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THE PRESENCE OF THE MONDAY EFFECT ON RETURN AND VOLATILITY OF THE BIST 100 INDEX

YÜKSEK LİSANS TEZİ

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The Presence of the Monday Effect on Return and Volatility of the BIST 100 Index

Pazartesi etkisinin BIST 100 getirisi ve değişkenliği üzerindeki varlığı

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List of Abbreviations

ARCH : Autoregressive Conditional Heteroskedasticity

BIST : Borsa Istanbul

EGARCH : Exponential Generalized Autoregressive Conditional Heteroskedasticity

GARCH : Generalized Autoregressive Conditional Heteroskedasticity

OLS : Ordinary least square

List of Symbols

P_t : Closing price in day t

P_{t-1} : Closing price in the day before

R : Rate of return of BIST 100

ε_t : Random error term

MD : Monday dummy variable

n : Sample size

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Abstract

This study examines the presence of the Monday effect on return and volatility of the BIST-100, for the period between January 5, 2009 to October 13, 2016 in Turkey. Daily series of the market index (BIST-100 Index) is used to compute the stock return and estimate simple regression from January 2009 to October 2016. Moreover, GARCH and EGARCH models were developed to increase the efficiency of the estimation to take into account the serial correlation and heteroskedasticity in the residuals. The results show that Monday has a positive effect on volatility. However, it has no effect on returns. Also, Borsa Istanbul is efficient equity market in terms of returns. Another result is presence of leverage effect, revealed by EGARCH model. It means negative shocks cause higher volatility than positive shocks. The study concludes that the Borsa Istanbul has a significant Monday effect on volatility but not on the expected returns.

Özet

Bu çalışma, 5 Ocak 2009 ve 13 Ekim 2016 arasında Pazartesi etkisinin BİST 100 getirisi ve değişkenliği üzerindeki varlığını inceler. Günlük endeks serisi (BİST-100 endeksi), hisse senedi getirisini hesaplamak ve basit regresyon uygulamak için Ocak 2009'dan Ekim 2016'ya kadar kullanılıyor. Ayrıca, tahminin etkinliğini arttırmak için (residuals)'lardaki kalıntı seri korelasyon ve farklı yayılım (heteroskedastisite) dikkate alınarak GARCH ve EGARCH modelleri geliştirildi. Sonuçlar, Pazartesi gününün değişkenlik (risk) üzerinde pozitif bir etkiye sahip olduğunu ama getiri üzerinde herhangi bir etkiye sahip olmadığını gösteriyor. Ayrıca, Borsa İstanbul getirileri açısından etkin sermaye piyasasıdır. Bir başka sonuç, EGARCH modelinin ortaya koyduğu yani açıkladığı kaldıraç etkisinin varlığıdır. Negatif şokların, pozitif şoklara göre daha yüksek değişkenliğe (riske) neden olduğu anlamına gelir. Bu çalışma Borsa İstanbul'un değişkenlik üzerinde önemli bir Pazartesi etkisine sahip olduğu ancak beklenen getiri üzerinde herhangi bir Pazartesi etkisine sahip olmadığı sonucuna varıyor.

1. INTRODUCTION

One of the most interesting and puzzling market anomalies in the stock markets is the calendar effect. Market anomaly is a price or rate of return distortion on a financial market which argue against the efficient-market hypothesis. It relates to structural factors, behavioral biases, calendar effects, like the January effect. Calendar effects available because of deviation in normal behaviors of stocks according to time periods (Latif et al, 2011, p. 10). Calendar anomalies contain the weekend effect, the month effect and year effect.

The Weekend Effect: Monday return is in interaction with Friday's return and this interaction is called "weekend anomaly". Stock prices more decrease on Monday than on the previous Friday. Some studies indicate that Monday returns are worse when compared with the other days.

The Month Effect: Stocks have higher returns at the beginning of the month. Stock prices rise on the last trading day of the month.

The Year Effect: This abnormal return emerges during the first two weeks of January (Schwert, 2002) and in the last week of December. Some of market anomalies appear once and disappear, while others are continuously appeared.

This study focuses on the day-of-the-week effect, described as stocks having distinct expected returns on distinct days of the week. Altough, testing the day of the week effect as a market anomaly in finance literature has been a research topic for the global market, a few investigations have hitherto taken account of

Turkish stock market. This research aims to contribute to the empiric literature by analyzing the existence of Monday effect on the stock market return and its variance in Borsa Istanbul.

The existence of market anomalies, such as Monday effect, has attained enomous attention by market efficiency and behavioaral finance literature. In efficient market prices completely reflect existing information (Fama, 1970). Buyers and sellers are assumed to degest new information immediately as it becomes available and, through their purchase and sale activities, to create a new market equilibrium price quickly. Jensen (1978) emphasizes trading profitability is important in evaluating market efficiency.

Efficient market hypothesis may not always explain the market anomalies. Behavioral finance includes research which uses less expected utility theory and arbitrage assumption with rational investors in efficient markets. It focuses on cognitive psychology (people's thoughts) and the limits to arbitrage (Ritter, 2003). Behavioral finance has a number of theories such as regret, herding, prospect and anchoring to explain the impact of human emotions on investment decision. Shortly, behavioral finance is based on investor behavior and its impact on investment decisions and stock prices (Gitman, 2009, pp.345-346).

This research is composed of five sections: second section presents the Monday Effect with a general glance at literature; third section explains the methodology that is being used. In addition, fourth section summarizes the interpretations of empirical conclusions and used data. Fifth section is the closing with the conclusions.

2. LITERATURE REVIEW

The primary aim of this study is to examine evidence for existence of the "daily effect" in Borsa Istanbul (BIST). There is avast literature on the Monday effect of stock markets. Demirer and Karan (2012) shows that the daily effect is on return variability, although not on market returns.

Investors want to maximize the expected return and minimize the standard deviation of their portfolio returns (Butler, 2008, p.467). Investigation of the Monday-effect is essential for financial decisions as investors at Borsa Istanbul (BIST) optimize their returns by scheduling the operations and they also act differently in the different days of the week. Another significant matter is the actions of individual investors. Stock investors purchase shares at a lower price and sell with a higher price by taking advantage of calendar anomaly (Çiçek, 2013.)

