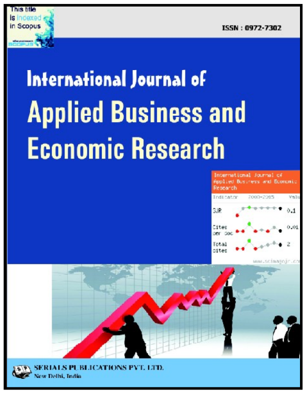

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The Vanishing Ramadan Effect: A Structural Time-Series Test

Abdullah M. Al-Awadhi*, Ahmad Bash* and Fouad Jamaani**

* *College of Business Studies, Public Authority for Applied Education and Training (PAAET), Kuwait, Corresponding Author E-mail: am.alawadhi1@paaet.edu.kw; ay.bash@paaet.edu.kw*
** *School of Economics, Finance, and Marketing, RMIT University, Australia; and, Department of Investment and Finance, College of Finance and Administration, Taif University, Saudi Arabia. E-mail: fouad.jamaani@rmit.edu.au.*

Abstract: This study investigates whether religious belief creates stock market return seasonality, focusing on the Muslim holy month "*Ramadan*". We use data from 12 stock markets in countries with a Muslim majority, and employ both deterministic and stochastic seasonality tests. We find there is no *Ramadan* return seasonality in the majority of these stock markets in neither deterministic nor stochastic tests. However, further analysis of the risk-adjusted returns reveals that the significant drop in market volatility during *Ramadan* leads to higher risk-adjusted returns.

Keywords: Religiosity; Seasonality; Ramadan; Risk-adjusted returns

1. INTRODUCTION

Religious beliefs can influence stock market outcomes (e.g., Durand *et al.* 2013, Canepa and Ibnrubbian, 2014, Al-Awadhi and Dempsey, 2017) and may lead to stock market return seasonality (e.g., Frieder and Subrahmanyam, 2004, Białkowski *et al.,* 2012).

Previous studies suggest that stock markets in Islamic societies exhibit higher returns in the Islamic holy month of "*Ramadan*" (Al-Hajieh *et al.*, 2011, Bia *et al.*, 2012, Al-Khazali, 2014). The arguments of these prior studies suggest that the religious experience of Muslim investors during this month leads to a positive sentiment and moves the market to higher returns. However, there are two main issues with this argument. First, the findings are inconsistent in relation to the appearance of "*Ramadan*" return seasonality with long-term data[1] in markets with a Muslim majority, such as the UAE, Bahrain, Egypt, Jordan, Kuwait, Malaysia, Oman, Pakistan, Qatar, Saudi Arabia, Turkey, and Indonesia (e.g., Almudhaf, 2012, Białkowski, 2012, Al-Khazali, 2014). This inconsistency could be the result of ignoring changes in market trends during financial crises (Al-Khazali, 2014, Hui, 2005). Second, previous studies suggest that the religious experience of Muslim investors during the "*Ramadan*" month leads to a positive sentiment and, hence, higher market returns and a positive valuation effect on equity markets in Islamic countries (Al-Hajieh *et al*., 2011, Bia *et al*., 2012, Al-Khazali, 2014). However, these studies lack methodological tests for this argument, which can result in incorrect conclusions (Shefrin, 2010).

Our study has two objectives in relation to *Ramadan* seasonality. The first is to resolve the inconsistency in market performance during *Ramadan* using a robust methodology for long-term data. This is achieved by applying a structural time-series model that takes into account a "trend component" and a stochastic "seasonal component". The second objective is to examine *Ramadan* return seasonality, while differentiating between absolute returns and risk-adjusted returns.[2] If *Ramadan* is an outcome of investors' sentiment and a positive valuation effect on equity, then we expect to find a significant increase in absolute returns during *Ramadan*. On the other hand, if *Ramadan* is caused by a drop in market volatility and not a positive equity evaluation, then we expect to find a significant increase in risk-adjusted returns during *Ramadan*. To the best of our knowledge, this is the first study of *Ramadan* return seasonality to use a structural time-series model. In addition, our research contributes to the Islamic calendar seasonality literature by revealing the truth of *Ramadan* seasonality using robust econometric techniques, covering a comprehensive data set of 12 major Muslim countries for the period 1995–2014.

