7. ANALYSIS OF RELATIVE RETURN BEHAVIOUR OF BORSA ISTANBUL REIT AND BORSA ISTANBUL 100 INDEX

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Abstract

This study examines the return and volatility behaviour of Borsa Istanbul Real Estate Investment Trusts (REITs) Index and Borsa Istanbul 100 (BIST 100) Index. It focuses on three main points. First, we search whether there are variations in index returns and volatilities by days of the week, months of the year, and turn of the month patterns. Second, we ask whether REITs Index performance is closely related to stock market performance. Third, we test whether the abnormal returns in the process have significant effects on the index returns and volatilities. Results reveals that calendar anomalies still exist and the volatility pattern across days of the week and months of the year are statistically different. The return pattern observed between REITs and BIST 100 index is strong enough. REITs performance is closely related to stock market performance. BIST 100 abnormal returns have also significant effects on BIST 100 and REITs returns and volatilities. This study performs GARCH and EGARCH methodologies to and finds significant implications for local and international investors for designing trading strategies, drawing investment decisions, risk management, timing of security issuances by firms, asset pricing and performance evaluation.

Keywords: calendar anomalies, volatility, abnormal return, GARCH, EGARCH, Borsa Istanbul REITs index, Borsa Istanbul 100 index

JEL Classification: G11, G12, G14, G17

1. Introduction

The securitization of real estate through the sale of Real Estate Investment Trust (REIT) shares is a global trend. REITs are recognized as an effective structure to finance and manage real estates. Securitized REITs are actively traded on stock

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exchanges and are the most effective means of securitizing real estate in Turkey.[3] In recent years, many studies on real estate investment trusts have questioned whether REITs performance is closely related to stock market performance. If it is so, both individual and institutional investors may want to learn whether REITs index exhibits calendar anomalies akin to that of other indexes. If such anomalies exist, then, opportunities of earning abnormal returns on REITs stocks may arise. The study examines returns for Borsa Istanbul 100 Index (XU100) and Borsa Istanbul REITs Index (XGMYO) to address two issues.

First, there have been numerous studies in the finance literature showing that abnormal returns can be earned at different times of the week or year or turn of the month contrary to the implication of the Efficient Markets Hypothesis (EMH). The purpose of this study is to provide an examination of these calendar anomalies in both REITs index and BIST 100 index. Several researchers have argued that seasonality in stock returns should diminish over time. Due to the improved market efficiency over time the calendar anomalies might have disappeared for BIST 100 Index. The study also compares the results of REITs index to the findings of calendar anomalies in BIST 100 index.

Investigating the relationship between REIT index return and BIST 100 index return and their volatilities are vital in the sense that it increases investor awareness in REIT sector. An increase in REIT's volatility will have important impacts on the issues of risk measurement and management making effective hedging more complex. Understanding the pattern of such volatilities will help optimizing portfolios to avoid high volatility. We have basically four research questions:

1) Are there days of the week, months of the year, and turn of the month calendar anomalies for both XU100 and XGMYO index returns and return volatilities?

2) Do the mean return and volatilities of XGMYO index depend on its and XU100 index return and volatilities?

3) How do XU100 index abnormal returns affect XGMYO index volatility and XGMYO index returns?

4) Do the abnormal returns in the process have significant effects on the XU100 and XGMYO indexes?

Our study focuses on securitized real estate investment trust, which is expected to behave like the underlying real estate related assets it holds. To the best of our knowledge, there have not been any studies on the calendar anomalies on REITs return and volatility for BIST using GARCH and EGARCH methodologies. The calendar anomalies in REITs return is especially interesting for several reasons. First, because these anomalies have been reported solely for REITs returns in other countries, it is appropriate to investigate whether similar results occur for Turkey. This could support the proposition that this seasonal effect is a general, world-wide phenomenon rather than the result of a special type of institutional arrangement in any country. Second, investing indirectly in real estate has recently become much more

[3] According to the CMBT, the number of REITs was 25 and the asset value of REITs was $ 13,524 as of 2012. Currently, there are 32 REITs registered with the Capital Markets Board of Turkey (CMBT) with shares quoted on the Borsa Istanbul (BIST).

popular in Turkey, which is reflected in the increased market capitalization of Turkish securitized real estate. With this increase it has become more important for Turkish (and non-Turkish) investors to gain insights into the seasonality of Turkish securitized real estate market and to discover diversification benefit by including REITs in multi-asset portfolios. These findings may help Investors whether or not to enter into the market. The remainder of this paper as follows. We discuss relevant literature in Section 2; Section 3 provides data and explains abnormal return calculations. Section 4 discusses methodological issues. Section 5 discusses analysis results. Section 6 concludes.

2. Literature for Calendar Anomalies

The days of the week effect as calendar anomaly has been widely studied in finance literature. In Table 1 (see Appendix), studies and the findings for days of the week anomaly for BIST are listed.

The January effect, where returns are higher in January than the other months, has been documented by Rozeff and Kinney (1976), Keim (1983), Roll (1983), Seyhun (1993). The turn of the month anomaly, which implies that returns are greater on the turn of the month trading days, was examined for the first time by Ariel (1987) and Ogden (1990). In Table 2 (see Appendix), studies and the findings for months of the year anomaly for BIST are also listed.

Researchers examine the returns on REITs for evidence of some of these anomalies. Colwell and Park (1990) examine mortgage and equity REITs for existence of January effects and size effects. The results indicate that January is the month when REIT returns peak and the high returns in January decline for large REITs including both equity and mortgage REITS.

The returns on REITs were first examined to find evidence for days of the week effect, turn of the month effect, January effect and pre-holiday effect by Redman *et al*. (1997). They construct three portfolios: a portfolio composed of REIT shares, an equal-weighted portfolio and a value-weighted portfolio of NYSE and AMEX stocks over the time period 1986 through 1993 based on the data from Center for Research in Security Prices (CRSP) database. The returns of the portfolios are examined for evidence of calendar anomalies. To analyze turn of the month effect, they divide trading days into turn of the month trading days (the final trading day of the previous month and the first three trading days of the current month) and non-turn of the month trading days. They find all of the calendar anomalies for the REIT portfolio and the equally weighted portfolio. They find only significant turn of the month anomaly for the value-weighted portfolio. They provide evidence for return anomalies in the market for REIT shares and shares of small companies. In Table 3 (see Appendix) studies about the calendar anomalies for REITs and the findings are listed.

