disasters

In addition to the four main news categories, all of the accidents and natural disasters, such as earthquakes and floods in Turkey and in the world are analyzed. These news

are sub-categorized into two: those that happened in Turkey and those occurred outside of Turkey (Table 3.6).

Table 3.6. The number of news items under “Accidents and Natural Disasters” category

ACCIDENTS AND NATURAL DISASTERS				
Sub-category	Total Number of News Events	Number of News during the Non-trading hours	Final sample	Percentage of news in the final sample to the initial sample
Turkey	17	9	8	47%
Other	37	15	22	59%
Total	54	24	30	56%

There is a tendency in Turkey to postpone important announcements to non-trading hours, which is based on the belief that financial markets are vulnerable to unexpected events. For example, Kemal Derviş announced his resignation on Saturday morning. The percentage of news events remaining in the final sample ranges between 43% and 56% for the main categories after eliminating those news that occurred during the non-trading hours. As a result, the total number of news items analyzed in this study reduces by almost 50 percent, from 3125 to 1478.

CHAPTER 4

EVENT STUDY

The aim of this study is to analyze the immediate impacts of domestic and foreign, political and economic news and their sub-categories on the ISE100 stock index using intradaily data. Two methods of analysis will be used for this purpose: an event study and a GARCH model estimation. The first part of this chapter presents the event study methodology employed in this study. In the next section, the results of the event study analysis are presented and discussed. The details of the GARCH model are presented in Chapter 6.

4.1. Event Study Methodology

An event study methodology is used in order to investigate whether political and economic news have an impact on the mean and volatility of returns and absolute returns. The analysis is carried out using the ISE100 index returns in 5-minute frequency. Using the tick data, the returns over 5-minute intervals are calculated.

In the analysis, an event is defined to be a news item reported by the Reuters agency, classified into 4 major categories and 44 sub-categories, as explained in the Data chapter. The event window is defined to be the number of 5-minute intervals before and after the event. In order to identify the reaction of stocks to the news items, no other events should occur at the same time during the event window. Hence, the determination of the length of the event window is important in an event study analysis. There is a trade-off in the selection of the length: the longer the event window, the higher the precision with which the change in the returns can be attributable to news. However, as the event window is extended, the probability of the occurrence of other news in the event window will increase, resulting in a decline in the number of observations that can be used in the analysis. For example, if the event window is specified to be two intervals, the total number of news used for analysis decreases from 1478 to 650. If the event window is increased to three intervals, then this number decreases to 463 and some of the sub-categories are left with very few observations to make a proper statistical analysis. Therefore, the event window is set to be two intervals. This makes a total of 25 minutes around the event for the analysis. The events that occurred in the first 5 minutes of trading in each session are included in the event study only if there is no other event in the non-trading period preceding the opening.

Two different types of tests are employed using event study methodology. First, the mean, median and variance of the ISE100 index returns and those of the absolute returns during the event window are compared to the mean, median and variance of a control sample. The control sample consists of intervals with no news, which are also surrounded by two intervals with no news. The first intervals of each trading session with no news are included in the control sample only if there is no event during preceding non-trading period. This series is assumed to represent the behavior of returns on the ISE100 index without any news. Therefore, this analysis will test whether the behavior of returns during the intervals with several types of news is different from those with no news.

Second, the behavior of the ISE100 index is compared before and after the events. Specifically, the cumulative returns and absolute returns in the two intervals before the events are compared with the cumulative returns and absolute returns in the two intervals after the events for each news category and sub-category.

To summarize, the event study methodology is used to test:

1. The equality of mean, median and variance of returns (absolute returns) during the event period against those of the control sample.
2. The equality of mean, median and variance of cumulative returns (absolute returns) before and after the events.

If a specific news category creates no impact on the stock market, then the mean, median and volatility of returns and absolute returns should not be significantly different from the mean, median and volatility of the control sample. Therefore, the null hypotheses can be expressed in the following way:

H₁: The mean return (absolute return) for the five 5-minute intervals surrounding a specific event category is equal to the mean of the control sample.

H₂: The median return (absolute return) for the five 5-minute intervals surrounding a specific event category is equal to the median of the control sample.

H₃: The variance of returns for the five 5-minute intervals surrounding a specific event category is equal to the variance of the control sample.

If an event has no effect on the returns, they should not display a different behavior before and after the event. Therefore, the following null hypotheses are also tested:

H₄: The mean of the cumulative returns (absolute returns) in the two intervals before the event is equal to the mean of the cumulative returns (absolute returns) in the two intervals after the event.

H₅: The median of the cumulative returns (absolute returns) in the two intervals before the event is equal to the median of the cumulative returns (absolute returns) in the two intervals after the event.

H_6 : The variance of cumulative returns (absolute returns) in the two intervals before the event is equal to the variance of cumulative returns (absolute returns) in the two intervals after the event.

The equality of means is tested using t-test. Wilcoxon/Mann-Whitney test is used to determine the equality of medians. Brown-Forsythe test is applied to examine the equality of variances. The details of the test procedures are presented in Appendix B. Parametric tests are used in the analysis to be consistent with the literature. Non-parametric tests are employed in addition to parametric tests because of non-normality in the return series as shown in Appendix A.

4.2. Event Study Results

In this section, the results of the event study analysis are presented. First, the results of the tests comparing the returns in the event window of news categories and the control sample are given. Second, the findings of tests for absolute returns are reported. Lastly, the results of tests comparing the behavior of returns before and after the events are provided.

4.2.1. Comparison of returns in the event window with the control sample

In this section, the results are given for testing whether the behavior of returns around news categories is different from that in the control sample (hypotheses H_1 , H_2 and H_3). Table 4.1 presents the results of the event study tests for returns. Each of the cells in Panels A, B and C contains the mean, median and standard deviation of returns respectively, during a 5-minute period around the event. Only the results for the main news categories are presented in this chapter. The tables containing the results for the sub-categories are given in Appendix C.

The ISE is found to react immediately to “Foreign Political” news. The mean and median returns 10-15 minutes after the release of “Foreign Political” news is found to be significantly different from the those of the control sample. There is also an immediate increase in volatility following these news. Although the mean and median of returns around “Domestic Political” news are not significantly different from those of the control sample, the standard deviation of returns increases 10-15 minutes before the appearance of these news on the Reuters screen. Interestingly, “Domestic Economic” news are not found to affect the behavior of ISE returns. However, the mean and median returns in the interval before the release of “Foreign Economic” news are significantly higher than those of the control sample.

Table 4.1. Tests of returns in the event window and the control sample⁴

Panel A – Mean returns and t-test results (Mean of the control sample: -0.0002)					
News Categories	t-2	t-1	t	t+1	t+2
Foreign Political News	-0.0002 (0.0759)	-0.0001 (0.4472)	-0.0004 (1.2551)	0.0001 (1.2005)	0.0001*** (3.3887)
Domestic Political News	0.0000 (0.7146)	0.0000 (0.5950)	0.0001 (1.2529)	0.0000 (0.5111)	-0.0002 (0.1607)
Foreign Economic News	0.0007 (1.4161)	0.0003* (1.8038)	0.0004 (1.5320)	0.0000 (0.9183)	0.0002 (1.2617)
Domestic Economic News	-0.0002 (0.2733)	-0.0003 (1.2665)	-0.0003 (0.6305)	0.0001 (1.0468)	0.0001 (1.0374)
Panel B – Median returns and Wilcoxon/Mann-Whitney test results (Median of the control sample: -0.0001)					
Foreign Political News	-0.0003 (0.1164)	-0.0001 (0.7278)	-0.0001 (0.0252)	-0.0001 (0.4099)	0.0000** (2.4490)
Domestic Political News	0.0001 (0.6439)	0.0001 (0.3933)	0.0003 (1.3262)	-0.0002 (0.2910)	0.0000 (0.0365)
Foreign Economic News	0.0005* (1.6512)	0.0001 (1.4456)	-0.0001 (1.2237)	0.0000 (0.5399)	0.0001 (0.3567)
Domestic Economic News	0.0000 (0.7810)	-0.0002 (1.0243)	-0.0004 (0.2626)	0.0001 (1.1862)	0.0000 (0.7742)
Panel C – Standard deviation of returns and Brown-Forsythe test results (Standard deviation of the control sample: 0.0031)					
Foreign Political News	0.0039** (4.2058)	0.0036 (2.4126)	0.0061*** (15.9376)	0.0061*** (10.4593)	0.0063*** (10.8622)
Domestic Political News	0.0039** (6.4788)	0.0042*** (6.7200)	0.0029 (0.2766)	0.0030 (0.0232)	0.0028 (0.6973)
Foreign Economic News	0.0029 (0.4676)	0.0027 (0.0000)	0.0029 (0.0175)	0.0032 (1.6277)	0.0040 (0.1278)
Domestic Economic News	0.0027 (1.9503)	0.0034 (0.5205)	0.0033 (0.4015)	0.0035 (1.1794)	0.0030 (0.2217)

⁴ The test statistics are given in parentheses where *, ** and *** indicate significance at 10, 5 and 1% levels respectively.

When the “Foreign Political” sub-categories are examined, mean, median and variance of returns are found to be significantly different from the control sample around many of these news, supporting the overall impact of “Foreign Political” news. For example, mean and median returns are significantly higher than those of the control sample about 15 minutes before the “Iraq War” news and about 15 minutes after the “Iraq Crisis” news and “Other Foreign Political” news (Tables C.1 and C.2 in Appendix C). Mean returns are significantly lower than the control sample roughly 10 minutes before the “Israel-Palestine Conflicts” news and during the 5-minutes around international “Terror” news. Both mean and median returns are also significantly lower about 15 minutes after the release of news in the “North Korea-US Conflicts” sub-category. Overall, “Foreign Political” news are associated with significantly higher mean and median returns than the control sample during the 10-15 minutes after the release of news in this category.

“Iraq Crisis,” “Iraq War” and “Terror” news are found to increase the variance of returns (Table C.3 in Appendix C). The increased variance lasts for at least 20 minutes after the “Iraq Crisis” news. “Other Confrontations” news are associated with a lower variance than the control sample 10-15 minutes after the news. When all of the sub-categories are combined, the variance of returns is found to be significantly higher than the control sample during the 20-25 minutes surrounding “Foreign Political” news in general.

When the sub-categories of “Domestic Political” news are examined, mean and median tests results are slightly different. The mean returns about 5-10 minutes before the news are found to be significantly higher than the control sample for “Cyprus” news and significantly lower than the control sample for “European Union” news. However, the t-statistic is only significant at the 10% level for both sub-categories. Moreover, mean return 10-15 minutes preceding the “Government Conflicts” news releases is significantly higher than the control sample. The significantly different median returns are obtained in different “Domestic Political” news categories. Median returns are significantly higher than the control sample during the 5-minutes surrounding “Union of the Left-Wing Parties” news and 10-15 minutes before the “Government Formation” news. Despite its significance in the “Foreign Political” category, Iraq Crisis/War news under the “Domestic Political” category does not affect mean and median returns significantly.

The impact of “Domestic Political” news on the volatility of returns is different across sub-categories. For example, variance of returns is significantly higher than the control sample around “After-Elections,” “Cyprus” and “Government Conflicts” news. On the other hand, variance of returns is lower around “Elections,” “European Union,” “Iraq Crisis,” “Union of the Left-Wing Parties” and “Other” political news.

Overall, “Domestic Political” news are found to have a significantly higher return variance 5-10 minutes before the release of new in this category. These findings support the conjecture that political events affect stock returns in Turkey.

Only the “Other” sub-category of the “Foreign Economic” news is found to have significantly different mean, median and variance of returns than those of the control sample; mean and median returns are higher and standard deviation of returns is lower than those of the control sample 10-15 minutes before the release of this type of news. This sub-category includes economic news about such countries as Brazil, Argentina and Japan. Overall, “Foreign Economic” news are associated with an increase in mean and median returns around the news release and no significant difference is found between the variance of returns around these news and the control sample.

Among the sub-categories of “Domestic Economic” news, news about “Budget,” “CBRT Auctions,” “CBRT Reserves,” “Taxes” and “Other Macroeconomic News and Indicators” are found to have mean and median returns that are significantly higher than the control sample for the 5-25 minutes around the news. On the other hand, “Interest Rates,” “Treasury Auctions” and “Iraq Crisis” news are associated with mean and median returns that are significantly lower than the control sample during the 10-minutes surrounding the news.

The results indicate that volatility of returns is not affected by many of the “Domestic Economic” sub-categories of news. Only the “Budget” and “Taxes” news are associated with higher return variances than the control sample and return variance is lower than the control sample around “Production” and “CBRT Auctions” sub-categories.

Overall, “Domestic Economic” news are found to induce no significant difference in mean, median and variance of returns around the news and the control sample. The insignificant impact of economic news might be explained by the analysis of actual returns.

4.2.2. Comparison of absolute returns in the event window with the control sample

In this section, the results are given for testing (hypotheses H_1 , H_2 and H_3) whether the mean, median and variance of absolute returns around news categories are different from those of the control sample. Table 4.2 presents the results of the event study tests for absolute returns. Each of the cells in Panels A, B and C contains the mean, median and standard deviation of absolute returns respectively, during a 5-minute period around the event. Only the results for the main news categories are

presented in this chapter. The tables containing the results for the sub-categories are given in Appendix C.

Table 4.2. Tests of absolute returns in the event window and the control sample⁵

Panel A – Mean absolute returns and t-test results (Mean of the control sample: 0.0022)					
	t-2	t-1	t	t+1	t+2
Foreign Political News	0.0025** (2.1318)	0.0024 (1.5424)	0.0029*** (3.9876)	0.0027*** (3.2355)	0.0028*** (3.4044)
Domestic Political News	0.0026** (2.5439)	0.0026*** (2.5827)	0.0021 (0.4726)	0.0022 (0.1734)	0.0021 (0.8417)
Foreign Economic News	0.0021 (0.6610)	0.0021 (0.0259)	0.0023 (0.1352)	0.0025 (1.2802)	0.0021 (0.3465)
Domestic Economic News	0.0020 (1.4003)	0.0023 (0.8077)	0.0023 (0.7459)	0.0023 (1.0830)	0.0021 (0.4819)
Panel B – Median absolute returns and Wilcoxon/Mann-Whitney test results (Median of the control sample: 0.0016)					
Foreign Political News	0.0015 (0.5678)	0.0015 (0.0703)	0.0019** (2.1499)	0.0017 (1.5031)	0.0017 (0.7921)
Domestic Political News	0.0017* (1.8058)	0.0018* (1.6739)	0.0016 (0.0717)	0.0016 (0.5026)	0.0014 (0.8947)
Foreign Economic News	0.0015 (0.2860)	0.0019 (0.8998)	0.0019 (0.9314)	0.0023** (1.9945)	0.0015 (1.0264)
Domestic Economic News	0.0015 (0.8865)	0.0015 (0.1903)	0.0019 (1.3956)	0.0016 (0.4580)	0.0018 (0.3987)
Panel C – Standard deviation of abs. returns and Brown-Forsythe test results (Standard deviation of the control sample: 0.0022)					
Foreign Political News	0.0030*** (7.0485)	0.0027** (5.1997)	0.0054*** (16.6574)	0.0055*** (10.4576)	0.0056*** (14.2197)
Domestic Political News	0.0028** (4.9281)	0.0033** (5.0871)	0.0019 (0.3694)	0.0021 (0.0162)	0.0019 (0.0480)
Foreign Economic News	0.0021 (0.9390)	0.0016 (0.7923)	0.0018 (0.1666)	0.0020 (0.2996)	0.0034 (0.0796)
Domestic Economic News	0.0018 (1.4913)	0.0025 (0.9501)	0.0024 (0.0361)	0.0027 (1.7110)	0.0020 (0.0163)

⁵ The test statistics are given in parentheses where *, ** and *** indicate significance at 10, 5 and 1% levels respectively.

The test results for absolute returns support the findings of tests for returns. The significant differences are observed in the “Foreign Political” and “Domestic Political” news categories. Mean absolute returns and variances are significantly higher than that of the control sample for about 25 minutes surrounding the “Foreign Political” news, whereas the higher median absolute returns is only significant during the 5-minute around the events. These results indicate considerable volatility around “Foreign Political” news. On the other hand, the effects of “Domestic Political” news seem to be evident 10-15 minutes before the news; the mean, median and variance of absolute returns are significantly higher than those of the control sample. “Domestic Economic” category seem to have no impact on absolute returns whereas for the “Foreign Economic” category, only the median absolute return is significantly higher than that of the control sample after 5-10 minutes of the news releases.

“Iraq Crisis” seems to be the major factor that leads to the finding that “Foreign Political” news have a significant impact on stock returns. The mean absolute returns of the ISE100 index are significantly higher than the control sample around the “Iraq Crisis,” “Iraq War” and “Terror” news. The effect of “Iraq Crisis” news continues for at least 15 minutes after the news release.

The median absolute returns are significantly higher than the control sample during the 5-minutes surrounding news about “North Korea-US Conflicts” and “Israel-

Palestine Conflicts,” however the statistics are significant only at the 10% level. “Other Confrontations” news are associated with mean and median absolute returns that are significantly lower than the control sample 5-10 after the news release.

The variance of absolute returns is significantly higher than the control sample around “Iraq War,” “Terror” and “Other Foreign Political” news sub-categories. The same is also true for the “Iraq Crisis” news, however the variance of absolute returns is found to be significantly lower than the control sample about 10 minutes after the news release.

With respect to “Domestic Political” news, the mean and median absolute returns around “After-Elections,” “Cyprus,” “European Union,” “Government Conflicts,” “Iraq Crisis,” “Iraq War” and “Government Formation” sub-categories are found to be significantly higher than the control sample. On the other hand, mean and median absolute returns are significantly lower than the control sample for “Elections” and “Union of the Left-Wing Parties” sub-categories. During the interval in which “Elections” news are released, the volatility of returns is significantly lower than that of the control sample. This finding suggests that traders might be following “wait and see” strategy.

The mean and median absolute returns are significantly lower than the control sample for the 5-10 minutes preceding the “Other Foreign Economic” news. However, the median absolute returns are significantly higher than the control sample 10-15 minutes before the news and 5-10 minutes after it. Therefore, the results are not conclusive. The median absolute returns are higher than the control sample also around the US economic news. Supporting the overall findings, no significantly different return behavior is observed around “Foreign Economic” sub-categories.

The mean and median absolute returns around “Domestic Economic” news show some differences among sub-categories. For example, the mean and median absolute returns of the ISE100 index are higher than the control sample around “Budget,” “Taxes” and “Employment” news. However, mean and median absolute returns are found to be significantly lower than the control sample 10-15 minutes after news about “CBRT Auctions” and “Production.” Moreover, median absolute returns are significantly lower than the control sample around “Credits” and “Debts” news. Only five sub-categories have a significantly different variance than the control sample. Variance of absolute returns is higher than the control sample around news in the “Budget,” “Interest Rates” and “Wages and Salary Determination” sub-categories and lower around “CBRT Auctions” and “Net Exports and Current Account” news.

4.2.3. Comparison of Returns (Absolute Returns) Before and After News

The results of the tests for the equality of means, medians and variances between the cumulative returns (absolute returns) before and after each news category are given in this section (hypotheses H_4 , H_5 and H_6). Table 4.3 presents the results of the equality of means, medians and variances tests in Panels A, B and C respectively. Only the results for the main news categories are presented in this chapter. The tables containing the results for the sub-categories are given in Appendix C.

These tests indicate a significant impact on the ISE returns only for the “Domestic Political” news. However, the findings are in contrast with the results of the other tests: the mean and median of absolute returns are found to decrease during the 10 minutes following “Domestic Political” news. The standard deviation of returns and absolute returns are also found to decrease after the news in this category.

On the other hand, many of the “Domestic Political” sub-categories are not found to have a significant impact after the news. Only the mean, median and variance of returns increase significantly after the news about the “Foreign Relations” and variance decreases after “Government Conflicts” news.

Table 4.3. Tests of returns (absolute returns) before and after the events⁶

Panel A – Mean Returns and t-test results							
		MEAN CUMULATIVE RETURN			MEAN CUMULATIVE ABSOLUTE RETURN		
	# of Obs	Before the news	After the news	Statistic	Before the news	After the news	Statistic
Foreign Political News	256	0	0.0008	1.3024	0.0048	0.0054	0.9692
Domestic Political News	242	0.0003	0	0.524	0.005	0.0041	2.6491***
Foreign Economic News	74	0.0011	0.0005	0.8942	0.0041	0.0045	0.7413
Domestic Economic News	272	-0.0001	0.0006	1.7280*	0.0041	0.0042	0.6116
Panel B – Median returns and Wilcoxon/Mann-Whitney test results							
		MEDIAN CUMULATIVE RETURN			MEDIAN CUMULATIVE ABSOLUTE RETURN		
Foreign Political News	256	0.0002	0.0003	0.4935	0.0034	0.0038	0.8726
Domestic Political News	242	0.0001	0.0001	0.2941	0.0038	0.0032	2.0546**
Foreign Economic News	74	0.0009	0.0003	1.6433	0.0033	0.0037	0.5484
Domestic Economic News	272	0.0002	0.0004	1.228	0.0033	0.0036	0.1691
Panel C – Standard Deviation of Returns and Brown-Forsythe Test Results							
		STANDARD DEVIATION OF CUMULATIVE RETURNS			STANDARD DEVIATION OF ABS. CUM. RETURNS		
Foreign Political News	256	0.0057	0.0088	0.6881	0.0046	0.0081	0.3183
Domestic Political News	242	0.0058	0.0041	5.9445**	0.0044	0.003	4.2715**
Foreign Economic News	74	0.0036	0.0052	1.5409	0.0029	0.0039	1.0244
Domestic Economic News	272	0.0045	0.005	0.0549	0.0031	0.0036	0.3284

⁶ The test statistics are given under the Statistics columns where *, ** and *** indicate significance at 10, 5 and 1% levels respectively.

