MSc Economics and Business

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The impact of the Islamic month of Ramadan on Turkish financial markets

Abstract:
This study examines the impact on the Islamic month of Ramadan on (I) daily returns of 328 Turkish firms and (II) the daily returns, volatility and trading volume of three indices traded on the Istanbul Stock Exchange for the period 1997 to 2017. Furthermore, the effect is also analyzed for the first, second and the last ten days and across small and big firms. A significant increase in daily returns is found at the firm level, the Ramadan effect is concentrated on small firms rather than big firms. Analysis on the three indices finds that volatility significantly increase during Ramadan, whereas trading volume plummets, especially during the last ten days. Because an increase in volatility and a decrease in trading volume cause an increase in risk, and in turn the extra returns investors expects for this risk, this study cannot assign increased returns to religious experience and optimism of investors.

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1. Introduction

The way an investor feels plays a huge role in the decisions he or she makes at work or in life in general. Many papers have been written in the field of behavioral finance on this subject that theorize that moods, emotions and feelings are highly influential when it comes to judgements and decision making (Subrahmanyam, 2007). Research has shown that the way investors value risk is highly dependent on the mood they're in (Johnson & Tversky, 1983). Studies also find evidence that the amount of sunshine is highly correlated with returns on financial markets on a certain day (Hirshleifer & Shumway, 2003). These papers paint a clear picture: investor sentiment is an important factor in the pricing of financial assets.

All of this research begs the question how religion impacts the mood of investors. Going back more than hundred years, Weber (1905) argued that religious beliefs and practice directly influence economic development. Since then, many papers have been written on the subject, ranging from the effect religious holidays have on stock prices to the effect the Islamic month of Ramadan has on stock markets. This study sets out to investigate such an effect of the month of Ramadan on Turkish financial markets over the period 1997-2017.

The Ramadan is the ninth month of the Islamic lunar calendar (Hijri Calendar), which is either 29 or 30 days depending on lunar cycles. The fact that the *Hijri Calendar* is 11 days shorter than the *Gregorian Calendar*, which is used in all western civilizations, makes it so that the Ramadan moves 11 days on the Gregorian calendar every year making it a moving calendar event. During the holy month of Ramadan over 1.7 billion Muslims worldwide fast from sunrise till sunset and adherents are encouraged to perform good deeds. Both solidarity and spirituality in general among the whole Muslim populous increases significantly. The argument that this month would affect Muslim investors not only mentally, but also physically which in turn would influence investor sentiment and in turn the decisions these investors make is a very logical one.

This study can be divided into two parts: (I) first individual Turkish firms listed on the BIST All Shares Index are examined and the Ramadan effect on stock prices is analyzed using fixed effects panel regression, controlling for firm and industry fixed effects. (II) Thereafter, the Ramadan effect on three Turkish indices is investigated. The daily returns, the volatility and trading volume

of the BIST All Shares Index, the BIST 50 Index and the BIST 30 Index using different methodologies (OLS-regression and GARCH) are analyzed in order to find out how these variables behave during Ramadan.

Using the aforementioned methodology, this study tries to answer to following five questions:

1. Is the mood of Muslim investors in Turkey influenced during the month of Ramadan and is this reflected in the pricing of stocks and indices?
2. Are there any observable differences in stock returns during the month, the first, the second and the last ten days of Ramadan?
3. Does volatility during the month of Ramadan statistically differ from the norm on Turkish indices, during the month, the first, the second and the last ten days of Ramadan?
4. Does trading volume during the month of Ramadan statistically differ from the norm on Turkish indices during the month, the first, the second and the last ten days of Ramadan?
5. How does the Ramadan affect stock returns of small firms compared to big firms?

Whereas many studies examine the Ramadan effect on a single index or a panel of countries using multiple indices, this paper adds to the existing literature by focusing on a single country and examining the effect not only at the index level but also at the firm level. This allows for the more thorough investigation as to what might cause the Ramadan effect. Furthermore, this study examines the effect on small and big firms and uses these results to draw conclusion as to why the effect cannot be found in daily returns of a single index. Finally, the analysis of risk factors, in this case liquidity risk, provide answers for abnormal returns which previous research explain using religious experience.

At the firm level this study finds Ramadan days have a significantly higher return than all other days. Ranging from 0.044 percent to 0.081 percent for Ramadan days compared to normal days. Furthermore, evidence is found that the Ramadan effect is concentrated more among small firms than big firms lending an explanation as to why researchers have struggled to find significant Ramadan effects on returns on indices.

The analysis of the indices yields no significant results when it comes to daily returns. However, volatility on the BIST All Shares Index and the BIST 30 Index is significantly higher for Ramadan days, 0.188 percent and 0.259 percent respectively. Interestingly, a significant decrease in trading volume, -7.013 percent for the BIST All Shares Index, -4.231 percent for the BIST 50 index and -4.835 percent for the BIST 30 Index, is found. The last ten days of Ramadan are also characterized by an even higher and significant decrease in trading volume. The BIST All Shares Index has a decrease of 25.680 percent, the BIST 50 Index has a decrease of 18.979 percent and the BIST 30 Index a decrease of 19.010 percent all significant at the 1% level for each day during the last ten days of Ramadan. This study also adds to existing literature by providing a different explanation for abnormal returns. Abnormal returns might be caused by added risk rather than investor optimism during Ramadan.

The remainder of this paper is organized as follows: section 2 discusses the relevant literature in this field and examines the results, section 3 discusses the data selection procedure used in this study, section 4 describes the methodology used in this research, section 5 presents the results and discusses potential drivers of these results, section 6 concludes this study.

2. Relevant literature

Calendar anomalies are a topic in finance that have been researched for many years. A paper, dating back to 1942, presents evidence of the existence of a *January effect* on the stock market. Evidence is presented that returns in the month of January are higher than in any other month (Wachtel, 1942). Thaler confirms these findings in his 1987 paper ''Anomalies: The January Effect" (Thaler R. M., 1987). The existence of this anomaly has been attributed to year-end *tax-loss harvesting* in December which leads to investors selling stocks for tax benefits. The following month stock is bought back causing the market to rally and prices to increase.

Besides the *January effect*, many other calendar anomalies haven been researched and found throughout the years. The *weekend effect*, which implies significantly negative average returns on Monday compared to the Friday before the weekend, was found by French (1980). Furthermore, Jaffe (1989) presents evidence of a *twist on the Monday effect* in stock prices whereby stock prices on Monday are abnormally low following a week of stock market declines. Finally, Thaler (1987) empirically proves the existence of a *turn of the month effect* on stock prices. This evidence entails that returns tend to rise on the last trading day of the month and the three days of the next month.

However, the more interesting research that pertains to this paper is that of returns surrounding religious festivities. Frieder and Subrahmanyam (2004) analyze stock returns around *St. Patrick's Day* and the Jewish holy days of *Rosh Hashanah* and *Yom Kippur*. Trading volume on U.S. stock markets went down on these days and returns preceding *St. Patrick's Day* and *Yom Kippur* were significantly higher. They also find significant negative returns following the Jewish holy day of *Yom Kippur*. These results seem to be consistent with the view that the ''mood' of investors plays a role in explaining certain market movements.

This idea of the ''mood'' influencing investor decisions is supported by other research from a completely different perspective. Hirshleifer and Shumway (2003) find empirical proof that returns on the stock market are significantly correlated with the amount of sunshine on a certain day. Intuitively, it makes sense that sunny weather would be associated with a better "mood". Taking it even a step further, Edmans, Garcia and Norli (2007) examine the relationship between

the outcome of football matches and the stock returns and find that these are significantly correlated. This argument is supported by Johnson and Tversky (1983). In their paper, they present evidence of the fact that the ''mood'' of investors strongly influences the way in which investors value risk.

The aforementioned papers present us with the following conclusions: (I) Anomalies on stock markets do exist, which contradicts the efficient market hypothesis and (II) The anomalies could be explained away with behavioral insights or investor sentiment of institutional investors.

Husain (1998) performs one of the first to studies that examine the Ramadan effect on stock markets, more specifically the Pakistani equity market. The sample consists of the daily stock returns of the *Karachi Stock Exchange* for the period 1989-1993. OLS-regression with a dummy for Ramadan days is used to define to effect of Ramadan days on returns compared to normal days. As to volatility, the researcher uses the same framework, but implements a GARCH-model to estimate the difference in volatility between Ramadan days and non-Ramadan days. Husain (1998) finds insignificant results concerning returns on the Pakistani equity market, but he did find a significant drop in the volatility during the month of Ramadan. Husain (1998) explains this result to the willingness of investors to speculate during Ramadan. Fazal, Abraham and Al-Hajji (2005) collaborate these findings in their study of the Saudi equity market, during the period of 1985 to 2000. The same framework is used for both returns and volatility, however this paper also examines the relationship between the Ramadan and transaction volume. Again, lower volatility of returns is found, yet no conclusions can be drawn concerning the Ramadan effect on returns. However, the amount of transactions during Ramadan seems to drop. Both papers are single-country studies that assign this drop in volatility to a drop in transaction volume. This opens up the possibility of investors to capitalize on higher returns with a lower volatility or risk than would normally be possible.

Bialkowski, Etebari and Wisniewski (2012) widened the scope of their research by examining 14 predominantly Muslim countries at once instead of a single country, for the period 1989-2007. Again, lower volatility on the stock markets is found, but contrary to previous research, they find a positive correlation between returns and the Ramadan dummy. It is noteworthy that they use

a control variable in their regression, the MSCI Global Returns Index. Al Hajieh, Redhead and Rodgers (2011) examine the equity markets of Egypt, Kuwait, Jordan, Saudi Arabia and Turkey for the period 1992 to 2007 and find results that are in line with Bialkowski, Etebari and Wisniewski (2012). A strong positive seasonal effect on returns for the whole Ramadan period is found on all stock markets.