Many studies about real estate investment trusts have questioned whether REIT performance is closely related to stock market performance, bond performance or to the performance of the underlying real estate assets (e.g., Li and Wang, 1995; Ling and Naranjo, 1999; Glascock *et al*., 2000; Clayton and MacKinnon, 2003; Case *et al*., 2012). Another group of studies have examined if REITs behave similarly to other stocks in corporate events such as in IPOs (Chan *et al*., 2013), merger announcements (e.g., Allen and Sirmans, 1987), and post-earnings announcements (Price *et al*., 2012). Smith and Shulman (1976) and Zerbst and Cambon (1984) conclude that the performance of REIT shares is similar to the performance of other stocks in the market. More recent studies suggest that the performance of REITs differs from other stocks in the sense that the returns on REIT stocks are generally subject to lower volatility. There are also several common factors such as market risk, the term structure of interest rates and unexpected inflation that influence both the performance of REIT stocks as well as the performance of stock market as a whole (Chan *et al*., 1990).

Hudson-Wilson (2001) shows that REITs under performs both bond and stock on a risk return basis over the 1987-2000 period. Clayton and MacKinnon (2003) examine the link between REIT, financial asset and real estate returns during the REIT boom of 1993-1998. As a conclusion, they find out that return relationships between asset classes undergo a structural change during this period.

Liu *et al*. (1992), Mei and Liu (1994), Li and Wang (1995), all find strong relationship in terms of cointegration between REITs and mainstream equities. Ling and Naranjo (1999) study the integration between direct real estate, REITs and common stocks. They find REITs to be integrated with non-real estate equities. Glascock *et al*. (2000) find contradicting results for different study periods. They report that while REITs are integrated with common stocks during the period 1992 to 1996, this is not the case for the period 1972-1991. Despite the existence of numerous studies supporting a strong relationship between REITs and equities, a number of studies also find contradicting evidence. Wilson and Okunev (1996) study the REITs and real estate markets in US, UK and Australia. They find domestic real estate and equity markets to be segmented, and also provide evidence that securitized property markets are segmented internationally for all three markets.

3. Data And The Abnormal Returns

The data used in this paper consists of daily data from the period January 2000 to November 2014. Borsa Istanbul 100 Index (XU100) and Borsa Istanbul REITs Index (XGMYO) are used throughout the rest of the paper[4]. Daily return is calculated as the percentage logarithmic change in the value of index compared to previous day's closing value as follows:

$$Y_{\mathbf{t}} = \ln(P_t/P_{t-1})*100$$

Abnormal returns rooted from the distributions of index returns below controls the exogenous shocks, such as news effects, some monetary policy applications. These shocks should be controlled and put into the model to eliminate some anomalies that

[4] *The XU100 index is a capitalization-weighted index composed of National Market companies except investment trusts. The constituents of the XU100 are selected on the basis of pre-determined criteria directed for the companies to be included in the indices. The XGMYO index is a capitalization-weighted free float adjusted Industry Group Index composed of National Market listed companies in the real estate industry.*

may lead to inaccurate results. To do that, we first define XU100AR as a dummy variable that is either 0 or 1 (if a statistically significant abnormal return for XU100 index takes place on day t, XU100AR = 1, otherwise XU100AR = 0). Based on this, we construct XU100AR index for our sample within specified period. Our XU100AR index series are then matched with the stock market series and analyzed in time series regression equations. Daily excess returns are measured by the mean-adjusted returns approach; that is, for each day at, and following, the event, we computed

$$AR_t = R_t - \bar{R} \tag{1}$$

where $\bar{R}$ the simple average of XU100's daily returns in the (-30, -11) estimation period. AR_t is the abnormal return for XU100 at time t. $\bar{R}$ is computed as follows:

$$\bar{R} = \frac{1}{20}\sum_{t=-30}^{-11} R_t \tag{2}$$

The date of the event is t=0. The mean adjusted returns model is estimated over 20 days from t = -30 to t = -11 relative to the event date. The main event window under study is the event date itself (t = 0).

The statistical significance of the event period abnormal returns was computed for each sample using the test statistics described by Brown and Warner (1985). We use a standardized abnormal return (SAR) where each abnormal security return is normalized by its estimation period standard deviation:

$$SAR_t = \frac{AR_t}{[SD(AR)]_t}. \tag{3}$$

The standard deviation $[SD(AR)]_t$ of each abnormal return is given by:

$$[SD(AR)]_t = \sqrt{\frac{1}{T_0 - 1}\sum_{t=1}^{T_0} AR_t^2} \tag{4}$$

where T_0 is the number of days in the estimation period. The standard deviation for calculating t-statistics to assess significance is also defined within a (-30, -11) days window.

$$[SD(AR)]_t = \sqrt{\frac{1}{19}\sum_{t=-30}^{-11} AR_t^2}\ . \tag{5}$$

4. Methodology

In our study we first apply generalized autoregressive conditional heteroscedasticity (GARCH) model proposed by Bollerslev (1986). This model allows for the conditional variance to be linearly dependent on the past behavior of the squared residuals and a moving average of the past conditional variances. The lagged squared error terms imply that if past errors have been large in absolute value, they are likely to be large in the present, leading to volatility clustering. An important restriction of GARCH model is about the symmetric response of volatility to positive and negative shocks. However, it can be observed that "bad news" or a negative shock to financial time series has larger effects on volatility than "good news" or a positive shock does. The tendency of such a negative correlation between volatility and returns is often called the leverage effect. A model that allows this asymmetric effect of shocks is the exponential-GARCH (EGARCH) model. Nelson (1991) proposed a specification that does not require the non-negativity of model parameters which is another advantage over the standard GARCH model. In our study we second apply EGARCH model to capture asymmetric response in the conditional variance. The other reason for the use of EGARCH model is to discover whether it gives a better explanation of returns' volatility than the simple GARCH model (Miron, Tudor, 2010).

The dummy variables represent the days of the week. To eliminate the possible multicollinearity problems we dropped one of the dummies in regression equations for days of the week. The GARCH(1,1) model employed in this study is as follows[5]:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \sum_{i=1}^{5} m_i D_{i,t} + \varepsilon_t \tag{6}$$

Y_t is the indices return on day *t*. $D_{1,t}$ through $D_{5,t}$ are days of week dummies that are either 0 or 1 ($D_{1,t}$ =1 for Monday and 0 otherwise and so on). ε_t is the random error term for day *t*. If m_1 is positive and significant, this suggests that the average return on Monday is significantly higher than zero. Similar interpretation is applied to m_1, m_2, m_3, m_4, m_5.