In terms of the news in the “Domestic Economic” main category, the mean and median return is significantly higher than before following “CBRT Auctions,” “CBRT Reserves” and “IMF” news. On the other hand, mean returns (absolute returns) fall significantly subsequent to the news in the “Production” category. Both the mean and variance of absolute returns increase after the news in the “Growth” category. News of “Forced Savings” are associated with a significant increase in the variance of returns (absolute returns) whereas the “Other” category, which encompasses news that cannot be assigned to any other category, induces a decrease in the variance of returns. Overall, ISE100 index returns increase in the 10-minute period following “Domestic Economic” news.

Mean/median returns are found to be significantly lower than before following the “Other” news in the “Foreign Economic” main category and “North Korea-US conflicts” news in the “Foreign Political” main category. On the contrary, the “Other” news in the “Foreign Political” main category are associated with a significant increase in mean/median returns.

CHAPTER 5

SEASONALITY OF NEWS AND RETURNS ON THE ISE100

INDEX

This chapter analyzes the seasonality in the news and the ISE100 index return series for the sample period between August 2002 and March 2003. Before the examination of the reaction of stock returns to news, seasonality in the data is examined since the existence of seasonality may create some problems and necessary adjustments should be made. For example, if a specific class of events tends to occur at certain times of the day and if the returns are higher in that period, then the event study methodology might indicate an association between returns and that type of news, even though they may not have any relationship. Furthermore, previous studies find intradaily pattern in mean returns and volatility in the Turkish stock market. For example, Bildik (2001) finds a W-shape for the stock returns and an L-shape in volatility for the Istanbul Stock Exchange. Therefore, before carrying out the analysis, the seasonality patterns of both returns and news in the sample period are examined.

5.1. Seasonality of the returns on the ISE100 Index

Parametric and non-parametric tests are applied to examine whether returns and absolute returns display any differences across intradaily trading intervals, weekdays and months. Only the 15-minute returns (absolute returns) are used in the tests for investigating the presence of intradaily seasonality since it is the series to be used in the GARCH model estimation. The equality of means, medians and variance of returns is tested across different time periods. Specifically, the following hypotheses are tested for the equality of returns over the trading intervals during the day:

$$H_{s1}: \mu_1 = \mu_2 = \mu_3 = \dots = \mu_{20}$$

$$H_{s2}: \eta_1 = \eta_2 = \eta_3 = \dots = \eta_{20}$$

$$H_{s3}: \sigma^2_1 = \sigma^2_2 = \sigma^2_3 = \dots = \sigma^2_{20}$$

where μ_i , η_i and σ^2_i are mean, median and variance of returns (absolute returns) in trading interval i respectively. There are twenty 15-minute intervals in a trading day.

Similarly, the following hypotheses are tested, regarding equality of mean, median and variance of returns across weekdays and months:

$$H_{s4}: \mu_{\text{Monday}} = \mu_{\text{Tuesday}} = \mu_{\text{Wednesday}} = \mu_{\text{Thursday}} = \mu_{\text{Friday}}$$

$$H_{s5}: \eta_{\text{Monday}} = \eta_{\text{Tuesday}} = \eta_{\text{Wednesday}} = \eta_{\text{Thursday}} = \eta_{\text{Friday}}$$

$$H_{s6}: \sigma^2_{\text{Monday}} = \sigma^2_{\text{Tuesday}} = \sigma^2_{\text{Wednesday}} = \sigma^2_{\text{Thursday}} = \sigma^2_{\text{Friday}}$$

$$H_{s7}: \mu_{\text{August}} = \mu_{\text{September}} = \mu_{\text{October}} = \mu_{\text{November}} = \mu_{\text{December}} = \mu_{\text{January}} = \mu_{\text{February}} = \mu_{\text{March}}$$

$$H_{s8}: \eta_{\text{August}} = \eta_{\text{September}} = \eta_{\text{October}} = \eta_{\text{November}} = \eta_{\text{December}} = \eta_{\text{January}} = \eta_{\text{February}} = \eta_{\text{March}}$$

$$H_{s9}: \sigma^2_{\text{August}} = \sigma^2_{\text{September}} = \sigma^2_{\text{October}} = \sigma^2_{\text{November}} = \sigma^2_{\text{December}} = \sigma^2_{\text{January}} = \sigma^2_{\text{February}} = \sigma^2_{\text{March}}$$

The ANOVA F-statistic, the Kruskal-Wallis statistic and Brown-Forsythe test are used to determine the equality of means, medians and variances of 15-minute returns (absolute returns) respectively across trading intervals, weekdays and months. The results are presented in Tables 5.1 through 5.3.

The mean, median and standard deviation of returns and absolute returns for the 15-minute intervals are presented in Table 5.1. The test results show that the means, medians and variances of returns (absolute returns) of these 20 intervals are significantly different from each other. High returns and variances at the opening of the morning session might explain these differences in mean, median and variance of returns. The inequality of variances indicates heteroskedasticity in the 15-minute ISE100 index returns and absolute returns.

Table 5.1. Mean, median and standard deviation of returns and absolute returns over 20 trading intervals during the day⁷

Interval	Mean		Median		Standard Deviation	
	Returns	Absolute Returns	Returns	Absolute Returns	Returns	Absolute Returns
9:30 - 9:45	0.0041	0.0096	0.0036	0.0064	0.0159	0.0132
9:45 - 10:00	-0.0014	0.0081	-0.002	0.006	0.0105	0.0069
10:00 - 10:15	-0.0004	0.0056	-0.0007	0.0042	0.0075	0.005
10:15 - 10:30	-0.0003	0.0043	0.0001	0.0029	0.006	0.0041
10:30 - 10:45	-0.0006	0.0037	-0.0004	0.0031	0.0049	0.0032
10:45 - 11:00	-0.0001	0.0034	-0.0004	0.0022	0.0047	0.0033
11:00 - 11:15	-0.0004	0.0037	0	0.0025	0.0051	0.0035
11:15 - 11:30	0.0006	0.0031	0.0009	0.002	0.0045	0.0033
11:30 - 11:45	0	0.0028	0	0.0015	0.004	0.0028
11:45 - 12:00	-0.0003	0.003	-0.0003	0.0024	0.0042	0.003
14:00 - 14:15	0.0005	0.0042	0.0006	0.0029	0.0057	0.0039
14:15 - 14:30	-0.0029	0.0057	-0.0031	0.0042	0.0071	0.0051
14:30 - 14:45	-0.0002	0.004	-0.0003	0.003	0.0054	0.0035
14:45 - 15:00	0.0004	0.0034	0.0004	0.0025	0.0054	0.0041
15:00 - 15:15	0.0002	0.0037	-0.0001	0.0028	0.0052	0.0037
15:15 - 15:30	0.0009	0.0035	0.0006	0.0028	0.0046	0.0031
15:30 - 15:45	0.0003	0.0036	0	0.0026	0.005	0.0034
15:45 - 16:00	-0.0006	0.0034	-0.0007	0.0024	0.0046	0.0032
16:00 - 16:15	0.0002	0.0031	0	0.0022	0.0043	0.003
16:15 - 16:30	-0.0006	0.0037	-0.0007	0.0032	0.0049	0.0032
Statistics for the equality among intervals	6.05***	21.65***	140.66***	258.95***	17.1***	14.45***

⁷ The ANOVA F, Kruskal-Wallis and Brown-Forsythe tests are used to test the equality of means, medians and variances respectively. The degrees of freedom are (19, 3220) for the ANOVA F and Brown-Forsythe statistics and 19 for the Kruskal Wallis statistic. *** represents significance at 1 percent level.

Table 5.2. Mean, median and standard deviation of returns and absolute returns across weekdays⁸

Weekday	Mean		Median		Standard Deviation	
	Returns	Absolute Returns	Returns	Absolute Returns	Returns	Absolute Returns
Monday	-0.0008	0.0044	-0.0004	0.003	0.0073	0.0058
Tuesday	-0.0001	0.0043	-0.0003	0.0029	0.0068	0.0053
Wednesday	0	0.0043	-0.0001	0.0028	0.0066	0.005
Thursday	0.0005	0.0043	0.0001	0.0031	0.0063	0.0046
Friday	0.0002	0.0042	0.0002	0.0027	0.0062	0.0046
Statistics for the equality among the weekdays	2.05*	0.23	7.9*	0.8	0.96	0.33

The mean, median and standard deviation of returns and those of absolute returns for the days of the week are presented in Table 5.2. The last row shows F, Kruskal-Wallis and Brown-Forsythe statistics. These test statistics show that there is no difference in mean and median of absolute returns and standard deviation of returns and absolute returns across the days of the week. Moreover, the mean and median returns are found to be significantly different across weekdays only at the 10 percent level.

⁸ The ANOVA F, Kruskal-Wallis and Brown-Forsythe tests are used to test the equality of means, medians and variances respectively. The degrees of freedom are (4, 2085) for the ANOVA F and Brown-Forsythe statistics and 4 for the Kruskal Wallis statistic. *** represents significance at 1 percent level

Table 5.3. Mean, median and standard deviation of returns and absolute returns across different months⁹

Month	Mean		Median		Standard Deviation	
	Returns	Absolute Returns	Returns	Absolute Returns	Returns	Absolute Returns
August	-0.0002	0.0037	-0.0001	0.0027	0.0051	0.0035
September	-0.0002	0.0031	-0.0003	0.0022	0.0042	0.0028
October	0.0004	0.0036	0.0002	0.0027	0.0048	0.0032
November	0.0006	0.0066	0.0004	0.0046	0.0095	0.0069
December	-0.0006	0.0047	-0.0002	0.0036	0.0063	0.0042
January	0.0001	0.0036	-0.0002	0.0025	0.005	0.0034
February	0.0002	0.004	-0.0003	0.003	0.0053	0.0035
March	-0.0005	0.0051	0	0.003	0.01	0.0087
Statistics for the equality among the months	1.57	22.24***	0.5	112.63***	22.06***	17.88***

Table 5.3 presents the mean, median and standard deviation of returns and absolute returns for all of the months in the sample period. The means and medians of returns across eight months in the sample are not found to be significantly different from each other. However, the absolute returns of the ISE100 index have significantly different means and medians across different months during the sample period. Moreover, the volatilities of both returns and absolute returns are also significantly different across months.

⁹ The ANOVA F, Kruskal-Wallis and Brown-Forsythe tests are used to test the equality of means, medians and variances respectively. The degrees of freedom are (7, 3190) for the ANOVA F and Brown-Forsythe statistics and 7 for the Kruskal Wallis statistic. *** represents significance at 1 percent level

The mean and variance of returns and absolute returns across 15-minute intervals during the trading day are plotted in Figures 5.1 and 5.2. After finding the existence of intradaily and monthly seasonalities in the ISE100 index, the next step is to identify the intradaily periods and months in which returns are different from those in the other periods and months.

Returns display large fluctuations during the first hour of the morning session and around the midday break. The absolute returns are also sizeable during the same period; however, they become smaller after about 10:00. The returns are negative on average for the last 15 minutes of the second session. The volatility of returns over 15-minute intervals follows an L shape during the day. As observed by Bildik (2001), the returns are more volatile at the opening (the first 30 minutes) compared to the rest of the day. Although volatility increases around the midday break (12:00-14:00), it is much smaller than the opening volatility.

There are some general comments that can be made about both series:

- Absolute returns are at their highest level at the opening intervals of both sessions.
- First few intervals and the last intervals of each trading session are characterized by negative returns.
- The greatest movements in the ISE100 index are negative.

- The lowest mean return during the 15-minute trading intervals is observed in the 12th interval, which corresponds to 14:15-14:30 period.
- Both the highest mean return and volatility are observed at the opening of the trading day: 9:30-9:45 period. This may be explained by the news and information revealed during the overnight non-trading hours.

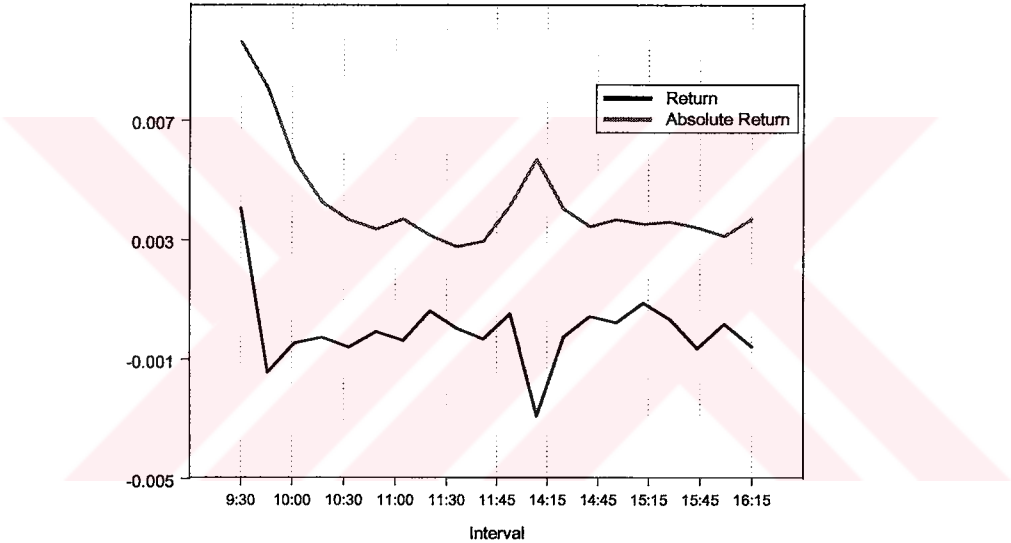


Figure 5.1. Mean returns and absolute returns over the 15-minute trading intervals during the day.

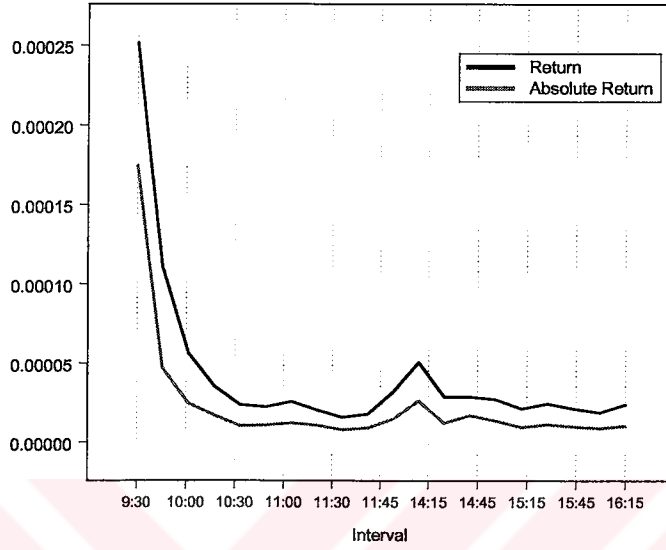


Figure 5.2. Variance of returns and absolute returns during the trading day

These figures suggest that the behavior of returns is different at the beginning of morning and afternoon sessions and at the end of the morning session. The following GARCH (1,1) model with seasonality dummy variables is estimated in order to identify the intradaily intervals and months that cause a seasonal pattern in the ISE100 index:

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + \sum_{i=1}^{19} \lambda_{Ti} ST_{it} + \sum_{i=1}^7 \lambda_{Mi} SM_{it} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1}) + \alpha_2 v_{t-1} + \sum_{i=1}^{19} \alpha_{Ti} ST_{it} + \sum_{i=1}^7 \alpha_{Mi} SM_{it}$$

where r_t is the return of the ISE100 index at interval t . λ_0 and α_0 are constants. λ_1 is the coefficient of the AR (1) term, α_1 is the coefficient of the ARCH term and α_2 is the coefficient of the GARCH term. ϕ is the leverage term, representing the presence of asymmetric effects of positive and negative returns on volatility, which may be caused by good and bad news, respectively. The error term, e_t , is assumed to be normally distributed with mean zero and variance v_t , which is conditional on the information set at the previous period, Ψ_{t-1} . SM_{it} and ST_{it} are vectors of dummy variables representing months and trading intervals respectively. Since the difference among weekdays is found to be weak for both mean, median and variance of returns, dummy variables for days are not included in the model. The resulting coefficients of the model are given in Table 5.4.

The coefficient estimates of the GARCH model are consistent with the plots of mean returns and volatility over the trading day (Figures 5.1 and 5.2). The returns at the beginning of both the morning and afternoon sessions are significantly higher than the returns at the end of the second session (16:15-16:30). They decline significantly after the opening interval in both sessions. Returns are found to be higher towards the end of the morning session (11:15-11:45), during a 45-minute period (14:45-15:30) in the middle of the afternoon session and a 15-minute period towards the end of the trading day (16:00-16:15).

Table 5.4. Coefficient estimates of the GARCH (1,1) model with seasonality variables¹⁰

	Mean Equation	Variance Equation
Constant	-0.00087** (-2.1703)	0.0409** (1.8424)
ARCH(1)		450.5*** (6.3080)
GARCH(1)		8159*** (30.8274)
LEV(1)		-936.6** (-1.6623)
AR(1)	-0.0522*** (-2.8220)	
<i>Intervals</i>		
9:30 – 9:45	0.0049*** (4.5369)	1.844*** (24.9655)
9:45 – 10:00	-0.00116* (-1.4210)	-0.8814*** (-7.3705)
10:00 – 10:15	-0.00019 (-0.2911)	-0.322*** (-3.3784)
10:15 – 10:30	0.0006 (1.2004)	-0.2254*** (-4.7302)
10:30 – 10:45	-0.00014 (-0.2607)	0.004 (0.1174)
10:45 – 11:00	0.00038 (0.8110)	-0.0697** (-2.3189)
11:00 – 11:15	0.00055 (1.0996)	0.0258 (0.8661)
11:15 – 11:30	0.00113*** (2.4049)	-0.0716*** (-2.5748)
11:30 – 11:45	0.00065* (1.4044)	-0.0326 (-1.2431)
11:45 – 12:00	0.00045 (1.0095)	-0.0283 (-1.0786)
14:00 – 14:15	0.00117** (2.1571)	0.0888*** (2.7102)
14:15 – 14:30	-0.00213*** (-3.5373)	0.0926** (2.0979)
14:30 – 14:45	0.00057 (1.0930)	-0.1339*** (-3.2349)
14:45 – 15:00	0.00128*** (2.5579)	-0.0345 (-1.0558)

¹⁰ The coefficients of the seasonality variables in the variance equation are multiplied by 10⁴. *, ** and *** indicate significance at the 10, 5 and 1 percent respectively.

Table 5.4 (cont'd)

15:00 – 15:15	0.00105** (2.1429)	-0.0246 (-0.8209)
15:15 – 15:30	0.00148*** (3.0274)	-0.013 (-0.4154)
15:30 – 15:45	0.00062 (1.2670)	-0.0126 (-0.4129)
15:45 – 16:00	0.00014 (0.2812)	-0.0275 (-0.9633)
16:00 – 16:15	0.00079* (1.5919)	-0.019 (-0.6200)
Months		
September	0.00019 (0.6649)	-0.0084*** (-3.2439)
October	0.00047* (1.4608)	0.0014 (0.5248)
November	0.00036 (0.8067)	0.0423*** (4.3525)
December	-0.00023 (-0.6054)	0.0127*** (2.7017)
January	0.00046* (1.4700)	-0.0012 (-0.4678)
February	0.00044 (1.1853)	0.0085** (2.2521)
March	0.00022 (0.6879)	-0.0055** (-1.9785)

The volatility of the ISE100 index returns at the beginning of both sessions (9:30 – 9:45 and 14:00 – 14:30) are greater than the volatility at the last 15 minutes of the trading day. However, the coefficients become negative after the opening, implying that the volatility during the remaining hours are lower than that at the end of the trading day. The coefficient during the first 30 minutes of the afternoon session is not as high as the one at the opening of the morning session. The reason for high volatility at the opening in the ISE can be explained by the arrival of information during non-trading hours since the opening procedure is the same as the procedure

during the trading day. Hence, trading halts increase volatility at the opening. These findings support Bildik (2001).

In terms of the months in the sample, returns in October and January are found to be significantly higher than in August at the 10% significance level. Moreover, volatility in September and March is lower but volatility in November, December and February are higher than the volatility in August. Consistent with the previous tests, the difference between mean returns in different months is not very significant.

5.2. Seasonality of the News Variables

The seasonality pattern of news events is examined in this section. Even though a great number of events in the sample are random and unique events that may happen at any point in time, some types of events may have a tendency to occur at certain times of the day or days of the week. The aim of this section is to identify such tendencies and compare these trends with the seasonal patterns of returns to see whether the two are parallel.

In order to get a better idea about the distribution of news during the trading hours of the ISE, the total number of news in all of the major news categories over the 15-

minute trading intervals are presented in Table 5.5. For example, 7 out of 495 “Domestic Economic” news are obtained during the 9:30 - 9:35 period. Similarly, the total number of news over the weekdays and months are given in Tables 5.6 and 5.7. Although most of the “Foreign Economic” news are reported in the afternoon session, majority of “Foreign Political” news are accumulated in the morning session. The Kruskal-Wallis statistic (the last rows in the tables) suggests that the median number of all types of news in all trading intervals, except political news, is not equal at 1 percent significance level. Political news may be distributed uniformly over the trading day.

