

RELIGIOUS HOLIDAY EFFECT ON BORSA ISTANBUL

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Abstract

Problem/ Relevance: *Calendar anomalies have been studied by a number of articles especially in the last two decades, which is considered against the efficient market hypothesis.*

Mostly, anomaly researchers have examined the holiday effect, the day of the week effect, the month effect, the year effect, and the holy days effect in order to investigate the particular time period for abnormal returns. The holiday effect is regarded as a well-organized calendar effect in stock markets and it has significant theoretical background

Research Objective/ Questions: *This study attempts to analyze the effect of the Religious Holiday - the feast of Ramadan and the feast of Sacrifice- on sectoral indices returns at the Borsa Istanbul for the time period between 1997-2015. BIST100, BIST30 and 23 sectoral indices are considered for this study. Their return performances' at time Day-3 (three days before religious holidays), Day-2 (two days before religious holidays), Day-1 (one day before religious holidays), Day+1 (one day after religious holidays), Day+2 (two days after religious holidays) and Day+3 (three days after religious holidays) are studied.*

Methodology: *In order to compare the results of both regression analysis and non-parametric tests, they were analyzed together. Mann-Whitney, Kruskal-Wallis, and Wilcoxon Rank tests were used for non-parametric tests.*

Major Findings: *The analysis shows that average return of Day-2 is better than the other days. 12 sectoral indices display positively statistically significant results on that day. Returns of BIST Real Estate, BIST Services, BIST Transportation were positive and statistically significant at the 10% level; returns for BIST Electricity, BIST Industrial, BIST Inv. Trust, BIST Tourism, BIST Wood, Paper and Print were positive and statistically significant at the 5% level; BIST Food & Beverage, BIST Non-Material Products, BIST Leasing and BIST Textiles were positive and statistically significant at the 1% level.*

Implications: *This study indicated that there is religious holiday effect in the BIST for some indices, which have highest average returns at Day-2. This study aimed to contribute to the efforts of academicians who study this field, and investors for their investment strategies, which may now be developed by analyzing the volatility of these indices at those time periods.*

Keywords: *Behavioral finance, Islamic finance, Religious Holidays, Borsa Istanbul*

Introduction

It has been suggested by the economics and finance theories that, actors are after the highest returns for a given level of risk in a market economy. It is no wonder that stock price predictions are of a major concern for a utility maximizer person. The nature and dynamics of the financial markets was and is under consideration, for discovering and money making opportunity. Market efficiency is important, because it establishes the basis for value. In a capitalistic world, stock markets are the center of the economic activity, providing funds for growth, safekeeping the value of investors' portfolios, and providing and appropriate measure for the value of assets. Therefore, knowing that the asset (stock) prices are correct, and unbiased measures of value have utmost importance. The efficient market hypothesis has been used for a long time for asset markets. The efficient market hypothesis (EMH) states that asset prices reflect all available information at any given time (Fama, 1970), and it alters promptly to new information (Fama, 1969). The efficient market hypothesis are categorized into three levels. Fama (1970) defines weak form efficiency as which reflects all available information and the past returns do not affect further returns; semi-strong forms has all publicly available information and stock prices reflect all available information quickly and it includes weak form efficiency; strong form efficiency reflects all publicly and privately information, investors can't profit above the average investor. Since 1980s, the EMH has been discussed mostly because of considering people as rational. However, people are irrational and their decisions depend on many parameters such as, age, family, environment, education and so on. Hence, behavioral finance has become very popular and vital theory in finance especially for last three decades. There are many studies focus on behavioral finance i.e. (Kahneman & Tversky, 1979; Bondt & Thaler, 1985; Thaler, 1990; Barberis, Shleifer, & Vishny, 1998; Barberis & Thaler, 2002; Ritter, 2003).

There are two key topics in behavioral finance anomalies and biases (Park & Sohn, 2013). Market anomalies are not consistent with the main theories of asset prices like EMH, random walk and capital asset pricing model (CAPM) and so on. They denote market inefficiency or shortcomings in the underlying asset-pricing model (Schwert, 2002). There are different kind anomalies; calendar anomalies, size effect, value effect, momentum effect and so on. There has been an increasing tendency to study calendar anomalies, generating a topic of significant interest for researchers. Former studies support the idea that investing in a specific time period of the year may provide larger-than-expected returns for a particular year. Weeks of the month, months of the year and days of the week are among these calendar anomalies (Cohen, 2014).

Borowski (2016) contributed to the current literature in two ways. First, they found that the persistence of a holiday effect could be seen between 1987 and 1993. If that holiday effect continues to endure post-1987, then its results are consistent with the view that the anomaly is not economically exploitable. Anomalies of stock markets can be divided into three types: cross-section, calendar and price anomalies. Calendar anomalies are further classified into different periods, such as month, week, and holiday anomaly in the literature (Yuan & Gupta, 2014).

Mostly, anomaly researchers have examined the holiday effect, the day of the week effect, the month effect, the year effect, and the holy days effect in order to investigate the particular time period for abnormal returns. The holiday effect is regarded as a well-organized calendar effect in stock markets and it has significant theoretical background. It focuses on stock returns that are significantly higher before holidays than normal operational days (Gama & Vieira, 2013). The pre-holiday effect is one of these calendar anomalies, too, and it is known for its abnormal returns on the day preceding a holiday (Gama & Vieira, 2013).

Similarly, several studies pertaining to the Turkish stock exchange have investigated calendar anomalies in Borsa Istanbul (BIST). Nevertheless, there are few studies that have considered the effect of pre- and post-holiday around Ramadan and Sacrifice holidays on the

Borsa Istanbul. (Alper & Aruoba, 2004) analyzed the market two days before and after the Ramadan and Sacrifice religious holiday effect on BIST between 1988 and 1999. They observed returns in BIST100 and companies that are within BIST30. Results revealed that the returns of Day-2 were higher than Day-1, Day+1 and Day+2, and were found to be statistically significant returns for some stocks.

Sacrifice day is celebrated for four and one-half days. The Ramadan feast is celebrated for three and one-half days. Furthermore, the stock exchange is stopped midday when the feast begins. To illustrate further, the nine-day holiday is available with the weekends when the feast starts on Monday. In addition, even though the holiday starts on a weekday (like Tuesday or Wednesday), the government usually declares a nine-day holiday for government officials and Borsa Istanbul is also closed on those days. These holidays influence retail trade, production, and financial markets. Due to religious reasons, people refuse to use credit cards for transactions for the Feast of Sacrifice and liquidity demand increases (Alper & Aruoba, 2004)

However, this study goes a step further and pioneers the investigation of the returns of BIST100 and BIST30 Indices and twenty-three Borsa Istanbul Sectoral Indices at Day-3, Day-2, Day-1, Day+1, Day+2, Day+3 for pre- and post-effects caused by the Ramadan and Sacrifice holidays. The main of the paper is to discover calendar anomaly is alive or not. It explores the existence of religious holiday effects in stock returns in BIST. In other words, weak-form market efficiency is tested. This study is thought to be the first to look at the BIST Index and its sub-indices. For the first one, regression analysis method was used; for the second one, Mann-Whitney, Wilcoxon Rank and Kruskal-Wallis tests were considered. The rest of the study is organized as follows: Section 2 reviews the existing literature on this topic. Section 3 elaborates the methodology and data. Section 4 discusses the empirical results, and Section 5 presents a conclusion.