We model the conditional variability of indices returns by incorporating the days of the week effect into our volatility equation. The coefficients V_1 through V_5 represents the volatility on Monday to Friday. If V_1 is positive and significant, this suggests that the volatility on Monday is significantly higher than zero.

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + \sum_{i=1}^{5} V_i D_{i,t} + V_c \tag{7}$$

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + \sum_{i=1}^{5} V_i D_{i,t} + XU100AR + V_c \tag{8}$$

This specification requires that $\alpha_i + \beta_j < 1$ in order to satisfy the non-explosiveness of the conditional variance. Each V_c, α_i, β_j has to be positive in order to satisfy the non-negativity of conditional variances for each given time *t*.

The specification of the conditional variance equation for EGARCH(p,q) can be expressed by:

$$\log(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{|\varepsilon_{t-i}|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q} \gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{5} V_i D_{i,t} + V_c \tag{9}$$

[5] $\varepsilon_t | \Omega_{(t-1)} \sim N(0, h_t)$.

$$\log(\sigma_t^2) = \sum_{j=1}^{p}\beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q}\alpha_i \frac{|\varepsilon_{t-i}|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q}\gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{5}V_i D_{i,t} + XU100AR + V_c \quad (10)$$

In EGARCH model, α parameter represents a magnitude effect or symmetric of the model, the "GARCH "effect. The β measures the persistence in conditional volatility. When β is relatively large, the volatility takes a long time to die out following a crisis in the market. If γ=0, the model is symmetric. When γ<0, then positive shocks (good news) generate less volatility then negative shocks (bad news).

In order to analyze months of the year anomaly, the GARCH(1,1) model with dummy variables representing the months of the year is used:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \sum_{i=1}^{12} m_i M_{i,t} + \varepsilon_t \quad (11)$$

Y_t is the indices return on month *t*. $M_{1,t}$ through $M_{12,t}$ are months of year dummies that are either 0 or 1 ($M_{1,t}$ =1 for January and 0 otherwise and so on). ε_t is the random error term for day *t*. If m_1 is positive and significant, this suggests that the average return on January is significantly higher than zero. Similar interpretation is applied to $m_1, m_2, m_3, m_4, m_5, m_6, m_7, m_8, m_9, m_{10}, m_{11}, m_{12}$.

We model the conditional variability indices returns by incorporating the months of the year effect into our volatility equation. The coefficients V_1 through V_{12} represent the volatility on January to December. If V_1 is positive and significant, this suggests that the volatility on January is significantly higher than zero.

$$h_t = \sum_{i=1}^{q}\alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p}\beta_j h_{t-j} + \sum_{i=1}^{5}V_i M_{i,t} + V_c \quad (12)$$

$$h_t = \sum_{i=1}^{q}\alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p}\beta_j h_{t-j} + \sum_{i=1}^{5}V_i M_{i,t} + XU100AR + V_c \quad (13)$$

The specification of the conditional variance equation for EGARCH (p,q) can be expressed by

$$\log(\sigma_t^2) = \sum_{j=1}^{p}\beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q}\alpha_i \frac{|\varepsilon_{t-i}|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q}\gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{12}V_i M_{i,t} + V_c \quad (14)$$

$$\log(\sigma_t^2) = \sum_{j=1}^{p}\beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q}\alpha_i \frac{|\varepsilon_{t-i}|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q}\gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{12}V_i M_{i,t} + XU100AR + V_c \quad (15)$$

The main empirical analysis is then extended to analyze GARCH (1,1) and EGARCH(1,1) model (p=q=1) between XU100 and XGMYO. Y_t is the return series for XGMYO and X_t is the return series for XU100.

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t \quad (16)$$

$$h_t = \sum_{i=1}^{q}\alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p}\beta_j h_{t-j} + \sum_{i=1}^{5}V_i D_{i,t} + V_c \quad (17)$$

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + V_c \tag{17}$$

$$\log(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{\left|\varepsilon_{t-i}\right|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q} \gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + V_c \ . \tag{18}$$

We model the conditional variability of XU100 and XGMYO returns by incorporating the days of the week effect into our volatility equation. Y_t is the return series for XGMYO and X_t is the return series for XU100. The coefficients V_1 through V_5 are the volatility on Monday to Friday. If V_1 is positive and significant, this suggests that the volatility on Monday is significantly higher than zero.

$$Y_t = \beta_0 + \beta_1 X_t + \sum_{i=1}^{5} m_i D_{i,t} + \varepsilon_t \tag{19}$$

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + V_c \tag{20}$$

$$\log(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{\left|\varepsilon_{t-i}\right|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q} \gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + V_c \ . \tag{21}$$

We additionally search the conditional variability of XU100 and XGMYO returns by incorporating the months of the year effect into our volatility equation. Y_t is the return series for XGMYO and X_t is the return series for XU100. The coefficients V_1 through V_{12} represent the volatility on January to December. A positive and significant V_1 suggests that the volatility on January is significantly and different from zero.

$$Y_t = \beta_0 + \beta_1 X_t + \sum_{i=1}^{12} m_i M_{i,t} + \varepsilon_t \tag{22}$$

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + V_c \tag{23}$$

$$\log(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{\left|\varepsilon_{t-i}\right|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q} \gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + V_c \ . \tag{24}$$

The turn of the month effect is a well-documented market anomaly where stocks experience superior returns in a window that spans from the last few days of one month through the first few days of the next. To examine the turn of the month effect, trading days are divided into turn of the month trading days-the final trading day of the previous month and the first three trading days of the current month- a definition adopted from Ogden (1990) and Redman, Manakyan and Liano (1997). The following regression with dummy variables representing the turn of the month trading is used

$$Y_t = \beta_0 + \beta_1 D_{TOM,t} + \varepsilon_t \tag{25}$$

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + V_c \tag{26}$$

$$\log(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{|\varepsilon_{t-i}|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q} \gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + V_c \ . \tag{27}$$

Y_t is the indices return on day *t* and $D_{TOM,t}$ is one if day *t* is a turn of the month trading day and zero, otherwise.

The empirical analysis is then extended to analyze GARCH (1,1) (p=q=1) model between XU100, XGMYO and turn of the month. Y_t is the return series for XGMYO and X_t is the return series for XU100. $D_{TOM,t}$ is one if day *t* is a turn of the month trading day and zero, otherwise.

$$Y_t = \beta_0 + \beta_1 D_{TOM,t} + \beta_1 X_t + \varepsilon_t \tag{28}$$

$$h_t = \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + V_c \tag{29}$$

$$\log(\sigma_t^2) = \sum_{j=1}^{p} \beta_j \log(\sigma_{t-j}^2) + \sum_{i=1}^{q} \alpha_i \frac{|\varepsilon_{t-i}|}{\sqrt{\sigma_{t-i}^2}} + \sum_{i=1}^{q} \gamma_i \frac{\varepsilon_{t-i}}{\sqrt{\sigma_{t-i}^2}} + V_c \tag{30}$$

To eliminate the possible multicollinearity problems, we dropped one of the dummies in regression equations for days of the week and months of the year.