Similarly, the equality of the median number of all types of news is rejected for the days of week and the months of the sample period. There are lengthy holidays in December and February during which no news were transmitted by Reuters. Therefore, the number of trading days is smaller in these two months, especially February (15 versus 20-22 in other months). The difference in the number of trading days per month may explain the rejection of the equality of the number of news across months.

Table 5.5. Distribution of the total number of news during the trading day¹¹

Interval	Total Number of News			
	Domestic Economic	Domestic Political	Foreign Economic	Foreign Political
9:30 - 9:45	20	12	1	33
9:45 - 10:00	17	14	4	44
10:00 - 10:15	22	12	0	35
10:15 - 10:30	25	15	1	22
10:30 - 10:45	27	21	5	20
10:45 - 11:00	18	16	2	21
11:00 - 11:15	17	22	6	26
11:15 - 11:30	30	33	6	7
11:30 - 11:45	61	20	4	17
11:45 - 12:00	41	25	2	25
14:00 - 14:15	30	18	9	12
14:15 - 14:30	22	24	2	20
14:30 - 14:45	17	21	0	11
14:45 - 15:00	18	24	7	21
15:00 - 15:15	24	23	2	15
15:15 - 15:30	21	28	3	23
15:30 - 15:45	18	20	35	22
15:45 - 16:00	22	20	18	24
16:00 - 16:15	23	24	5	14
16:15 - 16:30	22	12	4	19
Total Sum of News	495	404	116	431
Kruskal Wallis Chi-square (df = 19)	61.84***	26.078	313.44***	75.33***

¹¹ The last row of Table 5.5 gives the Kruskal-Wallis statistic for testing whether the median number of news is equal during the trading day. *** indicates significance at the 1% level.

Table 5.6. Distribution of the total number of news across weekdays¹²

Weekday	Total Number of News			
	Domestic Economic	Domestic Political	Foreign Economic	Foreign Political
Monday	82	53	12	81
Tuesday	127	84	18	80
Wednesday	100	94	14	109
Thursday	88	94	45	76
Friday	98	79	27	85
Total Sum of News	495	404	116	431
Kruskal Wallis Chi-square (df = 4)	15.18***	14.41***	32.46***	10.98**

Table 5.7. Distribution of the total number of news across months¹³

Month	Total Number of News			
	Domestic Economic	Domestic Political	Foreign Economic	Foreign Political
August	48	61	8	17
September	60	46	9	65
October	52	32	18	49
November	46	73	25	61
December	69	52	18	38
January	85	34	18	67
February	43	50	12	42
March	92	56	8	92
Total Sum of News	495	404	116	431
Kruskal Wallis Chi-square (df = 7)	32.93***	33.05***	15.74**	55.99***

¹² The last row of Table 5.6 gives the Kruskal-Wallis statistic for testing whether the median number of news is equal during the trading week. ** and *** indicate significance at the 5% and 1% levels respectively.

¹³ The last row of Table 5.7 gives the Kruskal-Wallis statistic for testing whether the median number of news is equal across months during the sample period. *** indicates significance at the 1% level

5.2.1. Domestic Economic News

There are a total of 983 “Domestic Economic” events in the sample and 495 of them correspond to the trading hours of the ISE. The news in this main category include regular macroeconomic announcements such as capacity utilization, inflation rates by the SIS and CBRT, economic impacts of some political events such as the operation in Iraq and relations with the International Monetary Fund.

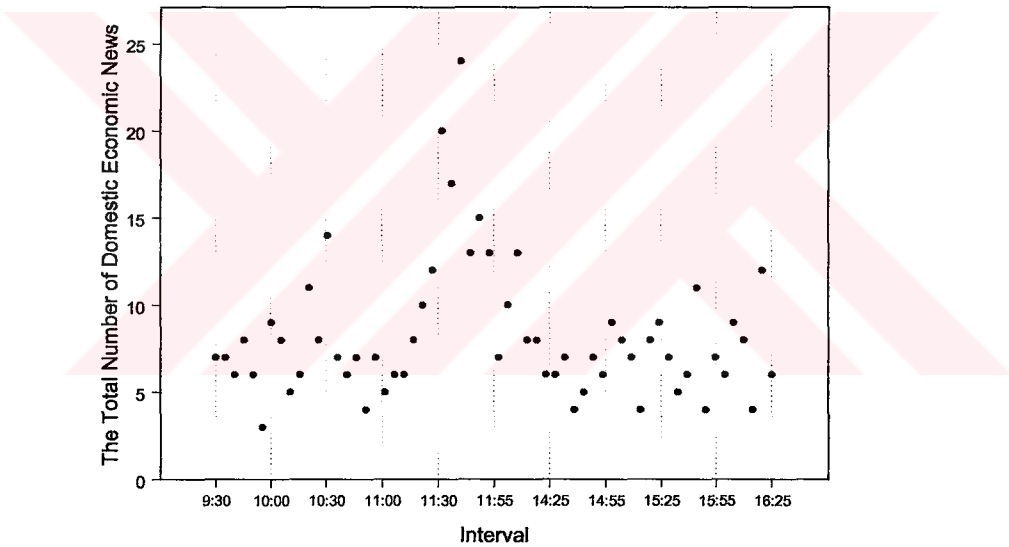


Figure 5.3. The distribution of “Domestic Economic” news across intervals

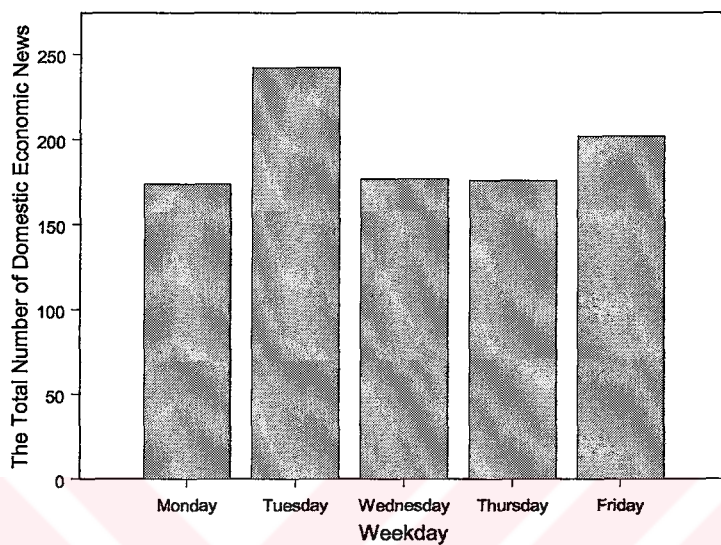


Figure 5.4. The distribution of “Domestic Economic” news across weekdays

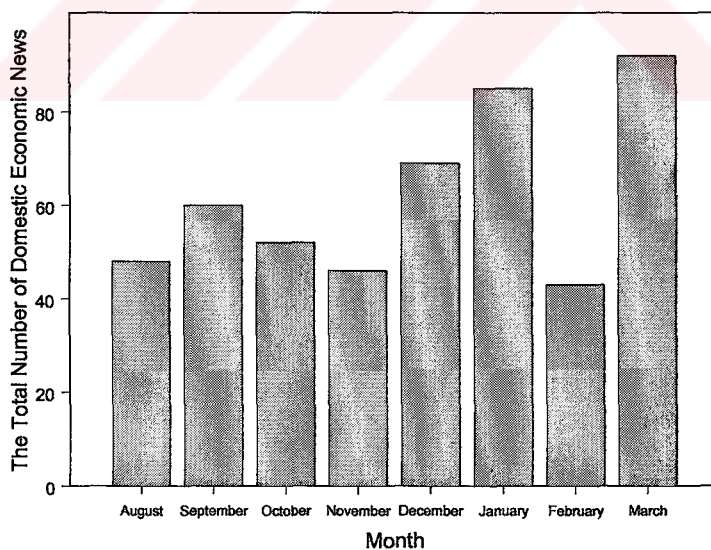


Figure 5.5. The distribution of “Domestic Economic” news across months

“Domestic Economic” news seem to be evenly scattered throughout the day except for a clustering in the last few intervals of the morning session, from about 11:15 through 14:00. In terms of the weekdays, Tuesday is the day with the greatest number of economic news events. It can be explained by Treasury auctions; half of all Treasury Auctions are made on Tuesdays and between 11:30 and 14:00. Central bank auctions are also made only between 11:15 and 11:45, which might contribute to the intensity of economic news in this period.

During the sample period, there are more economic news in December, January and March compared to the other months, whereas the number of news in the remaining months is similar. When the distribution of the news is analyzed for the sub-categories, it is observed that “Treasury Auctions” are considerably more frequent in December and January. Furthermore, January is the month with the preparation of budget for the new fiscal year and it causes an increase in the number of news in the “Budget” sub-category. The number of news in this category also increases in March when the government reviews whether the targets for the previous year are met. “IMF” news are concentrated in three months: October when the IMF officials come to Turkey for review, January when the new government prepared a new letter of intent and March when the fourth review by the IMF was completed. The operation in Iraq increases the number of economic news in January because of the discussions about direct and indirect costs of this operation on the Turkish economy, such as

increase in oil prices and failure to meet economic targets. Lastly, the number of news under the “Taxes” category increases with the tax amnesty in December and the imposition of new taxes in March.

5.2.2. Domestic Political News

The total number of “Domestic Political” news in the sample is 941 and 406 of these events are during the trading hours of the ISE. This category includes news related to the important political developments during the sample period, such as the general elections, meetings with the European Union and the Cyprus peace negotiations.

The distribution of “Domestic Political” news does not seem to indicate any specific pattern but most of these news are concentrated in the midday and afternoon hours. It can be explained by the fact that ISE trading hours are also the working hours for most institutions and it is natural to expect the announcements and news to occur during this period. Detailed investigation of the “Domestic Political” news under sub-categories reveals no intraday pattern. However, Turkey has witnessed several major political events during the sample period, which are reflected in the monthly distribution of news. The news intensity is more in August, November, December and March than the other months.

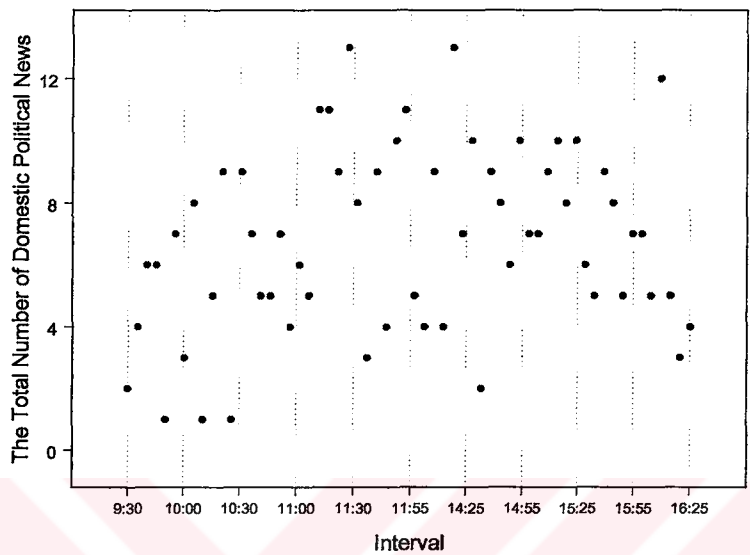


Figure 5.6. The distribution of “Domestic Political” news across intervals

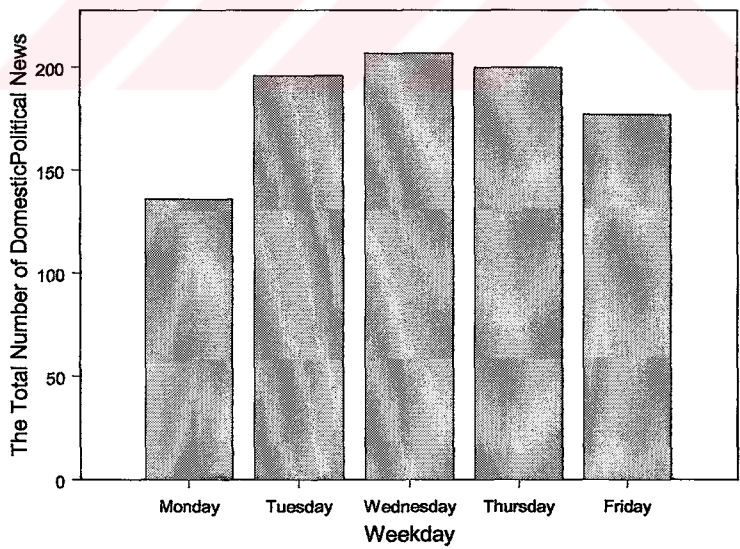


Figure 5.7. The distribution of “Domestic Political” news across weekdays

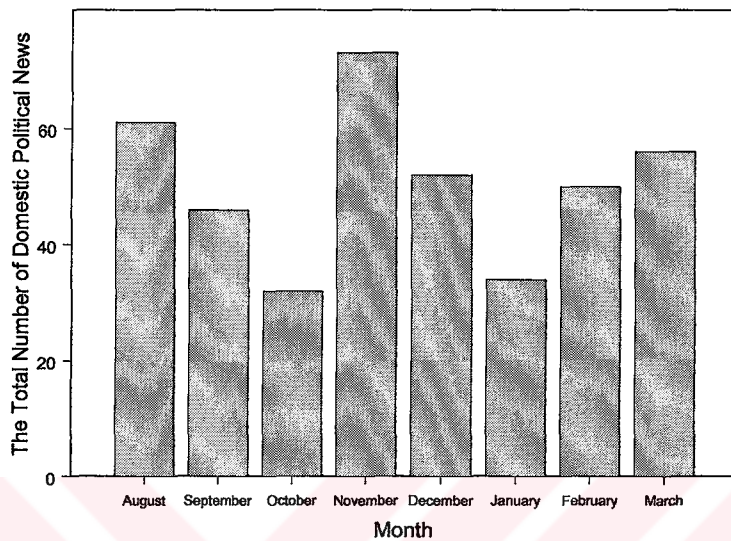


Figure 5.8. The distribution of “Domestic Political” news across months

There were three major political developments during August that increased the number of political news. First, Kemal Derviş started his efforts to unite the left-wing parties. Second, the parliament evaluated and passed a series of laws for accordance with the European Union. Third, the decision to hold general elections in November was made by the parliament.

In September, there was a government crisis when MHP applied to the Supreme Court to cancel some of the laws that were passed to comply with the European Union. In November, general elections were held with the victory of AKP, increasing

the number of news in the “After-elections” sub-category. In this month, there was a lot of debate about the new Cyprus peace plan proposed by Kofi Annan. The Copenhagen summit in December caused an increase in the number of news under the “European Union” sub-category since Europe started to assess the likelihood of the initial negotiations for the membership of Turkey. Moreover, the United States initiated efforts to request assistance from Turkey for the Iraq operation and pledged financial aid conditional on support in December. The markets became stressed as the operation became more likely. The number of news about the heated Iraq crisis peaked in February. For example, Turkey took the necessary measures and Turkish involvement in the operation was debated in that month. Troops and army supplies were transported to Southeast Turkey. NATO denied the protection of Turkey in the event of the operation in Iraq. Negotiations with the US government continued during the month of February and the government brought a much controversial permission proposal to the parliament on March 1, 2003. The parliament rejected to give permission to the United States army to use Turkey as a base in the Iraq operation in March. Markets were depressed in response to this outcome, since the hopes for a credit from the United States collapsed. The Iraq crisis heightened throughout the month and the war started in the early hours of March 20, 2003 before the ISE opened.

5.2.3. Foreign Economic News

There are a total of 207 news events under the “Foreign Economic” main heading and 116 of them are within the trading hours of the ISE. The news in this category are foreign macroeconomic announcements, mostly from the United States and European countries. The arrival of this type of news depends mostly on the opening of the financial markets in Europe and the US. Information flow increases twice during the day. The first one is a slight increase around 11:00, when the markets in the European countries start to operate. The second one is around 15:30 when the US markets open.

The intensity of “Foreign Economic” news is significantly higher on Thursdays. This intensity can be explained by the tendency of the government institutions in US and Europe to make macroeconomic announcements more frequently on Thursdays than the other days of the week (Ederington and Lee, 1993). Moreover, the intensity of “Foreign Economic” news is highest in November when the number of news from both the US and Europe is highest.

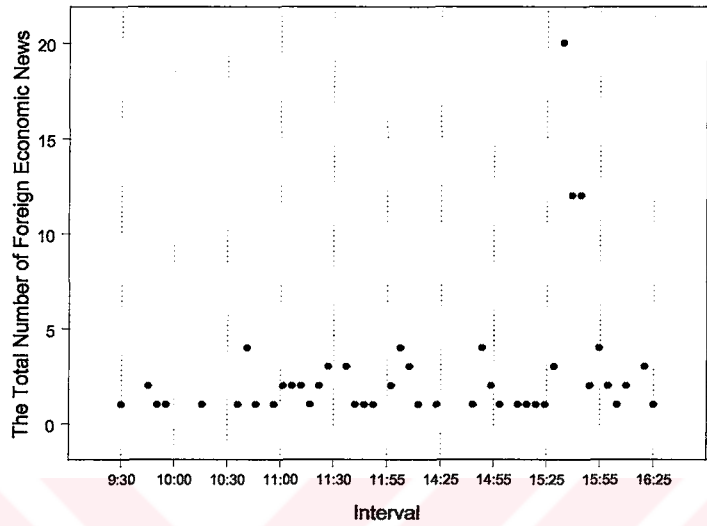


Figure 5.9. The distribution of “Foreign Economic” news across intervals

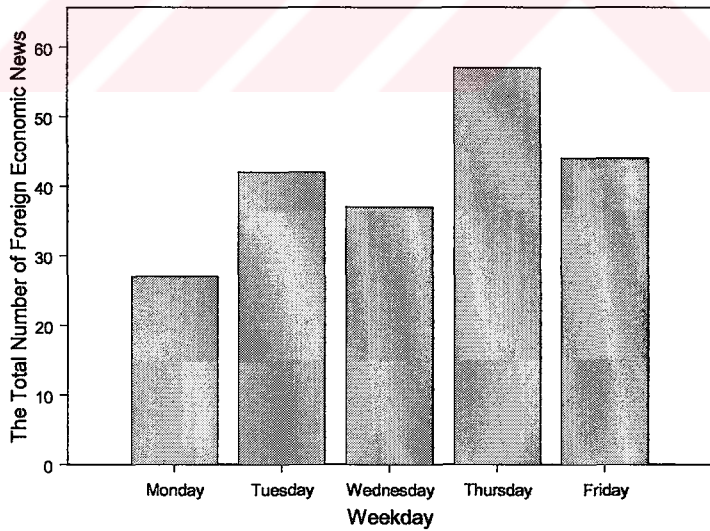


Figure 5.10. The distribution of “Foreign Economic” news across weekdays

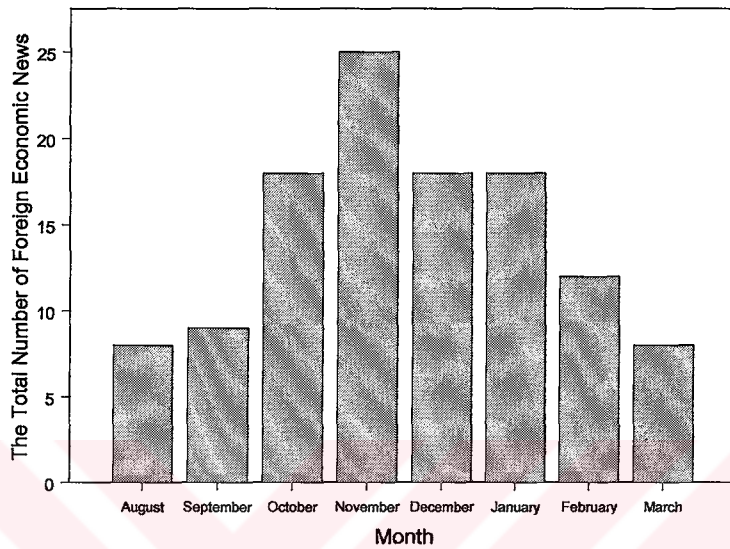


Figure 5.11. The distribution of “Foreign Economic” news across months

5.2.4. Foreign Political News

There are 940 news under the “Foreign Political” heading and only 431 of these news are used in the analysis. The news in this category include the major international political developments such as the Iraq War and the dispute between Israel and Palestine.

“Foreign Political” news are mostly dispersed during the trading day. However, the news intensity in the period between 9:30 and 11:00 seems to be greater than the rest

of the day. This pattern is caused by the arrival of news about the Iraq Crisis/War, since this category makes up more than 50% of the news in the “Foreign Political” category. The high frequency of “Iraq Crisis/War” news in this period can be explained by the fact that Reuters starts reporting the accumulated events during the morning hours.