Literature Review

Lakonishok & Smidt (1988) used 90 years of daily data from the Dow Jones Industrial Average in order to test seasonal anomalies such as the weekend effect, holiday returns, end-of-December returns, turn-of-the-month returns, and dividend effects. According to the results of pre and post-holiday returns, although pre-holiday rates of return are as much as twenty-three times higher than the regular daily returns, post-holiday returns are negative (but still statistically significant). Ariel (1990) explored the holiday effect on the Center for Research in Security Prices (CRSP)'s value-weighted and equally weighted daily returns for 1963 through 1982. On average, pre-holiday returns were nine to fourteen times higher than non-pre-holiday ones. (Meneu & Pardo, 2004) reported that there are abnormally high returns on the trading day before holidays on the NYSE, AMEX, and NASDAQ. Although, they also analyzed the holiday effect on Japan and the U.K. and found a pre-holiday effect, their holiday effect was independent from the U.S. stock market. Additionally, they could not find any post-holiday effect. Arsad & Coutts (1997) found a pre-holiday effect on the Financial Times Industrial Ordinary Shares Index from July 1935 to December 1994. Brockman & Michuyluk (1998) revealed the persistence of a holiday effect on the NYSE, AMEX, and NASDAQ. Pre-holiday returns are significantly higher than non-holiday returns in all size and price categories as well. (Meneu & Pardo, 2004) found the existence of a pre-holiday effect in the most significant five individual stocks on the Spanish Stock Exchange. Furthermore, pre-holiday effect revealed that the day prior to a holiday is the worst day to buy.

Oğuzsoy & Güven (2004) computed returns around the Holy Days in Turkey—the feast of Ramadan and the feast of Sacrifice—between 1988 and 1999. The ISE National 100 Composite Index and thirty stocks were analyzed and Day -2 (i.e., two days before the religious

holidays) attained better performance than other days. Loughran & Schultz (2004) analyzed localized trading behavior in Nasdaq firms' headquarters in twenty-five cities and found that there was evidence on fewer Jewish traders on Yom Kippur day.

Marrett & Worthington, (2009) analyzed the impact of the Christian holiday St. Patrick's Day and the Jewish holy days of Rosh Hashanah and Yom Kippur on U.S. equity markets from 1946 to 2000. They found that stock returns were significantly higher on Rosh Hashanah but significantly lower on Yom Kippur. For most holy days, trading volumes decline. Tan (2017) examined the holiday effect in Australian daily stock returns at market and industry levels from 1996 to 2006 by considering eight annual holidays.

Yatrakis & Williams (2010) investigated the impact of Rosh Hashanah and Yom Kippur Jewish holidays on daily returns of the Dow Jones Industrial Average between 1907 and 2008, based on the heuristic strategy "sell Rosh Hashanah and buy Yom Kippur." According to their strategy, selling before Rosh Hashanah and covering after Yom Kippur produced statistically and economically significant returns. Gama & Vieira (2013) provided further evidence of the holiday effect on the Portuguese Stock market and considered Euronext where the Portuguese stock market had been harmonized since 2013. They found a positive and statistically significant effect on national holidays relative to typical holidays, suggesting that a positive mood of investors, a positive buy feeling and a reluctance to sell contributed to prices being pushed up during country-specific holidays. Yuan & Gupta (2014) investigated the Chinese Lunar New Year (CLNY) holiday effect on major Asian stock markets: China, Hong Kong, Malaysia, South Korea, Japan, and Taiwan. Daily stock index returns were analyzed from 1999 to 2012. Using a GARCH model, they found that there was a significant pre-CLNY holiday effect for all stock markets, whereas Malaysia alone had significant stock returns for both pre- and post-CLNY holiday effects.

Methodology and Data

This study analyzed the impact of *pre-* and *post-*religious holiday effects on the BIST Index and its sub-indices by running regression and non-parametric tests. In order to compare the results of both regression analysis and non-parametric tests, they were analyzed together. Daily stock returns were analyzed by considering logarithmic returns. The advantage in looking at log returns of a series is that one can see relative changes in the variable and compare these directly with other variables whose values may have very different base values (Lee, Lee, & Lee, 2015). The following regression analysis was estimated to analyze the magnitude of the religious holiday effect:

$$R_p = \ln (P_t / P_{t-1})$$

where

R_p -return on the index

P_t -price of the index at day t

P_{t-1} -price of the index at day $t-1$

For the dummy variable test:

$$R_{i,t} = \theta_0 + \theta_1 Day_{T-3} + \theta_2 Day_{T-2} + \theta_3 Day_{T-1} + \theta_4 Day_{T+1} + \theta_5 Day_{T+2} + \theta_6 Day_{T+3} + \varepsilon_t(I)$$

where:

$R_{i,t}$ = the logarithmic daily return of index i on day t

$\theta_1 Day_{T-3}$ = a dummy variable that takes the value of 1 when three days before a religious holiday.

$\theta_2 Day_{T-2}$ = a dummy variable that takes the value of 1 when two days before a religious holiday.

$\theta_3 Day_{T-1}$ = a dummy variable that takes the value of 1 when one day before a religious holiday.

$\theta_4 Day_{T+1}$ = a dummy variable that takes the value of 1 when one day after a religious holiday.

$\theta_5 Day_{T+2}$ = a dummy variable that takes the value of 1 when two days after a religious holiday.

$\theta_6 Day_{T+3}$ = a dummy variable that takes the value of 1 when three days after a religious holiday.

ε_t = Random error term

According to Gujarati and Porter (2009), OLS is not appropriate by virtue of violations of its assumptions to the degree the normality, autocorrelation and heteroscedasticity of both data series. Since OLS has asymptotic properties or large sample properties, normality is not a main problem for large datasets. So, even if the errors are not normally distributed, the OLS estimators are still best linear unbiased estimators.

On the other hand, in addition, non-parametric methods were used in this study. Non-parametric tests offer further information regarding robustness of the statistical results held by t-tests where the data does not fit the normal distribution (Bildik, 2004). Therefore, the Mann-Whitney test, the Wilcoxon Rank test, and the Kruskal-Wallis test, all of which are regarded as non-parametric tests, were also used to test the analysis.

The Mann-Whitney U test is used to test whether the two population distributions are identical using two independent samples. The U statistic is based on the rank sum of the sample groups. The Mann-Whitney U test can be approximated by a standard normal distribution when the sizes of both samples are at least ten (Lim & Chia, 2010).

$$U_1 = \frac{n_1 + (n_1 + 1)}{2} R_1 \text{ and } U_2 = \frac{n_2 + (n_2 + 1)}{2} R_2 \quad (2)$$

where

R_1 is the rank sum for sample 1

R_2 is the rank sum for sample 2

n_1 is the number of observations in sample 1

n_2 is the number of observations in sample 2

For the Mann-Whitney U test, the null hypothesis and the alternative hypothesis are:

H_0 = *There is no difference between average returns at index i at day t and with returns of the same index on other days*

H_1 = *There is difference between average return at index i at day t and with returns of the same index on other days*

In this study, the Kruskal-Wallis statistic test was used to examine possible differences between the daily returns over six days. The null hypothesis is that there is no difference in the returns across these six days. The statistical test equation is:

$$KW = \frac{12}{n(n+1)} \sum_{i=1}^k \frac{R_i^2}{n_i} - 3(n+1) \quad (3)$$

where n is the total number of sample observations, n_i is the sample size on the i th trading day, k is the number of trading days' returns ($k = 5$), and R_i is the rank sum on the i th trading day. For larger sample sizes, the Kruskal-Wallis test statistic will follow a chi-square (χ^2) distribution with $(k - 1)$ degrees of freedom (Hui, 2005).