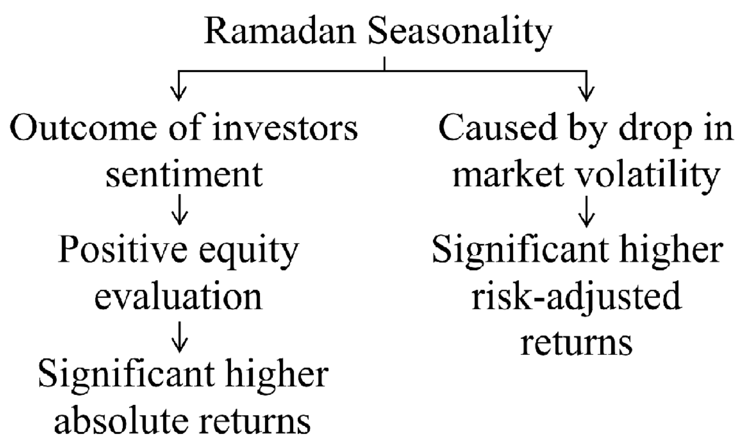

Figure 1: The Reason for Ramadan Seasonality

Our main results are summarized as follows. Using long-term data and a structural time-series model, we find that only one of the 12 markets in countries with a Muslim majority (i.e., Jordan) provides significant evidence of *Ramadan* return seasonality in terms of absolute returns. Secondly, using risk-adjusted returns (the Sharpe ratio) there is significant *Ramadan* return seasonality in six of the aforementioned stock markets. We find that these improved risk-adjusted returns are the outcome of a significant drop in stock market volatility during *Ramadan*.

Our study has a number of implications. The existence of *Ramadan* seasonality is caused by the drop in stock market volatility, and is not the result of an increase in absolute stock market returns caused by positive investor sentiment and positive equity evaluations (as suggested by previous studies). We conjecture that during *Ramadan*, Muslims' religious awareness increases and, hence, speculative trading may be reduced because excessive stock market speculation is either forbidden or undesirable in Islam (Ahmed, 2000, Naughton and Naughton, 2000, Kamali, 1996, Al-Masri, 2007, Zaher and Kabir~Hassan, 2001). Therefore, we encounter a less volatile market, implying higher risk-adjusted returns and more efficient market portfolios, as shown in Figure 1. This implies that risk-averse investors in markets with a Muslim majority may prefer to trade in the month of *Ramadan*.

The rest of this paper is organized as follows. The next section presents the literature review and develops our hypotheses. Section 3 presents the research methodology. Section 4 presents our data, and Section 5 discusses the results. Section 6 provides a further analysis. Lastly, Section 7 concludes the paper.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The influence of religious days on stock market outcomes has been well documented in the finance literature. For example, in Christian and Jewish contexts, (Frieder and Subrahmanyam, 2004) find that a positive return on the S&P500 index is associated with Catholic Irish and Jewish religious days.[3] In the Islamic context, studies have been conducted to understand stock market returns and volatility during *Ramadan*. For example, (Husain, 1998) examines *Ramadan* seasonality by studying the market volatility and returns of the Pakistani equity market. He finds that a significant decline in stock market volatility during *Ramadan* is not associated with a significant change in average returns. In addition, (Seyyed *et al*., 2005) find that a decline in volatility in the Saudi Arabian stock market is not associated with a significant change in average returns during *Ramadan*. They argue that the decline in market volatility during *Ramadan* is associated with religious belief factors, because during *Ramadan*, people devote their time to socio-religious activities. (Al-Hajieh *et al*., 2011) examine whether *Ramadan* is reflected in positive calendar anomalies in Islamic Middle Eastern stock markets. They find significant positive returns during *Ramadan* in six out of eight countries for the period 1992–2007.

Recent studies have been conducted on *Ramadan* seasonality with longer-term data sets and wider contexts by including several stock markets with a Muslim majority. These cover the following 12 markets: Bahrain, Egypt, Jordan, Kuwait, Malaysia, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Turkey, and Indonesia (Almudhaf, 2012, Bia *et al*., 2012, Al-Khazali, 2014). In his study on the period 1996–2007, (Almudhaf, 2012) finds that *Ramadan* return seasonality exists in four of the 12 markets: Jordan, Kuwait, Pakistan, and Turkey. In contrast, (Bia*et al*., 2012) find evidence of *Ramadan* return seasonality in the period 1989–2007 for nine of the 12 above-mentioned markets (the exceptions are Bahrain, Saudi Arabia, and Indonesia). However, (Bia *et al*., 2012) derive their results without testing for the statistical significance of absolute returns. On the other hand, (Al-Khazali, 2014) finds a weak existence of *Ramadan* return seasonality for the 12 markets during the period 1989–2012.