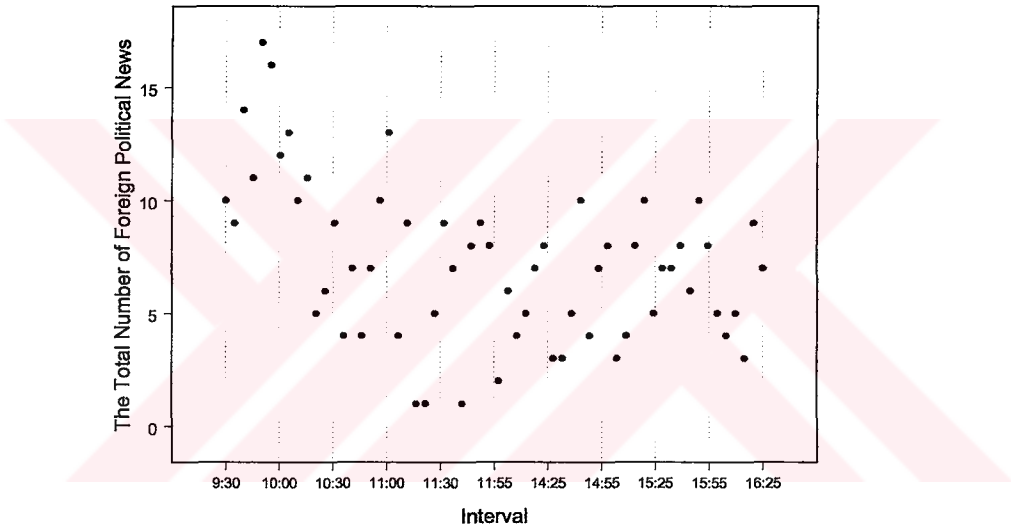


Figure 5.12. The distribution of “Foreign Political” news across intervals

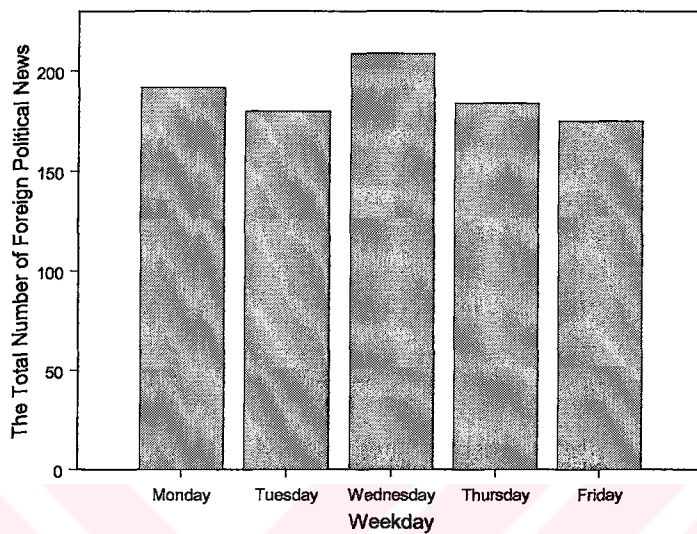


Figure 5.13. The distribution of “Foreign Political” news across weekdays

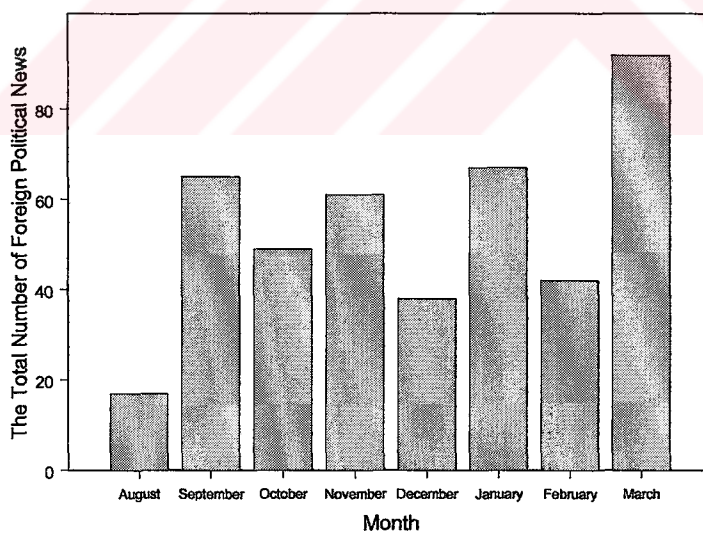


Figure 5.14. The distribution of “Foreign Political” news across months

The weekly distribution of the “Foreign Political” news does not display any visible patterns except a slightly higher number of news on Wednesdays. The same is not true for monthly distribution. The number of news during September is higher than the adjacent months because of three major developments in the international agenda. First, the possibility of an operation in Iraq started to be discussed. Second, the dispute between Palestine and Israel increased, as there were mutual attacks from both sides and Israeli soldiers besieged Arafat’s headquarters. Lastly, the international terrorist activity intensified in this month, especially in Afghanistan.

The number of “Iraq Crisis” news peaked in January as the US deadline approached. The weapons inspection in Iraq was completed; the implications of the resulting report were debated; UN did not find any mass destruction weapons. In February, Saddam Hussain challenged the US to attack; the first American troops entered Iraq. In March, Bush gave an ultimatum to Saddam Hussain to leave Iraq and the air attacks started during the early hours of March 20, 2003, resulting in the break out of the operation.

In summary, all of the news categories seem to display significant differences across trading intervals, weekdays and months. However, unlike return series, neither the individual categories nor the total number of news follows an intradaily pattern. Only the “Foreign Political” news seems to be concentrated at the opening, when both

mean returns (absolute returns) and their volatilities are high. This coincidence may create a bias in the event study towards finding a positive relationship between “Foreign Political” news and mean returns and volatility.

Overall, the analysis in this chapter suggests the presence of seasonal factors in return series and news arrival. Hence these seasonalities will be controlled for in the analysis.



CHAPTER 6

GARCH

Although the event study is frequently used method in Finance, it has some drawbacks. Therefore it is complemented by a generalized autoregressive conditional heteroskedasticity (GARCH) estimation in this study. The details of the models are given in the next section. Then, the results of the estimations are presented and discussed in Section 6.2.

6.1. GARCH Methodology

There are two reasons for using GARCH: The first is the presence of heteroskedasticity and autocorrelation in the intradaily ISE100 index return data (Appendix A). The GARCH model of Bollerslev (1986) provides a proper specification for the heteroskedastic and leptokurtic nature of lower frequency data. The second reason is that the seasonality in the data can easily be taken into account in a GARCH setting, although it may cause some problems in event study. Therefore, the reaction of the stock market to the news is examined after accounting for factors

such as autocorrelation, heteroskedasticity and intraday seasonality with the GARCH analysis.

Engle (1982) suggests that ARCH effects reflect the existence of factors, such as news, in explaining volatility and it follows that including these factors in the model will reduce the ARCH effects. Therefore, additional variables in GARCH models are also evaluated by the extent of the reduction in volatility persistence they induce. In this study, there are two classes of variables that are proposed to explain the intraday volatility process: news variables and seasonality variables. The news variables include the dummy variables created representing the sub-categories of news. The seasonality variables are included in the model in order to control for the differences in returns depending on the month of the year and time interval during the trading period. Since the returns data display considerable autocorrelation, an AR(1) term is included in the mean equation. Autoregressive terms of higher orders are found to be insignificant.

In the estimation of GARCH models, returns over 15-minute period is used instead of 5-minute because of two reasons. First, the number of seasonality and news dummy variables makes iteration difficult with the 5-minute frequency. However, the number of data points reduces to its one-third with the 15-minute frequency. Second, with the 5-minute frequency, lags of the independent variables would have to be used since

the full impact of the news may not arise in 5 minutes. Therefore, 15-minute is chosen to be an adequate period in which the impact of news can be felt and the model can be estimated more easily.

Each of the news sub-categories are represented in the model with a dummy variable. There are a total of 44 dummy variables for news. The news dummy variable takes a value of 1 in the trading interval, if a news item in that sub-category is reported at that trading interval. For example, if an event in the “Iraq War” sub-category is reported at 15:23, then a dummy variable for this sub-category takes a value of 1 for that day in the 15:15-15:30 interval.

Seasonality in the data is represented with dummy variables as well. Some of the intradaily periods display different means and volatilities than expected and these intervals are identified using another GARCH model (see Chapter 5 on Seasonality). Based on the results of this model, several seasonal dummy variables are created for the mean and variance equations, depending on the interval and the month. The day of the week is not controlled for since no difference in mean and variance of returns is observed among the days for the sample period.

Four models are estimated to analyze the impact of the news categories on stock returns. The first one is a GARCH (1,1) – AR(1) model with no additional variable.

The second model includes the news dummy variables in addition to the ARCH, GARCH and the AR terms. This model will illustrate the effect of the inclusion of the news variables to the magnitude and significance of the ARCH and GARCH coefficients, as well as the mean and volatility of returns. The third model is the extension of the second model with the seasonal dummy variables. This model will show whether the coefficients of the news variables change after controlling for seasonality in the return series. The fourth model will use main news categories as the news variables and the same seasonality variables as before.

A leverage term is added to each of the GARCH models to allow for asymmetric effects of positive and negative returns, which may have been caused by good and bad news, respectively.

The models can be represented formally as follows:

1) GARCH (1,1) model with an AR (1) term and no additional variables:

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1})^2 + \alpha_2 v_{t-1}$$

where r_t is the return of the ISE100 index at interval t , λ_0 and α_0 are constants. λ_1 is the coefficient of the AR (1) term, α_1 and α_2 are the coefficients of the ARCH (e_{t-1}^2) and GARCH (v_{t-1}) terms respectively, both of which are greater than or equal to zero.

ϕ is the leverage term. The error term, e_t , is assumed to be normally distributed with mean zero and variance v_t , which is conditional on the information set at the previous period, $\mathcal{Y}_{t-1}$.

2a) GARCH (1,1) - AR(1) model with dummy variables for the news, as additional variables only in the mean equation.

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + \sum_{i=1}^{44} \gamma_i N_{i,t} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1})^2 + \alpha_2 v_{t-1}$$

where $N_{i,t}$ is a vector of dummy variables representing news in the subcategory i at time t and γ_i is the coefficient vector for the news variables in the mean equation.

2b) GARCH (1,1) - AR(1) model with dummy variables for both news and seasonality, only in the mean equation.

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + \sum_{j=1}^6 \delta_j S_{j,t} + \sum_{i=1}^{44} \gamma_i N_{i,t} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1})^2 + \alpha_2 v_{t-1}$$

where δ_j is the coefficient vector for the seasonality dummy variables and S_j is the vector of dummy variables representing seasonality in the return series.

Because of the differences in mean returns and volatility across intradaily periods and months, these periods are controlled in the estimation of GARCH models using dummy variables. Overall, six dummy variables are included in the mean model to control for the differences in mean returns during the trading day:

Open 1.1 takes a value of 1 for the 9:30-9:45 interval and 0 otherwise.

Open 1.2 takes a value of 1 for the 9:45-10:00 interval and 0 otherwise.

Close 1 takes a value of 1 for the 11:15-11:30 and 11:30-11:45 intervals and 0 otherwise.

Open 2.1 takes a value of 1 for the 14:00-14:15 interval and 0 otherwise.

Open 2.2 takes a value of 1 for the 14:15-14:30 interval and 0 otherwise.

Mid-afternoon takes a value of 1 for 14:45-15:00, 15:00-15:15 and 15:15-15:30 intervals and 0 otherwise.

3.a) GARCH (1,1) - AR(1) model with dummy variables for the news only in the variance equation.

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1})^2 + \alpha_2 v_{t-1} + \sum_{i=1}^{44} \theta_i N_{it}$$

3.b) GARCH (1,1) - AR(1) model with dummy variables for both news and seasonality in the variance equation.

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1})^2 + \alpha_2 v_{t-1} + \sum_{j=1}^9 \delta_j S_{j,t} + \sum_{i=1}^{44} \theta_i N_{it}$$

Given the volatility pattern during the trading day (Chapter 5), four dummy variables are included in the GARCH model to control for the differences among trading intervals:

Open 1.1 takes a value of 1 for 9:30-9:45 interval and 0 otherwise.

Open 1.2 takes a value of 1 for 9:45-10:00, 10:00-10:15 and 10:15-10:30 intervals and 0 otherwise.

Open 2.1 takes a value of 1 for 14:00-14:15 and 14:15-14:30 intervals and 0 otherwise.

Open 2.2 takes a value of 1 for 14:30-14:45 interval and 0 otherwise.

Five dummy variables are included to control for differences in variance of returns in September, November, December, February and March. These dummy variables take a value of 1 in these months and zero otherwise.

4) GARCH (1,1) - AR(1) model with dummy variables for the main news categories instead of the sub-categories and seasonality variables in the mean and variance equations. The reason for estimating this model is to see the overall effects of the news categories on the mean returns and volatility.

$$r_t = \lambda_0 + \lambda_1 r_{t-1} + \sum_{j=1}^6 \delta_j S_{j,t} + \sum_{i=1}^5 \gamma_i N_{it} + e_t$$

$$v_t = \alpha_0 + \alpha_1 (|e_{t-1}| + \phi e_{t-1})^2 + \alpha_2 v_{t-1} + \sum_{j=1}^9 \delta_j S_{j,t} + \sum_{i=1}^5 \theta_i N_{it}$$

There are six dummy variables in the mean equation and nine in the variance equation, similar to Models 2b and 3b. The five news categories are “Accidents and Natural Disasters,” “Foreign Political” news, “Domestic Political” news, “Foreign Economic” news and “Domestic Economic” news.

The political events during the sample period represent important points in the history of Turkey. It is not easy to predict the effects of some political news, such as the elections, on the index returns. However, they are expected to increase volatility in returns because of uncertainty they create. Therefore, their coefficients in the variance equation are expected to be significantly positive during the sample period.

Since there was no distinction between good and bad news, it is equally hard to conjecture the signs of the economic news coefficients. However, based on the results

from previous studies, the coefficients of news in the “Growth,” “Inflation,” “IMF,” “Grading” and “Production” categories are expected to be significantly affecting mean returns. Furthermore, “IMF” news can be hypothesized to increase return volatility.

6.2. GARCH Results

A total of six GARCH models were estimated in order to determine the impacts of news on the ISE100 index returns, after accounting for autoregressive conditional heteroskedasticity and seasonal factors. The resulting coefficients are presented in Tables 6.1, 6.2 and 6.3.

Consistent with the previous findings, “Domestic Political” news are found to increase both mean returns and variability of the ISE100 index during a very short period of time. Another category that is found to have a significant impact on the ISE is “Foreign Economic” news category, which is found to significantly increase mean returns. “Accidents and Natural Disasters” category is found to have a negative and marginally significant effect on mean ISE100 returns.

Table 6.1. Estimation results for the GARCH models with additional variables in the mean equation¹⁴

	Model 1	Model 2a	Model 2b
MEAN EQUATION			
C	0.0000 (-0.2559)	-0.0001 (-1.1286)	-0.0003* (-1.6036)
AR(1)	-0.0523*** (-3.1533)	-0.0464*** (-2.5933)	-0.0160 (-0.8401)
Seasonal Dummies			
Open 1.1			0.0036*** (11.6235)
Open 1.2			-0.0025*** (-7.2637)
Close 1			0.0004 (0.8068)
Open 2.1			0.0006 (1.2252)
Open 2.2			-0.0025*** (-5.9028)
Mid-afternoon			0.0005* (1.5118)
News Variables			
Acc. and Natural Disasters Turkey		-0.0017 (-0.8496)	-0.0017 (-0.9298)
Acc. and Natural Disasters Other		-0.0008 (-0.5528)	-0.0003 (-0.2667)
Foreign Political			
Iraq Crisis		-0.0001 (-0.4243)	-0.0001 (-0.1963)
Iraq War		0.0009 (0.5622)	0.0007 (0.4685)
Israel-Palestine Conflicts		0.0005 (0.6080)	0.0004 (0.4791)
North Korea - US Conflicts		0.0000 (0.0078)	-0.0001 (-0.0783)
Terror		0.0000 (0.0136)	0.0001 (0.0996)

¹⁴ The t-values are given in parentheses where *, ** and *** indicate significance levels of 10, 5 and 1% respectively.

Table 6.1 (cont'd)

Other confrontations		0.0002 (0.1183)	0.0003 (0.1944)
Other political events		0.0001 (0.0518)	-0.0003 (-0.2240)
Domestic Political			
After-Elections		0.0006 (0.3575)	0.0008 (0.4611)
Cyprus		0.0046*** (8.9185)	0.0052*** (11.5246)
Elections		0.0005 (0.4721)	0.0005 (0.4196)
European Union		-0.0003 (-0.4894)	-0.0004 (-0.8157)
Foreign relations		-0.0021 (-0.5190)	-0.0012 (-0.2240)
Government Conflicts		0.0007 (0.3674)	0.0004 (0.2098)
Government Formation		0.0007 (0.3461)	0.0004 (0.2334)
Iraq Crisis		0.0008 (1.1960)	0.0006 (0.8906)
Iraq War		-0.0055*** (-3.9041)	-0.0057*** (-4.4554)
Union of the Left-Wing Parties		0.0003 (0.1428)	0.0004 (0.2030)
Other		0.0016** (1.8300)	0.0016** (1.8854)
Foreign Economic			
Europe		0.0016* (1.5501)	0.0015* (1.5614)
US		0.0002 (0.2670)	0.0002 (0.3566)
Other		0.0002 (0.1269)	-0.0001 (-0.0524)
Domestic Economic			
Budget		0.0004 (0.6574)	0.0004 (0.6851)
CBRT Auctions		0.0006 (0.3992)	0.0003 (0.2119)
CBRT Reserves		-0.0011 (-0.5197)	-0.0012 (-0.6160)
Credits		-0.0011 (-0.7624)	-0.0005 (-0.3745)

Table 6.1 (cont'd)

Debts		0.0000 (-0.0024)	0.0003 (0.1183)
Employment		0.0074*** (10.7571)	0.0101*** (18.8490)
Forced Savings		0.0098*** (10.5115)	0.0123*** (19.1908)
Foreign Exchange		-0.0015 (-0.7712)	-0.0016 (-0.8581)
General State of the Economy		-0.0004 (-0.2397)	-0.0006 (-0.3983)
Grading		0.0024* (1.4614)	0.0014 (0.8811)
Growth		-0.0008 (-0.4573)	-0.0006 (-0.3785)
IMF		-0.0003 (-0.2684)	-0.0001 (-0.0567)
Inflation		-0.0011 (-0.6769)	-0.0011 (-0.6892)
Interest Rates		0.0017 (0.8623)	0.0010 (0.5363)
Iraq Crisis		-0.0014 (-0.6610)	-0.0018 (-1.0559)
Net Exports and Current Account		0.0008 (0.7781)	0.0005 (0.4819)
Production		0.0019** (1.7466)	0.0018** (1.7729)
Taxes		0.0001 (0.0777)	-0.0003 (-0.2897)
Treasury Auctions		-0.0002 (-0.2851)	-0.0004 (-0.4295)
Wage/Salary Determination		-0.0020 (-1.0786)	-0.0021* (-1.3556)
Other Macr. Indicators and News		0.0005 (0.4084)	0.0008 (0.6047)
VARIANCE EQUATION			
A	0.0000*** (11.033)	0.0000*** (8.1167)	0.0000*** (8.3508)
ARCH(1)	0.0236*** (15.715)	0.0550*** (11.7930)	0.0749*** (12.1414)
GARCH(1)	0.9637*** (422.44)	0.9332*** (191.378)	0.9159*** (172.904)
LEV(1)	0.0347* (1.4824)	-0.1297*** (-5.6006)	-0.1884*** (-8.4138)
AIC	-23660	-23656	-23838

Table 6.1 (cont'd)

BIC	-23624	-23352	-23497
LOG LIKELIHOOD	11836	11878	11975

Table 6.2. Estimation results for the GARCH models with additional variables in the variance equation¹⁵

	Model 1	Model 3a	Model 3b
MEAN EQUATION			
C	0.0000 (-0.2559)	0.0000 (0.0629)	0.0000 (-0.2587)
AR(1)	-0.0523*** (-3.1533)	-0.0422*** (-2.4988)	-0.0462*** (-2.7775)
VARIANCE EQUATION			
A	0.0000*** (11.0327)	0.0000*** (7.3493)	0.0000*** (5.6046)
ARCH(1)	0.0236*** (15.715)	0.0053*** (3.0251)	0.0476*** (9.2645)
GARCH(1)	0.9637*** (422.445)	0.9737*** (282.317)	0.8374*** (67.199)
LEV(1)	0.0347* (1.4824)	0.5604*** (2.5681)	-0.0385 (-0.9272)
Seasonal Dummies			
Open 1.1			0.2506*** (26.185)
Open 1.2			-0.0409*** (-5.8224)
Open 2.1			0.1123*** (6.1110)
Open 2.2			-0.1236*** (-4.0227)
September			-0.0106*** (-5.6080)
November			0.0194*** (4.4557)

¹⁵ The coefficients of seasonality and news dummy variables are multiplied by 10^4 in the variance equation. t-values are given in parentheses where *, ** and *** indicate significance at 10, 5 and 1% levels respectively.