The hypotheses are as follows:

$H_0 =$ *There is no difference between the daily returns of six days*

$H_1 =$ *There is a difference between the daily returns of six days*

Rejecting the null hypothesis with the Kruskal-Wallis test would imply that a religious holiday effect exists. Then, the Wilcoxon Rank sum test must be performed to find out which two trading days' returns are different, and thus contributed to the rejection of the null hypothesis under the Kruskal-Wallis test. The test is conducted by comparing the return of one trading day with those of the other five days by using rank-transformed data (Newbold, Carlson, & Thorne, 2013).

The Wilcoxon Rank sum test compares the central locations of two independent random samples. The two samples were pooled together and the observations are ranked in ascending order, with ties assigned to the average of the next available ranks. The test statistic approaches the normal distribution when the number of sample observations increases. The Wilcoxon Rank sum has the mean:

$$E(T) = \mu_T = \frac{n_1(n_1 + n_2 + 1)}{2} \quad (4)$$

and variance

$$\text{Var}(T) = \sigma_T^2 = \frac{n_1(n_1 + n_2 + 1)}{2} \quad (5)$$

where n_1 is the number of observations from the first sample and n_2 is the number of observations from the second. Then, the distribution is estimated as a normal distribution with the following equation:

$$Z = \frac{T - \mu_T}{\sigma_T} \quad (6)$$

where T denotes the sum of ranks of the observations from the first sample (Fama, Fisher, Jensen, & Roll, 1969).

$H_0 =$ *There is no difference in returns between the two days.*

$H_1 =$ *There is a difference in returns between the two days.*

In this study, BIST and twenty-three sectoral indices' returns were used. All data used in this study are taken from Thomson Reuters DataStream. The time series for most of sectoral indices started on February 1997 (Table 1). The time period for the other indices started for BIST Info Technology (03.07.2000), BIST Real Estate (04.01.2000), BIST Technology (03.07.2000) and BIST Telecom (31.07.2000). BIST Sport and BIST Corporate Governance indices were not included in the study, since the first index did not become active until 2004 and second one until 2007, thus providing insufficient observations.

Table 1: Time period and code of indices

Indices	Start Date	End Date	Code
BIST 30	02.01.1997	31.12.2015	XU030
BIST 100	02.01.1997	31.12.2015	XU100
BIST BANK	02.01.1997	31.12.2015	XBANK
BIST BASIC MATERIALS	02.01.1997	31.12.2015	XMANA
BIST CHEMICALS	02.01.1997	31.12.2015	XKMYA
BIST ELECTRICITY	02.01.1997	31.12.2015	XELKT
BIST FINANCIAL	02.01.1997	31.12.2015	XUMAL
BIST FOOD & BEVERAGE	02.01.1997	31.12.2015	XGIDA
BIST HOLDING & INV	02.01.1997	31.12.2015	XHOLD
BIST INDUSTRIAL	02.01.1997	31.12.2015	XUSIN
BIST INFO TECHNOLOGY	03.07.2000	31.12.2015	XBLSM
BIST INSURANCE	02.01.1997	31.12.2015	XSGRT
BIST INV. TRUST	02.01.1997	31.12.2015	XYORT
BIST LEASING	02.01.1997	31.12.2015	XFINK
BIST METAL GOODS	02.01.1997	31.12.2015	XMESY
BIST NON-MATERIAL PRODUCTS	02.01.1997	31.12.2015	XTAST
BIST REAL ESTATE	04.01.2000	31.12.2015	XGMYO
BIST SERVICE	02.01.1997	31.12.2015	XUHIZ
BIST TECHNOLOGY	03.07.2000	31.12.2015	XUTEK
BIST TELECOM	31.07.2000	31.12.2015	XILTM
BIST TEXTILE	02.01.1997	31.12.2015	XTEKS
BIST TOURISM	02.01.1997	31.12.2015	XTRZM
BIST TRANSPORTATION	02.01.1997	31.12.2015	XULAS
BIST WHOLASALE & RETAIL	02.01.1997	31.12.2015	XTRCT
BIST WOOD, PAPER, PRINTING	02.01.1997	31.12.2015	XKAGIT

Empirical Results

Descriptive statistics information is shown in Table 2. This table includes both mean and standard deviation information for three days before and after the religious holidays. More detailed information related to descriptive statistics is given in Appendix. As can be understood from the results of that table, the T-2 variable (two days before the holiday) has the highest returns. Returns of BIST Leasing & Factoring, BIST Food & Beverage, BIST Tourism and BIST Textile & Leather are highest individual ones, respectively. These indices provided the highest returns. One plausible reason might be that entering the holiday period could contribute to increased (intensive) sales of goods and services. Therefore, investors invest in those indices or in the companies included in them. On the first day after the return from the holiday (T + 1), most of the indices had negative returns.

Table 2: Descriptive Statistics

<u>BIST 100</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.34%	0.64%	-0.05%	0.19%	0.49%	0.20%
Std.Dev.	0.02095	0.02352	0.01756	0.03431	0.02401	0.03183
<u>BIST 30</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.37%	0.59%	-0.12%	0.26%	0.49%	0.23%
Std.Dev.	0.02280	0.02540	0.01911	0.03702	0.02607	0.03321
<u>BIST BANK</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.47%	0.45%	0.21%	0.49%	0.47%	0.41%
Std.Dev.	0.02922	0.03153	0.02728	0.04256	0.02978	0.03575
<u>BIST BASIC MATERIALS</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.02%	0.83%	0.48%	-0.28%	0.77%	0.02%
Std.Dev.	0.02383	0.02514	0.02352	0.04066	0.03577	0.03292
<u>BIST CHEMICALS</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.48%	0.67%	0.10%	0.12%	0.42%	0.29%
Std.Dev.	0.019812	0.019453	0.017638	0.029358	0.028686	0.032483
<u>BIST ELECTRICITY</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.56%	0.97%	0.35%	-0.67%	-0.08%	-0.32%
Std.Dev.	0.02019	0.02233	0.02750	0.03107	0.02360	0.02386
<u>BIST FINANCIAL</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.32%	0.58%	-0.07%	0.33%	0.62%	0.32%
Std.Dev.	0.02542	0.02754	0.01939	0.03838	0.02720	0.03479

<u>BIST FOOD and BEVERAGE</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.25%	1.25%	-0.12%	-0.51%	0.02%	0.16%
Std.Dev.	0.02016	0.03087	0.01655	0.03166	0.02711	0.02913
<u>BIST HOLDING & INV.</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.32%	0.79%	-0.23%	-0.28%	0.60%	0.27%
Std.Dev.	0.02070	0.02459	0.02048	0.03622	0.02717	0.03396
<u>BIST INDUSTRIAL</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.34%	0.83%	0.10%	-0.14%	0.46%	0.24%
Std.Dev.	0.01657	0.02069	0.01557	0.02835	0.02155	0.02781
<u>BIST INFO-TECH</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	-0.04%	-0.04%	0.00%	-0.30%	0.52%	-0.02%
Std.Dev.	0.01482	0.01983	0.01536	0.02476	0.02394	0.02565
<u>BIST INSURANCE</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.13%	0.60%	0.54%	-0.35%	0.30%	0.60%
Std.Dev.	0.02375	0.02394	0.03031	0.04165	0.02973	0.03811
<u>BIST INV. TRUST</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.19%	0.98%	0.15%	-0.25%	0.25%	0.14%
Std.Dev.	0.01711	0.02032	0.01408	0.02714	0.01900	0.02225
<u>BIST LEASING & FACT</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.39%	1.51%	0.02%	0.27%	0.10%	-0.32%
Std.Dev.	0.02726	0.03230	0.01502	0.02683	0.03345	0.02591
<u>BIST METAL GOODS, MCH</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.31%	0.68%	0.27%	-0.07%	0.39%	0.29%
Std.Dev.	0.01985	0.02278	0.02165	0.03017	0.02963	0.03064
<u>BIST NON-MATER MRL PRDCTS</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.22%	0.96%	0.27%	-0.09%	0.61%	0.44%
Std.Dev.	0.01732	0.01973	0.01266	0.02462	0.01782	0.02495
<u>BIST REAL ESTATE</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.39%	0.66%	0.02%	-0.12%	0.44%	0.02%