Previous studies that have examined *Ramadan* seasonality suffer from a number of limitations, making it difficult to generalize their results. Firstly, none of the studies uses a model that specifically captures the effect of financial crises on return seasonality. The failure to account for such effects may lead to biased results of seasonality tests and, consequently, premature conclusions (Al-Khazali, 2014, Hui, 2005). Secondly, some previous studies examine the *Ramadan* seasonality effect using a single-country data set, which cannot be generalized to the Islamic world (Husain, 1998, Seyyed *et al*., 2005, Halari *et al*., 2015). Finally, a number of previous studies examine *Ramadan* seasonality effects for various markets by pooling the countries into one test, where different countries have different length data. Hence, the results may be adversely affected by outliers and cannot be generalized to all Islamic countries (Bia*et al*., 2012, Al-Ississ, 2015). To overcome these limitations, we test for the *Ramadan* seasonality effect using a model that captures changes in market trends due to financial crises (a structural time-series model) for each Muslim country and using a long-term data set.

Previous studies provide mixed results on whether stock markets in countries with a Muslim majority yield positive returns during Ramadan (Al-Hajieh *et al.*, 2011, Almudhaf, 2012, Bia*et al.*, 2012, Al-Khazali, 2014). Some of these studies argue that Ramadan, as a holy month, can have a positive effect on Muslim psychology (e.g., Al-Hajieh *et al.*, 2011, Biakowski *et al.*, 2012, Al-Khazali, 2014), and that investors' sentiment influences stock market outcomes (Edmans *et al.*, 2007). However, there is no clear method of capturing Ramadan investors' sentiment yet. In fact, we lack a coherent definition of sentiment in the field of behavioral finance. (Shefrin, 2010) recognizes that behavioral finance assumptions lack a unified and systematic testing approach, because this science is relatively new and, thus, certain results might be incorrect. This leads us to examine the following hypothesis.

Hypothesis: Stock markets in countries with a Muslims majority have a positive absolute return seasonality associated with Ramadan.

3. DATA

Our data are based on 12 stock markets of countries with a Muslim majority: UAE, Bahrain, Egypt, Jordan, Kuwait, Malaysia, Oman, Pakistan, Qatar, Saudi Arabia, Turkey, and Indonesia. These countries have a high proportion of Muslims and high levels of religiosity, as shown in Table 1. Table 2 presents the summary statistics of the stock markets in our study for 2012. In terms of total market capitalization, Malaysia, Indonesia, and Saudi Arabia are the largest markets. Saudi Arabia has the highest trading value and turnover ratio of the 12 countries, while Malaysia has the highest number of listed domestic firms of the 12 countries.

To generalize our results, we use standardized S&P index prices of stock markets in countries with a Muslim majority, taken from the Thomson Datastream. The indices were established on different dates, as shown in Table 3. To facilitate our tests, we convert the daily data from the *Gregorian* to the Islamic lunar calendar *Hijri*. In the Islamic lunar calendar, there are 12 months, of which *Ramadan* is the ninth: (1) Muharram, (2) Safar, (3) Rabia Awal, (4) Rabia Thani, (5) Jumaada Awal, (6) Jumaada Thani, (7) Rajab, (8) Sha'ban, (9) Ramadan, (10) Shawwal, (11) Dhul-Qi'dah, (12) Dhul-Hijjah.

Annualized returns during *Ramadan* and for the rest of the year are shown in Table 4, along with a test for the equality of means, medians, and variances. The results suggest that only Jordan and Pakistan exhibit significantly higher returns during *Ramadan* in comparison with the rest of the year at both the mean and median level, while the UAE exhibits significantly higher returns during *Ramadan* at the median level. The results of the variance equality test in Panel C suggest that, with the exception of Qatar and Indonesia, the markets all have significantly lower standard deviations of returns (volatility) during *Ramadan*.

4. METHODOLOGY

To test our research hypothesis, we conduct two empirical tests: (i) a classic seasonality test, and (ii) a structural time-series model.

Table 1
Religious Indicators in Countries with a Muslim Majority

This table presents a religiosity index from the Gallup Survey in 2009 for countries with a Muslim majority. The table also presents the ratio of Muslims to the total population, and the total population, in millions, taken from the PEW Research Center 2011 report, "The Future of the Global Muslim Population". *The data for the religiosity index for Turkey and Jordan are taken from the World Values Survey 2010–2014.