Al-Ississ (2010) adds to existing literature by subdividing the Ramadan into 8 classes: the Ramadan as a whole, the day of Ashoura, day 1-10, day 11-20, day 21-30, even and uneven days and the 27th day of the Ramadan (Laylayt al-Qadr) and analyzes these separately. The day of Ashoura is the 10th day of the Islamic month Muharram on which Muslims vast and Laylat al-Qadr is experienced as the most holy day of the Ramadan. The sample consists of 17 Islamic countries and Al-Ississ (2010) implores a more elaborate methodology compared to previous studies. A fixed effects panel regression is performed to take in account country specific effects and control variables are added for lagged returns, the day of the week and the month of the year. Al-Ississ (2010) finds a significant drop in the trading volume, an increase in returns during Ramadan with the highest returns on the day of Laylat al-Qadr and a significant decrease in returns on the day of Ashoura. Al-Ississ (2010) also finds that the last ten days or Ramadan tend to yield the highest returns, these are assigned to the effect of the 27th day. This supports the researcher's argument that religious beliefs drive investor sentiment and overall optimism about the market. After all, Muslims believe that the last 10 days of Ramadan the reward one gets for good deeds and worshipping of god is multiplied significantly.

Although, many studies find anomalous effects on Islamic market, especially more recent ones, other studies fail to do the same. Shah and Ahmed (2014) replicate the study done by Husain (1998) on the Pakistani equity market but use a more recent sample, 2010-2012. This paper does not find conclusive evidence of a Ramadan effect for both returns and volatility. However, research done by Al-Khazali (2014), which examines 15 Islamic countries for the period 1996 to 2012, tries to explain the disappearing of this effect. The sample is divided into sub-periods which are analyzed individually. This yields evidence that for the period 2007 to 2012 the Ramadan effect is still noticeable, though it has been significantly weakened during the financial crisis. Even

though results between different studies might differ, the key message of all the papers discussed is clear. Behavior of institutional investors is highly dependent on the mood they're in at a certain point in time. The Ramadan, which is one of the 5 pillars in Islam, is emotionally very relevant to the mood of Muslims worldwide. This paper examines the Ramadan effect on Turkish equities and Turkish indices and takes into account both volatility and liquidity of the markets. Table 1 presents a summary of the main papers discussed in this literature review.

Table 1. Relevant literature

Authors	Country	Period	Results
(Husain, 1998)	Pakistan	1989-1993	Lower volatility, no significant effect on returns
(Fazal, Abraham, & Al-Hajji, 2005)	Saudi Arabia	1985-2000	Lower volatility, no significant effect on returns
(Bialkowski, Etebari, & Wisniewski, 2012)	14 Islamic countries	1989-2007	Both lower volatility and higher return
(Al Hajieh, Redhead, & Rodgers, 2011)	Egypt, Kuwait, Jordan, Saudi Arabia and Turkey	1992-2007	Higher return, lower volatility
(Al-Ississ, 2010)	17 Islamic countries	1988-2007	Hoger rendement, lager handelsvolume.
(Shah & Ahmed, 2014)	Pakistan	2010-2012	Geen effecten van de Ramadan gevonden.
(Al-Khazali, 2014)	15 Islamic countries	1996-2012	Higher returns, relatively lowe during financial crisis.

3. Data

This paper discusses the Ramadan effect on Turkish indices as well as Turkish firms. Therefore, there are two different data types, time series data and panel data. This section covers both data gathering processes starting off with firm specific data. But first, the set up of the event window, in this case the month of Ramadan, is discussed.

3.1 Event window setup

The event window, in this paper the Ramadan, is determined by using the "calmath" add-in in excel. This add-in translates calendar dates of the Gregorian or Western calendar into Islamic or Hijri calendar dates. Then, a filter is used to isolate Ramadan days, which get assigned the value 1, all other days get assigned the value 0. The Islamic calendar is a lunar calendar. This means the start of a month is determined by looking at moon phases and cannot be determined in advance. Therefore, the event window is manually investigated further in excel by using data from Habibur.com (Habib, 2016). This website presents exact Ramadan start and end dates using the Gregorian calendar. Several dates translated by the ''calmath'' add-in were incorrect and had to be corrected, both for the start date of Ramadan as well as the end date. This study not only covers the Ramadan as a whole but also examines this month in sub-periods. The next section discusses the reasoning behind this and the construction of these sub-periods.

Muslims believe the last ten days of Ramadan are the holiest of days. The *Night of Destiny* (Laylat al-Qadr), the period wherein the Quran was first revealed to the prophet, is believed to fall in these last ten days. Therefore, spirituality and worship increase significantly during this period (Quran 97:1-5). So, besides looking at the Ramadan period as a whole, the Ramadan period is also divided into three ten-day periods. The first ten days are the hardest, as Muslims have to drastically change their diet, sleep schedule and daily life in general. The effect of Ramadan during this period is most likely accountable to a physical effect rather than to religious or spiritual effects. However, during the last ten days of Ramadan spirituality is amplified and we therefore expect the effect of Ramadan to be amplified also. A dummy variable is constructed for the first ten days, the second ten days, and all the remaining days of Ramadan in excel. The excel files contains calendar dates, a dummy for the month of Ramadan and the three dummies

for the sub-periods. This file is later merged with stock data, which will be discussed in the next part.

3.2 Data for firm specific analysis

This part of the study examines the data collection procedure. The data used is of 328 Turkish firms listed on the Istanbul Stock Exchange (BIST All Shares Index) from December 31,1997 to December 31,2017. The dataset is compiled by using the Datastream database and streaming daily prices for each firm. The Datastream data used in this paper could not directly be imported into Stata because of the 'wide' format. The data consisted of firms on the horizontal axis and dates on the vertical axis. In order to get to a format which Stata would recognize as a panel, with dates for each separate firm, it had to be reshaped. This is done using a manual for reshaping this data from the Princeton website. In this 'long' format the data could be analyzed and further manipulated in Stata (Princeton, n.d.).

The analysis conducted in this paper is based on daily returns calculated as the first differences of the natural logarithms of price. Returns are then multiplied by 100 to get percentages. This is done because the logarithmic returns provide returns with relative changes in price. This allows for comparison of values even though the base values might be significantly higher or lower. The equation for calculation of daily returns is presented below.

$$R_t = ln(P_t) - ln(P_{t-1})$$

R_t = return on day t

P_t = price on day t

P_{t-1}= price on day t – 1

Since, the Ramadan effect is also examined for small firms compared to big firms, yearly market value data is also downloaded from Datastream. The data is reshaped in the same way as prices. Thereafter, the yearly mean of market value is calculated and a dummy variable for small and big firms is generated. The small firm dummy takes on the value 1 if the market value is smaller than the mean and 0 otherwise, the big firm dummy takes on the value 1 if market value is greater than the mean.

The use of a fixed effects model also requires industry data for each firm. Key identifiers for firms are used to stream industry data from the Datastream. ICB or Industry Classification Bencmark is used to sort firms into 68 industry sectors (WC07040 in Datastream). GIC or General Industry Classification is used to sort firms into 6 general industries (WC06010 in Datastream). The latter will be used in the descriptive statistics table below and consists of the following industries: industrial, utility, transportation, bank/savings & loan, insurance, other financial. After reshaping the stock data, it is merged with the event window and industry data using date identifiers. Furthermore, a count variable is constructed that counts the number of Ramadan days for each firm for each year. Firms that have less than ten Ramadan days in a specific year are not entirely dropped, only the observations in that year.

Table 1. Descriptive statistics 328 firms

		#of obs.	Mean (%)	Std. Dev.	Min	Max
Return all days		1,182,971	0.0510	3.3230	-252.5729	194.8722
Return Ramadan days		99,680	0.0915	3.7785	-252.5729	44.3759
Return non-Ramadan days		1,083,291	0.0472	3.2778	-193.9402	194.8722
Return day 1 to 10		34,717	0.1187	4.2435	-32.3531	26.7055
Return day 11 to 20		34,920	-0.0088	3.6240	-26.8814	24.4061
Return day 21 to 30		30,043	0.1766	3.3582	-252.5729	44.3759
Return small firms Ramadan days		81,500	0.0946	3.7692	-252.5729	44.3759
Return small firms non-Ramadan days		894,381	0.0501	3.3343	-193.9402	194.8722
Return big firms Ramadan days		18,180	0.0774	3.8199	-32.3532	22.7398
Return big firms non-Ramadan days		188,910	0.0337	2.9962	-57.6741	44.9409
By sector						
Industrial	**Non-Ramadan days**	821,970	0.04913	3.2739	-193.9402	194.8722
	Ramadan days	75,646	0.0883	3.8025	-252.5729	26.7055
Utility	**Non-Ramadan days**	32,770	0.0122	2.8737	-34.6009	40.5465
	Ramadan days	3,006	0.1069	3.4211	-21.5930	21.8156
Transportation	**Non-Ramadan days**	15,863	0.0338	2.9142	-20.2027	18.2322
	Ramadan days	1,456	0.2094	3.3290	-13.8836	17.8692
Bank/savings & loan	**Non-Ramadan days**	57,111	0.0508	3.2640	-70.3877	53.5706
	Ramadan days	5,258	0.1528	3.9550	-23.1112	23.9180
Insurance	**Non-Ramadan days**	24,544	0.0714	3.1199	-24.9214	31.7617
	Ramadan days	2,255	0.0637	3.6692	-23.5549	18.8592
Other financial	**Non-Ramadan days**	13,1033	0.0398	3.4683	-118.928	139.1850
	Ramadan days	12,059	0.0716	3.7043	-24.8235	44.3759

The descriptive statistics of daily returns for all firms and by sector are given in table 1. They illustrate that Ramadan days have a higher mean than non-Ramadan days. Returns on the first ten days of Ramadan are also higher, whereas a negative mean can be observed for the following ten days. The last ten days of Ramadan have the highest mean, which is in line with the theory discussed in the previous section. Furthermore, returns for small firms and big firms also have different means for Ramadan and non-Ramadan days. Finally, all sectors except for the insurance sector have higher means for Ramadan days compared to non-Ramadan days.