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Std.Dev.	0.01369	0.02179	0.01420	0.02502	0.02200	0.02946
<u>BIST SERVICES</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.42%	0.72%	0.14%	-0.17%	0.06%	-0.11%
Std.Dev.	0.01629	0.02008	0.01623	0.02871	0.02077	0.02679
<u>BIST TECHNOLOGY</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	-0.02%	0.19%	0.24%	-0.16%	0.27%	0.12%
Std.Dev.	0.01383	0.01940	0.01422	0.02313	0.02056	0.02492
<u>BIST TELE COMMS</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.55%	0.15%	0.46%	-0.12%	-0.13%	0.00%
Std.Dev.	0.02789	0.02264	0.02463	0.03586	0.02790	0.02771
<u>BIST TEXTILE & LTHR</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.38%	1.09%	0.52%	-0.16%	0.39%	0.07%
Std.Dev.	0.01921	0.02409	0.01972	0.02565	0.02512	0.02502
<u>BIST TOURISM</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.69%	1.23%	-0.21%	0.09%	1.27%	0.19%
Std.Dev.	0.03481	0.03536	0.02400	0.03527	0.02766	0.03576
<u>BIST TRANSPORTATION</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.75%	0.92%	0.35%	-0.31%	0.70%	0.17%
Std.Dev.	0.02582	0.02160	0.01925	0.02552	0.03590	0.03176
<u>BIST WHSL & RETAIL</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	0.22%	0.59%	-0.07%	0.01%	0.22%	-0.24%
Std.Dev.	0.01868	0.01937	0.01694	0.02766	0.01824	0.02698
<u>BIST WOOD, PAPER, PRINT</u>	T-3	T-2	T-1	T+1	T+2	T+3
Mean	-0.18%	1.06%	-0.10%	0.08%	0.77%	0.29%
Std.Dev.	0.01996	0.02509	0.01425	0.03182	0.02959	0.02696

T-3 represents three days before religious holidays, T-2 represents two days before religious holidays,

T-1 represents one day before religious holidays, T+1 represents one day after holidays, T+2 represent two days after religious holidays and

T+3 represent three days after religious holidays.

Table 3 shows the results of our regression analysis. For BIST100 index, although there were positive returns on these days, except T-1, the results were not statistically significant.

Statistically, the best returns were obtained at time T-2. Returns of BIST Real Estate, BIST Services, BIST Transportation were statistically positive and significant at the 10% level; returns of BIST Electricity, BIST Industrial, BIST Inv. Trust, BIST Tourism, BIST Wood, Paper and Print were positively and statistically significant at the 5% level; BIST Food & Beverage, BIST Non-Material Product, BIST Leasing and BIST Textiles were statistically positive and significant at the 1% level. At time T + 1, BIST Food & Beverage was statistically negative significant at 10% level, although most indices have negative coefficients. At T+2, BIST Non-Material Min. Product and BIST Wood & Paper& Print were statistically positive and significant at the 10% level and BIST Tourism was statistically significant at the 5% level.

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Table 3: Results of Regression Analysis

BIST INDICES	T-3	T-2	T-1	T+1	T+2	T+3
BIST100	0,00238 (0,617)	0,00539 (1,396)	-0,00158 (0,409)	0,00081 (0,209)	0,00382 (0,99)	0,00093 (0,241)
BIST30	0,0027 (0,668)	0,00483 (0,002)	-0,00218 (-0,540)	0,00158 (0,391)	0,00391 (0,969)	0,00129 (0,32)
BIST BANK	0,00355 (0,773)	0,00332 (0,722)	0,0009 (0,196)	0,00378 (0,822)	0,00353 (0,77)	0,00298 (0,65)
BIST BASIC MATERIALS	0,00366 (0,825)	0,00715 (1,609)	-0,00094 (-0,211)	-0,00403 (-0,906)	0,00647 (1,456)	-0,00096 (-0,215)
BIST CHEMICALS	0,0038 (0,987)	0,00569 (1,476)	-0,00001 (-0,002)	0,00018 (0,048)	0,00315 (0,818)	0,00188 (0,487)
BIST ELECTRICITY	0,00505 (1,148)	0,00912** (2,072)	0,003 (0,682)	-0,00722 (-1,641)	-0,00131 (-0,297)	-0,0037 (-0,840)
BIST FINANCIAL	0,00205 (0,477)	0,00459 (1,068)	-0,00186 (-0,433)	0,00209 (0,487)	0,00502 (1,167)	0,00198 (0,461)
BIST FOOD & BEVERAGE	0,00132 (0,36)	0,01131*** (3,090)	-0,00237 (-0,647)	-0,00631* (-1,726)	-0,00095 (-0,260)	0,00044 (0,121)
BIST HOLDING & INV	0,00211 (0,498)	0,00682 (1,61)	-0,00346 (-0,816)	-0,00394 (-0,931)	0,00488 (1,153)	0,00154 (0,363)
BIST INFO TECHNOLOGY	-0,00076 (-0,180)	-0,00079 (-0,188)	-0,0004 (-0,094)	-0,00341 (-0,810)	0,00485 (1,152)	-0,00059 (-0,140)
BIST INDUSTRIAL	0,00244 (0,722)	0,00731** (2,167)	0 (-0,001)	-0,00235 (-0,698)	0,00367 (1,089)	0,00144 (0,426)
BIST INSURANCE	-0,00004 (-0,008)	0,00465 (1,061)	0,004 (0,911)	-0,00482 (-1,099)	0,00167 (0,381)	0,0046 (1,049)
BIST INV. TRUST	0,0011 (0,299)	0,00895** (2,430)	0,00064 (0,173)	-0,00332 (-0,901)	0,00171 (0,464)	0,00057 (0,154)
BIST LEASING	0,00311 (0,76)	0,01432*** (3,497)	-0,00057 (-0,140)	0,00186 (0,454)	0,00017 (0,042)	-0,004 (-0,976)
	0,00192	0,00564	0,00154	-0,0018	0,00273	0,00172