It has been claimed that there is significant evidence regarding a decline in stock prices on Mondays (Osborne, 1962) and an increase on the any other days (Cross, 1973). French (1980) also supports this finding. In addition, Osborne (1962) points out that individual investors are more active on Mondays since those individual investors who have time can concentrate on financial analyses and also plan the weekends (Güven ve Oğuzsoy, 2003, p.959). On the other hand, Mertens (2015) argues that institutional investors are less active on Mondays with respect to subjects such as strategic analysis and planning. Another finding is that individual investors operate highest on Mondays while

institutional investors operate at the lowest rate on the very same day in New York Stock Exchange (Lakonishok and Maberly, 1990). The Weekend Effect has the contribution of speculative short sales and as a result, the stock market prices increasing on Fridays and stock prices declining on Mondays. Unfavorable news is generally received on the weekends (Mehdian and Mark, 2001). This news causes investors to sell their stocks on the first day of the week. Besides, the same findings are also supported by Gharaibeh and Al Azmi (2015). On the other hand, contrary to risk-return correlation, the highest volatility occurs on Monday.

The reason for the weekend effect is especially the sellers with short positions in emerging markets. These sellers close their positions before the weekend and reopen their accounts on Monday in order to avoid any possible loss at the weekend (Chen ve Signal, 2003). Negative Monday return is explanatory to small firms, while positive Monday return is usually explanatory in large firms by trading volume (Brusa et al., 2011, p. 818).

The studies examine market efficiency. There is not a common thought If the ISE is efficient. Its efficiency is not stated strong or weak (Balaban, 1995). Another perspective is indicated that there is the efficiency for the ISE (Kawakatsu and Morey, 1999). The presence of the Monday effect has been investigated for many markets in the world. Studies states which returns of stock change according to the days of the week. Negative Monday returns were found and that used the Dow Jones Industrial Average (DJIA) values (Gibbons and Hess, 1981).

Many studies have different explanations for the day-of-the-week effect. However, none is satisfactory for the anomaly. But all these studies state the existence of Monday effect.

2.1. Calendar Anomalies in Developed Markets

While Monday has significant negative and lower returns, Wednesday and Friday have higher returns in 13 of 23 international markets such as Finland, France, Germany, Greece, Italy, the Netherlands, Spain, Sweden, Switzerland, Turkey, Hong Kong, China, South Korea, Malaysia, New Zealand, Philippines, Singapore, Thailand, Taiwan, and Israel (Çiçek, 2013). In addition, studying on 23 European, Asian and North American markets found extensive weekday effects. It was reported there is a negative the Monday effect in Canada and the UK, however Japan and Australia have a negative Tuesday effect (Jaff and Westerfield, 1985). Furthermore, several other evidences for the weekend effect were indicated for the US (Cross, 1973; French, 1980).

2.1.1. Calendar Anomalies in Developing Markets

A significant negative Monday and Tuesday effect were found in emerging markets such as Asia, Hong Kong, Singapore, Malaysia, and Phillippines. Morever, significant the Monday effect was found in Hong Kong, Thailand and Malaysia but not in Taiwan (Kamath and Liu, 2010). It was indicated the weekend effect in the Greek Stock market (Lyroudi et al, 2002).

2.1.2. Calendar Anomalies in Borsa Istanbul

Istanbul Stock Exchange is a developing market which operated in1986. It had a call market trading system until 1987. Orders were written by customers to brokers for trade. This system was not suitable because of growing rapidly. Therefore, ISE prefered the continuous auction instead of the call market in 1987. A significant date is 1989, restrictions of foreign investments are removed. Another important date is 1994, settlement period's increasing to two days. International investors have diversification alternatives in developing markets and for this reason the analysis of stock return behaviour of BIST can be useful for domestic and foreign investors (Oguzsoy and Guven, 2003).

Although Turkey has a free market economy since the 1980s, the government is an important player in determining investors' attitudes toward the stock market with its economic activities and the not stable political environment. Turkish stock market is not like the stock markets of developed countries especially that have a stable political and currency structure such as United States, United Kingdom, Australia (Demirer and Karan, 2002).

In Turkish market investors have uncertainties on corporate profits and the political system. Also, foreign currencies are alternative investments to stocks as a result of the unstable currency structure. Furthermore, inflation leads to increase uncertainty (Oguzsoy and Guven, 2003). It will be investigated whether the Turkish market exhibits any Monday effect like many established markets of the World.

2.2. Studies Confirmed the Existence Monday Effect for ISE –BIST 100 Index:

There are many studies that tested the presence of calender effect in different periods for ISE. Significant negative Tuesday returns were found for 1990-1992 period and positive Friday returns. (Muradoglu and Oktay, 1993). For the period of 1988 -1999 it was observed similar results that Friday has highest returns (Oguzsoy and Guven, 2003). Same periods and results are supported (Bildik, 2000). Another finding is statistically significant the weekend effect.

Negative Mondays returns, positive Thursdays and Fridays returns by AR-GARCH-M model for period 1987-2005 (Dicle and Hassan, 2007). Existence of anomaly in the daily return was confirmed by using the standard method GARCH (1,1) (Aktaş and Kozoğlu, 2007). Another study supports negative Monday effect in BIST 100 for the period of 2005 -2012 with same method (Konak and Kenderli, 2014). Moreover, ARCH-GARCH models for 2005-2013 and on Fridays and Wednesdays are positive (Özer and Ece, 2016).

The highest returns were found on Friday and the lowest returns were on Wednesday for the period of 1997-2007 using analysis of one-way variance (Ergul et al., 2009). Another finding indicated that the highest positive returns were on Thursdays between 1995-2008 using regression model (Cinko and Avcı, 2009). Otherwise, the findings showed which Monday had positive and the highest returns with EGARCH model for 2008-2012(Cicek, 2013).