The Shapiro-Wilk test is performed to test for normality of returns. The Null hypothesis which states that returns are normally distributed for both return on Ramadan days and non-Ramadan days can be rejected at the 1% significance level. Returns are not normally distributed. Figure 1 and table 1 both present the existence of extreme outliers in my data. However, since the nature of these extreme values is unknown they cannot be removed from the data.

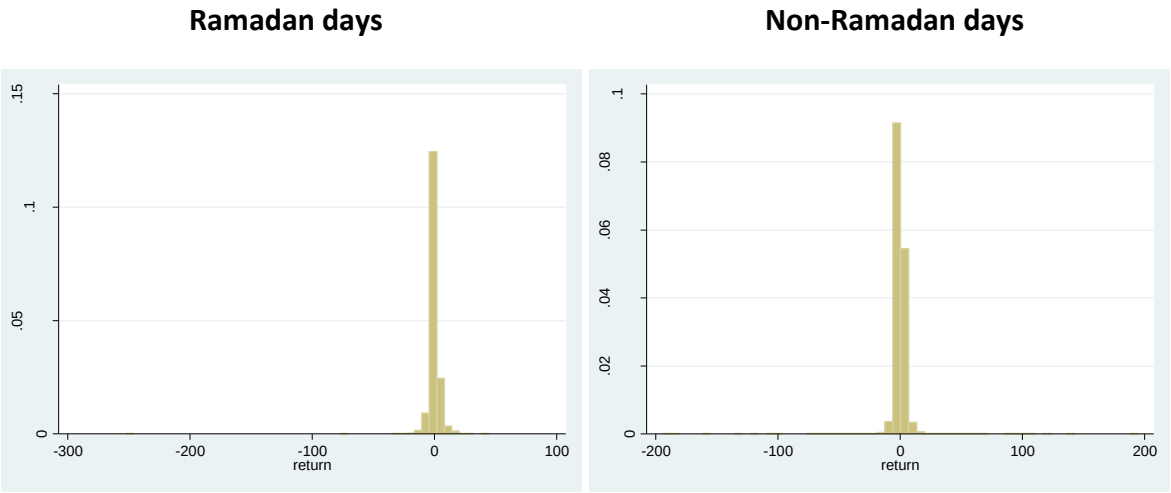


Figure 1. Histogram of returns on Ramadan & non-Ramadan Days

The Fischer-type unit-root test implemented to test whether the unbalanced panel data contains a unit-root. The existence of a unit-root would indicate that returns are non-stationary. The null hypothesis of this test states that all panels contain a unit-root. The null hypothesis is rejected at the 1% significance level, meaning the panel data contains no unit-root.

3.3 Data for index level analysis

Daily prices and trading volume data of three indices are used in this section of the analysis. The BIST All Share Index from December 31,1997 to December 31,2017, the BIST 50 Index from January 4,2000 (base date) to December 31,2017 and the BIST 30 Index from December 31,1997 to December 31,2017. Again, Datastream is used to compile a dataset with both the price of the index (PI in Datastream) and turnover by volume (VO in Datastream). Turnover by volume is the number of shares (in thousands) traded on a certain. This datatype is used as a proxy for trading volume since no data exists for real trading volume, meaning the actual value of all trades made. The return variable, which will be used in the analysis, is calculated in the same way as mentioned in the previous section. The same goes for turnover, the first differences of the logarithmic turnover by volume is taken for later analysis. This calculation is presented in the equation below.

$$Vol_t = ln(VO_t) - ln(VO_{t-1})$$

Vol_t = trading volume change in percentage on day t

VO_t = turnover by volume on day t

VO_{t-1}= turnover by volume on day t – 1

Finally, this index data is merged with data containing the Ramadan dummies.

The summary statistics of daily return and turnover for all three indices are presented in Table 2. Again, the mean of return for all three indices appear to be higher than that of non-Ramadan days. Interestingly, the turnover on Ramadan days is lower, pointing to a decline in trading activity.

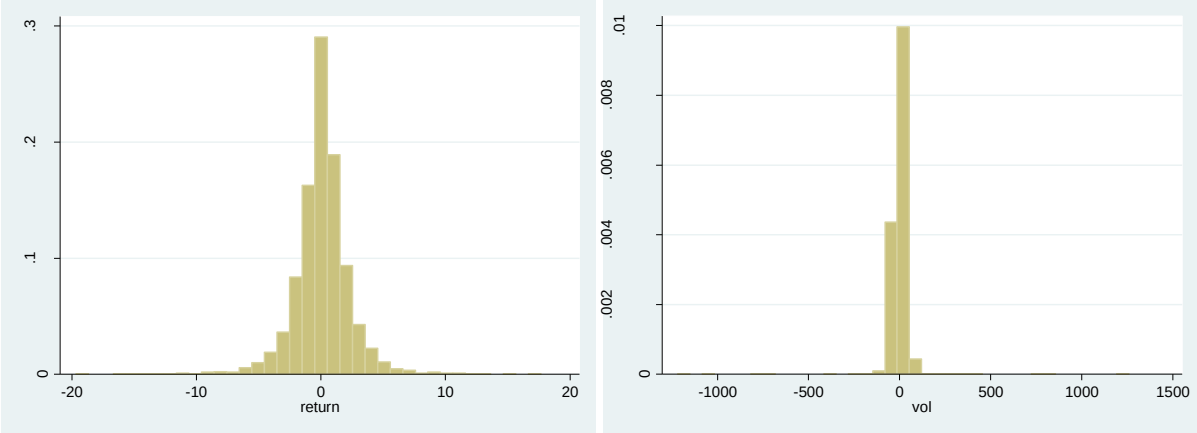
Table 2. Descriptive statistics for all indices

BIST All Shares Index	#of obs.	Mean	Std. Dev.	Min	Max
Return all days	5,460	0.08579	2.2568	-19.689	17.676
Return Ramadan days	464	0.23608	3.0054	-11.121	17.676
Return non-Ramadan days	4,996	0.07183	2.17409	-19.689	15.395
Turnover all days	5,129	-0.5119	56.5930	-1218.688	1258.711
Turnover Ramadan days	438	-6.2799	102.0415	-1208.309	1258.711
Turnover non-Ramadan days	4,691	0.0266	50.2820	-1218.688	1258.546
BIST 50 Index	**#of obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Return all days	4,677	0.0376	2.1344	-20.018	17.709
Return Ramadan days	382	0.04005	2.7367	-10.290	17.709
Return non-Ramadan days	4,295	0.0374	2.0728	-20.018	13.188
Turnover all days	4,395	-0.6890	33.3372	-418.927	404.202
Turnover Ramadan days	368	-4.3011	36.5863	-150.190	103.730
Turnover non-Ramadan days	4131	-0.3618	33.0126	-418.927	404.202
BIST 30 Index	**#of obs.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Return all days	5,460	0.08945	2.4605	-20.068	17.647
Return Ramadan days	464	0.2454	3.2744	-11.918	17.647
Return non-Ramadan days	4,996	0.07496	2.3707	-20.068	16.113
Turnover all days	5,112	-0.6831	37.390	-631.541	616.279
Turnover Ramadan days	435	-4.1566	37.151	-158.751	101.515
Turnover non-Ramadan days	4,677	-0.3265	37.310	-631.541	616.279

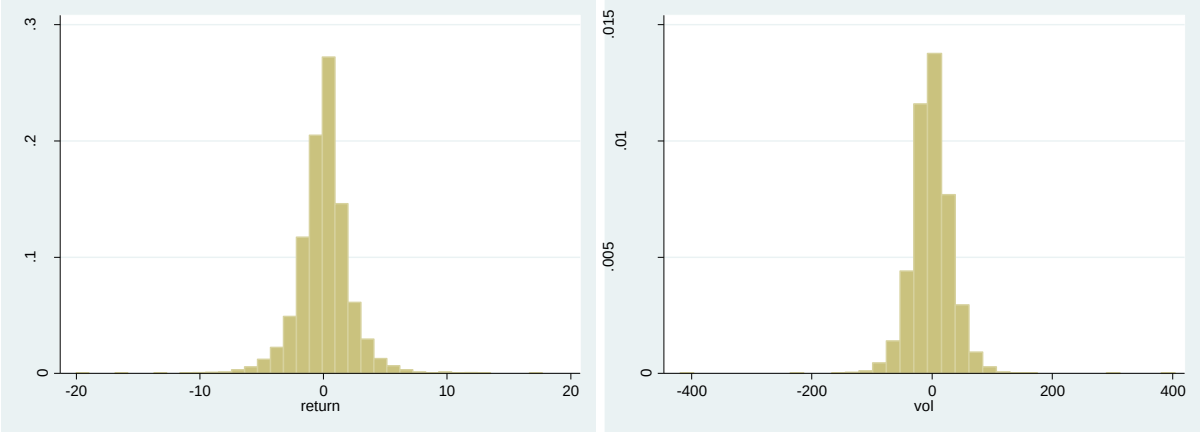
Normality of returns and trading volume is tested using the Shapiro-Wilk test in Stata. The null hypothesis, which states that returns or trading volume are normally distributed, can be rejected at the 1% significance level. Returns and trading volume are not normally distributed. Figure 2 presents histograms for both data types for the BIST All Shares Index, the BIST 50 Index and the BIST 30 Index. The existence of a unit root in the returns and trading volume data is tested using the Augmented Dickey-Fuller test. The null hypothesis of this test states that the variable in question contains a unit-root, meaning that the variable is non-stationary. The null hypothesis for all three indices can be rejected at the 1% significance level. The data for returns and trading volume are stationary.