BIST METAL GOODS	(0,483)	(1,423)	(0,39)	(-0,454)	(0,690)	(0,434)
BIST NON-MATERIAL MIN. PRODUCT	0,00137 (0,436)	0,00871*** (2,773)	0,00183 (0,582)	-0,00182 (0,578)	0,00519* (1,652)	0,00357 (1,137)
BIST REAL ESTATE	0,00359 (0,935)	0,00638* (1,659)	-0,00006 (-0,015)	-0,00143 (-0,373)	0,00414 (1,078)	-0,00007 (-0,019)
BIST SERVICES	0,00315 (0,873)	0,00623* (1,727)	0,00043 (0,120)	-0,00274 (-0,758)	-0,00046 (-0,127)	-0,00207 (-0,574)
BIST SPORT	0,00196 (0,465)	0,00336 (0,796)	0,00546 (1,296)	0,00458 (1,085)	0,00649 (1,540)	0,00739 (1,752)
BIST TECHNOLOGY	-0,00072 (-0,180)	0,00136 (0,330)	0,00182 (0,450)	-0,0022 (-0,540)	0,00216 (0,530)	0,00064 (0,160)
BIST TELECOM	0,00502 (1,024)	0,00099 (0,202)	0,00405 (0,826)	-0,00172 (-0,350)	-0,00184 (-0,376)	-0,00045 (-0,093)
BIST TEXTILE	0,00317 (0,905)	0,01026*** (2,929)	0,00459 (1,309)	-0,00222 (-0,632)	0,00334 (0,952)	0,00007 (0,019)
BIST TOURISM	0,00627 (1,234)	0,01165** (2,294)	-0,00271 (0,535)	0,00029 (0,056)	0,01206** (2,376)	0,00123 (-0,243)
BIST TRANSPORTATION	0,00645 (1,494)	0,00808* (1,871)	0,00244 (0,564)	-0,00414 (-0,958)	0,00596 (1,381)	0,00062 (0,143)
BIST WOOD & PAPER & PRINT	-0,00271 (-0,692)	0,00971** (2,476)	-0,00188 (0,479)	-0,00014 (0,034)	0,00676* (1,725)	0,00196 (0,501)
BIST WHSL & RETAIL	0,00088 (0,232)	0,00465 (1,231)	-0,00198 (-0,524)	-0,00116 (-0,308)	0,00094 (0,249)	-0,00371 (-0,980)

*,**,*** denotes statistically significant at %10, %5 and %1 respectively and “()” implies t-stat. T-3 represents three days before religious holidays, T-2 represents two days before religious holidays, T-1 represents one day before religious holidays, T+1 represents one day after holidays, T+2 represent two days after religious holidays and T+3 represent three days after religious holidays.

Before doing non-parametric tests, normality tests were performed to see if the indices for the data set used beforehand show a normal distribution, utilizing the Kolmogorov-Smirnov test and the Shapiro-Wilk test.

H_0 : The index returns do not show a normal distribution.

H_1 : The index returns show a normal distribution.

As shown in Table 4, the results of the analysis showed that all indices do not show a normal distribution for the Kolmogorov-Smirnov and Shapiro-Wilk tests at the 1% level. Therefore, the Mann-Whitney U test, the Kruskal-Wallis test, and the Wilcoxon Rank tests, which are non-parametric methods, were used to test whether those six days were different from other days.

Table 4: Tests of Normality

Indices	Kolmogorov-Smirnov	Shapiro-Wilk
BIST 30	0.074***	0.933***
BIST 100	0.076***	0.925***
BIST BANK	0.069***	0.946***
BIST BASIC MATERIALS	0.085***	0.927***
BIST CHEMICALS	0.085***	0.927***
BIST ELECTRICITY	0.101***	0.902***
BIST FINANCIAL	0.069***	0.938***
BIST FOOD & BEVERAGE	0.074***	0.921***
BIST HOLDING & INV	0.090***	0.947***
BIST INDUSTRIAL	0.092***	0.897***
BIST INFO TECHNOLOGY	0.088***	0.910***
BIST INSURANCE	0.087***	0.920***
BIST INV. TRUST	0.115***	0.866***
BIST LEASING	0.093***	0.913***
BIST METAL GOODS	0.088***	0.911***
BIST NON-MATERIAL MIN. PRODUCTS	0.096***	0.885***
BIST REAL ESTATE	0.081***	0.925***
BIST SERVICE	0.092***	0.904***
BIST TECHNOLOGY	0.083***	0.905***
BIST TELECOM	0.093***	0.882***
BIST TEXTILE	0.107***	0.878***
BIST TOURISM	0.106***	0.879***
BIST TRANSPORTATION	0.076***	0.938***
BIST WHSL & RETAILS	0.089***	0.906***
BIST WOOD & PAPER & PRINT	0.080***	0.922***

*, **, *** indicates significance level at 10%, 5% and 1% level.

Table 5 shows the Mann-Whitney test results. They were in line with the results of the regression analysis conducted above, and the index yield at the time of T-2 differed from other days. At T-3, BIST Bank and BIST Industrial indices differed statistically from other days at the 10% level. For T-2 time, BIST 100, BIST Material, BIST Tourism showed difference at the 10% level; BIST Electricity, BIST Food & Beverage, BIST Industrial, BIST Inv. Trust, BIST Non-Material Mineral Products, BIST Textile, BIST Wood & Paper & Print showed a difference around the 5% level and BIST Leasing and BIST Transportation showed difference around the 1% level. At T-1, returns from any index did not differ from other days. At T+1, only the BIST Electricity index was statistically significant at the 1% level. At T+2, BIST 30, BIST Financial, BIST Industrial and BIST Inv. Trust showed themselves to be statistically significant at the 10% level; BIST Material, BIST Chemicals, BIST Holding & Investment and BIST Wood & Paper & Print were statistically significant at the 5% level; BIST Non-Material Min. Products and BIST Tourism were significant at the 1% level. Finally, at T-3, only BIST Wholesale & Retail index were statistically significant at the 10% level.

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Table 5: Results of Mann-Whitney Test

Index	T-3	T-2	T-1	T+1	T+2	T+3
BIST 30	-1,597 (0,11)	-1,071 (0,284)	0,012 (0,99)	-0,541 (0,588)	-1,824* (0,068)	-0,477 (0,633)
BIST 100	-0,643 (0,52)	-1,818* (0,069)	-0,008 (0,994)	-0,438 (0,661)	-0,081 (0,936)	-0,643 (0,52)
BIST BANK	-1,732* (0,083)	-0,955 (0,34)	-0,255 (0,799)	-0,822 (0,411)	-1,204 (0,229)	-0,143 (0,886)
BIST MATERIAL	-1,076 (0,282)	-1,705* (0,088)	-0,078 (0,938)	-0,949 (0,342)	-2,413** (0,016)	-1,004 (0,315)
BIST CHEMICALS	-1,847 (0,65)	-1,489 (0,136)	-0,388 (0,698)	-0,432 (0,665)	-2,108** (0,035)	-0,406 (0,685)
BIST ELECTRICITY	-1,359 (0,174)	-2,235** (0,025)	-0,257 (0,797)	-1,653* (0,098)	-0,111 (0,912)	-0,822 (0,411)
BIST FINANCIAL	-1,354 (0,176)	-1,033 (0,302)	-0,191 (0,849)	-0,593 (0,553)	-1,939* (0,053)	0,396 (0,692)
BIST FOOD & BEVERAGE	-1,1332 (0,183)	-2,401** (0,016)	-1,208 (0,227)	-1,036 (0,300)	-0,192 (0,848)	-0,784 (0,443)
BIST HOLDING & INV.	-1,182 (0,237)	-1,548 (0,122)	-0,404 (0,686)	-1,065 (0,287)	-2,215** (0,027)	-0,693 (0,488)
BIST INDUSTRIAL	-1,819* (0,069)	-2,044** (0,041)	-0,83 (0,934)	-0,428 (0,669)	-1,724* (0,085)	-0,471 (0,638)
BIST INFO TECHNOLOGY	-0,333 (0,739)	-0,54 (0,589)	-0,447 (0,655)	-0,437 (0,662)	-1,6 (0,110)	-0,903 (0,367)
BIST INSURANCE	-0,248 (0,804)	-0,777 (0,437)	-0,469 (0,639)	-1,126 (0,260)	-1,49 (0,136)	-0,443 (0,665)
BIST INV. TRUST	-0,921 (0,357)	-2,289** (0,022)	-0,153 (0,879)	-0,924 (0,356)	-1,726* (0,084)	-0,266 (0,790)
BIST LEASING	-0,146 (0,884)	-2,934*** (0,003)	-0,079 (0,937)	-1,071 (0,284)	-0,912 (0,362)	-1,674 (0,940)
BIST METAL GOODS	-1,204	-1,511	-0,847	-0,562	-1,582	-0,545