Table 6.2 (cont'd)

December			0.0126*** (3.1554)
February			-0.0044** (-2.0958)
March			-0.0103*** (-4.0156)
News Variables			
Acc. and Natural Disasters Turkey		0.0430* (1.3823)	-0.0186 (-0.3436)
Acc. and Natural Disasters Other		0.0126 (0.6061)	0.0637* (1.3032)
Foreign Political			
Iraq Crisis		0.0025 (0.5219)	0.0131* (1.6325)
Iraq War		-0.1018*** (-7.8179)	-0.0131 (-0.9079)
Israel-Palestine Conflicts		0.0298** (2.0755)	0.0109 (0.4955)
North Korea - US Conflicts		0.0246 (0.9373)	-0.0069 (-0.1805)
Terror		0.0294** (2.2817)	0.0272 (1.2536)
Other confrontations		0.0125 (0.4942)	-0.0147 (-0.4344)
Other political events		-0.1068*** (-5.4082)	0.0302 (0.7399)
Domestic Political			
After-Elections		0.0631*** (2.3361)	0.1308*** (2.4635)
Cyprus		-0.0029 (-0.2007)	-0.0543*** (-3.9945)
Elections		-0.0173*** (-2.4384)	0.0304** (1.9784)
European Union		0.0208*** (3.2655)	0.0090 (0.6013)
Foreign relations		-0.0656*** (-2.6505)	-0.0436* (-1.4352)
Government Conflicts		-0.0113 (-0.8880)	0.0132 (0.3610)
Government Formation		0.1727*** (4.8494)	-0.0062 (-0.1347)
Iraq Crisis		0.0215*** (2.7644)	0.0078 (0.6316)

Table 6.2 (cont'd)

Iraq War		0.2236*** (7.7344)	0.0692*** (2.6169)
Union of the Left-Wing Parties		-0.0143* (-1.4394)	-0.0176 (-0.8866)
Other		-0.0137 (-1.2367)	-0.0178 (-0.9661)
Foreign Economic			
Europe		-0.0332** (-2.1119)	0.0149 (0.6734)
US		0.0433*** (3.1436)	-0.0205** (-1.7830)
Other		-0.1328*** (-5.3381)	-0.0641* (-1.5035)
Domestic Economic			
Budget		-0.0002 (-0.0143)	0.0411** (2.0466)
CBRT Auctions		-0.1035*** (-5.2386)	-0.0452** (-2.0643)
CBRT Reserves		-0.0559*** (-2.3254)	-0.0631** (-1.8172)
Credits		-0.1023*** (-4.4689)	0.0057 (0.1469)
Debts		0.0146 (0.4277)	-0.0255 (-0.6580)
Employment		0.1554 (4.2465)	-0.0730*** (-4.7762)
Forced Savings		0.2455*** (5.5518)	0.0577 (1.2177)
Foreign Exchange		-0.1192*** (-5.7226)	-0.0747*** (-2.4315)
General State of the Economy		0.0712** (2.0523)	0.0118 (0.2829)
Grading		0.3149*** (5.8834)	0.1007 (1.0445)
Growth		-0.0071 (-0.3256)	0.0152 (0.4239)
IMF		-0.0631*** (-4.6170)	-0.0168 (-0.7638)
Inflation		0.0332** (1.9670)	-0.0321 (-1.2045)
Interest Rates		-0.1294*** (-4.5560)	-0.0020 (-0.0348)
Iraq Crisis		-0.0277* (-1.5832)	0.0016 (0.0509)

Table 6.2 (cont'd)

Net Exports and Current Account		-0.0435** (-2.2900)	-0.0302* (-1.3504)
Production		-0.0167 (-0.8531)	0.0280 (0.9261)
Taxes		-0.0368** (-1.9157)	0.0488* (1.3012)
Treasury Auctions		-0.0346*** (-3.6909)	-0.0126 (-0.8162)
Wage/Salary Determination		-0.0083 (-0.5039)	-0.0273 (-1.2181)
Other Macr. Indicators and News		-0.0156 (-0.6420)	0.0232 (0.7920)
AIC	-23660	-24016	-23963
BIC	-23624	-23711	-23604
LOG LIKELIHOOD	11836	12058	12041

Table 6.3. Estimation results for the GARCH models with the main news categories and seasonality variables¹⁶

	Model 4
Mean Equation	
C	-0.0003*** (-2.7841)
AR(1)	-0.0565*** (-3.1196)
Seasonality Variables	
Open 1.1	0.0044*** (5.2804)
Open 1.2	-0.0015** (-1.8099)
Close 1	0.0005** (1.7914)

¹²The coefficients of seasonality and news dummy variables are multiplied by 10^4 in the variance equation. t-values are given in parentheses where *, ** and *** indicate significance at 10, 5 and 1% levels respectively.

Table 6.3 (cont'd)

Open 2.1	0.0008** (1.8191)
Open 2.2	-0.0025*** (-5.1226)
Mid-afternoon	0.0009*** (3.9074)
News Variables	
Accidents and Natural Disasters	-0.0015* (-1.6057)
Foreign Political News	-0.0001 (-0.3137)
Domestic Political News	0.0004** (1.8143)
Domestic Economic News	0.0000 (0.1823)
Foreign Economic News	0.0007** (1.8160)
Variance Equation	
A	0.0000*** (3.5791)
ARCH(1)	0.0391*** (6.1358)
GARCH(1)	0.8351*** (34.675)
LEV(1)	-0.1004** (-4.0144)
Seasonality Variables	
Open 1.1	1.4260*** (35.836)
Open 1.2	-0.3212*** (-16.27)
Open 2.1	0.1046*** (6.707)
Open 2.2	-0.1081*** (-4.0144)
September	-0.0079*** (-3.9187)
November	0.0363*** (4.2943)
December	0.0104*** (2.8297)
February	0.0051** (1.6556)

Table 6.3 (cont'd)

March	-0.0061*** (-2.6424)
News Variables	
Accidents and Natural Disasters	0.0096 (0.3008)
Foreign Political News	-0.0004 (-0.0609)
Domestic Political News	0.0095*** (2.5131)
Domestic Economic News	0.0016 (0.2811)
Foreign Economic News	-0.0088 (-0.7780)
AIC	-24771
BIC	-24582
LOG LIKELIHOOD	12416

In terms of the “Domestic Political” sub-categories, news about “Cyprus” and the news in the “Other” category are found to increase mean returns significantly in the 15-minutes surrounding the release of news. On the other hand, “Iraq War” news in the “Domestic Political” category have a significantly negative impact on mean returns. Some of the sub-categories are also found to influence the volatility of ISE100 returns. News about “Cyprus” and “Foreign Relations” are found to decrease the volatility whereas news about “Elections,” “After-Elections” and “Iraq War” are found to increase it during the 15-minutes surrounding the event.

Contrary to the event study results, none of the sub-categories in the “Foreign Political” category are found to have a significant impact on mean ISE100 returns and only the “Iraq Crisis” news are found to increase volatility, which is significant at the 10% level.

Macroeconomic announcements and other economic news from European countries are associated with a positive influence on the mean ISE100 index returns. On the other hand, economic news from the United States and the “Other” sub-category, which encompasses news mainly from Brazil, Japan and Argentina, are found to decrease the volatility of returns during the surrounding 15-minutes of the news.

Three “Domestic Economic” sub-categories, “Employment,” “Forced Savings” and “Production” turn out to have a significantly positive impact on mean returns whereas “Wages/Salary Determination” news induce a negative effect, which is only significant at the 10% level. “Domestic Economic” sub-categories that remain significant in the seasonally adjusted model are as follows: “Budget” and “Taxes” news are found to increase volatility while “Foreign Exchange,” “CBRT Auctions,” “CBRT Reserves,” “Employment” and “Net Exports and Current Account” news are found to decrease it.

“Accidents and Natural Disasters” news are found have insignificant coefficients in the mean equation, whether they originate from Turkey or any other country.

Overall, all the models indicate significant negative autocorrelation in mean returns of the ISE100 index returns. The leverage term, which is an indication of asymmetric effects by positive and negative news, is significantly negative in Models 2a, 2b and significantly positive in Models 1 and 3a. However, including seasonal adjustment diminishes the significance of the term in Model 3b. In Model 4, it is again significant with a negative coefficient. Despite the mixed results, there is evidence that bad news are associated with a higher impact on volatility than good news.

CHAPTER 7

CONCLUSION

This study analyzes the immediate effects of political and economic news on the behavior of ISE stocks using intradaily data. The news are classified into four main categories as “Foreign Political,” “Foreign Economic,” “Domestic Political” and “Domestic Economic.” Both event study approach and GARCH model estimation are used in the analysis.

Overall, many of the news categories, especially “Domestic Political” news, are found to influence the Turkish stock market within a very short period of time. This finding supports the conjecture that the stock market is at least as vulnerable to political news as economic news suggested by Chan and Wei (1996) and Kim and Mei (2001). Moreover, Iraq Crisis/War news are found to have a major impact on the ISE. This finding confirms the conclusion of Leigh, Wolfers and Zitzewitz (2003) that Turkey would be one of the countries to be affected most by the war in Iraq.

The event study suggests that “Foreign Political” news increases both mean returns and volatility in general. However, the GARCH model indicates no significant impact of these news on either the mean or volatility of returns. However, both methods identify some sub-categories as having a significant impact on returns. Mean and median returns are significantly different from the control sample around the “Iraq War,” “Iraq Crisis,” “Israel-Palestine Conflicts,” “North Korea-US Conflicts,” “Terror” and “Other Foreign Political” news. Median absolute returns are significantly different from the control sample around news about “North Korea-US Conflicts,” “Israel-Palestine Conflicts” and “Other Confrontations.”

“Iraq Crisis,” “Iraq War,” “Terror” and “Other Confrontations” news are associated with return (absolute return) variances that are significantly different from the control sample. Only the “Iraq Crisis” news are found to increase the volatility of ISE100 index returns in the GARCH model when seasonality during the day is controlled.

Overall, ISE seems to be concerned with international events that threaten peace, especially in a neighbor country. For example, the stock market reacts to the Iraq Crisis/War by requiring higher expected returns for compensating increased risk as a result of the war.

“Domestic Political” news are found to have a significant effect on the behavior of ISE stocks over the period analyzed: the event study and GARCH methods indicate a significant increase in mean returns and volatility around “Domestic Political” news. In addition, many of the sub-categories are also found to influence ISE100 returns. Mean and median returns are found to be significantly different from the control sample around “Government Conflicts,” “Government Formation,” “Union of the Left-Wing Parties,” “Cyprus” and “European Union” news. On the other hand, mean and median absolute returns around “After-Elections,” “Cyprus,” “European Union,” “Government Conflicts,” “Iraq Crisis,” “Iraq War,” “Government Formation,” “Elections” and “Union of the Left-Wing Parties” news are found to be significantly different from the control sample.

Variability of the magnitude of returns (absolute returns) is significantly different from the control sample around “After-Elections,” “Cyprus,” “Government Conflicts,” “Elections,” “European Union,” “Iraq Crisis” and “Union of the Left-Wing Parties” news. GARCH model suggests that news about “Cyprus” increase mean returns while “Iraq War” news decrease mean returns. News about “Cyprus” and “Foreign Relations” are also found to decrease the volatility of returns whereas news about “Elections,” “After-Elections” and “Iraq War” are found to increase it.

In terms of the political events related to Turkey, the results suggest that the market seems to worry about elections, changes in the government and the Iraq Crisis/War. The increase in volatility around the “After-Elections” news may reflect the uncertainty regarding the future actions of the government. Likewise, “Iraq Crisis/War” news, which are mainly about Turkey’s involvement in the operation, increase the volatility of returns, reflecting the market’s concern for the outcome of the operation. On the other hand, the decrease in volatility around “Elections” news may indicate that the elections are perceived as a positive event by the market regarding the future of the Turkish economy. The decline in volatility may be explained by the “wait” strategy of investors. News about “Cyprus” are also found to increase mean ISE100 index returns, implying that the market responds positively to peace negotiations in Cyprus. “Government Conflicts” and “Government Formation” sub-categories both reflect uncertainty regarding the government and they are found to have a positive impact on mean returns and volatility.

“After-Elections,” “Cyprus,” “Government Conflicts” and “Foreign Relations” sub-categories are found to decrease volatility, which may be caused by a decrease in volume. This finding supports the conjecture of Chan, Chui and Kwok (2001), who find a decrease in volatility following political news. They suggest that it takes more time for investors to interpret political news. However, many other political sub-

categories and “Domestic Political” news in general are found to increase volatility, therefore the underlying reasons may be a topic for further research.

Both the event study and GARCH methods indicate that mean returns are higher around “Foreign Economic” news. Since there are a lot of foreign investors trading in the ISE, it is reasonable for the investors to respond to economic developments in the other countries. However, the results for the sub-categories are mixed, each test giving different results. For example, the median absolute returns are higher than the control sample around the US economic news, however, the GARCH model indicates a negative impact on the variance of returns and no significant impact on mean returns.

The event study suggests that the “Other Foreign Economic” sub-category, which includes news about Brazil, Argentina and Japan, significantly increases mean and median returns and decreases variance. GARCH model also confirms a decrease in variance around news in this sub-category. Although these countries are geographically far away from Turkey, these news might affect the strategy of international traders and their behavior might be affecting the movement in the ISE. European economic news are associated with an increase in mean returns, indicating that economic events in Europe during this period are interpreted positively by the market.

Despite the finding of a significant impact on the stock market by some of the individual “Domestic Economic” sub-categories, the overall impact is less than expected: “Domestic Economic” news are found to have no significant impact on mean and variability of returns as indicated by event study and GARCH model estimation. However, despite the insignificance of the category as a whole, some of the sub-categories have turned out to have a significant effect on returns. For example, event study indicates that news about “Budget,” “CBRT Auctions” and “Taxes” sub-categories influence mean and median returns and absolute returns. “CBRT Reserves,” “Interest Rates,” “Treasury Auctions” and “Iraq Crisis” sub-categories only affect mean and median of returns significantly. There are some differences in the types of news sub-categories that are significantly different, depending on the measure of return. These may be explained by the perception and beliefs of investors as to whether these news affect the stock market positively or negatively.

“Budget,” “Taxes,” “Production” and “CBRT Auctions” sub-categories are associated with return variances that are significantly different from the control sample and “Budget,” “Interest Rates,” “Wages and Salary Determination,” “CBRT Auctions” and “Net Exports and Current Account” news are associated significant differences in the variability of the magnitude of returns.

Slightly different “Domestic Economic” news are found to affect stock returns using the GARCH model estimation. “Employment,” “Forced Savings,” and “Production” sub-categories are associated with significantly higher mean returns whereas “Wages and Salary Determination” news are found to decrease mean returns. “Budget” and “Taxes” news are found to increase volatility and “Foreign Exchange,” “CBRT Auctions,” “CBRT Reserves,” “Employment” and “Net Exports and Current Account” news are found to decrease it. Consistent with Hayo and Kutan (2001), the news related to “IMF” are also found insignificant in this study.

The significant positive impact of “Budget” news on mean returns and volatility can be explained by the market’s interest in the performance of the government in terms of meeting the goals of the IMF program. Volatility is found to be low around “CBRT Auctions” and “Production” news, which may be caused by a decrease in volume or to uncertainty regarding the auctions. News about “Taxes” are also found to increase volatility. Since taxes represent a very important item in business, news concerning taxation create an immediate response by the market.

The event study and GARCH methods have given conflicting results in some cases, which is natural given the dissimilarity of the two methods. Although the GARCH method is superior in controlling for heteroskedasticity and seasonality in the returns data, the non-parametric tests employed in the event study perform better when there

are very few observations and non-normality. Another reason for the difference in results obtained from the two methods may be due to the difference in trading intervals analyzed; the GARCH model is estimated for 15-minute returns whereas the event study is carried out with 5-minute return data and analyzes a total of 25 minutes around the news release. Lastly the GARCH model assumes normally distributed errors, which may not be met in reality. Therefore the results should be interpreted accordingly.

The results suggest that sub-categories of news affect the behavior of stocks differently and an aggregate classification may not be appropriate for analyzing the impact of news on stock returns. For example, even though the “Domestic Economic” category as a whole seems to have no impact, its sub-categories such as “CBRT Auctions” and “Taxes” are found to significantly influence the volatility of returns.

The insignificance of the economic news in general may be due to an absence of distinction between expected and unexpected news. For example, if the inflation rate for a given month is correctly predicted by the market before it is announced, then there will be no initial response since the market will already have incorporated the information in the prices. Hence these types of news can be classified as predictable and unpredictable and their effects can be analyzed as a further study.

The GARCH model documented the extent to which inclusion of seasonality and news variables decreased the volatility persistence in the 15-minute return series. Furthermore, the leverage term in Model 4, which includes main news categories, is found to be significantly negative, indicating the presence of asymmetric effects of good and bad news on volatility. Another extension of this study is to classify the news as good and bad news and examine their impacts. This would have provided additional insights for the analysis, since the two may have different, possibly opposite, impacts on returns. However, the wide variety of news and the ambiguous characteristics of some of the news classes make it impossible to make such judgments. For example, based on the expectations, one can decide whether a certain macroeconomic announcement is “good” or “bad.” However, the same principle cannot be applied to all types of news, elections for example. The stability promised by a one-party government may be deemed as “good” news whereas the increased right-wing alignment in the majority of the parliament may invoke distress in some sections of the society.

This study only analyzes the immediate impacts of news on stock returns. If a certain sub-category is found to have no immediate impact on the ISE100 returns, it does not mean that the investors are not concerned with that particular subject. The effects may become apparent after 15 minutes of the news release or the news classification may have caused some important news to appear insignificant because of the

presence of less relevant news in the sub-category. This study can be extended and a longer time period can be analyzed as further research in order to identify which kinds of news are perceived to be important by the investors in the ISE.

Another extension of this study is the employment of an EGARCH estimation method to account for the asymmetric effects of positive and negative returns on volatility. Moreover, a factor analysis can be used to group news and then their effects on the stock market can be examined.



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Appendix A – Tests of Normality, Stationarity and Autocorrelation

In this section, the characteristics of the ISE100 index return series are presented to identify whether the underlying assumptions for the tests used in the event study and GARCH methodologies are met.

A.1.Normality

The descriptive statistics of returns and absolute returns over the 5-minute and 15-minute intervals are given in Table A.1.

Table A.1. Descriptive statistics of the ISE100 return series

	5-minute		15-minute	
	Return	Absolute Returns	Return	Absolute Returns
Mean	-0.012%	0.232%	-0.003%	0.428%
Median	-0.006%	0.161%	-0.009%	0.291%
Minimum	-10.4%	0%	-9.9%	0%
Maximum	7.8%	10.4%	8.9%	9.9%
Std. Dev.	0.37%	0.29%	0.67%	0.51%
Skewness	-1.977	10.784	-0.200	5.899
Kurtosis	115.536	283.701	32.536	76.213
Jarque-Bera	5,406,884*** (0.00)	32,751,584*** (0.00)	142,478*** (0.00)	800,456*** (0.00)

The descriptive statistics indicate that there have been very large changes in the ISE100 index during the sample period: the drops are in the magnitude of 9-10% and the largest increases are about 8% for both 5- and 15-minute return frequencies. The means and medians are negative for the return series. The distributions of return and absolute return series display signs of non-normality. Negative skewness indicates that the distribution has an asymmetry with a long left tail, which means that negative returns are more frequent than positive returns. This can also be seen from the fact that both the mean and median returns are negative for each frequency. The null hypothesis of positive mean return is rejected with a p-value of 0.0009 for the 5-minute series but it cannot be rejected for the 15-minute frequency.

The kurtosis coefficients greatly exceed 3, which is the kurtosis of the normal distribution. The return series for both frequencies are observed to be leptokurtic, indicating that the distribution is peaked relative to normal. Lastly, the Jarque-Bera statistics lead to the rejection of the null hypothesis that the return and absolute return series are from a normal distribution for both frequencies.

A.2. Stationarity

The augmented Dickey-Fuller and Phillips-Perron tests are applied to the ISE100 index series in both frequencies for examining the presence of a unit root. The test

statistics are given in Table A.2. The presence of a unit root in the ISE100 index series cannot be rejected. However, the tests for ISE100 returns indicate no unit root. In this case, the returns are said to be stationary and they will be used for analysis.

Table A.2. Results of the unit root tests¹⁷

	ISE100 Index		Returns	
	5-minute	15-minute	5-minute	15-minute
Augmented Dickey-Fuller	-1.42 (0.1565)	-1.52 (0.1298)	-45.88*** (0)	-24.75*** (0)
Phillips-Perron	-1.47 (0.156)	-1.49 (0.1391)	-89.35*** (0)	-57.99*** (0)

A.3. Autocorrelation

The autocorrelation plots of both 5- and 15-minute ISE100 index return and absolute return series are given in Figures A.1 through A.4 below. The lag lengths for the plots correspond to two trading days, i.e. 120 lags for the 5-minute returns and 40 lags for the 15-minute returns. The dotted lines represent 95% confidence bands for the mean, which mark significant autocorrelation for the lines exceeding it.

¹⁷ *** indicates that the test statistics are significant at the 1% level.