Figure 2. Histograms of daily return and trading volume

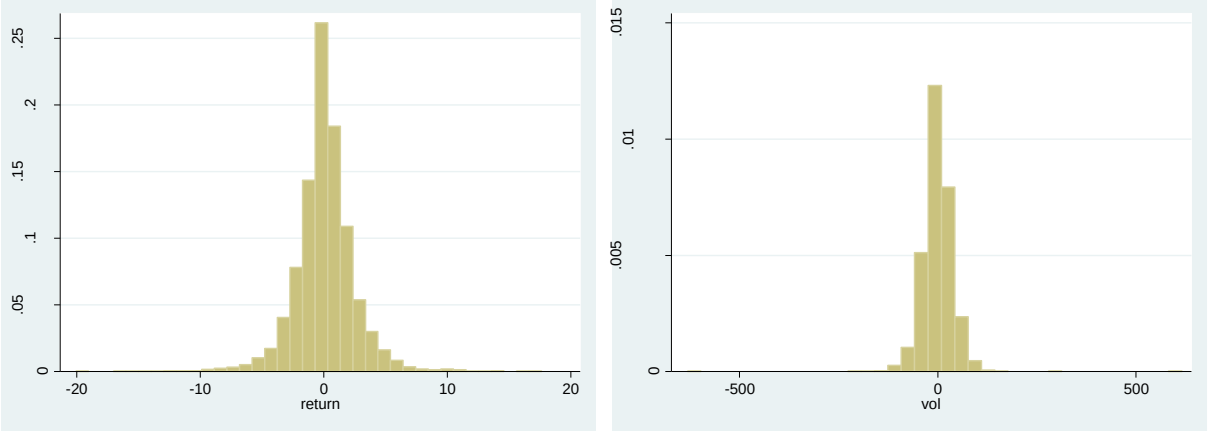
BIST All Shares Index



BIST 50 Index



BIST 30 Index



4 Methodology

This section describes the methods used in this paper to determine the effect of the holy month of Ramadan on Turkish firms as well as on the domestic index as whole. Therefore, the methodology is divided two parts. First, the analysis on the firm level is thoroughly discussed. Thereafter, the methodology of the analysis on the indices is explained.

4.1 Variable selection & firm specific analysis

As discussed in the relevant literature section there many models which can be used to estimate the effect of Ramadan on stock markets. In this paper this effect is estimated by running a fixed effects panel regression on returns across all firms. The basic model without any control variables is presented in regression 1.

$$R_{i,t} = \beta_0 + \beta_1 Ramadan + \varepsilon_{i,t} \qquad (1)$$

$R_{i,t}$ = return on day t

β_0 = intercept coefficient

$Ramadan$ = dummy variable with value 1 if day t is a Ramadan day

$\varepsilon_{i,t}$ = error term with expectation zero

Another phenomenon that might affect stock returns is the day-of-the-week effect. Lakonishok and Smidt (1988) find that returns on Mondays are significantly lower than on other days of the week. Therefore, a dummy variable is included for each day of the week excluding Tuesday, which is incorporated in the constant. As previously discussed, the Islamic calendar differs from the Gregorian calendar in that it consists of 354 or 355 days per calendar year instead of 365 days. This means Islamic months shift ten or eleven days backwards every year on the Gregorian calendar. Over the twenty-year period analyzed in this paper this entails a shift of approximately 200 days. This brings us to the next addition to my model. Research shows that returns in some months can differ from other months. One of the most commonly found effects is the January-effect, were returns are higher than all the other months of the year (Giovanis, 2009) (Van der Sar, 2003). Therefore, a month of year dummy is incorporated to account for this month-of-year effect. The regression in the model below incorporate these calendar variables.

$$R_{i,t} = \beta_0 + \beta_1\, Ramadan\ +\ \beta_2 \sum_{j=2}^{t=6} D_{i,t} +\ \beta_3 \sum_{j=2}^{t=12} M_{i,t}\ + \varepsilon_{i,t} \quad (2)$$

$D_{i,t}$ = day of the week dummy variable, Tuesday omitted

$M_{i,t}$ = dummy for month of year, excluding June

Building on this model variables are added which might affect returns to get a better estimation of β_1. As per Saunders (1993) two lagged return variables are included to account for price movement persistence. This regression is presented below:

$$R_{i,t} = \beta_0 + \beta_1 Ramadan + \beta_2 \sum_{j=2}^{t=6} D_{i,t} +\ \beta_3 \sum_{j=2}^{t=12} M_{i,t} +\ \beta_3 R_{t-1} + \beta_4 R_{t-2} +\ \varepsilon_{i,t} \quad (3)$$

R_{t-1} = one day lagged return of stock i

R_{t-2} = two days lagged return of stock i

Analysis on the firm level requires taking into account the effect the market has on the returns of firms. Therefore, a variable is added for market return in the regression. The final model is presented in regression 5 below. As mentioned in the data section, market price is computed by taking the sum of returns across all firms on a certain date, thus creating the market portfolio. The same calculation to get return is performed to get market return.

$$R_{i,t} = \beta_0 + \beta_1 Ramadan + \beta_2 \sum_{j=2}^{t=6} D_{i,t} +\ \beta_3 \sum_{j=2}^{t=12} M_{i,t} +\ \beta_3 R_{t-1} + \beta_4 R_{t-2} +\ \beta_5 R_{m,t}\ +\ \varepsilon_{i,t} \quad (4)$$

$R_{m,t}$ = market return on day is t

These four models will be henceforth referred to as model 1 to 4. The results and the validity of the regressions will be presented and discussed in the next chapter.

As mentioned in the data section, a thorough analysis is done by examining the different periods within Ramadan and the effect on small and big firms. These specifications will also be discussed in all four models. For convenience, only model 4 is presented below with these specifications implemented.

$$R_{i,t} = \beta_0 + \beta_1\, Ramadan_{1to10} + \beta_2\, Ramadan_{11to20} + \beta_3\, Ramadan_{21to30} + \beta_4 \sum_{j=2}^{t=6} D_{i,t} + \beta_5 \sum_{j=2}^{t=12} M_{i,t} + \beta_6 R_{t-1} + \beta_7 R_{t-2} + \beta_8 R_{m,t} + \varepsilon_{i,t}$$

Where β_1, β_2 and β_3 are the coefficients of the different sub-periods.

$$R_{i,t} = \beta_0 + \beta_1 Ramadan * Small\_Firms + \beta_2 Ramadan * Big\_Firms + \beta_3 \sum_{j=2}^{t=6} D_{i,t} + \beta_4 \sum_{j=2}^{t=12} M_{i,t} + \beta_5 R_{t-1} + \beta_6 R_{t-2} + \beta_7 R_{m,t} + \varepsilon_{i,t}$$

Where β_1 and β_2 are the coefficients of the interaction dummies of Ramadan and firm size. The sample is divided in two sub-samples by mean, Small_Firms is 1 if firm market value is below mean and 0 if above. The same is done for big firms. The effect of Ramadan is isolated for small and big firms.

Finally, in order to account for firm specific effects, a fixed effects panel regression is used with control variables for firm fixed effects and industry fixed effects. In total, the following models are used: (1) regression with just return and Ramadan variables, (2) day-of-the-week and month-of-the-year dummies are added, (3) first and second order lags of return are added, (4) market return variable is added.

4.2 Index level analysis

As previously mentioned, besides examining the Ramadan effect at the firm level a study is conducted on several indices. The variable selection is roughly the same, excluding market return, but the method used is quite different. First off, OLS-regression is used on returns with roughly the same model mentioned in the previous section. This regression is presented below.

$$R_{i,t} = \beta_0 + \beta_1 Ramadan + \beta_2 \sum_{j=2}^{t=6} D_{i,t} + \beta_3 \sum_{j=2}^{t=12} M_{i,t} + \beta_3 R_{t-1} + \beta_4 R_{t-2} + \varepsilon_{i,t}$$

Research proves that OLS-regression on a single index rarely yields significant results (Husain, 1998) (Fazal, Abraham, & Al-Hajji, 2005). A possible explanation is that the Ramadan effect might be concentrated on small stocks, which is tested at the firm level. However, volatility of returns are also examined.

To examine the effect of the Ramadan on volatility of returns this paper follows Bialkowski, Etebari and Wisniewski (2012) and applies the GARCH process to estimate this volatility on Turkish financial markets. The GARCH model stems from the ARCH or Autoregressive Conditional Heteroskedastic model pioneered by Engle (1982). The assumption of this model is that conditional variance depends on the lagged squared residuals of returns. Building on this model, Bollerslev (1986) added the lagged value of the variance to the model. A specification of the estimation of the conditional variance or volatility using the GARCH(1, 1) model is presented below.

$$\sigma_t^2 = \alpha_0 + \alpha_1 \gamma_{t-1}^2 + \beta_j \sigma_{t-1}^2$$

σ_t^2 = conditional variance at t

γ_{t-1}^2 = squared residuals at t-1 (ARCH term)

σ_{t-1}^2 = squared variance at t-1 (GARCH term)

The model as adopted in this paper with a Ramadan dummy is presented below.

$$\sigma_t^2 = \alpha_0 + \alpha_1 \gamma_{t-1}^2 + \beta_j \sigma_{t-1}^2 + \beta_2 Ramadan$$

Where Ramadan is a dummie variable that takes on the value 1 the day falls in the month of Ramadan, and the value zero otherwise.