2.2.1. Studies Find No Evidence of Calendar Effect Turkish Market:

Presence of Monday effect was not found for ISE 100 over dataset between 1988 and 1991 (Aybar, 1993) and also, it was expressed not found Friday-Monday anomaly between 2002 and 2005 (Tuncel, 2007). Although the presence of anomaly was appeared in the first sub-period it was entirely disappeared in the second half period 2003-2007 by using GARCH and OLS methodology in the Turkish market (Chinpiao, Kamath and Ravindra Liu, 2010). It was limited in the ISE based on the Stochastic Dominance (SD) results for 1988-2010 (Başdaş, 2011). Another study found returns in the BIST indexes have not strong the Monday effect in 2005-2015 and the lowest returns are on afternoon session of Wednesday and the highest returns are on morning sessions of Thursday (Kemal Eyuboglu and Sinem Eyuboglu; Yamak, 2015). The results of the study performed recently Steel-Dwass Test is used on daily returns of BIST-100 Index, for 1998-2015 and the results indicate the presence of Monday effect for the main period and for the first sub-period. It is not valid for the second sub-period (Erkam and Erdoğan, 2015). Although the BIST 100 Index has abnormal returns and volatilities, the calendar anomaly has disappeared (Aksoy and Ulusoy, 2015).

2.3. The Efficient-Market Hypothesis (EMH):

Theory defining the behavior of an supposed perfect market, specially states that (1) securities are typically in equilibrium, which means that they are fairly priced and which their expected returns equal their required returns; (2) security prices fully reflect all public information available about the firm and its securities, and

these prices react swiftly to new information; (3) Since stocks are completely and fairly priced, investors do not have to spend their time to find mispriced securities(Gitman, 2009, pp.343-344).

Testing Market Efficiency

$$\boldsymbol{CAPM = E(ri) = rf + \beta i[E(rm) - rf]}$$

$\boldsymbol{E(ri)}$=Expected return,

$\boldsymbol{rf}$=Risk free,

$\boldsymbol{\beta i}$=Beta,

$\boldsymbol{[E(rm) - rf]}$=Risk premium.

The CAPM can be used to evaluate single –period projects within firms. Managers of firms should maximize the net present value of the firm, as calculated using the pricing form of the CAPM formula. It wil generate the greatest wealth for existing owners and provide the maximum expansion of the efficient frontier for all mean- variance investors (Luenberger, 1998, p. 193). When an asset has higher mean return at a given level of risk than other assets (or, lower risk at a given level of return), it is said to be mean-variance efficient (Butler, 2008, p.473). The capital asset pricing model ensures a beneficial conceptual framework for evaluating and linking risk and return (Gitman, 2009, p. 259).

3. DATA & METHODOLOGY

Daily data is obtained from Bloomberg Terminal for the BIST-100 Stock Index, for the period January 5, 2009 through October 13, 2016 (7 years or 1957 observations on prices).

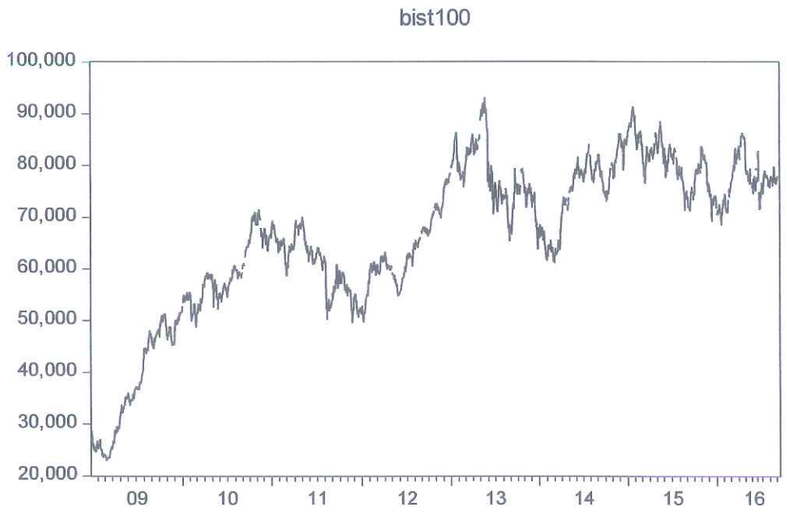

Figure 3.1: Bist100 Index Graph

Bist100 index had a sharp collapse and recoveery during the mortgage crisis between 2008- 2009 and Taksim Gezi Park events in 2013. Bist 100 incerased about 25.000 points between 2008- 2009 after mortgage crisis and declined from 93.000 to 76.000 during Gezi Park process.

The model will use a dummy variable as an explanatory variable and the stock market return as the dependent variable. Most of the studies in the liteature on daily market anomalies have employed the method of regression using dummy variables. Therefore, it will be easy to compare the results with the earlier findings by adopting same methodology for this research. Since price is non-stationary, price can not modelled so return series is generated. Dependent variable; daily return calculation is formulated as:

R_t=log (P_t /P_{t-1})

P_t is closing price in day t,

P_{t-1} is closing price in the day before,

R= Daily rate of return on BIST 100.

Definition of rate of return

The return is the total gain or loss experienced on an investment over a given period of time; calculated by dividing the asset's cash distributions during the period, plus change in value, by its beginning of period invetsment value.

Definition of Risk

Risk is the change of financial loss or, more formally, the variability of returns associated with a given asset (Gitman, 2009, p. 228).

Risk Measurement

The standard deviation and coefficient of variation measure the variability of returns.

Standard Deviation(σ_r)

It measures the dispersion around the expected value. It is calculated as follows:

$$\sigma_r = \sqrt{\sum_{i=1}^{n} (r_i - \bar{r})^2 \times Pr_i}$$

r_i= return for jth outcome,

Pr_i= probability of occurrence of the jth outcome,

n= number of outcomes considered.

The higher the standard deviation means the greater the risk.

Coefficient of Variation

The coefficient of variation is a measure of relative dispersion which is beneficial in comparison the risk of asset with different expected returns (Gitman, 2009, p. 239).