	(0,229)	(0,131)	(0,397)	(0,574)	(0,114)	(0,586)
BIST NON-MATERIAL MIN. PRODUCTS	-1,081 (0,28)	-2,243** (0,025)	-0,74 (0,459)	-1,134 (0,257)	-2,685*** (0,007)	0,283 (0,777)
BIST REAL ESTATE	-1,149 (0,25)	-1,393 (0,164)	-0,068 (0,946)	-0,338 (0,736)	-1,223 (0,221)	-1,095 (0,273)
BIST SERVICE	-1,911 (0,056)	-1,324 (0,186)	-0,762 (0,446)	-1,27 (0,204)	-0,275 (0,783)	-1,335 (0,182)
BIST TELECOM	-1,566 (0,117)	-0,074 (0,941)	-1,355 (0,175)	-0,494 (0,621)	-0,389 (0,689)	-0,931 (0,361)
BIST TEXTILE	-1,475 (0,140)	-2,324** (0,020)	-0,85 (0,395)	-0,546 (0,585)	-1,255 (0,210)	-0,483 (0,629)
BIST TOURISM	-1,097 0,273	-1,89* (0,059)	-0,746 (0,456)	-0,098 (0,922)	-3,446*** (0,001)	-0,789 (0,430)
BIST TRANSPORTATION	-1,336 (0,182)	-2,70*** (0,007)	-0,63 (0,529)	-0,987 (0,324)	-1,506 (0,132)	-0,227 (0,820)
BIST WHOSALE & RETAIL	-1,085 (0,278)	-1,227 (0,220)	-0,207 (0,836)	-1,153 (0,249)	-0,457 (0,648)	-1,87* (0,062)
BIST WOOD & PAPER & PRINT	-0,317 (0,752)	-2,382** (0,017)	-0,621 (0,534)	-0,585 (0,559)	-1,979** (0,048)	-0,182 (0,856)

*,**,*** denotes statistically significant at %10, %5 and %1 respectively and “()” implies t-stat. T-3 represents three days before religious holidays, T-2 represents two days before religious holidays, T-1 represents one day before religious holidays, T+1 represents one day after holidays, T+2 represent two days after religious holidays and T+3 represent three days after religious holidays.

Table 6 shows the Kruskal-Wallis test results. The values are statistically insignificant for all indices except BIST Electricity, BIST Leasing, BIST Tourism and BIST Wood & Paper & Print. The results were statistically significant at the 10% level for BIST Electricity, BIST Wood & Paper & Print, and at the 5% level for BIST Leasing and BIST Tourism. Therefore, the null hypothesis, which presumed no differences between the daily returns of six days are rejected. In other words, the date indeed indicates that there was a pre- and post-religious holiday effect.

Table 6: Results of Kruskal-Wallis Test

Index	Chi Square	p-value
BIST 30	3,461	0,629
BIST 100	3,974	0,553
BIST BANK	1,901	0,863
BIST MATERIAL	8,138	0,149
BIST CHEMICALS	3,94	0,558
BIST ELECTRICITY	9,62*	0,087
BIST FINANCIAL	3,257	0,66
BIST HOLDING	8,692	0,122
BIST INDSUTRIAL	5,977	0,308
BIST INFO TECHNOLOGY	4,404	0,493
BIST INSURANCE	3,748	0,586
BIST INV. TRUST	6,327	0,276
BIST LEASING	11,307**	0,046
BIST METAL GOODS	3,988	0,551
BIST NON-MATERIAL MIN PRO.	8,143	0,149
BIST REAL ESTATE	4,722	0,451
BIST SERVICE	8,165	0,147
BIST TELECOM	4,338	0,502
BIST TEXTILE	6,077	0,299
BIST TOURISM	13,116**	0,022
BIST TRANSPORTATION	6,725	0,242
BIST WHSL & RETAIL	7,683	0,175
BIST WOOD & PAPER & PRINT	9,676*	0,085

*, **, *** denotes significance level at 10%, 5% and 1% respectively.

Table 7 shows the results of the Wilcoxon Rank test. This test is used to determine the influence of the pre- and post-religious holiday effect on the null hypothesis in the Kruskal-Wallis test results, and to determine whether the two-day returns differed significantly from one other. Only four of these indices were included in the Wilcoxon Rank test analysis because the null hypothesis of Kruskal-Wallis test results were rejected for BIST Electricity, BIST Leasing, BIST Tourism and BIST Wood & Paper & Print indices. For BIST Electric, the returns for T-3 were statistically significant and higher than T+3. T-2 was significantly and 5% higher than both T+1 and T-2. For BIST Leasing, returns for T-2 were (quite significantly) 5% higher than T-1, T+2 and T+3, and the returns for T+2 were significantly higher than those for T+3. For BIST Tourism, T-2's return was significantly higher than T-1's, and T+2's return was

significantly higher than T-1's at the 5% level. In addition, returns for T+2 were significantly more than T+3 at the 10% level. For BIST Wood & Paper & Print, T-2 and T+3 returns were significantly higher at the 5% level than T-3 and the returns for T-2 were significantly higher at the 10% level than those for T-1.

Table 7: Wilcoxon Rank Test

Days	BIST ELECTRICITY	BIST LEASING	BIST TOURISM	BIST WOOD & PAPER & PRINT
T-3 - T-2	-0,907	-1,559	-0,43	-1,667*
T-3 - T-1	-0,851	-0,511	-0,712	-0,108
T-3 - T+1	-1,588	-0,161	-0,04	-0,04
T-3 - T+2	-1,186	-0,282	-1,263	-1,788*
T-3 - T+3	-1,94*	-1,64	-1,263	-0,39
T-2 - T-1	-1,27	-2,352**	-2,460**	-2,312**
T-2 - T+1	-2,526**	-1,25	-1,143	-1,613
T-2 - T+2	-1,451	-2,164**	-1,022	-0,457
T-2 - T+3	-2,247**	-2,151**	-1,371	-0,901
T-1 - T+1	-1,395	-0,768	-0,457	-0,349
T-1 - T+2	-0,014	-0,874	-2,352**	-1,425
T-1 - T+3	-1,088	-0,686	-0,336	-0,363
T+1 - T+2	-1,144	-0,282	-1,841	-0,927
T+1 - T+3	-0,74	-1,586	-0,309	-0,081
T+2 - T+3	-0,893	-1,855*	-1,909*	-1,075

*, **, *** indicates significance level at %10, %5 and %1 respectively.

Conclusion

In this study, the occurrence of the *Religious holiday effect*—witnessed in the feast of Ramadan and the feast of Sacrifice—on sectoral index returns on the Borsa Istanbul (Turkish stock exchange) between 1997 and 2015 were analyzed, including BIST100, BIST30, and twenty-three sectoral indices. Their return performances' at times Day-3 (three days before the religious holidays), Day-2 (two days before the religious holidays), Day-1 (one day before the religious holidays), Day+1 (one day after the religious holidays), Day+2 (two days after the religious holidays) and Day+3 (three days after the religious holidays) were selected. To this end, regression analysis and non-parametric tests were used. Regression analysis and Mann-Whitney, Kruskal-Wallis, and Wilcoxon Rank tests were used for non-parametric tests. The analyses showed that the average returns for Day-2 were better than other days. Returns of BIST Leasing & Factoring, BIST Food & Beverage, BIST Tourism and BIST Textile & Leather

were the highest ones, respectively. These indices provided the highest returns, plausibly because entering the holiday period could have boosted sales intensively. Twelve sectoral indices displayed positive, statistically significant results on that day. Returns of BIST Real Estate, BIST Services, BIST Transportation were positive and statistically significant at the 10% level; returns for BIST Electricity, BIST Industrial, BIST Inv. Trust, BIST Tourism, BIST Wood, Paper and Print were positive and statistically significant at the 5% level; BIST Food & Beverage, BIST Non-Material Products, BIST Leasing and BIST Textiles were positive and statistically significant at the 1% level.