In order to study the effect Ramadan has on trading volume OLS-regression is used with trading volume as the independent variable. Again, the Ramadan is analyzed as a whole and in subsections. Day-of-the-week dummies, month-of-the-year dummies, lagged trading volume at t-1 and lagged trading volume at t-2 are used as control variables. This regression is presented below.

$$V_{i,t} = \beta_0 + \beta_1 Ramadan + \beta_2 V_{t-1} + \beta_3 V_{t-2} + \beta_4 \sum_{j=2}^{t=6} D_{i,t} + \beta_5 \sum_{j=2}^{t=12} M_{i,t} + \varepsilon_{i,t}$$

$V_{i,t}$ = trading volume in percentages at t

V_{t-1} = trading volume in percentages at t-1

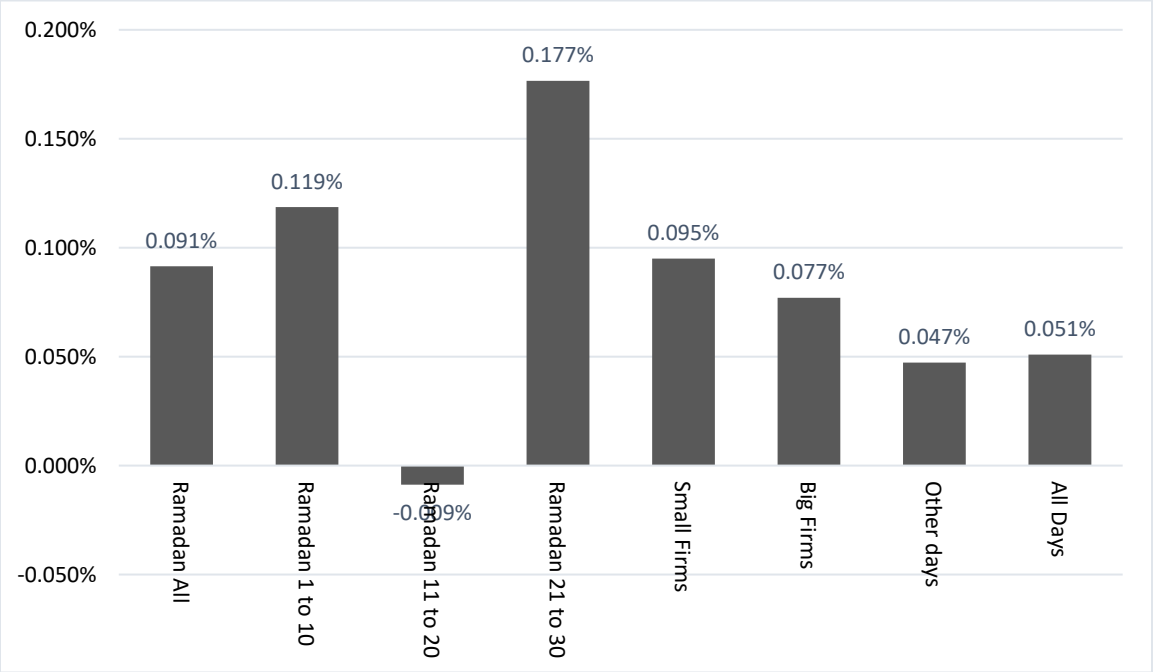
V_{t-2} = trading volume in percentages at t-2

4. Results

4.1 Results firm specific analysis

Figure 1 illustrates the mean returns for the holy days examined in this paper compared to other days. It is apparent by these numbers that there is a difference between Ramadan days and normal days across these firms. The mean of daily returns for all other days is 0.047 percent. Table 5 in Appendix A reports all of these means along with descriptive statistics and their corresponding t-statistics. The mean of daily returns during the whole month of Ramadan is significantly higher (0.091%) than all other days (0.047%). Additionally, daily returns for all sub-periods significantly differ from other days. The mean of daily returns for the first ten days of Ramadan are positive (0.119%), which is consist with my predictions. However, the ten days following this period have significantly negative returns (-0.009%) compared to all other days. This entails that markets are slow to react to changes in investor sentiment. The last ten days, which are the most holy of days, have the highest mean of daily returns (0.177%) and differ significantly at the 1% level from all other days. Which is again in line with my predictions. Finally, the mean of returns for small firms during Ramadan days are significantly higher (0.095%) than returns of small firms during normal days (see t-statistics in Table 5 of Appendix A). These significant returns are compared with the mean of daily returns of small firms, not the mean of all other days. Figure 1 also displays that the mean of daily returns is higher than that of other days. Contrary to returns of small firms, returns of big firms do not statistically differ from the mean of normal daily returns of big firms. This is in line with predictions discussed in previous section. It seems that the Ramadan effect is concentrated on smaller stocks.

Figure 1. Mean daily returns for holy days and all other days



The regression results for the four models discussed in the methodology are presented in Table 3. Table 6 in Appendix A shows the complete table of the regression models with all variables included, whereas Table 3 only gives a summary of the variables of interest. Models 1 through 4 are specified as follows: Model 1 regresses returns on just the dummy variables of Ramadan, model 2 includes day-of-the-week dummies as well as month-of-the-year dummies, Model 3 includes two lagged daily return variables, Model 4 also includes an independent variable for market return.

Regression 1, which regresses returns on the Ramadan dummies, would indicate that returns during the whole month are significantly higher (0.044% for firm & industry fixed effects models) at the 1% level. Additionally, daily returns during the first ten days are significantly higher (0.071% for firm & industry fixed effects models) at the 1% level. Returns during the following ten days are significantly lower (-0.056% for firm & industry fixed effects models) at the 1% level. Daily returns during the last ten days however are significantly higher (0.129% for firm & industry fixed effects models) at the 1% level. This is in line with the values presented in Figure 1 and the expectations discussed in previous sections. The last ten days of Ramadan are the most holy and religious belief and spirituality are amplified during this period. The Ramadan effect on daily

returns of small firms are significantly higher (0.050% for firm & 0.048% for industry fixed effects models) at the 1% level. The regression on big firms yields insignificant results. This illustrates that the Ramadan effect is mainly concentrated on small stocks rather than on big stocks. The R-squared of this model is very low, which would not necessarily indicate that there is no relationship between returns and Ramadan, but more variables are added to observe how the coefficients react.

Regression 2, which accounts for day-of-the-week and month-of-the-year effects on returns, presents results that are in line with regression one. Daily returns during the whole Ramadan are significantly higher (0.081% for firm & industry fixed effects models), even higher than in regression 1, at the 1% level. The same goes for daily returns during the first ten days, which are significantly higher (0.120% for firm & industry fixed effects models) than returns on normal days at the 1% level. Contrary to regression 1, the following ten days of Ramadan yield insignificant results. The sign of the coefficient however remains negative. This would indicate that the of the day-of-the-week and month-of-the-year dummies absorb the negative effect found in regression 1. Daily returns of small firms during Ramadan are also amplified in this regression. Returns are significantly higher (0.087% for firm & 0.086% for industry fixed effects models) at the 1% level. Regression 2 also finds a positive and significant returns (0.054% for firm & 0.061% for industry fixed effects models) during Ramadan days on big firms significant at the 5% level. The coefficient for small firms is higher than that of big firms, thus my prediction that the Ramadan effect is concentrated on small firms remains valid.

Regression 3, which also adds lagged return variables, indicates that the Ramadan effect persists even when correcting for price movement persistence. However, the coefficients across all variables of interest are lower than in regression 2. The lagged variables seem to absorb some of the effect found, which is logical because chances are that returns trend upward during Ramadan. Daily returns for Ramadan days are significantly higher (0.068% for firm & industry fixed effects models) at the 1% level. During the first ten days daily returns are also significantly higher (0.095% for firm & industry fixed effects models) at the 1% level. The following ten days yield insignificant results. However, the returns during the last ten days of Ramadan remain

significantly higher (0.147% for firm & industry fixed effects models) at the 1% level. The Ramadan effect on small firms are significantly higher (0.087% for firm & 0.075% for industry fixed effects models) at the 1% level. Daily returns during Ramadan for big firms are only higher and significant (0.061% for firm fixed effects model), in the firm fixed effect model at the 5% level.

Finally, regression 4 mostly yields results that are not in line with the previous three models. Daily returns during Ramadan days are insignificant. Returns during the first ten days are significantly lower (-0.047% for firm & industry fixed effects models) at the 1% level. The following ten days yield insignificant results. Returns during the last ten days remain higher and significant (0.034% for firm & industry fixed effects models) at the 5% level. Regression on firm size yields insignificant results. As discussed in the methodology market return is calculated by adding all daily prices on a certain date and computing market returns. Because of this, the Ramadan effect is also incorporated in this variable, especially through big firms which influence the market price much more than small firms. This explains why the Ramadan effect disappears in this regression. Table 6 in Appendix A presents the coefficient for market return, which is 0.769. Including this variable is an oversight, but what it shows is that the last ten days of Ramadan are very influential. This variable remains significant throughout all models. However, this model is faulty, and as such will not be discussed in the results.

With the results of all regression summarized I can continue discussing the implication of these results. First and foremost, even though the R-squared of model 1 to 3 is extremely low, it does not take away from any conclusions drawn using this model. Model 1 to 3 indicate that daily returns during Ramadan are higher than normal days, which is in line with previous research done by Al Hajieh, Redhead and Rodgers (2011) and Bialkowski, Etebari and Wisniewski (2012) and my prediction that spirituality and religious worship amplify optimism of investors and as such affect asset pricing holds when only looking at returns. Daily returns during the first and last ten days are higher and significant at the 1% level. Daily returns during the last ten days are the highest of the three sub-periods, ranging from 0.129 percent to 0.157 percent. The coefficient even remains signficant in model 4, where market return absorbs most of the Ramadan effect. This is in line

with prior research done by Al-Ississ (2010) where the highest returns are found in the last ten days. Furthermore, the Ramadan effect on daily returns are more pronounced for small firms than for big firms. Daily returns for small firms during Ramadan are significantly higher at the 1% level in the relevant models, ranging from 0.048 percent to 0.087 percent.