It is calculated as follows:

$$CV = \frac{\sigma_r}{\bar{r}}$$

The higher the variability coefficient, the higher risk and expected return are significant focus points.

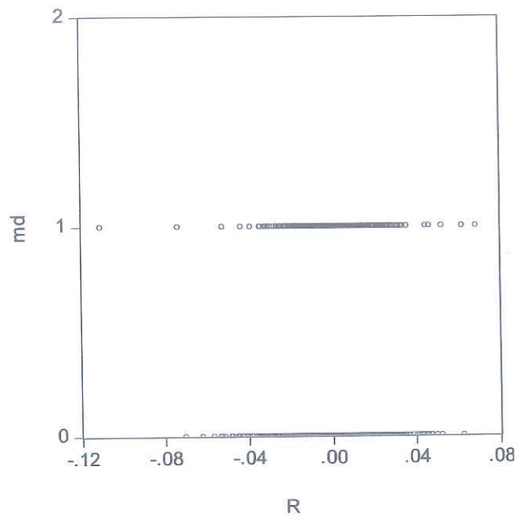

Figure 3. 2: Scatter Plot of Daily BIST100 Return against Monday Dummy

Scatter plot of Daily BIST100 return against Monday dummy is presented in figure 3.2 and datas indicate that Monday dummy has positive average returns.

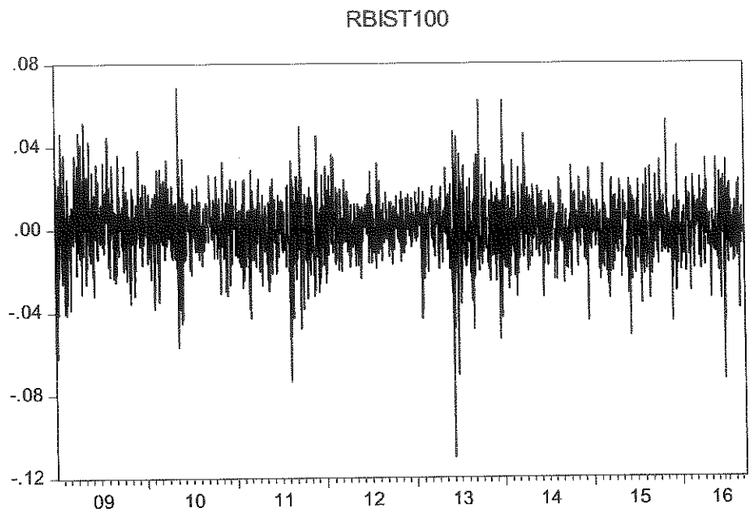

Figure 3.3: Rbist100 Daily Return

In Bist 100 index return volatility cluster is clearly visible. While major changes follow strong fluctuations in logarithmic returns, small changes follow weak fluctuations. This is an indication of variable variability and volatility clusters at Bist 100. Also, in the graph fluctuations are seen very strong in certain periods.

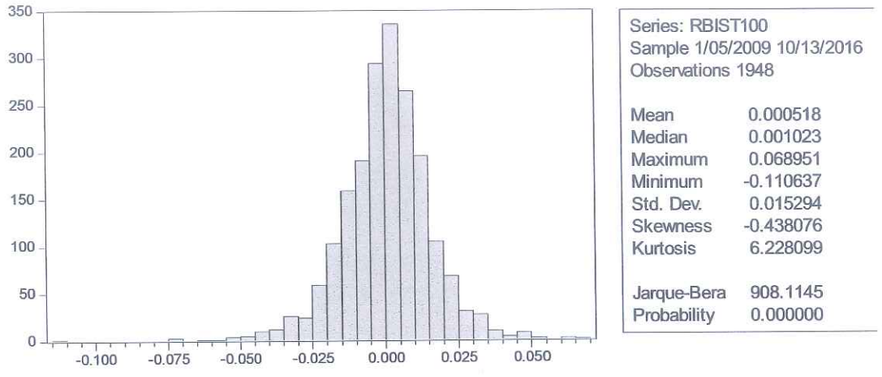

Figure 3. 4: Histogram for Rbist100 Return

In figure 3.4, histogram of return shows BIST-100 return doesn't normal distribution, since p-value of the Jarque-Bera test stat is less than 1%. The main source of non-normality is the thicker tails resulting a kurtosis of 6.228099. This is higher than normal distribution. It designates a leptokurtic distribution and means that probability of having booms and busts in the stock market is higher than the estimated probability using normal distribution assumption. The normal distribution skewness is 0. The BIST100 daily return has a skewness of-0.438076. Existence of little negative skewness designates that there are negative shocks. The mean of data is 0.000518 and its standard deviation is 0.015294.

Explanatory variable

There are 1557 observations on other days and 391 observations on Mondays. Table 3.1 shows the statistical summaries of daily returns for Mondays and other trading days. In the table, zero presents other days and 1 is Monday.

Other days have positive returns 0.000390, Monday has positive returns 0.001027. In terms of standard deviation, Monday returns have a higher standard deviation than other days' returns. For both groups, skewness is negative. Showing positive returns and asymmetric response to negative shocks. For kurtosis, returns have high kurtosis but other days returns are closer than the Monday return to normal distribution is 3. To put it another way, Monday return data is more leptokurtic.

The means and standard deviations are high for both groups but Table 3.1 indicates that there might be a significant difference between means and standard deviations of these groups. The purpose is to examine whether there is a difference between mean and standard deviation.

Table 3.1 Descriptive Statistics for RBIST100

MD	Mean	Median	Max	Min.	Std. Dev.	Skew.	Kurt.	Obs.
0	0.000390	0.000837	0.062378	-0.070585	0.014769	-0.271813	4.621411	1557
1	0.001027	0.002189	0.068951	-0.110637	0.017238	-0.869764	9.427762	391
All	0.000518	0.001023	0.068951	-0.110637	0.015294	-0.438076	6.228099	1948

Leptokurtic Distribution:

If the kurtosis value is large positive, this distribution is leptokurtic and has a fatter and longer tail. The fat tail indicates risk comes from outlier events.