The Mann-Whitney U test was used to verify that the two population distributions were identical when using two independent samples. According to Mann-Whitney test at T-2, BIST 100, BIST Material, BIST Tourism were statistically significant at the 10% level; BIST Electricity, BIST Food & Beverage, BIST Industrial, BIST Inv. Trust, BIST Non-Material Mineral Products, BIST Textile, BIST Wood & Paper & Print were statistically significant at the 5% level and BIST Leasing and BIST Transportation were statistically significant at the 1% level. The Kruskal-Wallis statistic test was used to examine possible differences between the daily returns over six days. The results were statistically significant for BIST Electricity, BIST Leasing, BIST Tourism and BIST Wood & Paper & Print. For the Wilcoxon Rank test, only these same four indices were analyzed because the null hypothesis was rejected under the Kruskal-Wallis test results.

This study indicated that there is religious holiday effect in the BIST for some indices, which have highest average returns at Day-2. This study aimed to contribute to the efforts of academicians who study this field, and investors for their investment strategies, which may now be developed by analyzing the volatility of these indices at those time periods.

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Appendix

Table: Detailed Descriptive Statistics

<u>BIST 100</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.34%	0.0210	0.0337	-0.0826	-18.386	62.378
T-2	0.64%	0.0235	0.0700	-0.0432	0.5333	0.9098
T-1	-0.05%	0.0176	0.0314	-0.0737	-18.445	70.601
T+1	0.19%	0.0343	0.0951	-0.0911	-0.0723	0.9900
T+2	0.49%	0.0240	0.0418	-0.0862	-13.821	41.813
T+3	0.20%	0.0318	0.1161	-0.0659	12.442	36.019
<u>BIST 30</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.37%	0.0228	0.0444	-0.0837	-14.657	45.803
T-2	0.59%	0.0254	0.0692	-0.0623	0.1582	11.446
T-1	-0.12%	0.0191	0.0357	-0.0805	-18.913	70.237
T+1	0.26%	0.0370	0.1048	-0.0953	0.0028	0.9606
T+2	0.49%	0.0261	0.0490	-0.0928	-13.309	39.980
T+3	0.23%	0.0332	0.1197	-0.0673	11.878	32.241
<u>BIST BANK</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.47%	0.0292	0.0518	-0.0921	-12.572	25.208
T-2	0.45%	0.0315	0.0838	-0.1197	-10.368	58.949
T-1	0.21%	0.0273	0.1119	-0.0843	0.8821	81.250
T+1	0.49%	0.0426	0.1236	-0.1124	-0.0010	11.726
T+2	0.47%	0.0298	0.0602	-0.1054	-10.045	37.004
T+3	0.41%	0.0358	0.1363	-0.0732	11.844	40.384
<u>BIST BASIC MATERIALS</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.02%	0.0238	0.0711	-0.0884	-0.6867	56.956
T-2	0.83%	0.0251	0.0799	-0.0483	0.5930	10.950
T-1	0.48%	0.0235	0.0594	-0.0561	-0.1293	0.2901
T+1	-0.28%	0.0407	0.1047	-0.0926	0.1531	0.6560
T+2	0.77%	0.0358	0.0872	-0.0974	-0.7501	20.385
T+3	0.02%	0.0329	0.0959	-0.0453	10.072	12.949
<u>BIST CHEMICALS</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis

T-3	0.48%	0.0198	0.0472	-0.0806	-18.323	81.775
T-2	0.67%	0.0195	0.0651	-0.0327	0.8088	14.446
T-1	0.10%	0.0176	0.0374	-0.0442	-0.5443	10.091
T+1	0.12%	0.0294	0.0559	-0.0750	-0.4466	0.2741
T+2	0.42%	0.0287	0.0551	-0.1216	-23.264	89.826
T+3	0.29%	0.0325	0.1159	-0.0745	11.461	34.439
<u>BIST ELECTRICITY</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.56%	0.0202	0.0566	-0.0451	0.5555	11.505
T-2	0.97%	0.0223	0.0640	-0.0225	0.5417	-0.3067
T-1	0.35%	0.0275	0.0936	-0.0416	¹⁷ .130	35.502
T+1	-0.67%	0.0311	0.0758	-0.0718	0.1478	0.5112
T+2	-0.08%	0.0236	0.0641	-0.0665	-0.4159	21.032
T+3	-0.32%	0.0239	0.0511	-0.0768	-0.3801	17.917
<u>BIST FINANCIAL</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.32%	0.0254	0.0487	-0.0883	-13.528	35.675
T-2	0.58%	0.0275	0.0790	-0.0794	-0.0880	22.738
T-1	-0.07%	0.0194	0.0373	-0.0818	-19.897	71.801
T+1	0.33%	0.0384	0.1103	-0.1029	-0.0270	11.989
T+2	0.62%	0.0272	0.0527	-0.1031	-15.320	55.849
T+3	0.32%	0.0348	0.1287	-0.0664	12.967	35.137
<u>BIST FOOD and BEVERAGE</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.25%	0.0202	0.0367	-0.0794	-18.801	61.850
T-2	1.25%	0.0309	0.1438	-0.0328	20.268	74.097
T-1	-0.12%	0.0166	0.0440	-0.0474	0.3617	19.538
T+1	-0.51%	0.0317	0.0587	-0.1097	-0.9019	22.718
T+2	0.02%	0.0271	0.0619	-0.0976	-0.7717	35.280
T+3	0.16%	0.0291	0.1228	-0.0443	19.345	67.908
<u>BIST HOLDING & INV.</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.32%	0.0207	0.0489	-0.0774	-13.269	50.858
T-2	0.79%	0.0246	0.0757	-0.0442	0.6088	11.160

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T-1	-0.23%	0.0205	0.0353	-0.0826	-17.067	53.991
T+1	-0.28%	0.0362	0.0967	-0.0846	0.4161	15.428
T+2	0.60%	0.0272	0.0497	-0.0966	-15.263	41.992
T+3	0.27%	0.0340	0.1109	-0.0522	13.807	25.343
<u>BIST INDUSTRIAL</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.34%	0.0166	0.0240	-0.0765	-29.518	134.793
T-2	0.83%	0.0207	0.0618	-0.0327	0.6929	0.8718
T-1	0.10%	0.0156	0.0375	-0.0589	-0.9800	54.317
T+1	-0.14%	0.0284	0.0712	-0.0786	-0.2086	10.904
T+2	0.46%	0.0216	0.0537	-0.0670	-0.9171	25.184
T+3	0.24%	0.0278	0.1033	-0.0565	13.594	40.475
<u>BIST INFO-TECH</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	-0.04%	0.0148	0.0359	-0.0333	0.0320	0.8422
T-2	-0.04%	0.0198	0.0692	-0.0508	0.8704	51.420
T-1	0.00%	0.0154	0.0322	-0.0422	0.0630	16.395
T+1	-0.30%	0.0248	0.0432	-0.0819	-10.241	22.676
T+2	0.52%	0.0239	0.0774	-0.0587	0.2404	29.868
T+3	-0.02%	0.0256	0.1155	-0.0428	29.058	134.391
<u>BIST INSURANCE</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.13%	0.0238	0.0507	-0.0779	-0.6626	23.292
T-2	0.60%	0.0239	0.0903	-0.0314	13.628	31.317
T-1	0.54%	0.0303	0.1205	-0.0678	12.862	49.401
T+1	-0.35%	0.0417	0.0991	-0.1118	0.1058	0.8887
T+2	0.30%	0.0297	0.0669	-0.1193	-18.101	72.988
T+3	0.60%	0.0381	0.1796	-0.0423	26.536	104.120
<u>BIST INV. TRUST</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.19%	0.0171	0.0310	-0.0777	-23.474	115.976
T-2	0.98%	0.0203	0.0587	-0.0228	11.648	0.7128
T-1	0.15%	0.0141	0.0402	-0.0400	-0.1331	19.637
T+1	-0.25%	0.0271	0.0490	-0.0814	-0.6443	13.587
T+2	0.25%	0.0190	0.0391	-0.0792	-19.443	81.709
T+3	0.14%	0.0222	0.0642	-0.0544	0.3235	18.217