Table 3. Regression results for all models

`	Model 1 Returns (%)		Model 2 Returns (%)		Model 3 Returns (%)		Model 4 Returns (%)	
Firm fixed effects								
Ramadan days	0.044***		0.081***		0.068***		-0.013	
	(0.000)		(0.000)		(0.000)		(0.200)	
Return day 1 to 10		0.071***		0.120***		0.095***		-0.047***
		(0.000)		(0.000)		(0.000)		(0.004)
Return day 11 to 20		-0.056***		-0.024		-0.026		-0.020
		(0.002)		(0.187)		(0.148)		(0.211)
Return day 21 to 30		0.129***		0.157***		0.147***		0.034**
		(0.000)		(0.000)		(0.000)		(0.048)
Constant	0.047***	0.047***	-0.111***	-0.110***	-0.101***	-0.100***	-0.059***	-0.058***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.000	0.000	0.002	0.002	0.003	0.003	0.221	0.221
Observations	1,182,971	1,182,971	1,182,971	1,182,971	1,182,335	1,182,335	1,182,335	1,182,335
Industry fixed effects								
Ramadan days	0.044***		0.081***		0.068***		-0.013	
	(0.000)		(0.000)		(0.000)		(0.199)	
Return day 1 to 10		0.071***		0.120***		0.095***		-0.047***
		(0.000)		(0.000)		(0.000)		(0.004)
Return day 11 to 20		-0.056***		-0.024		-0.026		-0.020
		(0.002)		(0.188)		(0.148)		(0.211)
Return day 21 to 30		0.129***		0.158***		0.147***		0.034**
		(0.000)		(0.000)		(0.000)		(0.048)
Constant	0.049*	0.049*	-0.108***	-0.107***	-0.097***	-0.096***	-0.047*	-0.046*
	(0.065)	(0.065)	(0.000)	(0.000)	(0.001)	(0.001)	(0.066)	(0.071)
R-squared	0.000	0.000	0.002	0.002	0.003	0.004	0.221	0.221
Observations	1,182,971	1,182,971	1,182,971	1,182,971	1,182,335	1,182,335	1,182,335	1,182,335
Firm size analysis								
	Firm FE	**Industry FE**	**Firm FE**	**Industry FE**	**Firm FE**	**Industry FE**	**Firm FE**	**Industry FE**
Small firms	0.050***	0.048***	0.087***	0.086***	0.075***	0.073***	-0.008	-0.010
Ramadan days	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.439)	(0.365)
Big firms	0.019	0.025	0.054**	0.061**	0.038	0.045*	-0.032	-0.026
Ramadan days	(0.458)	(0.312)	(0.034)	(0.016)	(0.134)	(0.078)	(0.155)	(0.247)
Constant	0.047***	0.050*	-0.111***	-0.108***	-0.101***	-0.097***	-0.059***	-0.047*
	(0.000)	(0.062)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.067)
R-squared	0.000	0.000	0.002	0.002	0.003	0.003	0.221	0.221
Observations	1,182,971	1,182,971	1,182,971	1,182,971	1,182,335	1,182,335	1,182,335	1,182,335

* p<0.1, ** p<0.05, *** p<0.01

4.2 Results index level analysis

Table 4 present a summary of the relevant variables and their coefficient for BIST All Shares Index, the BIST 50 Index and the BIST 30 Index. Returns, volatility and trading volume are examined for all three indices using OLS-regression and the GARCH methodology. The results will be discussed per variable, starting off with returns.

As predicted, the regression on returns for all indices yield no significant results. This is in line with previous research done on single indices by Husain (1998) and Fazal, Abraham and Al-Hajji (2005). Regression results from the firm specific analysis show that the Ramadan effect is concentrated among small stocks. Since big stocks are overrepresented in the respective indices, it is only logical that the effect is not noticeable.

Contrary to the regression on daily returns, the analysis of the volatility of returns does yield significant results for the BIST All Shares Index and the BIST 30 Index. A significant increase at the 5% level in volatility (0.188%) is found on Ramadan days on the BIST All Shares Index. An even higher significant increase in volatility (0.259%) exists for the Ramadan as whole at the 1% level on the BIST 30 Index. Furthermore, an increase is found in volatility for the first and the following ten days (0.326% and 0.205%) significant at the 5% and 10% level respectively. These results contradict previous single index research done by Husain (1998) and Fazal, Abraham and Al-Hajji (2005) who find a significant lower volatility on Pakistani and Saudi stock markets. This increase in volatility, which means returns are vary more during Ramadan, would indicate that the market compensates for more risk due to factors which will be discussed in the next section.

The regression on trading volume in this study yield the most significant and the most interesting results since an explanation is given for the previously found increase in volatility and the higher returns found in the firm specific analysis. Table 4 presents the results of the regression on trading volume using two trading volume lagged variables, day-of-the-week and month-of-the-year dummies. Across all three indices trading volume significantly decreases during Ramadan days (-7.013%, -4.231% and -4.835%) all significant at the 1% level. These results are in line with previous research done by Al-Ississ (2010) were trading volumes across all countries signifcantly decreases during Ramadan. But these results could also explain the increase in volatility found

on the BIST All Shares Index and the BIST 30 Index. Lower trading volume logically indicates that less shares are traded on a certain date. This brings liquidity risk into the picture, the bid-ask spread becomes larger. The harder it is to sell a stock, the higher the liquidity risk. Investors need to be compensated for taking these risks. This also ties in to the analysis at the firm specific level. Higher returns are found during Ramadan days, especially during the last ten days of Ramadan. Regression on trading volume for the last ten days of Ramadan, presented in Table 4, show a decrease in trading volume (-18.979%, -25.680% and -19.010%) significant at the 1% level. This could explain the abnormally high returns during the last ten days of Ramadan found in the firm specific analysis. To reiterate, analysis on indices is chosen because of the unavailability of firm specific trading volume data. Because the firm specific analysis is done on firms that make up the BIST All Shares Index conclusions can still be drawn using these results.

In short, even though higher daily returns during Ramadan at the firm level are found, this does not necessarily mean that investors are more optimistic about the market. The index level analysis for volatility and trading volume present evidence that it might be a correction for added liquidity risk. Further analysis would be needed in order to isolate the true effect of Ramadan on investors. Is it the optimism due to religious experience? Or is it the higher risk during Ramadan due to the fact that investors take time off work causing trading volume to plummet? A big issue is the availability of data at the firm level, firm specific trading volume data does is extremely incomplete as of yet.

Table 4. Regression result on indices

	BIST ALL		**BIST 50**		**BIST 30**	
	Returns (%)					
Ramadan days	0.151 (0.175)		0.025 (0.835)		0.154 (0.205)	
Return day 1 to 10		0.286 (0.119)		0.081 (0.673)		0.301 (0.133)
Return day 11 to 20		0.192 (0.296)		-0.083 (0.665)		0.251 (0.209)
Return day 21 to 30		-0.035 (0.854)		0.080 (0.689)		-0.105 (0.610)
Constant	-0.090 (0.465)	-0.092 (0.452)	-0.095 (0.451)	-0.094 (0.453)	-0.069 (0.605)	-0.073 (0.587)
R-squared	0.008	0.009	0.008	0.008	0.007	0.008
Observations	5,458	5,458	4,675	4,675	5,458	5,458

	Volatility					
Ramadan days	0.188**		0.116		0.259***	
	(0.015)		(0.162)		(0.001)	
Ramadan day 1 to 10		0.247*		0.184		0.326**
		(0.074)		(0.167)		(0.027)
Ramadan day 11 to 20		0.112		0.016		0.205*
		(0.294)		(0.893)		(0.059)
Ramadan day 21 to 30		0.213		0.165		0.260
		(0.231)		(0.382)		(0.117)
Constant	-0.184*	-0.190*	-0.170	-0.171	-0.147	-0.142
	(0.064)	(0.056)	(0.124)	(0.119)	(0.255)	(0.275)
Observations	5,460	5,460	4,677	4,677	5,460	5,460
	Trading Volume					
Ramadan days	-7.013***		-4.231**		-4.835***	
	(0.003)		(0.015)		(0.007)	
Ramadan day 1 to 10		1.017		2.594		1.157
		(0.793)		(0.354)		(0.689)
Ramadan day 11 to 20		0.934		1.768		1.366
		(0.808)		(0.529)		(0.636)
Ramadan day 21 to 30		-25.680***		-18.979***		-19.010***
		(0.000)		(0.000)		(0.000)
Constant	4.412*	4.193	7.298***	7.022***	7.588***	7.401***
	(0.087)	(0.103)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.223	0.228	0.174	0.182	0.168	0.173
Observations	4,891	4,891	4,188	4,188	4,868	4,868

* p<0.1, ** p<0.05, *** p<0.01

5. Conclusion

This paper examines the Ramadan effect on Turkish financial markets between the period 1997 to 2017. This is done from a behavioral point of view, meaning that religious experience and spirituality during this holy month are amplified and directly affect the decisions investors make and in turn asset pricing. This effect is investigated at the firm level and at the index level. At the firm level, daily returns during Ramadan days are analyzed across all firms, during the first, second and third ten days of Ramadan and for small and big firms. At the index level, daily returns, volatility and trading volume are evaluated during the month of Ramadan, again dividing the Ramadan into three sub-periods.

The firm specific analysis finds results which would argue the following: (I) Daily returns are higher during the whole month of Ramadan, the first ten days of Ramadan, and are the highest during the last ten days. (II) The Ramadan effect on daily returns is more concentrated among small firms rather than on big firms.

These results would argue that investors during Ramadan are more optimistic and thus returns on stock markets are higher, especially since the last ten days of Ramadan present the highest returns. The last ten days of Ramadan are the most holy and therefore the religious effect reasoning seems to be a possible explanation for the abnormal returns. In order to check whether this reasoning is correct returns, volatility and trading volume are examined in the index level analysis. This decision is made because firm specific data for Turkish firms is very incomplete and would require a much more extensive data collection process. Time constraints make this impossible.