5. Empirical Results

XU100 and XGMYO return series ensures the stationarity required for regression analysis. EViews specification of the GARCH(1,1) model with Normal (Gaussian) distribution and EGARCH(1,1) model with Generalized Error (GED) distribution are used in this paper. The remaining ARCH effects in the residuals are tested for each equation though results are not reported. The results of GARCH(1,1) and EGARCH(1,1) equations are represented in the following tables. The symbols ***, ** and * indicate the level of significance at the 1 percent, 5 percent and 10 percent level, respectively in the tables. For the GARCH(1,1) results, V_c, α, β are all positive and $\alpha + \beta < 1$ for all equations. The summation of these two coefficients is also close to one which indicates that the volatility is persistent in both XGMYO and XU1000.

The day of the week for XGMYO index is given in Table 4 (see Appendix) for both GARCH(1,1) and EGARCH(1,1). We dropped dummy for Tuesday in return and Wednesday in variance equation. We also add XU100AR index into regression equation to capture abnormal return effects. High β values shows persistence in volatility. And it also shows that it takes a long time to die out following a crisis. The negative γ values for EGARCH(1,1) shows that good news generate less volatility than bad news. When we look at the results in Table 4 we see that there is the days of the week anomaly for returns in EGARCH(1,1) models for Monday, Thursday and Friday. There is the days of the week anomaly for volatilities in GARCH(1,1) models for Monday and Friday, and in EGARCH(1,1) models for Tuesday and Friday. Abnormal returns (XU100AR) also have significant and strong effects on XGMYO volatilities in both models.

The month of the year regression results for XGMYO index is given in Table 5 (see Appendix). We dropped dummy for October in regression equation. The returns in May, June and November are negative and statistically significant. We reject the equality of returns and volatility across the months of the year. Abnormal returns (XU100AR) also have significant and strong effects on XGMYO volatilities in both models.

The turn of the month results are shown in Table 6 (see Appendix). The turn of the month coefficient for XGMYO is positive and statistically significant implying that stock prices tend to be higher around the turn of the month days. Abnormal returns (XU100AR) also have significant and strong effects on XGMYO volatilities in both models.

The day of the week for XU100 index is given in Table 7 (see Appendix). We dropped dummy for Thursday in return and variance equation. We reject the equality of return volatility across the days of the week. On the other hand results show that day of the week anomaly for returns have disappeared for BIST 100 Index.

The month of the year regression results for XU100 index is given in Table 8 (see Appendix). We dropped dummy for October in regression equation. The returns in May, June, August and November are negative and statistically significant. We reject the equality of returns and return volatility across the months of the year. The turn of the month results are shown in Table 9 (see Appendix). The turn of the month coefficient for XU100 is positive and statistically significant implying that stock prices tend to be higher around the turn of the month days.

The dynamic between XU100 index and the XGMYO index is also analyzed. Bivariate return and volatility linkages are outlined in Table 10 (see Appendix). The relationship observed between XU100 and XGMYO is strong. Investment decisions depend on investor's degree of risk aversion. Beta measures the systematic tendency of individual stocks to follow market movements. The market as a whole (represented by a broad stock market index XU100) is accepted a beta of one. Investors who are risk averse and willing to accept a market level of risk could buy low-beta portfolios. Coefficient value for XU100 is positive and less than one. This shows that risk-averse investors can buy REITs for their portfolios. The dynamic between XGMYO index with the XU100 index and day of the week, month of the year and turn of the month is also analyzed. The results are shown in Table 11; Table 12 and Table 13 (see Appendix). Day of the week, month of the year and turn of the month is not affecting the degree of connection between XGMYO and XU100.

6. Conclusion

This study first provides a comprehensive analysis of calendar anomalies for both XU100 and XGMYO index returns with GARCH(1,1) and EGARCH(1,1). Specifically, the study examined the possible existence of days of the week effect, months of the year effect and turn of the month effect with abnormal returns. Regressions are run using dummy variables for days of the week, for months of the year, for turn of the month trading days and for abnormal return. The coefficients of GARCH and EGARCH equations are statically significant in the all cases. Furthermore, the coefficient denoting the leverage effect is statistically significant and presents the expected and correct sign in all cases with the exception of regression results for the relation between XGMYO and XU100 index. The empirical results provide evidence for the existence of calendar anomalies for both XU100 and XGMYO index returns and volatilities. The only exception is that the day of the week anomaly for returns has disappeared for the BIST 100 Index. The GARCH(1,1) and EGARCH(1,1) results show that the volatility is persistent in both XGMYO and XU1000. The EGARCH(1,1) results show that good news generate less volatility than bad news. When we compare XU100 and XGMYO, we can say that daily and monthly volatility of XGMYO can be attributed to the volatility fluctuations of the general stock market. The results also show that EGARCH(1,1) model might be more useful than the GARCH(1,1) model to understand anomalies for return and volatility. When we analyzed the relation between XU100 and XGMYO we found that the beta, sensitivity of XGMYO with respect to XU100, was lower than unit. This shows an opportunity for risk-averse investors to use REITs as an alternative for their portfolios. When the abnormal returns are included in to the models, the results show that they have significant and strong effects on returns and volatilities.

According to the Efficient Markets Hypothesis, investors should not be able to earn above-average returns since all information is reflected in stock prices. Previous studies in finance have provided evidence that return anomalies exist in the trading of common stock and REIT stock. Results of this study provide further evidence for the existence of both return and volatility anomalies in the market for REIT shares and common stock in BIST. Abnormal returns also have significant effects on returns and volatilities. REITs have unique status as assets connected to both the real estate and stock markets. The results of this study also provide a more complete description of REIT volatility and interactions of REITs with common stock markets. This could be useful in the future for options trading in Turkey and for those investing in REITs or adding them to a portfolio. The findings of these calendar anomalies in both indices have important implications for practitioners and academics. For practitioners, it affects designing trading strategies, drawing investment decisions, risk management and timing of security issuances by firms. For academics, it has implications for asset pricing and performance evaluation.