Briefly, it can be expressed as kurtosis> **3**. Normal distribution(bellshaped) indicates $\boldsymbol{K = 3}$, mesokurtic. Platykurtic distribution is $\boldsymbol{K < 3}$. It is flatter and has shorter tails than a normal distribution. When comparing two distributions leptokurtic distribution is more peaked at the mean and it has small changes less frequent than normal distribution, but extreme events might be happen such as large price moves much larger than normal distribution. A leptokurtic distribution is far more likely to characterise financial time series, and to characterise the residuals from a financial time series model (Brooks, 2008, p.162).

Methodology:

- First, simple regression will be estimated (OLS method) using the equation given below;

$\boldsymbol{R_t = \alpha + \beta\, MD + \varepsilon_t}$

$\boldsymbol{Rt}$ is the daily return on the Bist 100 index, $\boldsymbol{MD}$ is a Monday dummy variable that takes the value of 1 if day is Monday and 0 otherwise. The random error term is represented by $\boldsymbol{\varepsilon_t}$. The null hypothesis is $\boldsymbol{H_0}$: $\boldsymbol{\beta_1 = 0}$ the alternative is $\boldsymbol{H_1}$: $\beta \neq 0$. If the null hypothesis is rejected, there is a Monday effect in Borsa Istanbul.

After regression serial correlation LM test will be checked. If the test shows that there is autocorrelation, ARMA will be added. If these assumptions do not hold ARMA-GARCH processes will be estimated to take into account these issues.

Since Monday might effect the volatility ***MD*** dummy variable will be used as an explanatary variable in the volatility equation, too.

- Then the following tests will be ran to check the validity of OLS assumptions;

Serial Correlation LM Test

The Breusch--Godfrey test is a more general test than the DW test for autocorrelation (Brooks, 2008), LM test can be used for AR (1) and higher orders of serial correlation such as AR (2), AR (3).

Thereafter, ARCH will be tested and If there is heteroskedasticity problem.

ARCH Test

ARCH model is used to model time series. In estimation of an ARCH model, it requires $\alpha i > 0$ because variance cannot be negative. The assumption which the variance of the errors is constant is known as homoscedasticity, i.e.it is assumed which $Var\,(u_t) = \sigma_u^2$. If the variance of the errors is not constant, it is heteroscedasticity. When the errors are heteroscedastic, however assumed homoscedastic, an implication would be which standard error estimates could be wrong (Brooks, 2008, p. 386).

Monday effect will be checked on volatility by estimating GARCH and EGARCH. Modeling volatility with heteroskedasticity test (ARCH). And then, another model is GARCH (1,1) (model generalized autoregressive conditional heteroscedasticity) for volatility.

Since volatility is not seen constant, GARCH model might be required to capture the autoregressive heteroskedasticity

- In case of existence of ARCH effect, the volatility of BIST 100 return will be modelled using GARCH methods;

GARCH

GARCH avoids overfitting so is better model than ARCH. If there is heteroscedasticity, then it can used.

Mean Equation: $r_t = \alpha + \beta MD_t + \varepsilon_t$

h_t^2 is t return on day t. MD_t Monday dummy which is 0 or 1 ($MD_t = 1$ for Monday and 0 otherwise and so on). ε_t is the random error on day t. If M is positive and significant, this suggests that the average return on Monday is significantly higher than zero.

Garch Variance

$$Ht = \sum_{i=1}^{q} \alpha_i \, \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j \, h_{t-j} + \phi \, MD_t + V_c$$

It is modelled the conditional variability of indices returns into volatility equation. The coefficients V_1 *is* the volatility on Monday. If V_1 is positive and significant, this means that the volatility on Monday is significantly higher than zero conditional variability of BIST 100 return.

It requires that $\alpha_i + \beta_j < 1$ in terms of satisfy the conditional variance's non-explosiveness. Each V_c , α_i , β_j has to be positive in terms of satisfy the conditional variances' nonnegativity for each given time t.

EGARCH Model

GARCH model 's a significant restriction is volatility's symmetric response for positive and negative shocks. In the conditional variance, asymmetric response is captured with EGARCH model. Another reason of the using EGARCH model is to have a better explanation for volatility of returns instead of the simple GARCH model.

Mean Equation: $r_t = \alpha + \beta MD_t + \varepsilon_t$

The conditional variance equation of EGARCH (p, q) is expressed by:

$$\text{Log}(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{|\varepsilon_t - i|}{\sqrt{\sigma_{t-j}^2}} + \phi\, MD_t + V_c$$

In EGARCH model, α parameter is a magnitude effect or the model' symmetric, the "GARCH "effect. The β is measurement of persistence for conditional volatility. If β is large, the volatility dies out not in short time for a crisis in the market. If $\gamma = 0$, the model is symmetric, $\gamma \neq 0$ it is asymmetric. When $\gamma < 0$, then positive shocks (good news) generate less volatility than negative shocks

(bad news) and $\gamma > 0$ there is the leverage effect. In short, leverage effect can be explained it is the reason why negative returns have higher volatility than do positive returns.

$$\mathbf{LOG(GARCH)} = \mathbf{C}(3) + \mathbf{C}(4) * \mathbf{ABS}(\mathbf{RESID}(-1)/\mathbf{SQRT}(\mathbf{GARCH}(-1))) + \mathbf{C}(5) * \mathbf{RESID}(-1)/\mathbf{SQRT}(\mathbf{GARCH}(-1)) + \mathbf{C}(6) * \mathbf{LOG}(\mathbf{GARCH}(-1))$$

After this estimation, both of these methods will be compared and found better method that has the lowest Akaike and Schwarz. After that it is tested Monday dummy of better method and it is choosen the best method that fitted to model according to the lowest Akaike and Schwarz. Thereafter, ARCH effect of choosen the best method will be checked. After this, colegram is checked whether there is autocorrelation and then, histogram is estimated it has normal distribution or not. Finally, Descriptive statistic for bist100 will be tested whether regression analysis is significant.