Index level analysis provides the following results: (I) No significant results for daily returns during Ramadan on the index level. (II) Daily volatility during Ramadan days on the BIST All Shares Index and the BIST 30 Index is higher. (II) Trading volume on all three indices goes down significantly during Ramadan, especially during the last ten days.

The effect on big firms being much less pronounced provides an explanation for the lack of significant results for daily returns. Bigger firms have a much higher impact on index prices than smaller firms, simply due to their higher market value and therefore it is quite logical the Ramadan effect on index returns is insignificant.

Prior research assigns higher returns during Ramadan to an increase in spirituality among investors. This reasoning directly contradicts the theory of EMH (efficient market hypothesis), which states that prices reflect all available information. This study however presents a counter-argument to that explanation. Higher returns go hand in hand with more risk according to the EMH. This paper presents evidence for the existence of more risk on Turkish markets. Returns on Ramadan days are more volatile. The trading volume on all indices, especially during the last ten days of Ramadan, decrease significantly. Therefore, it might not be a behavioral argument that would explain these abnormal returns, but an argument grounded more in rationality. Higher risk, be it liquidity risk or some other risk, causes investors to seek higher returns on their investments to compensate for this added risk. It cannot be said that religion and spirituality don't play a role in explaining these higher returns. Further research is definitely needed to isolate the effect of Ramadan on investors. Firm specific data on trading volume and other risk

factors need to be added as control variables in order to prove whether investor sentiment is really affected during Ramadan.

The study set out to answer the five research questions stated in the introduction. First off, the mood of investors in Turkey cannot be determined using these results. The mood might be affected, yet it cannot be discerned whether this affects financial markets directly or is caused by added risk. Second, stock returns during the three sub-periods definitely differ from each other, especially between the first and last ten days. Third, an increase in volatility on two of the three indices if found. Meaning returns are more volatile during Ramadan days. Fourth, a decrease in trading volume is found during Ramadan on all three indices. This effect is concentrated in the last ten days of Ramadan. And finally, the Ramadan effect seems to be concentrated among small firms, providing an explanation for insignificant results several researchers encountered during their studies of single indices.

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Appendix A

Table 5. Mean of returns of holy days compared to other days

	# Obs.	Mean (%)	Std. Dev. (%)	t-test
Ramadan days	99,680	0.092	3.779	3.696***
Return day 1 to 10	34,717	0.119	4.244	3.136***
Return day 11 to 20	34,920	-0.009	3.625	-2.890***
Return day 21 to 30	30,043	0.177	3.358	6.677***
Small Firms Ramadan	81,500	0.095	3.769	3.090***
Big Firms Ramadan	18,180	0.077	3.820	1.406
Other days	1,083,291	0.047	3.278	-

* p<0.1, ** p<0.05, *** p<0.01

Table 6. Regression results on firms (full table)

	Model 1 Returns (%)		Model 2 Returns (%)		Model 3 Returns (%)		Model 4 Returns (%)	
	Firm fixed effects							
Ramadan days	0.044***		0.081***		0.068***		-0.013	
	(0.000)		(0.000)		(0.000)		(0.200)	
Return day 1 to 10		0.071***		0.120***		0.095***		-0.047***
		(0.000)		(0.000)		(0.000)		(0.004)
Return day 11 to 20		-0.056***		-0.024		-0.026		-0.020
		(0.002)		(0.187)		(0.148)		(0.211)
Return day 21 to 30		0.129***		0.157***		0.147***		0.034**
		(0.000)		(0.000)		(0.000)		(0.048)
Monday			-0.093***	-0.093***	-0.101***	-0.101***	-0.064***	-0.064***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wednesday			-0.050***	-0.050***	-0.051***	-0.052***	-0.027***	-0.027***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Thursday			0.100***	0.101***	0.100***	0.101***	0.024***	0.024***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)
Friday			0.095***	0.094***	0.090***	0.090***	-0.066***	-0.066***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
January			0.215***	0.213***	0.193***	0.192***	0.120***	0.118***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
February			0.082***	0.081***	0.076***	0.075***	0.009	0.008
			(0.000)	(0.000)	(0.000)	(0.000)	(0.520)	(0.565)
March			0.231***	0.231***	0.219***	0.218***	0.100***	0.099***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
April			0.413***	0.412***	0.391***	0.390***	0.165***	0.164***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
May			-0.015	-0.017	-0.019	-0.020	0.117***	0.116***
			(0.302)	(0.265)	(0.201)	(0.173)	(0.000)	(0.000)
July			0.193***	0.192***	0.183***	0.182***	0.099***	0.098***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
August			-0.039***	-0.040***	-0.039***	-0.040***	0.111***	0.110***
			(0.008)	(0.007)	(0.009)	(0.007)	(0.000)	(0.000)
September			0.072***	0.071***	0.067***	0.066***	0.075***	0.074***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

October			0.258***	0.257***	0.246***	0.245***	0.081***	0.080***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
November			0.036**	0.036**	0.034**	0.033**	0.042***	0.041***
			(0.014)	(0.017)	(0.022)	(0.027)	(0.001)	(0.002)
December			0.295***	0.295***	0.282***	0.281***	0.057***	0.056***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lag1					0.033***	0.033***	0.034***	0.034***
					(0.000)	(0.000)	(0.000)	(0.000)
Lag2					0.010***	0.010***	0.003***	0.003***
					(0.000)	(0.000)	(0.001)	(0.001)
Market return							0.769***	0.769***
							(0.000)	(0.000)
Constant	0.047***	0.047***	-0.111***	-0.110***	-0.101***	-0.100***	-0.059***	-0.058***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.000	0.000	0.002	0.002	0.003	0.003	0.221	0.221
Observations	1,182,971	1,182,971	1,182,971	1,182,971	1,182,335	1,182,335	1,182,335	1,182,335
				Industry Fixed effects				
Ramadan days	0.044***		0.081***		0.068***		-0.013	
	(0.000)		(0.000)		(0.000)		(0.199)	
Return day 1 to 10		0.071***		0.120***		0.095***		-0.047***
		(0.000)		(0.000)		(0.000)		(0.004)
Return day 11 to 20		-0.056***		-0.024		-0.026		-0.020
		(0.002)		(0.188)		(0.148)		(0.211)
Return day 21 to 30		0.129***		0.158***		0.147***		0.034**
		(0.000)		(0.000)		(0.000)		(0.048)
Monday			-0.093***	-0.093***	-0.101***	-0.101***	-0.064***	-0.064***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wednesday			-0.050***	-0.050***	-0.051***	-0.052***	-0.027***	-0.027***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Thursday			0.100***	0.101***	0.100***	0.101***	0.024***	0.024***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)
Friday			0.095***	0.094***	0.090***	0.090***	-0.066***	-0.066***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
January			0.215***	0.213***	0.193***	0.191***	0.120***	0.118***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
February			0.082***	0.081***	0.076***	0.075***	0.009	0.008
			(0.000)	(0.000)	(0.000)	(0.000)	(0.524)	(0.569)
March			0.231***	0.231***	0.219***	0.218***	0.100***	0.099***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
April			0.413***	0.412***	0.391***	0.390***	0.165***	0.164***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
May			-0.015	-0.017	-0.019	-0.020	0.117***	0.116***
			(0.302)	(0.265)	(0.200)	(0.173)	(0.000)	(0.000)
July			0.193***	0.192***	0.183***	0.182***	0.099***	0.098***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
August			-0.039***	-0.040***	-0.039***	-0.040***	0.111***	0.110***
			(0.008)	(0.007)	(0.008)	(0.007)	(0.000)	(0.000)
September			0.072***	0.071***	0.067***	0.065***	0.075***	0.073***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
October			0.258***	0.257***	0.246***	0.245***	0.081***	0.080***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
November			0.036**	0.035**	0.034**	0.033**	0.042***	0.041***
			(0.015)	(0.017)	(0.023)	(0.028)	(0.001)	(0.002)
December			0.295***	0.294***	0.281***	0.281***	0.057***	0.056***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lag1					0.033***	0.033***	0.034***	0.034***
					(0.000)	(0.000)	(0.000)	(0.000)
Lag2					0.010***	0.010***	0.003***	0.003***
					(0.000)	(0.000)	(0.001)	(0.001)
Market return							0.769***	0.769***
							(0.000)	(0.000)
	0.049*	0.049*	-0.108***	-0.107***	-0.097***	-0.096***	-0.047*	-0.046*

Constant	(0.065)	(0.065)	(0.000)	(0.000)	(0.001)	(0.001)	(0.066)	(0.071)
R-squared	0.000	0.000	0.002	0.002	0.003	0.004	0.221	0.221
Observations	1,182,971	1,182,971	1,182,971	1,182,971	1,182,335	1,182,335	1,182,335	1,182,335