Country	*Religiosity Index (2009)*	*Muslims to Total Total Population (%)*	*Total Population (million)*
Malaysia	96	61.4	28.4
Indonesia	99	87.2	239.87
Saudi Arabia	93	97.1	27.45
Turkey	68*	98	72.75
Qatar	95	77.5	1.76
Kuwait	91	86.4	2.74
UAE	91	76.0	7.51
Egypt	97	94.9	81.12
Pakistan	92	96.4	173.59
Jordan	93*	97.2	6.19
Oman	-	85.9	2.78
Bahrain	94	81.2	1.26

Table 2
Summary Statistics of Stock Markets in Countries with a Muslim Majority

This table compares the stock markets in countries with a Muslim majority population in 2012. The market capitalization of listed companies is expressed in USD billion, and are based on listed domestic companies. The market capitalization of listed companies as a percentage of GDP is also based on listed domestic companies. The stocks traded value is calculated as the total value of shares traded during the year divided by the GDP for the year. The stocks traded turnover ratio is calculated as the total value of shares traded in the year divided by the average market capitalization for the year, and the number of listed companies includes only domestic companies. Data are taken from the World Bank database.

Country	*Market Cap ($bn)*	*Market Cap (% of GDP)*	*Trading Value (% of GDP)*	*Stock Turnover Ratio (%)*	*Number of Listed Companies*
Malaysia	476	156	40.8	28.6	921
Indonesia	397	43	10.0	23.3	459
Saudi Arabia	373	51	70.1	144.4	158
Turkey	309	39	44.2	136.5	405
Qatar	126	67	8.1	12.2	42
Kuwait	97	56	13.2	23.2	189
UAE	68	18	4.7	25.3	102
Egypt	58	22	7.7	37.8	234
Pakistan	44	19	5.3	31.3	573
Jordan	27	87	9.0	10.3	243
Oman	20	26	3.5	13.3	124
Bahrain	16	52	1.0	1.9	43

Table 3
The Dates S&P Indices were Established

This table presents the dates each of the S&P indices were established, following both the *Gregorian* and the Islamic lunar (*Hijri*) calendars, and the number of *Ramadan* months available in our data for each index, from the date the index was established to 30/12/1435 *Hijri* (25/10/2014 *Gregorian*)

Country	*Date Established (Gregorian)*	*Date Established (Islamic Lunar)*	*Number of Ramadan Observations*
Bahrain	01/05/2000	26/01/1421	14
UAE	03/01/2005	22/11/1425	9
Egypt	14/07/2006	18/06/1427	8
Jordan	30/06/1995	02/02/1416	19
Kuwait	03/01/2005	22/11/1425	9
Malaysia	30/06/1989	27/11/1409	25
Oman	19/04/2000	14/01/1421	14
Pakistan	30/06/1995	02/02/1416	19
Qatar	31/12/2004	19/11/1425	9
Saudi Arabia	31/12/1997	02/09/1418	17
Turkey	17/07/2006	21/06/1427	8
Indonesia	17/07/2006	21/06/1427	8

Table 4
Summary Statistics and Equality Tests

Summary statistics and equality tests of the index annualized returns (in percent), based on the 12 Islamic lunar calendar months, from the date each index was established to 30/12/1435 *Hijri* (25/10/2014 *Gregorian*). The column *Ramadan Days* shows the percentage of days of the ninth month of the Islamic lunar calendar. The p-values of the median equality test in Panel B correspond to a Wilcoxon/Mann-–Whitney signed rank median test. The p-values of the variance equality test in Panel C correspond to an F-test and Bartlett test. The Bartlett test compares the logarithm of the weighted average variance with the weighted sum of the logarithms of the variances (for further details, see Sokal *et al.*, 1995).

Panel A: Mean Equality Test

Country	*Ramadan Days (%)*	*Rest of the Year (%)*	*P-Value (t-test)*
Bahrain	3.38	44.08	(0.77)
UAE	61.10	-1.04	(0.13)
Egypt	27.67	6.47	(0.61)
Jordan	43.82	3.28	(0.04)
Kuwait	22.32	-2.63	(0.42)
Malaysia	2.17	5.25	(0.84)
Oman	13.92	8.68	(0.80)
Pakistan	66.29	4.80	(0.01)
Qatar	34.18	7.88	(0.48)
Saudi Arabia	21.14	9.68	(0.69)
Turkey	23.82	10.42	(0.69)
Indonesia	28.40	12.69	(0.64)

Panel B: Median Equality Test

Country	*Ramadan Days (%)*	*Rest of the Year (%)*	*P-Value (Wilcoxon/Mann-Whitney)*
Bahrain	2.49	2.78	(0.92)
UAE	79.72	18.19	(0.02)
Egypt	80.76	28.50	(0.50)
Jordan	17.55	-5.61	(0.04)
Kuwait	35.04	5.79	(0.17)
Malaysia	7.91	8.23	(0.61)
Oman	28.18	12.03	(0.32)
Pakistan	30.91	16.72	(0.02)
Qatar	50.00	19.75	(0.28)
Saudi Arabia	22.45	26.53	(0.53)
Turkey	54.61	15.77	(0.79)
Indonesia	40.92	32.52	(0.44)