4. DATA ANALYSIS AND RESULTS

OLS estimation results are given in Table 4.1 and its results indicate that volatility is not constant. R-square is 0.000278 %. It means Monday dummy explains 0.000278 % return of BIST. R-square explains the percentage change of BIST. Adjusted R- square is-0.000236

Monday dummy coefficient is 0.000637, Coefficient is not significant because it is not different than zero. There is no enough statistical evidences to reject H_0.

For T-stat >T critical, Monday dummy (0.735744) smaller than critical 2 don't reject H_0, insignificant. Thereafter, it is examinated in terms of Prob <0,05 and 0,10. The result shows that Prob 0.4620> 0,05 and 0,10 don't reject H_0 insignificant, there is not ARMA structure. It is bigger than 0,05 and also 0,10 so it has not autocorelation. F statistic prob> 0,05 and 0,10 don't reject H_0 and it is insignificant at 5 % and 10% statistical level. C is 0.000390 is positive, Monday dummy is 0.735744. In F test Durbin Watson stat is 2.010007. There is not autocorelation because it is close to 2. Akaike-5.521456 and Schwarz are-5.515732. If coefficient is insignificant, F statistic doesn't reject and F test says all correlation is not equal.

Table 4.1 Estimation Results of OLS

Variable	Coefficient	t-Statistic	Prob
C	0.000390	1.007299	0.3139
MD	0.000637	0.735744	0.4620
R-squared	0.000278	Durbin-Watson stat	2.010007
Adjusted R-squared	-0.000236		
F-statistic	0.541320		
Prob (F-statistic)	0.461975		

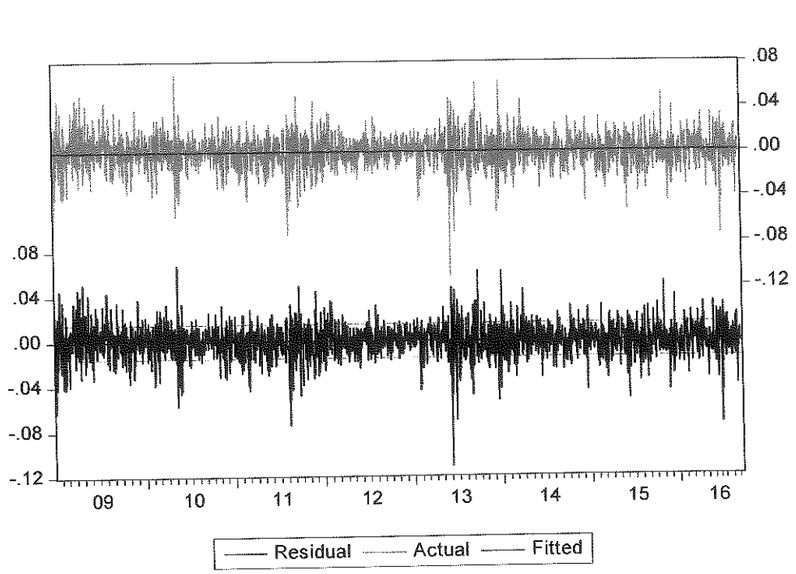

Figure 4. 1: The Residual, Actual and Graph of OLS Estimation

Figure 4.1 presents the Residual, Actual and Graph of OLS Estimation. From the graph, it can be seen which there are several large (negative) outliers, but the largest of all occur in 2013. The residual in 2012 is not quite so prominent because even though the stock price fell, the market index value fell as well.

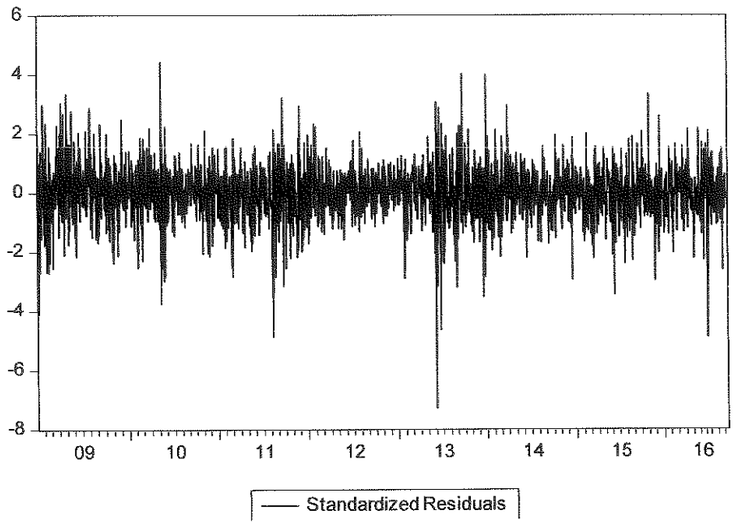

Figure 4. 2: Standardized Residuals Graph of OLS

Serial correlation LM test shows in Table 4.2 that P value is insignificant at the 10% level with the value of 0.3621 so there is no autocorrelation. H_0 can not be rejected

Table 4.2 Breusch-Godfrey Serial Correlation LM Test

F-statistic	1.014730	Prob. F(2,1944)	0.3627
Obs*R-squared	2.031515	Prob. Chi-Square (2)	0.3621

In Table 4.3. heteroskedasticity (ARCH) is checked in the residuals of each estimation by capturing the relationship of risk and return, increased efficiency and volatility of return. In terms of P value <5 %, P value is significant at the 5% level with the value of 0,0000 reject H_0. Significance F (prob) 0,000000 is significant at the 5% and 10 % level, reject H0. There is heteroskedasticity problem. For T-stat >T –critical, t-stat is bigger than critical 2 reject H_0, significant.

Coefficient is significant because it is different than zero. We can reject H_0, significant. The F-test is significant at 95% confidence interval. This means which the Monday affects the volatility of return.