Firm size analysis

	Firm FE	Industry FE	Firm FE	Industry FE	Firm FE	Industry FE	Firm FE	Industry FE
Small firms Ramadan days	0.050***	0.048***	0.087***	0.086***	0.075***	0.073***	-0.008	-0.010
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.439)	(0.365)
Big firms Ramadan days	0.019	0.025	0.054**	0.061**	0.038	0.045*	-0.032	-0.026
	(0.458)	(0.312)	(0.034)	(0.016)	(0.134)	(0.078)	(0.155)	(0.247)
Monday			-0.093***	-0.093***	-0.101***	-0.101***	-0.064***	-0.064***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wednesday			-0.050***	-0.050***	-0.051***	-0.051***	-0.027***	-0.027***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Thursday			0.100***	0.100***	0.100***	0.100***	0.024***	0.024***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.005)
Friday			0.095***	0.095***	0.090***	0.090***	-0.066***	-0.066***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
January			0.215***	0.215***	0.193***	0.193***	0.120***	0.120***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
February			0.082***	0.082***	0.076***	0.076***	0.009	0.009
			(0.000)	(0.000)	(0.000)	(0.000)	(0.519)	(0.523)
March			0.231***	0.231***	0.219***	0.219***	0.100***	0.100***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
April			0.413***	0.413***	0.391***	0.391***	0.165***	0.165***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
May			-0.015	-0.015	-0.019	-0.019	0.117***	0.117***
			(0.303)	(0.303)	(0.201)	(0.201)	(0.000)	(0.000)
July			0.193***	0.192***	0.183***	0.182***	0.099***	0.099***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
August			-0.039***	-0.039***	-0.039***	-0.039***	0.111***	0.111***
			(0.008)	(0.008)	(0.009)	(0.009)	(0.000)	(0.000)
September			0.072***	0.072***	0.067***	0.067***	0.075***	0.074***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
October			0.258***	0.258***	0.246***	0.246***	0.081***	0.081***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
November			0.037**	0.036**	0.034**	0.034**	0.042***	0.042***
			(0.014)	(0.014)	(0.022)	(0.023)	(0.001)	(0.001)
December			0.295***	0.295***	0.282***	0.282***	0.057***	0.057***
			(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lag1					0.033***	0.033***	0.034***	0.034***
					(0.000)	(0.000)	(0.000)	(0.000)
Lag2					0.010***	0.010***	0.003***	0.003***
					(0.000)	(0.000)	(0.001)	(0.001)
Market return							0.769***	0.769***
							(0.000)	(0.000)
Constant	0.047***	0.050*	-0.111***	-0.108***	-0.101***	-0.097***	-0.059***	-0.047*
	(0.000)	(0.062)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.067)
R-squared	0.000	0.000	0.002	0.002	0.003	0.003	0.221	0.221
Observations	1,182,971	1,182,971	1,182,971	1,182,971	1,182,335	1,182,335	1,182,335	1,182,335

* p<0.1, ** p<0.05, *** p<0.01

Table 7. Regression results on indices (full table)

	BIST ALL		BIST 50		BIST 30	
	Returns (%)					
Ramadan days	0.151		0.025		0.154	
	(0.175)		(0.835)		(0.205)	
Return day 1 to 10		0.286		0.081		0.301
		(0.119)		(0.673)		(0.133)
Return day 11 to 20		0.192		-0.083		0.251
		(0.296)		(0.665)		(0.209)
Return day 21 to 30		-0.035		0.080		-0.105
		(0.854)		(0.689)		(0.610)
Lag1	0.010	0.010	-0.004	-0.004	0.008	0.007
	(0.456)	(0.458)	(0.773)	(0.766)	(0.578)	(0.582)
Lag2	0.033**	0.033**	0.018	0.018	0.029**	0.029**
	(0.014)	(0.014)	(0.210)	(0.212)	(0.035)	(0.035)
Monday	-0.073	-0.074	-0.155	-0.155	-0.087	-0.088
	(0.452)	(0.444)	(0.116)	(0.116)	(0.411)	(0.403)
Wednesday	0.048	0.047	0.021	0.021	0.048	0.048
	(0.622)	(0.624)	(0.834)	(0.835)	(0.646)	(0.648)
Thursday	0.187*	0.187*	0.163*	0.164*	0.181*	0.180*
	(0.052)	(0.052)	(0.097)	(0.096)	(0.085)	(0.086)
Friday	0.198**	0.198**	0.133	0.133	0.194*	0.194*
	(0.040)	(0.040)	(0.177)	(0.177)	(0.065)	(0.065)
January	0.155	0.160	0.116	0.115	0.134	0.140
	(0.300)	(0.285)	(0.448)	(0.451)	(0.411)	(0.390)
February	0.033	0.039	-0.011	-0.011	0.025	0.033
	(0.827)	(0.800)	(0.945)	(0.942)	(0.879)	(0.845)
March	0.078	0.081	0.076	0.076	0.047	0.051
	(0.601)	(0.587)	(0.617)	(0.620)	(0.772)	(0.753)
April	0.332**	0.335**	0.379**	0.378**	0.324**	0.328**
	(0.028)	(0.026)	(0.014)	(0.014)	(0.049)	(0.046)
May	-0.143	-0.141	-0.124	-0.125	-0.175	-0.172
	(0.338)	(0.345)	(0.415)	(0.412)	(0.282)	(0.291)
July	0.184	0.186	0.228	0.228	0.181	0.184
	(0.217)	(0.211)	(0.134)	(0.135)	(0.266)	(0.258)
August	-0.163	-0.161	0.012	0.011	-0.192	-0.189
	(0.273)	(0.280)	(0.938)	(0.940)	(0.237)	(0.244)
September	0.046	0.050	0.044	0.044	0.043	0.048
	(0.757)	(0.739)	(0.772)	(0.776)	(0.794)	(0.772)
October	0.226	0.229	0.310**	0.309**	0.239	0.242
	(0.129)	(0.125)	(0.042)	(0.042)	(0.142)	(0.135)
November	0.008	0.011	-0.042	-0.042	-0.012	-0.008
	(0.959)	(0.943)	(0.785)	(0.782)	(0.943)	(0.962)
December	0.277*	0.282*	0.205	0.205	0.278*	0.284*
	(0.065)	(0.061)	(0.182)	(0.183)	(0.090)	(0.083)
Constant	-0.090	-0.092	-0.095	-0.094	-0.069	-0.073
	(0.465)	(0.452)	(0.451)	(0.453)	(0.605)	(0.587)
R-squared	0.008	0.009	0.008	0.008	0.007	0.008
Observations	5,458	5,458	4,675	4,675	5,458	5,458
	Volatility					
Ramadan days	0.188**		0.116		0.259***	
	(0.015)		(0.162)		(0.001)	
Ramadan day 1 to 10		0.247*		0.184		0.326**
		(0.074)		(0.167)		(0.027)
Ramadan day 11 to 20		0.112		0.016		0.205*
		(0.294)		(0.893)		(0.059)
Ramadan day 21 to 30		0.213		0.165		0.260
		(0.231)		(0.382)		(0.117)
	0.264***	0.264***	0.254***	0.255***	0.247***	0.248***

ARCH	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GARCH	0.761***	0.762***	0.773***	0.773***	0.765***	0.764***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.184*	-0.190*	-0.170	-0.171	-0.147	-0.142
	(0.064)	(0.056)	(0.124)	(0.119)	(0.255)	(0.275)
Observations	5,460	5,460	4,677	4,677	5,460	5,460
			Trading Volume			
Ramadan days	-7.013***		-4.231**		-4.835***	
	(0.003)		(0.015)		(0.007)	
Ramadan day 1 to 10		1.017		2.594		1.157
		(0.793)		(0.354)		(0.689)
Ramadan day 11 to 20		0.934		1.768		1.366
		(0.808)		(0.529)		(0.636)
Ramadan day 21 to 30		-25.680***		-18.979***		-19.010***
		(0.000)		(0.000)		(0.000)
Lag1	-0.495***	-0.497***	-0.353***	-0.356***	-0.354***	-0.357***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lag2	-0.234***	-0.234***	-0.200***	-0.202***	-0.202***	-0.203***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monday	-14.570***	-14.637***	-21.203***	-21.191***	-21.837***	-21.867***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wednesday	-0.471	-0.415	-2.588*	-2.476	-2.869*	-2.806*
	(0.823)	(0.843)	(0.092)	(0.105)	(0.073)	(0.078)
Thursday	1.927	1.855	-1.753	-1.710	-0.763	-0.789
	(0.362)	(0.379)	(0.258)	(0.267)	(0.635)	(0.622)
Friday	-10.280***	-10.240***	-12.660***	-12.554***	-11.975***	-11.914***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
January	3.715	4.139	0.720	0.992	0.205	0.524
	(0.257)	(0.206)	(0.757)	(0.669)	(0.933)	(0.829)
February	-1.118	-0.657	-0.730	-0.511	-0.789	-0.439
	(0.726)	(0.837)	(0.749)	(0.822)	(0.740)	(0.853)
March	-1.899	-1.672	0.458	0.680	-0.677	-0.505
	(0.540)	(0.589)	(0.836)	(0.758)	(0.769)	(0.826)
April	1.778	2.008	0.506	0.728	0.027	0.202
	(0.584)	(0.535)	(0.825)	(0.750)	(0.991)	(0.933)
May	0.125	0.289	-1.106	-0.952	-0.677	-0.552
	(0.969)	(0.928)	(0.631)	(0.678)	(0.778)	(0.818)
July	1.223	1.406	0.670	0.840	-0.201	-0.064
	(0.692)	(0.648)	(0.762)	(0.703)	(0.930)	(0.978)
August	-0.819	-0.598	-1.072	-0.875	-0.743	-0.578
	(0.795)	(0.849)	(0.632)	(0.694)	(0.751)	(0.804)
September	1.942	2.118	0.692	0.853	0.513	0.645
	(0.544)	(0.507)	(0.764)	(0.710)	(0.830)	(0.786)
October	-6.055*	-5.813*	-1.832	-1.589	-2.093	-1.896
	(0.056)	(0.066)	(0.420)	(0.482)	(0.375)	(0.421)
November	5.616*	5.839*	0.343	0.603	-0.347	-0.132
	(0.078)	(0.066)	(0.880)	(0.791)	(0.884)	(0.956)
December	-4.071	-3.857	-3.324	-2.783	-3.548	-3.426
	(0.198)	(0.221)	(0.143)	(0.218)	(0.131)	(0.144)
Constant	4.412*	4.193	7.298***	7.022***	7.588***	7.401***
	(0.087)	(0.103)	(0.000)	(0.000)	(0.000)	(0.000)
R-squared	0.223	0.228	0.174	0.182	0.168	0.173
Observations	4,891	4,891	4,188	4,188	4,868	4,868

* p<0.1, ** p<0.05, *** p<0.01