<u>BIST LEASING & FACT</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.39%	0.0273	0.1064	-0.0433	18.223	51.216
T-2	1.51%	0.0323	0.0916	-0.0649	0.4904	0.7874
T-1	0.02%	0.0150	0.0400	-0.0438	-0.2983	16.671
T+1	0.27%	0.0268	0.0564	-0.0650	-0.6130	0.9186
T+2	0.10%	0.0335	0.0419	-0.1787	-40.160	218.655
T+3	-0.32%	0.0259	0.0894	-0.0675	11.453	45.150
<u>BIST METAL GOODS, MCH</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.31%	0.0199	0.0355	-0.0812	-18.718	73.405
T-2	0.68%	0.0228	0.0630	-0.0484	0.4231	11.796
T-1	0.27%	0.0217	0.0594	-0.0789	-0.8809	56.054
T+1	-0.07%	0.0302	0.0891	-0.0752	0.1932	21.139
T+2	0.39%	0.0296	0.0495	-0.1129	-16.896	52.660
T+3	0.29%	0.0306	0.1064	-0.0474	11.931	25.071
<u>BIST NON-MATER MIN PRDCTS</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.22%	0.0173	0.0309	-0.0690	-17.755	63.955
T-2	0.96%	0.0197	0.0575	-0.0225	10.304	0.6471
T-1	0.27%	0.0127	0.0300	-0.0417	-0.5185	33.471
T+1	-0.09%	0.0246	0.0601	-0.0549	0.4069	0.7426
T+2	0.61%	0.0178	0.0479	-0.0674	-14.937	70.816
T+3	0.44%	0.0249	0.0912	-0.0541	15.192	48.304
<u>BIST REAL ESTATE</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.39%	0.0137	0.0310	-0.0244	0.1190	-0.3975
T-2	0.66%	0.0218	0.0704	-0.0428	0.6030	19.381
T-1	0.02%	0.0142	0.0324	-0.0453	-0.5012	24.793
T+1	-0.12%	0.0250	0.0475	-0.0586	-0.0472	-0.3995
T+2	0.44%	0.0220	0.0488	-0.0643	-0.5126	22.222
T+3	0.02%	0.0295	0.0979	-0.0344	17.928	44.216

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<u>BIST SERVICES</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.42%	0.0163	0.0333	-0.0631	-16.437	66.293
T-2	0.72%	0.0201	0.0671	-0.0273	11.424	13.417
T-1	0.14%	0.0162	0.0437	-0.0588	-10.609	50.809
T+1	-0.17%	0.0287	0.0715	-0.0547	0.5823	0.3851
T+2	0.06%	0.0208	0.0412	-0.0657	-0.8750	20.853
T+3	-0.11%	0.0268	0.0757	-0.0759	0.6166	29.939
<u>BIST TECHNOLOGY</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	-0.02%	0.0138	0.0275	-0.0319	-0.2481	0.2963
T-2	0.19%	0.0194	0.0698	-0.0416	0.8026	45.015
T-1	0.24%	0.0142	0.0302	-0.0442	-0.7172	27.204
T+1	-0.16%	0.0231	0.0442	-0.0809	-12.540	35.507
T+2	0.27%	0.0206	0.0346	-0.0666	-14.532	34.694
T+3	0.12%	0.0249	0.1149	-0.0436	30.125	142.453
<u>BIST TELE COMMS</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.55%	0.0279	0.0597	-0.1023	-15.071	66.034
T-2	0.15%	0.0226	0.0435	-0.0408	0.4761	-0.2785
T-1	0.46%	0.0246	0.0769	-0.0667	0.0088	34.507
T+1	-0.12%	0.0359	0.1071	-0.0759	0.8004	22.300
T+2	-0.13%	0.0279	0.0465	-0.0823	-11.725	21.402
T+3	0.00%	0.0277	0.1053	-0.0444	17.056	59.184
<u>BIST TEXTILE & LTHR</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.38%	0.0192	0.0464	-0.0697	-10.821	50.102
T-2	1.09%	0.0241	0.0818	-0.0355	10.309	12.370
T-1	0.52%	0.0197	0.0962	-0.0349	25.849	114.950
T+1	-0.16%	0.0256	0.0588	-0.0588	-0.2329	0.4780
T+2	0.39%	0.0251	0.0543	-0.1072	-19.073	94.367
T+3	0.07%	0.0250	0.0731	-0.0702	0.1516	27.613
<u>BIST TOURISM</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.69%	0.0348	0.1342	-0.0729	12.513	50.239
T-2	1.23%	0.0354	0.1448	-0.0475	19.321	52.737

T-1	-0.21%	0.0240	0.0540	-0.1031	-15.033	77.133
T+1	0.09%	0.0353	0.1259	-0.0854	0.5952	36.747
T+2	1.27%	0.0277	0.0640	-0.0818	-0.6610	24.157
T+3	0.19%	0.0358	0.1296	-0.0526	18.880	52.182
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<u>BIST TRANSPORTATION</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.75%	0.0258	0.1077	-0.0343	16.060	49.157
T-2	0.92%	0.0216	0.0483	-0.0488	-0.6237	0.3261
T-1	0.35%	0.0192	0.0496	-0.0603	-0.2074	26.831
T+1	-0.31%	0.0255	0.0510	-0.0616	-0.0394	-0.2175
T+2	0.70%	0.0359	0.1265	-0.0884	0.7405	37.587
T+3	0.17%	0.0318	0.0912	-0.0722	0.1420	12.802
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<u>BIST WHSL & RETAIL</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	0.22%	0.0187	0.0384	-0.0690	-15.064	48.268
T-2	0.59%	0.0194	0.0782	-0.0338	13.030	38.728
T-1	-0.07%	0.0169	0.0268	-0.0671	-15.125	52.774
T+1	0.01%	0.0277	0.0731	-0.0435	0.8317	0.4831
T+2	0.22%	0.0182	0.0414	-0.0377	-0.1960	-0.3094
T+3	-0.24%	0.0270	0.0751	-0.0782	0.3658	22.990
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<u>BIST WOOD, PAPER, PRINT</u>	Mean	Std.Dev.	Max	Min	Skew	Kurtosis
T-3	-0.18%	0.0200	0.0345	-0.0873	-20.771	79.957
T-2	1.06%	0.0251	0.0656	-0.0372	0.4564	0.2863
T-1	-0.10%	0.0143	0.0458	-0.0558	-0.6954	73.483
T+1	0.08%	0.0318	0.1003	-0.0905	0.6008	34.506
T+2	0.77%	0.0296	0.0711	-0.0956	-0.7622	28.683
T+3	0.29%	0.0270	0.0814	-0.0846	0.2203	34.490