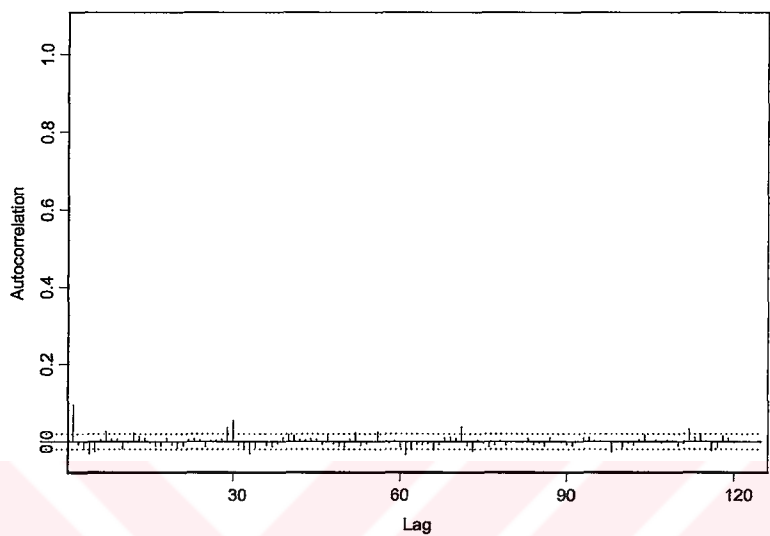


Figure A.1. Autocorrelation plot for the 5-minute return series

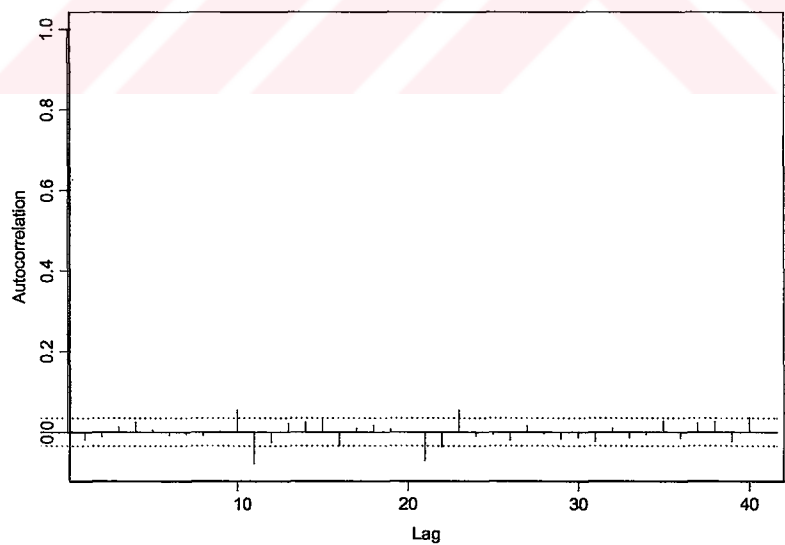


Figure A.2. Autocorrelation plot for the 15-minute return series

There is significant positive autocorrelation in the 5-minute return series at lags 1 and 30, at the openings of both sessions, which die down beyond one day. For the 15-minute return series, the daily pattern is less obvious and again the correlations cease to be significant beyond almost one day.

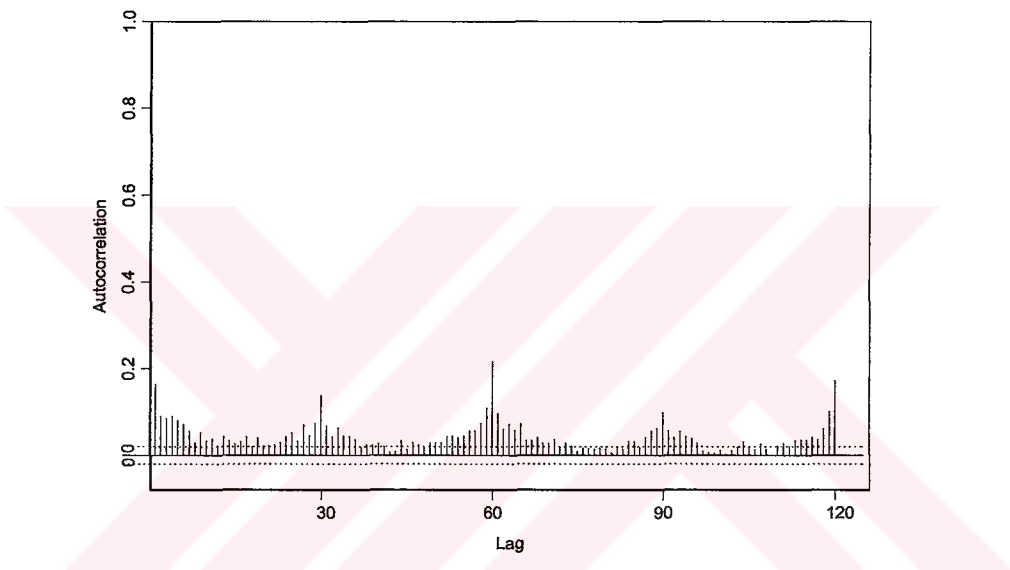


Figure A.3. Autocorrelation plot for the 5-minute absolute return series

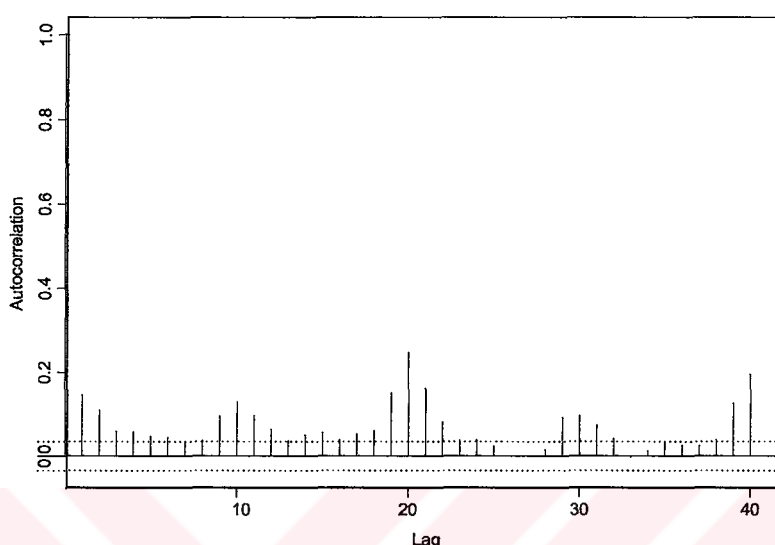


Figure A.4. Autocorrelation plot for the 15-minute absolute return series

The presence of a daily seasonal pattern can be more easily seen by examining the correlograms of the absolute return series for both 5-minute and 15-minute frequencies. In this case, most of the intervals display significant autocorrelation up to two trading days, which is more emphasized at the multiples of 30 (for 5-minute frequency) or 10 (for 15-minute frequency) intervals that correspond to midday breaks and closing of the trading days. These correlograms indicate that large price changes tend to be followed by large changes (of either sign) hence the presence of intertemporal dependence between interval returns.

Appendix B –Test statistics used in the event study

In this section, the details of the statistical test procedures employed in the analyses for testing the equality of means, medians and variances across returns are presented.

B.1. Test for the equality of means

The ANOVA F-statistic is used to test the equality of means across several samples. If there are only two samples, the t-statistic is used, which is the square root of the F-statistic. It is based on testing whether between group variability is similar to within group variability in which case the sub-groups would have the same mean.

Let $x_{g,i}$ be the i th observation in group g and $i=1,2,\dots,n_g$ for groups 1 to G . Then, between sums of squares is defined as

$$SS_B = \sum_{g=1}^G n_g (\bar{x}_g - \bar{x})^2$$

and within sums of squares as

$$SS_W = \sum_{g=1}^G \sum_{i=1}^{n_g} (x_{i,g} - \bar{x}_g)^2$$

where $\bar{x}_g$ is the sample mean within group and $\bar{x}$ is the overall mean. The F-statistic is

$$F = \frac{SS_B / (G - 1)}{SS_W / (N - G)}$$

where N is the total number of observations. This statistic has an F-distribution with N-G degrees of freedom under the null hypothesis of independent and identical normal distribution.

B.2. Test for the equality of medians

The Wilcoxon/Mann-Whitney test, which is a non-parametric rank-based test for two samples, is used to test the equality of the medians. The test is devised in the following way: let $X_1, X_2, \dots, X_n$ and $Y_1, Y_2, \dots, Y_m$ be two random and independent samples of sizes n and m respectively. The two samples are pooled and ranked from smallest (1) to largest (n+m). The ranks are denoted as $R(X_i)$ and $R(Y_j)$. If there are ties, i.e. equal sample values, the average of their ranks is assigned to both.

If there are no ties, the test statistic is calculated as:

$$T = \sum_{i=1}^n R(X_i)$$

if there are many ties, it is found as follows:

$$T_1 = \frac{T - n \frac{N+1}{2}}{\sqrt{\frac{nm}{N(N-1)} \sum_{i=1}^N R_i^2 - \frac{nm(N+1)^2}{4(N-1)}}}$$

E-Views reports the normal approximation to the U-statistics with continuity and tie-correction. When there are more than two samples to be compared, the Kruskal Wallis test statistic is used, which is an extension of the Mann Whitney test.

B.3. Tests for the equality of variances

Brown and Forsythe (1974) suggest a modification of the Levene test, which is robust to violations of the non-normality assumption.

Let x_{ij} be the j^{th} observation in the i^{th} group, where the means are not necessarily equal. The observations are assumed to be independent. The test statistic is:

$$W = \frac{\sum_i n_i (\bar{z}_{i.} - \bar{z}_{..})^2 / (g-1)}{\sum_i \sum_j (z_{ij} - \bar{z}_{i.})^2 / \sum_i (n_i - 1)}$$

$z_{ij} = |x_{ij} - x'_i|$ where x'_i is the median of the i^{th} group.

$$\bar{z}_{i.} = \sum z_{ij} / n_i \text{ and } \bar{z}_{..} = \sum \sum z_{ij} / \sum n_i$$

The **Brown-Forsythe test** has an approximate F-distribution with $G-1$ numerator degrees of freedom and $N-G$ denominator degrees of freedom.

Appendix C – Results of the event study for sub-categories of news

In this section, the results of the event study analysis for the sub-categories of news are presented. First, the results of the tests comparing the returns in the event window of news categories and the control sample are given. Second, the findings of tests for absolute returns are reported. Lastly, the results of tests comparing the behavior of returns before and after the events are provided.

Table C.1. Mean returns in the event windows of the news categories and the equality of means test results (Mean of the control sample = -0.0002)¹⁸

	t-2	t-1	t	t+1	t+2
<i>Foreign Political News</i>					
Iraq Crisis	-0.0005 (1.1968)	0.0001 (0.9439)	-0.0004 (0.7058)	0.0002 (1.3320)	0.0006*** (2.9035)
Iraq War	0.0021*** (2.8777)	0.0006 (0.9227)	0.0004 (0.6828)	-0.0001 (0.0295)	0.0011 (1.5423)
Israel-Palestine Conflicts	0.0005 (0.7657)	-0.0015* (1.9095)	0.0013 (1.0811)	-0.0003 (0.1962)	0.0003 (0.3607)
North Korea - US Conflicts	-0.0019 (1.3543)	0.0015 (1.3354)	-0.0010 (0.6695)	-0.0012 (0.8067)	-0.003** (2.2417)
Terror	0.0003 (0.7525)	-0.0004 (0.2974)	-0.0016** (2.1705)	-0.0001 (0.1696)	0.0003 (0.6713)
Other confrontations	-0.0003 (0.0609)	0.0003 (0.3533)	-0.0014 (0.9188)	0.0000 (0.1435)	-0.0004 (0.1411)

¹⁸ The results of the t-test for the equality of means between the returns around the events and the control sample are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.1. (cont'd)

Other political events	-0.0006 (0.2688)	-0.0009 (0.9588)	-0.0014 (0.9069)	0.0001 (0.4507)	0.0018*** (3.1555)
Domestic Political News					
After-Elections	0.0008 (1.1932)	0.0009 (1.2301)	0.0008 (1.2100)	0.0011 (1.4755)	-0.0009 (0.9092)
Cyprus	0.0006 (0.9782)	0.0012* (1.9284)	-0.0005 (0.4948)	-0.0005 (0.4519)	-0.0002 (0.0821)
Elections	0.0002 (0.4891)	0.0001 (0.4245)	-0.0001 (0.1393)	0.0001 (0.3316)	-0.0005 (0.4734)
European Union	0.0001 (0.6193)	-0.0008* (1.6760)	-0.0002 (0.2217)	0.0000 (0.1272)	0.0000 (0.4294)
Foreign relations	-0.0023 (1.5136)	-0.0017 (1.1351)	-0.0002 (0.0223)	0.0001 (0.1913)	0.0013 (1.0957)
Government Conflicts	0.0027** (2.0534)	0.0005 (0.5092)	0.0010 (0.8398)	-0.0004 (0.1629)	-0.0004 (0.1798)
Government Formation	0.0009 (1.1453)	-0.0001 (0.0494)	-0.0014 (1.2939)	0.0000 (0.1519)	-0.0005 (0.3265)
Iraq Crisis	-0.0006 (0.8978)	-0.0001 (0.2364)	0.0002 (0.8369)	-0.0007 (1.1920)	-0.0001 (0.1217)
Iraq War	-0.0001 (0.0729)	-0.0002 (0.0653)	-0.0005 (0.3487)	0.0011 (1.2746)	0.0002 (0.3427)
Union of the Left-Wing Part.	-0.0009 (0.8980)	-0.0002 (0.0471)	0.0009 (1.3193)	0.0007 (1.0928)	0.0001 (0.2801)
Other	-0.0002 (0.0452)	-0.0011 (1.0290)	0.0013 (1.6366)	-0.0002 (0.0721)	-0.0007 (0.5881)
Foreign Economic News					
Europe	-0.0002 (0.2675)	0.0006 (1.0980)	0.0008 (1.5715)	0.0009 (1.6265)	0.0001 (0.5792)
US	0.0006 (1.5511)	0.0002 (0.7108)	0.0002 (0.6251)	-0.0001 (0.1496)	0.0005 (1.3547)
Other	0.0031** (2.2715)	0.0001 (0.7510)	-0.0003 (0.5630)	-0.0020 (0.9650)	-0.0009 (0.5992)
Domestic Economic News					
Budget	-0.0006 (0.6793)	-0.0003 (0.2613)	-0.0005 (0.5424)	-0.0010 (1.4812)	0.0002 (0.5972)
CBRT Auctions	0.0002 (0.4427)	-0.0015 (1.4915)	0.0017** (2.0631)	0.0007 (0.9708)	0.0002 (0.3885)

Table C.1. (cont'd)

CBRT Reserves	-0.0005 (0.2047)	-0.0008 (0.4575)	0.0002 (0.2918)	0.0029** (2.1978)	0.0003 (0.3268)
Credits	-0.0001 (0.1080)	0.0005 (0.7155)	-0.0009 (0.7804)	-0.0009 (0.7172)	0.0006 (0.8020)
Debts	0.0004 (0.4003)	0.0008 (0.6819)	-0.0004 (0.1358)	0.0001 (0.2073)	-0.0004 (0.1713)
Employment	-0.0013 (1.2048)	-0.0005 (0.3750)	-0.0007 (0.5910)	0.0005 (0.7288)	0.0000 (0.1241)
Foreign Exchange	0.0005 (0.4639)	0.0005 (0.4562)	-0.0011 (0.6811)	0.0013 (1.0390)	-0.0001 (0.0338)
Growth	0.0000 (0.0953)	-0.0003 (0.1024)	-0.0005 (0.2543)	0.0003 (0.3687)	0.0004 (0.3920)
IMF	-0.0007 (0.6878)	-0.0009 (1.0619)	0.0001 (0.4172)	0.0009 (1.4268)	0.0010 (1.6065)
Inflation	0.0006 (0.7731)	0.0003 (0.5009)	0.0003 (0.4738)	0.0013 (1.4058)	0.0012 (1.3312)
Interest Rates	-0.0009 (0.6017)	-0.0026* (1.9277)	0.0010 (0.9390)	-0.0007 (0.3913)	0.0006 (0.6075)
Iraq Crisis	0.0015 (1.5814)	0.0000 (0.2020)	-0.0026** (2.3348)	-0.0019 (1.6391)	-0.0019 (1.6840)
Net Exp. and Current Acc.	0.0002 (0.5930)	-0.0004 (0.6134)	0.0001 (0.3331)	0.0003 (0.3748)	0.0003 (0.2830)
Production	-0.0004 (0.0619)	0.0008 (0.7460)	-0.0001 (0.0220)	-0.0005 (0.4425)	0.0002 (0.6871)
Taxes	0.0009 (1.1964)	-0.0012 (1.1515)	-0.0008 (0.6394)	-0.0007 (0.6130)	0.0006 (0.8180)
Treasury Auctions	-0.0007 (0.8699)	-0.0009 (1.1358)	-0.0004 (0.4248)	0.0001 (0.4347)	-0.0014* (1.9569)
Wage/Salary Determination	-0.0002 (0.0712)	0.0010 (1.3837)	0.0001 (0.3276)	0.0009 (1.2885)	0.0004 (0.6703)
Oth. Macr. Indic. and News	-0.0001 (0.0372)	0.0001 (0.2557)	0.0011 (1.2378)	-0.0002 (0.0234)	-0.0005 (0.3320)

Table C.2. Median returns in the event windows of the news categories and the equality of medians test results (Median of the control sample = -0.0001)¹⁹

	t-2	t-1	t	t+1	t+2
Foreign Political News					
Iraq Crisis	-0.0003 (0.7959)	-0.0002 (0.7603)	-0.0001 (0.7056)	-0.0001 (0.5305)	0.0003 (1.6239)
Iraq War	0.0014*** (2.0624)	0.0004 (0.8917)	0.0013 (0.9797)	-0.0012 (1.0251)	-0.0001 (0.8738)
Israel-Palestine Conflicts	0.0008 (0.8183)	-0.0005 (1.4778)	0.0014 (0.8219)	-0.0013 (1.1045)	0.0009 (0.3897)
North Korea - US Conflicts	-0.0004 (0.3954)	0.0012 (0.9977)	-0.0020 (0.8112)	-0.0004 (0.5963)	-0.0028* (1.8596)
Terror	-0.0004 (0.5869)	0.0005 (0.2958)	-0.0006 (1.2401)	0.0006 (0.9795)	0.0004 (1.1381)
Other confrontations	-0.0007 (0.2076)	0.0007 (0.7103)	-0.0002 (1.0326)	-0.0003 (0.1728)	0.0001 (0.3062)
Other political events	-0.0004 (0.1626)	0.0001 (0.1161)	-0.0013 (0.9446)	0.0002 (0.5343)	0.0014*** (2.6863)
Domestic Political News					
After-Elections	0.0003 (0.8638)	0.0011 (0.8751)	0.0005 (1.0339)	0.0001 (0.9331)	-0.0010 (1.0153)
Cyprus	-0.0009 (1.1419)	0.0005 (1.4205)	-0.0003 (0.5966)	0.0004 (0.1705)	0.0001 (0.1800)
Elections	-0.0002 (0.1529)	0.0001 (0.6421)	0.0000 (0.0372)	-0.0001 (0.2613)	0.0000 (0.3713)
European Union	0.0002 (0.7398)	-0.0005 (0.8242)	0.0002 (0.0094)	-0.0004 (0.0377)	0.0001 (0.3930)
Foreign relations	-0.0013* (1.7384)	-0.0019 (1.5413)	0.0015 (0.1728)	0.0001 (0.0244)	0.0008 (1.2049)
Government Conflicts	-0.0014 (0.3671)	0.0005 (0.2488)	0.0005 (0.6723)	-0.0007 (0.2258)	-0.0001 (0.0638)

¹⁹ The results of the Wilcoxon/Mann-Whitney test for the equality of medians between the returns around the events and the control sample are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.2. (cont'd)

Government Formation	0.0011* (1.9010)	0.0000 (0.0231)	-0.0019 (1.2464)	-0.0001 (0.0481)	0.0001 (0.0942)
Iraq Crisis	0.0006 (0.4798)	0.0001 (0.7045)	0.0004 (0.9890)	-0.0007 (1.3846)	-0.0001 (0.3826)
Iraq War	-0.0006 (0.0697)	-0.0015 (0.6400)	-0.0008 (0.2013)	0.0007 (0.8947)	0.0014 (0.9929)
Union of the Left-Wing Part.	-0.0004 (0.6190)	0.0003 (0.2603)	0.0006* (1.8039)	0.0007 (1.3273)	-0.0005 (0.0370)
Other	-0.0002 (0.1352)	-0.0012 (1.2028)	0.0011 (1.5109)	-0.0011 (0.0821)	-0.0010 (1.0341)
Foreign Economic News					
Europe	0.0000 (0.2072)	0.0005 (1.2779)	-0.0003 (1.1386)	0.0001 (1.4032)	0.0002 (0.5177)
US	0.0002 (1.3260)	-0.0002 (0.0984)	-0.0001 (0.4588)	0.0000 (0.0355)	0.0001 (0.1378)
Other	0.0030*** (2.6649)	0.0001 (1.0665)	-0.0001 (0.7688)	-0.0031 (1.4487)	-0.0008 (0.8306)
Domestic Economic News					
Budget	-0.0004 (0.4450)	-0.0006 (0.5228)	0.0003 (0.7686)	-0.0001 (0.4270)	-0.0001 (0.6793)
CBRT Auctions	0.0005 (0.3367)	-0.0010* (1.7816)	0.0018*** (2.8180)	0.0008 (1.4731)	0.0000 (0.5383)
CBRT Reserves	-0.0005 (0.3126)	-0.0001 (0.3627)	0.0002 (0.2822)	0.0038* (1.7539)	0.0000 (0.0275)
Credits	0.0003 (0.3930)	0.0009 (0.7999)	0.0000 (0.8893)	-0.0015 (0.9475)	0.0006 (1.1327)
Debts	0.0002 (0.5931)	0.0009 (1.0182)	0.0001 (0.0832)	0.0007 (0.1343)	-0.0007 (0.3740)
Employment	-0.0002 (1.0000)	0.0004 (0.1887)	-0.0021 (0.9719)	0.0004 (0.9463)	-0.0005 (0.1689)
Foreign Exchange	0.0009 (0.5773)	-0.0008 (0.0645)	-0.0024 (1.0093)	0.0015 (1.0330)	-0.0001 (0.1916)
Growth	-0.0002 (0.1041)	-0.0003 (0.2440)	-0.0005 (0.3454)	-0.0001 (0.3881)	0.0004 (0.3373)
IMF	-0.0004 (0.7055)	-0.0004 (0.7736)	-0.0003 (0.2840)	0.0003 (1.0476)	0.0005 (0.8284)