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Appendix

Table 1

Study of Days of the Week Anomalies in BIST

		Study period & Main Findings
Muradoglu & Oktay	1993	1988-1992 & Tuesday has negative, Friday has positive return
Balaban	1995	1988-1994 & Tuesday has the lowest (Statistically insignificant), Friday has the highest return
Bildik	2000	1988-1999 & Tuesday has negative, Friday has the highest return
Oguzsoy & Guven	2003	1988-1999 & Tuesday has the lowest, Friday has the highest return
Berument, Inamlik & Kiymaz	2004	1986-2003 & Days of the week anomaly observed. Highest volatility on Monday and lowest volatility on Friday.
Kiyilar & Karakas	2005	1988-2003 & Monday has the lowest, Thursday and Friday have the highest return
Tuncel	2007	2002-2005 & Monday has the lowest, Friday has the highest return
Dicle & Hassan	2007	1987-2005 & Monday has negative, Thursday and Friday have positive return
Aktas & Kozoglu	2007	2001-2007 & Thursday and Friday (Statistically significant), Days of the week anomaly observed
Ergul, Akel & Dumanoglu	2009	1997-2007 & Friday has the highest return
Hepsen	2012	2000-2010 & Days of the week anomaly, January effect and the turn of the month effect observed for REITs Index

Table 2

Study of Months of the Year Anomalies in BIST

		Study period & Main Findings
Balaban	1995	1988-1994 & January, June, September have higher returns
Ozmen	1997	1988-1996 & January, June, September have higher returns, October has negative return
Bildik	2000	1988-1999 & January, June, September have higher returns, August has the lowest return
Ozer & Ozcan	2002	1988-1997 & Existence of January effect

Table 3

Study of Calendar Anomalies for REITs

		Study period, Country & Main Findings
Redman, Manakyan & Liano	1997	1986-1993, US & Existence of January effect, the turn-of-the-month effect, the day-of-the-week effect, and the pre-holiday effect
Friday & Higgins	2000	1970-1995, US & For equity REITs, returns on Monday are positive when returns on Friday are positive; returns on Monday are negative when returns on Friday are negative.
Hardin, Liano & Huang	2005	1994-2002, US & The presence of calendar anomalies is sensitive to the use of REIT index type as well as the dividend yield and capital yield components.

		Study period, Country & Main Findings
Chan, Leung & Wang	2005	1981-1999, US & REIT stocks with higher institutional holdings perform better on Monday than REITs with lower institutional holdings during the 1990s, but not in the 1980s. They find supporting results for the claim that the change in REIT structure and the increase in institutional participation in the REIT market in the 1990s make REIT stocks behave more like other equities in the stock market.
Compton, Johnson & Kunkel	2006	1999-2003, US & Existence of the turn-of-the-month effect in non-mortgage REIT markets.
Lenkkeri, Marquering & Strunkmann-Meister	2006	1990-2003, Europe & Eight out of eleven European countries exhibit abnormally high Friday returns.
Brounen & Ben-Hamo	2009	1987-2007, Eleven most prominent markets around the world & price anomalies for Fridays and Mondays.
Wiley & Zumpano	2009	1980-2004, US & Existence of the turn-of-the-month effect. Stock returns around the turn-of-the-month are influenced by the level of institutional investment.
Chiu, Lee & Ou	2009	2001-2008, US & Positive return on Monday, Tuesday, Wednesday and Friday. Positive effect of volatility on Tuesday, but negative on Wednesday.

Table 4

Regression Results of XGMYO Index with Days of the Week

XGMYO			Modified		With Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH	GARCH	EGARCH
MON	0.0652 (0.4693)	0.1790 (0.0268**)	0.0489 (0.6217)	0.1859 (0.0253**)	0.0814 (0.3689)	0.1906 (0.0293**)
WED	0.0695 (0.4450)	0.1082 (0.1867)	0.0694 (0.4678)	0.1118 (0.1680)	0.0428 (0.6327)	0.0975 (0.2465)
THUR	0.0852 (0.3533)	0.1519 (0.0634*)	0.0933 (0.3134)	0.1586 (0.0503*)	0.0573 (0.5250)	0.1428 (0.0905*)
FRI	0.1334 (0.1824)	0.1916 (0.0223**)	0.1177 (0.2284)	0.1848 (0.0197*)	0.1350 (0.1181)	0.1728 (0.0318**)
C	0.0200 (0.7715)	0.0418 (0.6762)	0.0228 (0.7553)	0.0428 (0.6561)	0.0439 (0.4985)	0.1288 (0.2006)
			Variance			
Vc	0.1737 (0.0000***)	-0.1484 (0.0000***)	0.0099 (0.9368)	-0.0668 (0.4164)	0.4509 (0.0004***)	-0.0142 (0.8585)
α	0.1358 (0.0000***)	0.2821 (0.0000***)	0.1389 (0.0000***)	0.2832 (0.0000***)	0.2398 (0.0000***)	0.4625 (0.0000***)
γ		-0.0522 (0.0001***)		-0.0523 (0.0001***)		-0.0739 (0.0019***)
β	0.8327 (0.0000***)	0.9522 (0.0000***)	0.8283 (0.0000***)	0.9514 (0.0000***)	0.5973 (0.0000***)	0.7220 (0.0000***)
MON			0.8832 (0.0000***)	0.1522 (0.1787)	0.3463 (0.0657*)	0.1387 (0.1640)
TUES			0.0118 (0.9497)	-0.2723 (0.0346**)	0.0060 (0.9759)	-0.2083 (0.0666**)

XGMYO			Modified		With Abnormal Return	
THUR			0.0140 (0.9519)	-0.0519 (0.7104)	0.1091 (0.6108)	-0.0472 (0.6911)
FRI			-0.0493 (0.7414)	-0.2343 (0.0273**)	-0.4134 (0.0160**)	-0.2380 (0.0155**)
XU100AR					5.4263 (0.0000***)	1.2079 (0.0000***)