Table 4.3 ARCH Test of OLS Estimation

F-statistic	25.05945	Prob. F(2,1944)	0.0000
Obs*R-squared	48.93404	Prob. Chi-Square(2)	0.0000

Variable	Coefficient	t-Statistic	Prob.
C	0.000184	13.20059	0.0000
RESID^2(-1)	0.095643	4.245995	0.0000
RESID^2(-2)	0.116444	5.169925	0.0000
F-statistic	25.05945		
Prob(F-statistic)	0.000000		

Since ARCH test can be rejected at 1% percent significance level, GARCH model will be estimated to capture the heteroskdasticity in the residuals.

$$r_t = \beta_0 + \beta_1 * MD + \varepsilon_t$$

$$h_t = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 h_{t-1}$$

In Table 4.4 Monday dummmy indicates its coefficient is not different than zero and probability> at 1%, 5% and 10% significant level statistically insignificant, there is no enough statistical evidences to reject H_0.

Table 4.4 GARCH Estimation

Variable	Coefficient	Prob.
C	0.000784	0.0307
MD	0.000865	0.2468
Variance Equation		
C	1.40E-05	0.0000
RESID(-1)^2	0.084546	0.0000
GARCH(-1)	0.854587	0.0000
Akaike info criterion	-5.603220	
Schwarz criterion	-5.588911	

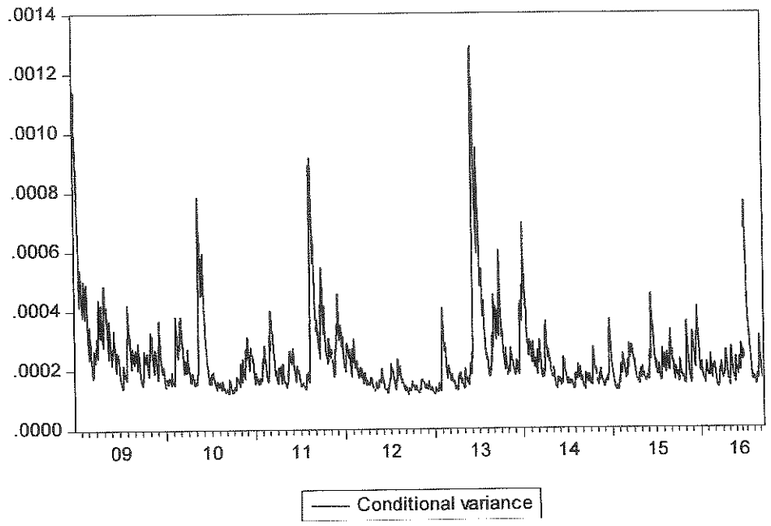

Figure 4.3: Graph of GARCH Variance

Unfavorable news has greater effect on return volatility. Additionally, it is seen in Figure 4.3 that volatility shocks are quite persistent. Especially, the variance (risk) is significant high in Monday returns in 2013.

Since EGARCH model is to have a better explication for volatility of returns instead of the simple GARCH model and asymmetric response is captured with EGARCH, this model will be estimated.

Mean Equation: $\boldsymbol{r_t = \beta_0 + \beta_1 * MD + \varepsilon_t}$

$$\text{Log}(\sigma_t^2) = \sum_{j=1}^{p} \boldsymbol{\beta_j} \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \boldsymbol{\alpha_i} \frac{|\varepsilon_t - i|}{\sqrt{\sigma_{t-j}^2}} + \boldsymbol{\phi\, MD_t + V_c}$$

Table 4.5 indicates EGARCH estimation

According to Monday dummy P value> 0.10

C (3), C (4), and C (5), C (6) are smaller than 0.10 significant so there is leverage effect. It means negative shocks cause higher volatility than positive shocks. C (5) has not absolute value resid therefore, it is asymmetric and negative.

$\boldsymbol{\gamma}$: Asymetric term is negative so negative shock increases volatility. This is leverage effect. If coefficient is positive, positive shock causes to decrease on volatility. If coefficient is negative, negative shock causes to increase on volatility.

Table 4.5 OLS EGARCH Estimation

Variable	Coefficient	Prob.
C	0.000599	0.0885
MD	0.000991	0.1651
	Variance Equation	
C(3)	-0.701818	0.0000
C(4)	0.170249	0.0000
C(5)	-0.077921	0.0000
C(6)	0.932406	0.0000
Akaike info criterion	-5.613678	
Schwarz criterion	-5.596508	

GARCH has -5.603220 Akaike and Schwarz -5.588911. EGARCH has Akaike-5.613678 and Schwarz -5.596508. After GARCH and EGARCH are compared, EGARCH is found better method that explains the model because it has the lowest Akaike and Schwarz.

Whether significance of volatility continues in the Monday dummy will be checked and also method that explains best the model will be found.

Table 4.6 indicates Monday dummy C (7) is added to variance.

C (7) is Monday dummy, its P value is significant 10 % and 5%. Monday dummy effects volatility but it has not an impact on returns. Because Monday dummy' P value is insignificant

Table 4.6 EGARCH with Monday Dummy

Variable	Coefficient	Prob.
C	0.000573	0.0856
MD	0.001063	0.1993
Variance Equation		
C(3)	-0.744062	0.0000
C(4)	0.163792	0.0000
C(5)	-0.074310	0.0000
C(6)	0.936529	0.0000
C(7)	0.403036	0.0000
Akaike info criterion	-5.622076	
Schwarz criterion	-5.602044	

After EGARCH Monday dummy is tested, it indicates that EGARCH Monday dummy is the best method fitted to the model with its the lowest Akaike and Schwarz.

Thereafter, colegram will be checked whether there is autocorrelation.

Table 4.7 indicates that there is not autocorrelation because of not passing the broken line here, this is insignificant.