Table C.2. (cont'd)

Inflation	0.0006 (0.9635)	0.0003 (0.2173)	-0.0002 (0.1846)	0.0003 (1.0347)	0.0016 (1.5213)
Interest Rates	-0.0007 (0.8110)	-0.0005 (1.1416)	0.0009 (1.0158)	-0.0005 (0.3130)	0.0008 (0.6148)
Iraq Crisis	0.0015 (1.4147)	-0.0018 (0.4540)	-0.0016* (1.9138)	0.0000 (0.3139)	-0.0004 (1.0422)
Net Exp. and Current Acc.	0.0003 (0.7643)	0.0003 (0.2292)	-0.0007 (0.5800)	0.0005 (0.4038)	-0.0003 (0.2647)
Production	0.0005 (0.9719)	0.0001 (0.5954)	-0.0001 (0.1863)	-0.0005 (0.6434)	0.0002 (0.9819)
Taxes	0.0007* (1.6490)	-0.0011 (0.5351)	-0.0010 (0.5866)	-0.0006 (0.4362)	0.0001 (0.6339)
Treasury Auctions	-0.0005 (1.3206)	-0.0006 (0.8057)	-0.0008 (0.4852)	-0.0002 (0.1288)	-0.0012 (1.6330)
Wage/Salary Determination	0.0005 (0.2835)	-0.0001 (0.2866)	-0.0002 (0.4216)	0.0002 (1.0440)	0.0000 (0.0666)
Oth. Macr. Indic. and News	0.0006 (0.1704)	-0.0007 (0.1283)	0.0015* (1.7301)	0.0003 (0.2514)	-0.0002 (0.4465)

Table C.3. Standard deviation of returns in the event windows of the news categories and the equality of variances test results (Standard deviation of the control sample = 0.0031)²⁰

	t-2	t-1	t	t+1	t+2
Foreign Political News					
Iraq Crisis	0.0039 (1.7823)	0.0039** (4.0663)	0.0071*** (13.5937)	0.0072*** (15.0832)	0.0073*** (15.3795)
Iraq War	0.0055* (2.7981)	0.0028 (0.1550)	0.0025 (0.3135)	0.0042 (0.4919)	0.0057 (1.1269)
Israel-Palestine Conflicts	0.0032 (0.3504)	0.0033 (0.0105)	0.0042 (1.5282)	0.0026 (0.9431)	0.0029 (0.0192)
North Korea - US Conflicts	0.0056 (2.1426)	0.0035 (0.4871)	0.0036 (0.5550)	0.0030 (0.3487)	0.0036 (0.9174)
Terror	0.0034 (0.0832)	0.0027 (0.2965)	0.0042* (2.8826)	0.0038 (0.4869)	0.0027 (1.4783)
Other confrontations	0.0010 (2.6643)	0.0022 (0.7835)	0.0023 (0.4283)	0.0014 (1.3851)	0.0008* (2.7755)
Other political events	0.0033 (0.0544)	0.0032 (0.0633)	0.0034 (0.6496)	0.0025 (0.0581)	0.0035 (0.4976)
Domestic Political News					
After-Elections	0.0049*** (8.4165)	0.0052*** (9.4254)	0.0030 (0.0122)	0.0038 (0.4075)	0.0034 (1.1072)
Cyprus	0.0065** (5.0004)	0.0034 (0.3325)	0.0021 (1.7800)	0.0032 (0.0225)	0.0042* (3.3898)
Elections	0.0002 (0.2063)	0.0001 (2.3916)	0.0001** (5.0193)	0.0001 (1.1171)	0.0005 (1.4037)
European Union	0.0002 (0.8953)	0.0001*** (7.8127)	0.0000 (0.0342)	0.0001 (1.0700)	0.0000 (0.0245)
Foreign relations	0.0025 (0.2112)	0.0021 (1.0552)	0.0026 (0.0691)	0.0033 (0.0138)	0.0023 (0.2451)
Government Conflicts	0.0068** (4.7135)	0.0035 (0.1168)	0.0042 (0.1059)	0.0024 (0.1850)	0.0021 (0.9926)

²⁰ The results of the Brown-Forsythe test for the equality of variances between the returns around the events and the control sample are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.3. (cont'd)

Government Formation	0.0033 (0.5055)	0.0030 (0.0353)	0.0036 (0.7840)	0.0023 (0.2326)	0.0024 (0.7268)
Iraq Crisis	0.0039 (2.0335)	0.0027 (0.3001)	0.0029 (0.0286)	0.0027* (2.8625)	0.0028 (0.4350)
Iraq War	0.0021 (0.3821)	0.0041 (0.6888)	0.0031 (0.1783)	0.0042 (2.3224)	0.0026 (0.6256)
Union of the Left-Wing Part.	0.0028 (0.3002)	0.0030 (0.0007)	0.0014** (4.2756)	0.0021 (0.6268)	0.0018 (2.5392)
Other	0.0025 (0.8646)	0.0023 (0.7081)	0.0033 (0.1382)	0.0038 (0.8545)	0.0014* (3.1875)
Foreign Economic News					
Europe	0.0031 (0.2437)	0.0027 (0.0153)	0.0028 (0.0156)	0.0034 (0.1863)	0.0023 (0.8604)
US	0.0024 (1.3384)	0.0029 (0.3422)	0.0030 (0.2566)	0.0032 (1.1839)	0.0051 (0.3588)
Other	0.0044 (0.5557)	0.0018* (3.3623)	0.0030 (0.0843)	0.0029 (0.0555)	0.0021 (1.1868)
Domestic Economic News					
Budget	0.0036 (2.1071)	0.0024 (0.2999)	0.0051 (0.7599)	0.0049*** (8.4753)	0.0027 (0.0477)
CBRT Auctions	0.0022 (0.6298)	0.0021 (0.6553)	0.0023 (1.4720)	0.0020 (1.6606)	0.0012* (3.7384)
CBRT Reserves	0.0025 (0.4903)	0.0026 (0.3372)	0.0028 (0.0011)	0.0037 (0.2932)	0.0027 (0.2342)
Credits	0.0028 (0.0003)	0.0023 (0.1747)	0.0020 (1.5646)	0.0030 (0.0029)	0.0021 (0.8216)
Debts	0.0011 (2.1510)	0.0018 (1.3003)	0.0020 (0.6262)	0.0027 (0.0574)	0.0016 (1.0463)
Employment	0.0033 (0.0378)	0.0033 (0.0668)	0.0035 (0.3625)	0.0021 (0.7700)	0.0033 (0.2641)
Foreign Exchange	0.0019 (0.5342)	0.0042 (0.9611)	0.0027 (0.1109)	0.0031 (0.0420)	0.0023 (0.3457)
Growth	0.0008 (2.6673)	0.0009 (2.2448)	0.0022 (0.7666)	0.0023 (0.1894)	0.0027 (0.0228)
IMF	0.0025 (0.0192)	0.0041 (0.7838)	0.0036 (0.5144)	0.0032 (0.1821)	0.0042 (1.2375)

Table C.3. (cont'd)

Inflation	0.0020 (0.8811)	0.0030 (0.1430)	0.0031 (0.0228)	0.0032 (0.0147)	0.0026 (0.0167)
Interest Rates	0.0020 (0.3979)	0.0050 (0.6269)	0.0024 (0.2232)	0.0024 (0.3271)	0.0032 (0.0464)
Iraq Crisis	0.0030 (0.0337)	0.0036 (0.3512)	0.0042 (0.3719)	0.0059 (1.6795)	0.0042 (2.3243)
Net Exp. and Current Acc.	0.0018 (2.2070)	0.0027 (0.6916)	0.0029 (1.2995)	0.0019 (2.5805)	0.0021 (1.6494)
Production	0.0039 (0.0057)	0.0035 (0.1683)	0.0027 (0.0070)	0.0020 (1.2911)	0.0015** (3.9759)
Taxes	0.0015 (2.3813)	0.0053* (3.7211)	0.0042 (2.6731)	0.0048 (2.6534)	0.0027 (0.2452)
Treasury Auctions	0.0026 (0.7100)	0.0033 (0.5208)	0.0028 (0.2315)	0.0029 (0.5076)	0.0032 (0.3038)
Wage/Salary Determination	0.0029 (0.0079)	0.0050 (2.3006)	0.0024 (0.8334)	0.0025 (0.6283)	0.0041 (1.0288)
Oth. Macr. Indic. and News	0.0032 (0.0092)	0.0018 (1.2674)	0.0019 (1.3112)	0.0021 (1.3470)	0.0017 (1.1963)

Table C.4. Mean absolute returns in the event windows of the news categories and the equality of means test results (Mean absolute return of the control sample = 0.0022)²¹

	t-2	t-1	t	t+1	t+2
<i>Foreign Political News</i>					
Iraq Crisis	0.0025 (1.4469)	0.0026** (2.0269)	0.0030*** (3.6779)	0.0030*** (3.8779)	0.0030*** (3.9918)
Iraq War	0.0035** (2.2419)	0.0020 (0.3544)	0.0021 (0.1609)	0.0029 (1.1924)	0.0028 (1.0632)
Israel-Palestine Conflicts	0.0025 (0.6782)	0.0023 (0.3527)	0.0033 (1.2302)	0.0020 (0.1990)	0.0024 (0.2264)
North Korea - US Conflicts	0.0036 (1.6103)	0.0028 (0.6943)	0.0031 (1.0282)	0.0018 (0.4607)	0.0034 (1.4011)
Terror	0.0023 (0.3252)	0.0020 (0.4872)	0.0030* (1.8470)	0.0026 (0.9362)	0.0017 (1.0981)
Other confrontations	0.0009 (1.3480)	0.0017 (0.5473)	0.0016 (0.6065)	0.0011 (1.1064)	0.0006* (1.6528)
Other political events	0.0025 (0.3219)	0.0024 (0.3684)	0.0029 (0.9497)	0.0022 (0.2069)	0.0032 (1.4764)
<i>Domestic Political News</i>					
After-Elections	0.0039*** (2.8924)	0.0041*** (3.2655)	0.0023 (0.1696)	0.0026 (0.6611)	0.0029 (1.2160)
Cyprus	0.0035** (2.5391)	0.0026 (0.7565)	0.0015 (1.2653)	0.0023 (0.1895)	0.0031* (1.8341)
Elections	0.0020 (0.4333)	0.0015 (1.5260)	0.0012** (2.2410)	0.0017 (1.0595)	0.0016 (1.1811)
European Union	0.0025 (0.9701)	0.0033*** (2.9083)	0.0021 (0.1743)	0.0026 (1.0993)	0.0022 (0.1850)
Foreign relations	0.0025 (0.2695)	0.0023 (0.1294)	0.0022 (0.0336)	0.0021 (0.0937)	0.0019 (0.3426)
Government Conflicts	0.0046** (2.4505)	0.0026 (0.4391)	0.0028 (0.5684)	0.0019 (0.2958)	0.0012 (0.9779)

²¹ The results of the t-test for the equality of means between the absolute returns around the events and the control sample are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.4. (cont'd)

Government Formation	0.0023 (0.1434)	0.0021 (0.1880)	0.0032 (1.5014)	0.0019 (0.4690)	0.0016 (0.8447)
Iraq Crisis	0.0027* (1.6867)	0.0020 (0.5050)	0.0023 (0.2412)	0.0018 (1.2307)	0.0020 (0.6597)
Iraq War	0.0018 (0.5301)	0.0033 (1.4618)	0.0026 (0.5348)	0.0035* (1.7649)	0.0021 (0.1892)
Union of the Left-Wing Parties	0.0019 (0.5504)	0.0022 (0.0020)	0.0012* (1.7689)	0.0018 (0.7580)	0.0014 (1.3901)
Other	0.0017 (0.8497)	0.0019 (0.4788)	0.0026 (0.6893)	0.0030 (1.1956)	0.0013 (1.3611)
Foreign Economic News					
Europe	0.0024 (0.4870)	0.0017 (0.0302)	0.0018 (0.1451)	0.0025 (0.4932)	0.0014 (0.8778)
US	0.0018 (1.1373)	0.0024 (0.5959)	0.0024 (0.5081)	0.0026 (1.0836)	0.0024 (0.6107)
Other	0.0039 (0.9569)	0.0012* (1.7516)	0.0025 (0.2925)	0.0031 (0.7880)	0.0017 (0.8287)
Domestic Economic News					
Budget	0.0028 (1.4731)	0.0020 (0.3776)	0.0026 (0.9006)	0.0034*** (2.9011)	0.0021 (0.2231)
CBRT Auctions	0.0017 (0.7092)	0.0019 (0.5209)	0.0024 (0.2676)	0.0016 (0.8745)	0.0010* (1.9332)
CBRT Reserves	0.0017 (0.5329)	0.0017 (0.5539)	0.0022 (0.0014)	0.0035 (1.3160)	0.0017 (0.4799)
Credits	0.0022 (0.0190)	0.0020 (0.2449)	0.0013 (1.2412)	0.0025 (0.3976)	0.0017 (0.7281)
Debts	0.0008 (1.4032)	0.0016 (0.5946)	0.0015 (0.7616)	0.0021 (0.0954)	0.0013 (0.8898)
Employment	0.0023 (0.1979)	0.0021 (0.1437)	0.0030 (1.2326)	0.0016 (0.8540)	0.0026 (0.5173)
Foreign Exchange	0.0017 (0.5578)	0.0033 (1.1488)	0.0024 (0.1662)	0.0027 (0.5188)	0.0016 (0.5608)
Growth	0.0006 (1.6006)	0.0008 (1.4297)	0.0015 (0.7231)	0.0018 (0.4169)	0.0021 (0.0798)
IMF	0.0021 (0.1423)	0.0027 (0.8923)	0.0026 (0.7834)	0.0024 (0.4927)	0.0028 (1.1737)

Table C.4. (cont'd)

Inflation	0.0016 (0.7686)	0.0020 (0.3371)	0.0023 (0.1719)	0.0023 (0.1688)	0.0024 (0.2223)
Interest Rates	0.0016 (0.6319)	0.0031 (1.0132)	0.0020 (0.2456)	0.0017 (0.5134)	0.0024 (0.2717)
Iraq Crisis	0.0025 (0.4121)	0.0028 (0.8690)	0.0033 (1.4895)	0.0031 (1.2960)	0.0034 (1.6436)
Net Exp. and Current Account	0.0014 (1.4065)	0.0019 (0.8092)	0.0022 (0.8181)	0.0015 (1.5305)	0.0017 (1.1863)
Production	0.0024 (0.3180)	0.0026 (0.4628)	0.0021 (0.0333)	0.0014 (0.9390)	0.0011* (1.9355)
Taxes	0.0013 (1.2907)	0.0036** (2.0689)	0.0035** (1.9766)	0.0033* (1.7063)	0.0019 (0.4775)
Treasury Auctions	0.0020 (0.4368)	0.0025 (0.7686)	0.0021 (0.2300)	0.0019 (0.6791)	0.0025 (0.6973)
Wage/Salary Determination	0.0023 (0.1893)	0.0031 (1.5353)	0.0017 (0.9149)	0.0017 (0.7662)	0.0028 (1.0091)
Other Macr. Indicators and News	0.0022 (0.0137)	0.0015 (1.0224)	0.0019 (0.4576)	0.0014 (1.0303)	0.0014 (1.0613)

Table C.5. Median absolute returns in the event windows of the news categories and the equality of medians test results (Median absolute return of the control sample = 0.0016)²²

	t-2	t-1	t	t+1	t+2
<i>Foreign Political News</i>					
Iraq Crisis	0.0014 (0.0457)	0.0017 (0.3777)	0.0019 (1.1132)	0.0018* (1.6719)	0.0020* (1.7761)
Iraq War	0.0022 (1.1985)	0.0014 (0.4455)	0.0016 (0.6445)	0.0023 (1.3223)	0.0007 (1.2653)
Israel-Palestine Conflicts	0.0023 (1.1392)	0.0010 (0.5091)	0.0026* (1.7467)	0.0018 (0.4367)	0.0019 (0.9461)
North Korea - US Conflicts	0.0026 (0.7387)	0.0022 (0.9339)	0.0032* (1.7265)	0.0007 (1.2059)	0.0030 (0.8940)
Terror	0.0014 (0.0499)	0.0014 (0.3003)	0.0016 (0.9640)	0.0015 (0.6444)	0.0010* (1.7086)
Other confrontations	0.0009 (1.6182)	0.0017 (0.2235)	0.0002 (1.1212)	0.0011 (1.0970)	0.0004** (2.3725)
Other political events	0.0016 (0.4765)	0.0009 (0.5427)	0.0024 (0.4714)	0.0019 (0.0804)	0.0022 (0.5738)
<i>Domestic Political News</i>					
After-Elections	0.0038** (2.1579)	0.0043*** (2.8028)	0.0016 (0.2631)	0.0016 (0.2502)	0.0030* (1.7601)
Cyprus	0.0019 (0.7891)	0.0014 (0.3795)	0.0011 (1.3508)	0.0014 (0.1882)	0.0026 (1.4518)
Elections	0.0010 (0.9655)	0.0010* (1.7144)	0.0008*** (2.7670)	0.0014 (0.4404)	0.0010 (1.5551)
European Union	0.0024* (1.8503)	0.0021* (1.8297)	0.0016 (0.1870)	0.0019 (1.3943)	0.0015 (0.4594)
Foreign relations	0.0013 (0.3424)	0.0019 (0.9307)	0.0019 (0.9599)	0.0010 (0.3781)	0.0010 (0.3502)

²² The results of the Wilcoxon/Mann-Whitney test for the equality of medians between the absolute returns around the events and the control sample are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.5. (cont'd)

Government Conflicts	0.0018 (1.3840)	0.0022 (0.7526)	0.0011 (0.0009)	0.0016 (0.2239)	0.0005 (1.3943)
Government Formation	0.0012 (0.2388)	0.0014 (0.4019)	0.0024** (2.2196)	0.0021 (0.1267)	0.0010 (1.0385)
Iraq Crisis	0.0018 (1.5561)	0.0014 (0.2064)	0.0019 (0.7080)	0.0012 (1.4856)	0.0011 (1.1174)
Iraq War	0.0020 (0.1871)	0.0023** (1.9796)	0.0020 (1.4479)	0.0031* (1.9469)	0.0018 (0.4169)
Union of the Left-Wing Parties	0.0012 (0.8930)	0.0015 (0.0916)	0.0008** (2.2420)	0.0015 (0.4067)	0.0010 (1.3346)
Other	0.0010 (1.1383)	0.0016 (0.1445)	0.0021 (0.8959)	0.0019 (1.5241)	0.0014 (1.0316)
Foreign Economic News					
Europe	0.0024 (0.6387)	0.0017 (0.5824)	0.0018 (0.4353)	0.0025 (0.0188)	0.0014 (0.4902)
US	0.0014 (0.8946)	0.0021* (1.9307)	0.0020 (1.2679)	0.0023* (1.9506)	0.0014 (0.9233)
Other	0.0033* (1.8864)	0.0005** (2.4797)	0.0021 (0.0072)	0.0035** (2.0369)	0.0015 (0.7252)
Domestic Economic News					
Budget	0.0023 (1.5632)	0.0019 (0.7048)	0.0010 (1.0075)	0.0026** (2.3822)	0.0020 (0.1911)
CBRT Auctions	0.0015 (0.1977)	0.0011 (0.5792)	0.0020 (1.0915)	0.0011 (0.5971)	0.0011** (2.2409)
CBRT Reserves	0.0007 (0.6449)	0.0010 (0.8674)	0.0021 (0.4946)	0.0038 (1.0803)	0.0016 (0.6315)
Credits	0.0016 (0.3800)	0.0018 (0.6744)	0.0006* (1.8575)	0.0022 (0.9299)	0.0018 (0.4238)
Debts	0.0007* (1.8396)	0.0013 (0.1616)	0.0011 (0.6559)	0.0019 (0.3556)	0.0018 (0.7005)
Employment	0.0007 (0.5986)	0.0012 (0.4527)	0.0028** (2.1429)	0.0010 (0.7290)	0.0024 (0.8525)
Foreign Exchange	0.0015 (0.0324)	0.0034 (1.5761)	0.0030 (0.7986)	0.0027 (1.1433)	0.0017 (0.4226)
Growth	0.0004** (2.2200)	0.0007* (1.7974)	0.0006 (0.8504)	0.0024 (0.0165)	0.0018 (0.4545)

Table C.5. (cont'd)

IMF	0.0020 (0.7176)	0.0011 (0.2572)	0.0022 (0.6461)	0.0019 (0.7928)	0.0020 (0.8396)
Inflation	0.0010 (0.5382)	0.0011 (0.6401)	0.0014 (0.3625)	0.0012 (0.0689)	0.0028 (0.8546)
Interest Rates	0.0016 (0.4942)	0.0011 (0.3613)	0.0014 (0.1434)	0.0013 (0.4643)	0.0019 (0.6577)
Iraq Crisis	0.0020 (0.7715)	0.0020 (1.3873)	0.0019 (1.0698)	0.0016 (0.0939)	0.0032 (1.2977)
Net Exp. and Current Account	0.0012 (1.3977)	0.0011 (1.2714)	0.0016 (0.0116)	0.0009 (1.5517)	0.0014 (0.8875)
Production	0.0018 (0.2392)	0.0015 (0.1870)	0.0018 (0.6238)	0.0010 (0.9199)	0.0008** (2.4862)
Taxes	0.0009 (1.2693)	0.0025 (1.5855)	0.0030** (2.3235)	0.0025 (1.1293)	0.0013 (0.6792)
Treasury Auctions	0.0021 (0.1202)	0.0015 (0.7449)	0.0019 (0.3019)	0.0013 (0.9640)	0.0018 (0.5093)
Wage/Salary Determination	0.0024 (0.8179)	0.0019 (0.0180)	0.0012 (1.0534)	0.0011 (1.1896)	0.0022 (0.8781)
Other Macr. Indicators and News	0.0011 (0.2207)	0.0014 (0.7223)	0.0016 (0.2676)	0.0010 (1.1685)	0.0014 (0.8270)