Table 5

Regression Results of XGMYO Index with Months of the Year

XGMYO			Modified		Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH	GARCH	EGARCH
JAN	-0.0036 (0.9808)	0.0230 (0.8616)	-0.0026 (0.9880)	0.0008 (0.9958)	0.0306 (0.8312)	0.0625 (0.6483)
FEB	-0.2440 (0.1216)	-0.0797 (0.5696)	-0.2370 (0.2098)	-0.0989 (0.5106)	-0.1356 (0.3442)	-0.0234 (0.8687)
MAR	-0.1002 (0.5184)	-0.1079 (0.4166)	-0.0817 (0.6339)	-0.0876 (0.5250)	-0.1519 (0.2431)	-0.0432 (0.7357)
APR	-0.0335 (0.8337)	-0.0945 (0.4613)	-0.0366 (0.8160)	-0.1055 (0.4287)	0.0498 (0.6948)	0.0308 (0.8116)
MAY	-0.3652 (0.0161**)	-0.2554 (0.0496**)	-0.3559 (0.0318**)	-0.2594 (0.0594**)	-0.3884 (0.0040***)	-0.2288 (0.0962*)
JUN	-0.3603 (0.0224**)	-0.3700 (0.0043***)	-0.3515 (0.0218**)	-0.3532 (0.0062***)	-0.3394 (0.0063***)	-0.3268 (0.0062***)
JUL	-0.0750 (0.6206)	-0.0819 (0.5078)	-0.0671 (0.6655)	-0.0960 (0.4453)	-0.1101 (0.3709)	-0.0746 (0.5349)
AUG	-0.1022 (0.5225)	-0.2033 (0.1048)	-0.1048 (0.4982)	-0.2217 (0.0833*)	-0.0772 (0.5459)	-0.1438 (0.2336)
SEP	0.0001 (0.9997)	-0.0356 (0.7801)	0.0113 (0.9453)	-0.0478 (0.7161)	-0.0419 (0.7491)	-0.0027 (0.9826)
NOV	-0.2709 (0.0872*)	-0.3334 (0.0098***)	-0.2655 (0.1078)	-0.3424 (0.0104**)	-0.3013 (0.0285**)	-0.2927 (0.0283**)
DEC	0.0017 (0.9921)	-0.0194 (0.8834)	0.0049 (0.9795)	-0.0419 (0.7621)	0.0746 (0.5747)	0.0291 (0.8204)
C	0.2228 (0.0518*)	0.2943 (0.0163**)	0.2191 (0.0799*)	0.3032 (0.0184**)	0.2244 (0.0139**)	0.3522 (0.0043***)
Variance						
Vc	0.1719 (0.0000***)	-0.1489 (0.0000***)	0.1735 (0.0000***)	-0.1445 (0.0000***)	0.3061 (0.0001***)	-0.1147 (0.0256**)
α	0.1393 (0.0000***)	0.2814 (0.0000***)	0.1397 (0.0000***)	0.2772 (0.0000***)	0.2394 (0.0000***)	0.4480 (0.0000***)
γ		-0.0568 (0.0000***)		-0.0577 (0.0000***)		-0.0720 (0.0027***)
β	0.8309 (0.0000***)	0.9526 (0.0000***)	0.8302 (0.0000***)	0.9516 (0.0000***)	0.5949 (0.0000***)	0.7245 (0.0000***)
JAN			0.0789 (0.1476)	0.0241 (0.3527)	0.4206 (0.0030***)	0.1010 (0.0971*)
FEB			0.1089 (0.0245**)	0.0109 (0.6032)	0.1948 (0.1145)	0.0643 (0.2776)

XGMYO			Modified		Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH	GARCH	EGARCH
MAR			-0.0212 (0.5965)	-0.0148 (0.5024)	0.1162 (0.2178)	0.0393 (0.4727)
APR			-0.0631 (0.1067)	0.0059 (0.8076)	0.1951 (0.0405**)	0.0752 (0.1965)
MAY			0.0625 (0.2077)	0.0049 (0.8440)	0.2023 (0.0831*)	0.0790 (0.1928)
JUN			-0.0963 (0.0112**)	-0.0289 (0.2410)	0.1442 (0.1285)	0.0039 (0.9490)
JUL			-0.0362 (0.2696)	-0.0105 (0.6574)	0.0019 (0.9825)	-0.0399 (0.4948)
AUG			-0.0861 (0.0302**)	-0.0118 (0.6429)	0.0293 (0.7612)	-0.0338 (0.5735)
SEP			0.0658 (0.1542)	0.0131 (0.5999)	0.2628 (0.0088***)	0.0187 (0.7447)
NOV			-0.0253 (0.5690)	0.0065 (0.8213)	0.2662 (0.0147**)	0.0819 (0.2015)
DEC			0.0769 (0.0047***)	0.0009 (0.9644)	0.1291 (0.1666)	0.0364 (0.5178)
XU100AR					5.7047 (0.0000***)	1.2216 (0.0000***)

Table 6

Regression Results of XGMYO Index with Turn of the Month

XGMYO			Modified	
Variable	GARCH	EGARCH	GARCH	EGARCH
TOM	0.2306(0.0011***)	0.1389(0.0258**)	0.2010(0.0023***)	0.1564(0.0147**)
C	0.0433(0.2275)	0.1099(0.2106)	0.0688(0.0329**)	0.1967(0.0305**)
Variance Equation				
Vc	0.1657(0.0000***)	-0.1492(0.0000***)	0.4391(0.0000***)	-0.0948(0.0059***)
α	0.1347(0.0000***)	0.2839(0.0000***)	0.2385(0.0000***)	0.4628(0.0000***)
γ		-0.0525(0.0001***)		-0.0687(0.0038***)
β	0.8356(0.0000***)	0.9515(0.0000***)	0.6024(0.0000***)	0.7215(0.0000***)
TOM			0.0344(0.6396)	0.0428(0.3027)
XU100AR			5.3939(0.0000***)	1.2224(0.0000***)

Table 7

Regression Results of XU100 Index with Days of the Week

XU100			Modified		Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH	GARCH	EGARCH
MON	-0.1051 (0.1880)	-0.0871 (0.2659)	-0.1273 (0.1437)	-0.0941 (0.2650)	-0.0896 (0.2822)	-0.1065 (0.2251)
TUES	-0.1063 (0.1975)	-0.0992 (0.2024)	-0.1189 (0.1531)	-0.1177 (0.1368)	-0.0935 (0.2486)	-0.1202 (0.1443)
WED	-0.0607 (0.4573)	-0.0711 (0.3584)	-0.0797 (0.3378)	-0.0857 (0.2880)	-0.0407 (0.6167)	-0.0689 (0.4168)