Table 4.7 Correlogram of Residuals of EGARCH Estimation

Date: 11/29/16 Time: 14:55
Sample: 1/05/2009 10/13/2016
Included observations: 1948

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob...
		1	0.030	0.030	1.7318	0.188
		2	0.026	0.025	3.0454	0.218
		3	0.011	0.010	3.2887	0.349
		4	0.002	0.001	3.2952	0.510
		5	0.019	0.019	4.0289	0.545
		6	-0.02...	-0.02...	5.4958	0.482
		7	0.001	0.002	5.4988	0.599
		8	-0.00...	-0.00...	5.5209	0.701
		9	-0.01...	-0.01...	6.2357	0.716
		1...	0.034	0.035	8.5425	0.576
		1...	0.011	0.011	8.7647	0.644
		1...	0.037	0.035	11.485	0.488
		1...	0.014	0.011	11.871	0.538
		1...	-0.00...	-0.00...	11.936	0.611
		1...	0.003	-0.00...	11.954	0.683
		1...	-0.00...	-0.00...	12.102	0.737
		1...	0.017	0.017	12.699	0.756
		1...	0.008	0.009	12.835	0.801
		1...	0.039	0.041	15.903	0.664
		2...	0.006	0.002	15.969	0.719
		2...	-0.01...	-0.01...	16.419	0.746
		2...	0.008	0.004	16.534	0.789
		2...	-0.00...	-0.00...	16.534	0.831
		2...	-0.01...	-0.01...	17.054	0.846
		2...	-0.00...	-0.00...	17.176	0.875
		2...	-0.02...	-0.02...	18.695	0.849
		2...	0.011	0.012	18.929	0.873
		2...	-0.02...	-0.02...	20.033	0.863
		2...	0.005	0.003	20.074	0.891
		3...	-0.01...	-0.01...	20.384	0.906
		3...	0.004	0.004	20.422	0.926
		3...	0.023	0.021	21.497	0.920
		3...	-0.02...	-0.02...	23.010	0.903
		3...	-0.01...	-0.01...	23.363	0.915
		3...	-0.03...	-0.03...	25.357	0.885
		3...	0.020	0.024	26.156	0.886

*Probabilities may not be valid for this equation specification.

After colegram whether heteroskedasticity problem is captured by model will be checked.

Table 4.8 shows prob.chi square 0.2688 is greater than 10%, insignificant, not reject H_0. There is no ARCH effect.

Table 4.8 ARCH Test of EGARCH Monday Dummy

F-statistic	1.313558	Prob.F(2,1943)	0.2691
Obs*R-squared	2.627619	Prob. Chi-Square(2)	0.2688

Variable	Coefficient	Prob.
C	0.964544	0.0000
WGT_RESID^2(-1)	-0.000143	0.9950
WGT_RESID^2(-2)	0.036748	0.1052

Lastly, whether Histogram of EGARCH Monday dummy is normal distributed will be checked.

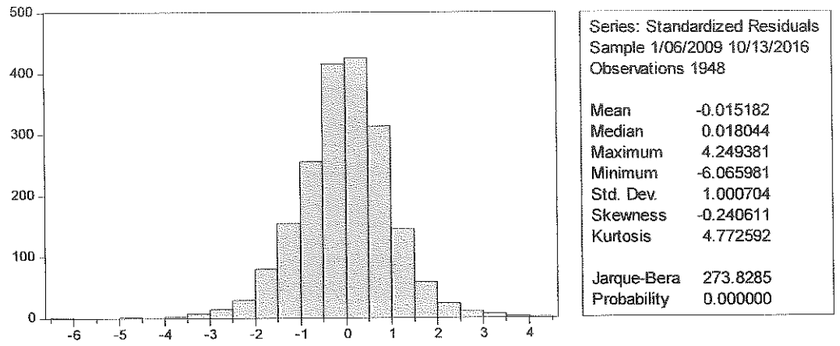

Figure 4. 3: Histogram of EGARCH Monday Dummy

In Figure 4.3 its histogram shows it has not normal distribution p-value (0.000000) > 0,10. Kurtosis should be 3. The graph has 4.772592 kurtosis. This is higher than normal distribution. It means return probability higher than normal distribution. Skewness should be 0. The graph has skewness -0.240611. It is seen very little negative skewness, there are negative shocks. Skewness is negligible.

5. CONCLUSION

The findings of this research indicate that BIST has a significant Monday effect on volatility but not on the expected return. Borsa Istanbul is an efficient equity market in terms of returns. Since three days pass from Friday to Monday, the probability of receiving new information that might affect the stock market is higher compared to other trading days. This causes higher volatility on Mondays; however, since these shocks aren't always necessarily positive or negative, a prominent impact on returns is not observed. Volatility is higher since the possibility of shock in a longer period of time might be higher.

First, a simple regression model (OLS method) is applied by using dummy variable on Monday. Serial correlation LM test is controlled after the regression. Test indicates the lack of autocorrelation, that's why, ARMA isn't added. Then, ARCH is tested and there is heteroscedasticity problem. Therefore, by predicting GARCH and EGARCH, Monday effect on volatility is being controlled. After doing this prediction, both of these models are compared and a better method the lowest Akaike and Schwarz Information Criteria is picked. Then, EGARCH Monday Dummy is tested and this test indicates that EGARCH Monday Dummy is the best method fitted to the data with the lowest Akaike and Schwarz.

Findings confirm that there are negative skewness values, positive returns and asymmetric response to the negative shocks. On the other hand, bad news has more impact on the volatility of return. Besides, it is observed that volatility shocks are quite permanent.

If the market has the positive return rates and volatility is low, they trust in the investors. Research comes up with the conclusion that Monday Effect has a positive impact on volatility. This, the result of another research, supports the fact that the daily impact is on the return volatility but not on the market returns (Demirer and Karan, 2002) and also, just as the Berument, Inamlik and Kiymaz's (2004) research result, the highest volatility appears on Monday. The findings of this research contradict with the findings of Çiçek (2013) which supports that the Monday Effect has an impact on the returns and the highest returns are on Monday but both of the researches accepts the presence of this effect on the volatility. Lastly, Monday has the highest volatility and 3-days-shock might cause higher volatility, which is the reason why Friday investments seem risky for the investors who make investments on Friday and waiting for the Monday. To put it in another way, volatility is high in this three days' time; therefore, investors investing on Friday have the higher possibility of encountering an unexpected shock because more information will be received.

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