Table C.6. Standard deviation of absolute returns in the event windows of the news categories and the equality of variances test results (Standard deviation of the absolute returns in the control sample = 0.0022)²³

	t-2	t-1	t	t+1	t+2
<i>Foreign Political News</i>					
Iraq Crisis	0.0030* (3.7468)	0.0030*** (7.5444)	0.0023*** (18.2629)	0.0031*** (16.8677)	0.0017*** (14.2791)
Iraq War	0.0047** (4.1216)	0.0020 (0.2136)	0.0014 (0.9215)	0.0030 (0.0740)	0.0051* (3.7695)
Israel-Palestine Conflicts	0.0019 (0.0042)	0.0027 (0.6510)	0.0028 (0.0120)	0.0017 (1.0022)	0.0016 (0.5714)
North Korea - US Conflicts	0.0044 (2.4054)	0.0023 (0.0107)	0.0016 (0.2091)	0.0027 (0.0001)	0.0030 (2.5863)
Terror	0.0024 (0.0635)	0.0019 (0.8826)	0.0024* (3.5852)	0.0019 (0.6604)	0.0012 (0.5684)
Other confrontations	0.0004 (2.1390)	0.0012 (0.5849)	0.0022 (0.0049)	0.0006 (1.4447)	0.0006 (1.6523)
Other political events	0.0020 (0.1103)	0.0032 (0.5240)	0.0028 (1.4260)	0.0016 (0.0781)	0.0033* (3.3703)
<i>Domestic Political News</i>					
After-Elections	0.0029** (4.3974)	0.0031 (2.5434)	0.0020 (0.0109)	0.0029* (2.7938)	0.0019 (0.1988)
Cyprus	0.0055*** (8.1910)	0.0025 (1.2516)	0.0015 (1.3004)	0.0022 (0.0222)	0.0027 (2.2554)
Elections	0.0023 (0.0407)	0.0014 (1.0843)	0.0011** (3.8689)	0.0012 (2.2964)	0.0018 (0.3696)
European Union	0.0019 (0.0110)	0.0045** (4.8568)	0.0020 (0.3748)	0.0022 (0.3643)	0.0019 (0.0655)
Foreign relations	0.0022 (0.0168)	0.0012 (1.1379)	0.0008 (1.2165)	0.0023 (0.1195)	0.0018 (0.0669)
Government Conflicts	0.0053** (4.1261)	0.0021 (0.0047)	0.0031 (0.8946)	0.0011 (0.5869)	0.0016 (0.2481)

²³ The results of the Brown-Forsythe test for the equality of variances between the absolute returns around the events and the control sample are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.6. (cont'd)

Government Formation	0.0025 (0.0170)	0.0021 (0.0175)	0.0020 (0.0034)	0.0012 (0.8126)	0.0017 (0.1652)
Iraq Crisis	0.0028 (0.9756)	0.0018 (0.4184)	0.0019 (0.0053)	0.0021 (1.5243)	0.0020 (0.0005)
Iraq War	0.0010 (1.5180)	0.0021 (0.0214)	0.0015 (0.6782)	0.0024 (0.2744)	0.0015 (1.1114)
Union of the Left-Wing Parties	0.0023 (0.2562)	0.0019 (0.0010)	0.0012 (2.1038)	0.0013 (0.6761)	0.0011 (2.0858)
Other	0.0018 (0.1581)	0.0017 (0.9919)	0.0022 (0.0693)	0.0023 (0.0881)	0.0007* (2.9853)
Foreign Economic					
Europe	0.0024 (0.3391)	0.0017 (0.5923)	0.0018 (0.0028)	0.0025 (0.8070)	0.0014 (0.8623)
United States	0.0016 (1.9237)	0.0016 (1.1837)	0.0018 (0.0836)	0.0018 (0.0128)	0.0045 (0.9509)
Other	0.0035 (0.5116)	0.0012 (1.6538)	0.0013 (0.1742)	0.0011 (1.6106)	0.0015 (0.6964)
Domestic Economic News					
Budget	0.0022 (1.2235)	0.0013 (1.7802)	0.0045 (2.6402)	0.0037** (4.9182)	0.0017 (0.0271)
CBRT Auctions	0.0012 (1.5098)	0.0018 (0.0647)	0.0015 (0.4820)	0.0013 (0.9080)	0.0007* (2.9718)
CBRT Reserves	0.0017 (0.0483)	0.0020 (0.0209)	0.0014 (0.2218)	0.0030 (0.7224)	0.0019 (0.0287)
Credits	0.0017 (0.1223)	0.0010 (1.3927)	0.0017 (0.2611)	0.0018 (0.0675)	0.0013 (0.5736)
Debts	0.0008 (1.2295)	0.0009 (1.0723)	0.0012 (0.8524)	0.0014 (0.1953)	0.0008 (1.0797)
Employment	0.0026 (1.2155)	0.0025 (0.0125)	0.0016 (0.3489)	0.0013 (0.5150)	0.0020 (0.0037)
Foreign Exchange	0.0008 (1.6666)	0.0020 (0.0007)	0.0013 (0.7756)	0.0015 (0.1005)	0.0014 (0.2662)
Growth	0.0004 (2.0470)	0.0004 (2.0718)	0.0015 (0.1811)	0.0012 (0.5771)	0.0014 (0.4902)
IMF	0.0014 (1.0168)	0.0033 (2.1108)	0.0025 (0.3850)	0.0021 (0.0016)	0.0033 (0.7676)

Table C.6. (cont'd)

Inflation	0.0013 (0.5454)	0.0022 (0.0337)	0.0020 (0.0002)	0.0024 (0.0025)	0.0015 (0.2574)
Interest Rates	0.0014 (0.2646)	0.0046* (2.9445)	0.0015 (0.3812)	0.0017 (0.4068)	0.0018 (0.0419)
Iraq Crisis	0.0021 (0.0273)	0.0019 (0.0003)	0.0037 (1.1334)	0.0053 (1.9638)	0.0029 (1.3695)
Net Exp. and Current Account	0.0012 (1.5516)	0.0020 (0.1379)	0.0019 (2.3917)	0.0012* (2.7877)	0.0012 (1.2412)
Production	0.0031 (0.2199)	0.0023 (0.3039)	0.0015 (0.3213)	0.0014 (0.7430)	0.0010 (2.4521)
Taxes	0.0011 (1.4623)	0.0039 (1.7394)	0.0022 (0.3032)	0.0035 (1.9756)	0.0019 (0.0022)
Treasury Auctions	0.0017 (0.1957)	0.0023 (0.5108)	0.0018 (1.1295)	0.0022 (0.0999)	0.0024 (0.2731)
Wage/Salary Determination	0.0016 (0.1303)	0.0039** (6.5838)	0.0016 (0.3863)	0.0019 (0.2015)	0.0030 (0.3346)
Other Macr. Indicators and News	0.0021 (0.0611)	0.0010 (2.0535)	0.0010 (1.2370)	0.0014 (0.6320)	0.0010 (1.3700)

Table C.7. Mean returns (absolute returns) before and after the news categories and the equality of means test results²⁴

		MEAN CUMULATIVE RETURN			MEAN CUMULATIVE ABSOLUTE RETURN		
	# of Obs.	Before the news	After the news	Statistic	Before the news	After the news	Statistic
<i>Foreign Political News</i>							
Iraq Crisis	155	-0.0004	0.0009	1.3065	0.005	0.006	1.1285
Iraq War	18	0.003	0.0013	0.8021	0.0053	0.0054	0.0829
Israel-Palestine Conflicts	20	-0.0006	0.0003	0.6302	0.0045	0.0041	0.4607
North Korea – US Confl.	9	0.0008	-0.0029	1.4831	0.0059	0.005	0.4363
Terror	26	0.0002	0.0005	0.251	0.0041	0.0041	0.0056
Other confrontations	8	0.0005	0	0.5181	0.0022	0.0014	1.5833
Other political events	19	-0.0008	0.0024	1.8014*	0.0043	0.0046	0.2659
<i>Domestic Political News</i>							
After-Elections	17	0.0022	0.0005	0.731	0.0074	0.0051	1.541
Cyprus	21	0.0036	0.0034	0.2992	0.0059	0.0051	0.503
Elections	25	0.0045	0.0043	0.2274	0.0033	0.0031	0.1991
European Union	48	-0.0005	0.0002	0.5822	0.0056	0.0047	1.0678
Foreign relations	8	-0.0028	0.0019	3.3025***	0.0045	0.0035	0.9595

²⁴ The results of the t-test for the equality of means between the returns (absolute returns) before and after the events are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.7. (cont'd)

Government Conflicts	8	0.0036	-0.0001	1.2403	0.0064	0.0027	1.677
Government Formation	14	0.0012	-0.0001	0.7973	0.004	0.0032	0.8198
Iraq Crisis	56	-0.0005	-0.0007	0.2566	0.0046	0.0037	1.5217
Iraq War	12	0.0001	0.0019	1.0516	0.0045	0.005	0.4067
Union of the Left-Wing Part.	17	-0.0007	0.0009	1.2875	0.0038	0.0029	0.9014
Other	15	-0.0009	-0.0006	0.2053	0.0033	0.004	0.6281
Foreign Economic News							
Europe	25	0.0006	0.0011	0.5999	0.0039	0.0039	0.0501
United States	40	0.0009	0.0006	0.2482	0.004	0.0049	0.9817
Others	9	0.0035	-0.0021	3.5725***	0.0048	0.0045	0.2245
Domestic Economic News							
Budget	30	-0.0009	-0.0008	0.0184	0.0048	0.0055	0.6565
CBRT Auctions	12	-0.0013	0.0009	1.8960*	0.0036	0.0026	1.1566
CBRT Reserves	8	-0.0004	0.0036	1.9494*	0.003	0.0049	1.3958
Credits	10	0.0005	-0.0003	0.4545	0.0042	0.0042	0.0533
Debts	8	0.0014	0.0003	0.9003	0.0022	0.0029	0.9533
Employment	13	-0.0011	0.0008	1.0925	0.0041	0.0037	0.2762
Forced Savings	6	0.0008	0.0059	1.1606	0.002	0.0083	1.769
Foreign Exchange	8	0.0015	0.0017	0.13	0.0042	0.0038	0.3944

Table C.7. (cont'd)

Gen. State of the Economy	7	0.003	0.0013	0.6522	0.0038	0.0046	0.4874
Grading	6	-0.002	0.0016	0.9987	0.0055	0.0047	0.3504
Growth	8	-0.0001	0.0012	0.9956	0.0012	0.0032	2.2310**
IMF	21	-0.0012	0.0021	1.8593*	0.0045	0.005	0.3792
Inflation	12	0.0013	0.0027	1.0214	0.0033	0.0044	1.0115
Interest Rates	9	-0.0021	0.0006	1.2758	0.0045	0.0037	0.5337
Iraq Crisis	12	0.0018	-0.0023	1.6873	0.0049	0.0061	0.7092
Net Exp. and Current Acc.	19	0.0001	0.0008	0.6371	0.003	0.0029	0.1674
Production	15	0.0009	-0.0001	0.5997	0.0046	0.0024	1.8872*
Taxes	14	0.0002	0.0004	0.1028	0.0046	0.0048	0.0932
Treasury Auctions	28	-0.0013	-0.001	0.225	0.0044	0.0042	0.1321
Wage/Salary Deter.	17	0.0012	0.0015	0.2023	0.005	0.0042	0.5871
Oth. Macr. Indic. and News	9	0	-0.0007	0.4266	0.0036	0.0029	0.8098

Table C.8. Median returns (absolute returns) before and after the news categories and the equality of medians test results²⁵

		MEDIAN CUMULATIVE RETURN			MEDIAN CUMULATIVE ABSOLUTE RETURN		
	# of Obs.	Before the news	After the news	Statistic	Before the news	After the news	Statistic
<i>Foreign Political News</i>							
Iraq Crisis	155	0.0001	0.0004	0.4778	0.0035	0.0041	1.3345
Iraq War	18	0.0015	0.0005	1.0599	0.004	0.0032	0.2057
Israel-Palestine Conflicts	20	-0.0004	-0.0002	0.2029	0.0039	0.0038	0.0812
North Korea - US Conflicts	9	0.0008	-0.0032	1.8543*	0.0047	0.0042	0.5298
Terror	26	0.0002	0.0007	0.6314	0.0033	0.0029	0.2654
Other confrontations	8	0.0005	-0.0003	0.8927	0.0024	0.0015	1.5228
Other political events	19	-0.0001	0.0016	1.8539*	0.0021	0.0029	1.0218
<i>Domestic Political News</i>							
After-Elections	17	0.0016	-0.0009	0.775	0.0075	0.0047	1.2916
Cyprus	21	0.0027	0.0026	0	0.0043	0.0038	0.3522
Elections	25	0.0035	0.0027	0.6015	0.0024	0.0026	0.1358
European Union	48	-0.0003	0.0002	0.3957	0.0048	0.004	0.8097
Foreign relations	8	-0.0035	0.0012	2.6780***	0.0043	0.0033	0.5776

²⁵ The results of the Wilcoxon/Mann-Whitney test for the equality of medians between the returns (absolute returns) before and after the events are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively

Table C.8. (cont'd)

Government Conflicts	8	0.0016	-0.0008	0.7877	0.0042	0.0022	1.5228
Government Formation	14	0.0015	-0.0003	1.2636	0.0025	0.0026	0.3906
Iraq Crisis	56	0.0004	-0.0007	0.6372	0.0036	0.003	1.6323
Iraq War	12	-0.0015	0.0017	1.2413	0.0043	0.0048	0.0866
Union of the Left-Wing Part.	17	-0.0001	0.0008	1.0161	0.0026	0.0021	0.31
Other	15	-0.0011	-0.0009	0	0.0026	0.0036	1.037
Foreign Economic News							
Europe	25	0.0004	0.0009	0.0388	0.003	0.003	0.0873
United States	40	0.0007	0.0003	0.7169	0.0037	0.0036	0.4667
Others	9	0.0032	-0.0029	2.7374***	0.0032	0.0044	0.4415
Domestic Economic News							
Budget	30	0.0003	-0.0001	0.2883	0.0047	0.0048	0.2883
CBRT Auctions	12	-0.0015	0.001	1.7321*	0.003	0.0023	0.7217
CBRT Reserves	8	-0.0009	0.0035	1.6278	0.0029	0.004	1.2077
Credits	10	0.0003	0.0006	0.4158	0.0045	0.0041	0.1134
Debts	8	0.0012	-0.0001	1.1027	0.002	0.0032	0.5776
Employment	13	0.0001	0.0003	0.7436	0.0028	0.004	0.1026
Forced Savings	6	0.0006	0.0025	0.5604	0.002	0.006	0.8807
Foreign Exchange	8	0.0005	0.0024	0.2626	0.0043	0.0041	0.2626

Table C.8. (cont'd)

Gen. State of the Economy	7	0.0029	-0.0021	1.15	0.0037	0.0025	0.1278
Grading	6	-0.0021	0.0004	1.0408	0.0042	0.0048	0.5604
Growth	8	-0.0004	0.0007	1.2077	0.0013	0.0038	1.3128
IMF	21	-0.0008	0.0013	1.7861*	0.0031	0.0043	0.654
Inflation	12	0.001	0.0025	1.2413	0.0024	0.0037	1.3568
Interest Rates	9	-0.0012	-0.0001	1.0155	0.0029	0.0034	0
Iraq Crisis	12	0.0006	-0.0013	1.4145	0.0042	0.0046	0.5196
Net Exp. and Current Acc.	19	-0.0002	0.0001	0.2044	0.0028	0.0024	0.0584
Production	15	0.0013	-0.0003	1.6591*	0.0031	0.0018	1.5969
Taxes	14	0.0005	-0.0003	0.5743	0.0031	0.0036	0.2987
Treasury Auctions	28	-0.001	-0.0009	0.2622	0.0038	0.0032	0.4015
Wage/Salary Deter.	17	0.0008	0.0009	0.1894	0.004	0.0034	0.7233
Oth. Macr. Indic. and News	9	-0.0003	-0.0005	0.3532	0.0023	0.0033	0.9713

Table C.9. Standard deviation of returns (absolute returns) before and after the news categories and the equality of variances test results²⁶

		STANDARD DEVIATION OF CUMULATIVE RETURNS			STANDARD DEVIATION OF ABS. CUM. RETURNS		
	# of Obs.	Before the news	After the news	Statistic	Before the news	After the news	Statistic
<i>Foreign Political News</i>							
Iraq Crisis	155	0.0061	0.0106	0.6728	0.005	0.0099	0.3368
Iraq War	18	0.0064	0.006	0.1671	0.0058	0.0059	0.0084
Israel-Palestine Conflicts	20	0.0046	0.004	0.714	0.0033	0.0026	1.4369
North Korea - US Conflicts	9	0.0053	0.0053	0.0236	0.0042	0.0038	0.0101
Terror	8	0.0021	0.0015	0.7499	0.001	0.001	0.0602
Other confrontations	19	0.0058	0.005	0.1062	0.004	0.0035	0.1621
Other political events	26	0.0038	0.0043	0.1069	0.0027	0.0032	0.5832
<i>Domestic Political News</i>							
After-Elections	17	0.0074	0.0058	0.7073	0.0049	0.0034	1.9081
Cyprus	21	0.0027	0.0023	0.8332	0.006	0.004	0.1321
Elections	25	0.0031	0.0034	0.2301	0.0027	0.0023	0.9911
European Union	48	0.0061	0.0049	0.0268	0.0049	0.0033	0.2349
Foreign relations	8	0.0031	0.0026	0.1791	0.0015	0.0025	9.608***

²⁶ The results of the Brown-Forsythe test for the equality of variances between the returns (absolute returns) before and after the events are given in parenthesis. *, ** and *** indicate the significance of the statistics at the 10%, 5% and 1% levels respectively.

Table C.9. (cont'd)

Government Conflicts	8	0.0082	0.0024	4.3478*	0.006	0.0019	0.9933
Government Formation	14	0.005	0.0035	0.3732	0.0034	0.0021	1.4115
Iraq Crisis	56	0.0046	0.0041	0.5448	0.0033	0.003	0.2497
Iraq War	12	0.0048	0.0034	0.5739	0.0024	0.0035	0.3903
Union of the Left-Wing Part.	17	0.0044	0.0026	0.9166	0.0035	0.0018	1.1958
Other	15	0.0042	0.0037	0.1049	0.0031	0.0024	0.0128
Foreign Economic News							
Europe	25	0.0033	0.0033	0	0.0035	0.003	0.2018
United States	40	0.0037	0.0063	1.7249	0.0023	0.0047	1.8566
Others	9	0.0032	0.0035	0.0579	0.0037	0.0013	1.8744
Domestic Economic News							
Budget	30	0.0051	0.0065	0.1839	0.0028	0.0045	0.0392
CBRT Auctions	12	0.0034	0.002	2.1978	0.0025	0.0016	2.826
CBRT Reserves	8	0.0036	0.0046	0.1139	0.0019	0.0035	0.4206
Credits	10	0.0035	0.0036	0.0236	0.0013	0.0023	2.2597
Debts	8	0.002	0.0026	0.3384	0.0013	0.0018	2.4328
Employment	13	0.0057	0.0028	1.7183	0.0041	0.0026	0.6099
Forced Savings	6	0.0014	0.0108	5.9580**	0.001	0.0087	5.7859**
Foreign Exchange	8	0.0038	0.0037	0.204	0.0024	0.0018	1.6247

Table C.9. (cont'd)

Gen. State of the Economy	7	0.0023	0.0062	1.4653	0.0017	0.004	1.2488
Grading	6	0.0066	0.0061	0.0046	0.0039	0.0039	0.4479
Growth	8	0.0014	0.0034	1.5033	0.0008	0.0024	12.195***
IMF	21	0.0055	0.0059	0.0187	0.0036	0.0041	0.0477
Inflation	12	0.0031	0.0037	0.3898	0.0027	0.0026	0.1064
Interest Rates	9	0.0054	0.0035	0.605	0.0038	0.0021	0.625
Iraq Crisis	12	0.0048	0.0069	0.1297	0.0028	0.0049	1.0466
Net Exp. and Current Acc.	19	0.0032	0.0033	0.0236	0.0021	0.002	0.1848
Production	15	0.006	0.0023	1.6222	0.0043	0.0015	2.1541
Taxes	14	0.0045	0.0049	0.2079	0.0042	0.0049	0.3611
Treasury Auctions	28	0.0042	0.0049	0.1516	0.0028	0.0032	0.1108
Wage/Salary Deter.	17	0.0058	0.0052	0.3869	0.004	0.0041	0.1491
Oth. Macr. Indic. and News	9	0.0044	0.0016	4.4063*	0.0023	0.0017	0.548