XU100			Modified		Modified with Abnormal Return	
FRI	-0.0409 (0.6205)	-0.0082 (0.9175)	-0.0692 (0.4075)	-0.0304 (0.7060)	0.0080 (0.9191)	0.0006 (0.9937)
C	0.1825 (0.0010***)	0.3225 (0.0005***)	0.1947 (0.0009***)	0.3272 (0.0008***)	0.1729 (0.0033***)	0.3760 (0.0011***)
Variance						
Vc	0.0678 (0.0000***)	-0.1262 (0.0000***)	0.2682 (0.0337**)	-0.0033 (0.9632)	0.5006 (0.0005***)	0.0804 (0.2620)
α	0.1038 (0.0000***)	0.1970 (0.0000***)	0.0986 (0.0000***)	0.1971 (0.0000***)	0.2000 (0.0000***)	0.4703 (0.0000***)
γ		-0.0530 (0.0000***)		-0.0530 (0.0000***)		-0.0869 (0.0002***)
β	0.8857 (0.0000***)	0.9803 (0.0000***)	0.8890 (0.0000***)	0.9803 (0.0000***)	0.6546 (0.0000***)	0.6065 (0.0000***)
MON			0.2421 (0.1736)	0.0557 (0.5741)	0.0765 (0.6798)	0.1087 (0.2037)
TUES			-0.4998 (0.0032***)	-0.2906 (0.0027***)	-0.2408 (0.1990)	-0.2124 (0.0136**)
WED			-0.2248 (0.2962)	-0.0561 (0.6446)	-0.1698 (0.4344)	-0.0349 (0.7245)
FRI			-0.5026 (0.0143**)	-0.3238 (0.0073***)	-0.5640 (0.0126**)	-0.3154 (0.0014***)
XU100AR					5.3638 (0.0000***)	1.6367 (0.0000***)

Table 8

Regression Results of XU100 Index with Months of the Year

XU100			Modified		Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH	GARCH	EGARCH
JAN	-0.2030 (0.1319)	-0.1584 (0.2022)	-0.1718 (0.2575)	-0.1474 (0.2735)	-0.1171 (0.3943)	-0.0944 (0.4815)
FEB	-0.3714 (0.0099***)	-0.2261 (0.1074)	-0.3573 (0.0422**)	-0.2092 (0.1813)	-0.2559 (0.1006)	-0.1821 (0.2124)
MAR	-0.1797 (0.2090)	-0.1853 (0.1675)	-0.1730 (0.2561)	-0.1468 (0.2922)	-0.1215 (0.3596)	-0.1516 (0.2534)
APR	-0.1767 (0.2312)	-0.1839 (0.1527)	-0.1828 (0.2133)	-0.1583 (0.2419)	-0.0704 (0.5964)	-0.0055 (0.9672)
MAY	-0.3445 (0.0083***)	-0.4000 (0.0011***)	-0.3640 (0.0165**)	-0.3682 (0.0063***)	-0.3238 (0.0194**)	-0.3298 (0.0123**)
JUN	-0.2957 (0.0314**)	-0.2619 (0.0393**)	-0.2736 (0.0580*)	-0.2241 (0.0887*)	-0.2773 (0.0323**)	-0.2315 (0.0770*)
JUL	-0.0870 (0.5158)	-0.1089 (0.3614)	-0.0842 (0.5567)	-0.0905 (0.4817)	-0.0598 (0.6320)	-0.1067 (0.4014)
AUG	-0.2673 (0.0666*)	-0.3209 (0.0104**)	-0.2420 (0.0963*)	-0.2861 (0.0281**)	-0.2023 (0.1195)	-0.2429 (0.0480**)
SEP	-0.1728 (0.1976)	-0.1999 (0.0948*)	-0.1567 (0.2856)	-0.2160 (0.1062)	-0.1507 (0.2520)	-0.1848 (0.1425)
NOV	-0.2773	-0.3106	-0.2638	-0.2855	-0.3146	-0.2865

XU100			Modified		Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH	GARCH	EGARCH
	(0.0592*)	(0.0188**)	(0.0854*)	(0.0460**)	(0.0300**)	(0.0498**)
DEC	-0.0977 (0.5306)	-0.1291 (0.3428)	-0.0939 (0.5294)	-0.1062 (0.4462)	-0.0479 (0.7249)	-0.0950 (0.4871)
C	0.3221 (0.0015***)	0.4601 (0.0001***)	0.3172 (0.0051***)	0.4663 (0.0003***)	0.2795 (0.0049***)	0.4824 (0.0005***)
Variance						
Vc	0.0682 (0.0000***)	-0.1231 (0.0000***)	0.0803 (0.0021***)	-0.1041 (0.0000***)	0.5315 (0.0000***)	0.0928 (0.2317)
α	0.1047 (0.0000***)	0.1926 (0.0000***)	0.0969 (0.0000***)	0.1752 (0.0000***)	0.2280 (0.0000***)	0.4628 (0.0000***)
γ		-0.0558 (0.0000***)		-0.0534 (0.0000***)		-0.0869 (0.0003***)
β	0.8848 (0.0000***)	0.9805 (0.0000***)	0.8911 (0.0000***)	0.9831 (0.0000***)	0.5638 (0.0000***)	0.5301 (0.0000***)
JAN			0.0674 (0.0853*)	0.0125 (0.4998)	0.0832 (0.5617)	0.0187 (0.8351)
FEB			0.0424 (0.3130)	-0.0024 (0.8901)	0.1456 (0.3487)	0.0586 (0.5107)
MAR			-0.0401 (0.2331)	-0.0237 (0.1550)	-0.0728 (0.5546)	-0.0191 (0.8226)
APR			-0.0517 (0.1186)	-0.0104 (0.5581)	0.0175 (0.8950)	0.0676 (0.4237)
MAY			0.0678 (0.0288**)	-0.0016 (0.9261)	-0.0367 (0.7788)	0.0092 (0.9122)
JUN			-0.0684 (0.0329**)	-0.0339 (0.0626*)	-0.0394 (0.7529)	-0.0319 (0.7080)
JUL			0.0021 (0.9489)	-0.0001 (0.9964)	-0.1911 (0.1086)	-0.0976 (0.2401)
AUG			-0.0639 (0.0403**)	-0.0320 (0.0709*)	-0.1160 (0.3346)	-0.15430767*)
SEP			0.0340 (0.3775)	0.0199 (0.3311)	-0.1144 (0.3315)	-0.1639 (0.0600*)
NOV			-0.0320 (0.4923)	-0.0080 (0.7360)	0.1504 (0.3679)	0.1434 (0.1112)
DEC			-0.0749 (0.0132**)	-0.0292 (0.0954*)	-0.1013 (0.4029)	-0.0382 (0.6518)
XU100AR					6.8843 (0.0000***)	1.8079 (0.0000***)

Table 9

Regression Results of XU100 Index with Turn of the Month

XU100			Modified	
Variable	GARCH	EGARCH	GARCH	EGARCH
TOM	0.2103(0.0018***)	0.213755(0.0007***)	0.2105(0.0026***)	0.259204(0.0001***)
C	0.0802(0.0113**)	0.237653(0.0027***)	0.0823(0.0089***)	0.2763(0.003***)
Variance				
Vc	0.0673(0.0000***)	-0.127821(0.0000***)	0.0488(0.0002***)	-0.053173(0.1641)

XU100			Modified	
Variable	GARCH	EGARCH	GARCH	EGARCH
α	0.1051(0.0000***)	0.199624(0.0000***)	0.1062(0.0000***)	0.464818(0.0000***)
γ		-0.05353(0.0000***)		-0.085659(0.0002***)
β	0.8848(0.0000***)	0.979935(0.0000***)	0.8829(0.0000***)	0.634755(0.0000***)
TOM			0.1141(0.0289**)	0.086937(0.0334**)
XU100AR				1.594828(0.0000***)

Table 10

Regression Results for the Relation between XGMYO and XU100

XGMYO			With Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH
RET_XU100	0.8198(0.0000***)	0.8105(0.0000***)	0.8134(0.0000***)	0.8054(0.0000***)
C	-0.0341(0.0564*)	-0.0593(0.4200)	-0.0002(0.9912)	-0.0547(0.4603)
XU100AR			-0.5589(0.0000***)	-0.5347(0.0000***)
Variance Equation				
Vc	0.1852(0.0000***)	-0.1987(0.0000***)	0.1667(0.0000***)	-0.1953(0.0000***)
α	0.1831(0.0000***)	0.3045(0.0000***)	0.1683(0.0000***)	0.2962(0.0000***)
γ		0.0043(0.7865)		0.0103(0.4927)
β	0.7094(0.0000***)	0.9073(0.0000***)	0.7320(0.0000***)	0.9109(0.0000***)

Table 11

Regression Results for the Relation between XGMYO and XU100 with Days of the Week

XGMYO			Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH
RET_XU100	0.8201(0.0000***)	0.8112(0.0000***)	0.8138(0.0000***)	0.8055(0.0000***)
MON	0.0744(0.1540)	0.0551(0.2805)	0.0831(0.1114)	0.0662(0.1941)
WED	0.0339(0.5290)	-0.0089(0.8647)	0.0283(0.6052)	-0.0076(0.8841)
THUR	0.0067(0.9036)	-0.0044(0.9323)	0.0248(0.6544)	0.0039(0.9399)
FRI	0.0530(0.3343)	0.0300(0.5608)	0.0457(0.4103)	0.0245(0.6337)
C	-0.0676(0.0762*)	-0.0756(0.3474)	-0.0365(0.3532)	-0.0724(0.3706)
XU100AR			-0.5599(0.0000***)	-0.5417(0.0000***)
Variance Equation				
Vc	0.1849(0.0000***)	-0.1985(0.0000***)	0.1668(0.0000***)	-0.1957(0.0000***)
α	0.1832(0.0000***)	0.3041(0.0000***)	0.1686(0.0000***)	0.2968(0.0000***)
γ		0.0039(0.8059)		0.0100(0.5055)
β	0.7095(0.0000***)	0.9072(0.0000***)	0.7317(0.0000***)	0.9105(0.0000***)

Table 12

Regression Results for the Relation between XGMYO and XU100 with Months of the Year

XGMYO			Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH
RET_XU100	0.8185(0.0000***)	0.8114(0.0000***)	0.8125(0.0000***)	0.8055(0.0000***)
JAN	0.1059(0.2099)	0.1244(0.1316)	0.1112(0.1912)	0.1122(0.1738)
FEB	-0.0493(0.5725)	-0.0416(0.6219)	-0.0482(0.5836)	-0.0383(0.6498)
MAR	-0.0193(0.8094)	-0.0296(0.7081)	-0.0143(0.8612)	-0.0407(0.6096)
APR	0.0550(0.5302)	0.0492(0.5472)	0.0263(0.7666)	0.0198(0.8091)
MAY	-0.1318(0.1277)	-0.0766(0.3383)	-0.1439(0.0973*)	-0.0886(0.2725)
JUN	-0.1513(0.0923*)	-0.1464(0.0767*)	-0.1646(0.0696*)	-0.1599(0.0538*)
JUL	-0.0444(0.5993)	-0.0388(0.6204)	-0.0520(0.5453)	-0.0547(0.4904)
AUG	0.0538(0.5369)	0.0650(0.4193)	0.0544(0.5343)	0.0632(0.4315)
SEP	-0.0043(0.9598)	0.0260(0.7507)	-0.0101(0.9068)	0.0178(0.8286)
NOV	-0.1514(0.0695*)	-0.0613(0.4502)	-0.1583(0.0591*)	-0.0835(0.3026)
DEC	-0.0262(0.7625)	-0.0515(0.5349)	-0.0497(0.5671)	-0.0888(0.2834)
C	-0.0013(0.9829)	-0.0591(0.5302)	0.0399(0.5157)	-0.0265(0.7806)
XU100AR			-0.5616(0.0000***)	-0.5483(0.0000***)
Variance Equation				
Vc	0.1822(0.0000***)	-0.1981(0.0000***)	0.1654(0.0000***)	-0.1955(0.0000***)
α	0.1849(0.0000***)	0.3026(0.0000***)	0.1700(0.0000***)	0.2955(0.0000***)
γ		0.001(0.9514)		0.0069(0.6505)
β	0.7094(0.0000***)	0.9090(0.0000***)	0.7309(0.0000***)	0.9123(0.0000***)

Table 13

Regression Results for the Relation between XGMYO and XU100 with Turn of the Month

XGMYO			Modified with Abnormal Return	
Variable	GARCH	EGARCH	GARCH	EGARCH
RET_XU100	0.8193(0.0000***)	0.8094(0.0000***)	0.8128(0.0000***)	0.8055(0.0000***)
TOM	0.0476(0.2829)	0.0488(0.2426)	0.0543(0.2170)	0.0423(0.3040)
C	-0.0433(0.0315**)	-0.0586(0.4268)	-0.0105(0.6054)	-0.0606(0.4159)
XU100AR			-0.5610(0.0000***)	-0.5320(0.0000***)
Variance				
Vc	0.1859(0.0000***)	-0.1989(0.0000***)	0.1679(0.0000***)	-0.1957(0.0000***)
α	0.1835(0.0000***)	0.3045(0.0000***)	0.1691(0.0000***)	0.2967(0.0000***)
γ		0.0045(0.7742)		0.0104(0.4908)
β	0.7086(0.0000***)	0.9075(0.0000***)	0.7305(0.0000***)	0.9108(0.0000***)