Panel C: Variance Equality Test

Country	*Ramadan Days St.dev*	*Rest of Days St.dev*	*P-Value (F-test)*	*P-Value (Bartlett)*
Bahrain	2.13	22.18	(0.00)	(0.00)
UAE	4.60	5.12	(0.05)	(0.07)
Egypt	4.20	4.83	(0.02)	(0.03)
Jordan	3.05	3.40	(0.01)	(0.01)
Kuwait	3.08	3.74	(0.00)	(0.00)
Malaysia	3.08	3.48	(0.00)	(0.00)
Oman	2.60	3.05	(0.00)	(0.00)
Pakistan	3.88	4.46	(0.00)	(0.00)
Qatar	4.81	4.58	(0.43)	(0.40)
Saudi Arabia	3.64	4.41	(0.00)	(0.00)
Turkey	4.82	4.29	(0.04)	(0.03)
Indonesia	4.00	4.26	(0.25)	(0.27)

4.1. Classic seasonality test

We start our analysis by conducting a classic seasonality test, regressing each index of monthly returns on 12 dummy variables representing the months of the Islamic lunar calendar, from the establishment date of each index to the end of 1435 *Hijri* (2014 Gregorian):

$$R_t = \beta_1 D_{1t} + \beta_2 D_{2t} + \ldots + \beta_{12} D_{12t} + \varepsilon_t, \tag{1}$$

where R_t is the index average monthly continuous return, $D_{1t}, D_{2t}, ..., D_{12t}$ are dummy variables representing the 12 Islamic calendar months ($D_{1t} = 1$ if month t is the first month in the Islamic calendar *Muharram*, and zero otherwise, and so on), and ε_t is an i.i.d. error term. Then, β_1 - β_{12} represents the mean of the returns for the 12 months of the Islamic calendar. A significant coefficient for the index returns of the ninth month of the Islamic calendar (*Ramadan*) is required to support the hypothesis of Islamic calendar seasonality.

4.2. Structural time-series test

Previous studies suggest that changes in a market trend component (e.g., a financial crisis) may affect seasonality tests that cover long-term data, leading to incorrect conclusions if the model is not able to capture the trend movement (Al-Khazali, 2014, Hui, 2005). To avoid this problem, we test for long-term *Ramadan* return seasonality, while allowing for trend elements to be captured using a structural time-series model. Several studies have tested for stock market seasonality using structural time-series models (e.g., Fraser, 1992, Priestley, 1997, Al-Saad, 2005). Structural time-series models contain four elements: trend, cycle, season, and a random element. Here, we are interested in testing the trend and the seasonal elements of stock market returns, which is achieved by applying the structural time-series model with an autoregressive element (Harvey, 1990, Harvey, 1997) and a maximum likelihood estimation, while updating the state vector by applying a Kalman filter:

$$R_t = \mu_t + \alpha_t R_{t-1} + \gamma_t + \varepsilon_t, \tag{2}$$

where R_t is the average continuous return of an index for month t, μ_t is the trend element that captures the long-term movement, α_t is the coefficient of the first-order autoregressive component, R_{t-1}, γ_t is the seasonal element, and ε_t is a random variable, assuming $\varepsilon \sim NID(0, \sigma_\varepsilon^2)$. The trend μ_t is a random walk with a drift factor:

$$\mu_t = \mu_{t-1} + \beta_{t-1} + \eta_t, \tag{3}$$

where

$$\beta_t = \beta_{t-1} + \xi_t, \tag{4}$$

with $\eta \sim NID(0, \sigma_\eta^2)$ and $\xi \sim NID(0, \sigma_\xi^2)$. Here, β_t is derived from an autoregressive process, as in equation (4). In this model, the trend is deterministic if the variances of η and ξ are equal to zero. In structural time-series models, a seasonal element may have several specifications (Harvey, 1990). For a direct interpretation of the seasonal element, we use the specification of stochastic dummies, following (Al-Saad and Moosa, 2005):

$$\gamma_t = -\Sigma_{j=1}^{s-1} \gamma_{t-j} + \kappa_t, \tag{5}$$

where s is the number of seasons in each year (12 months), and $\kappa_t \sim NID(0, \sigma_\kappa^2)$.

5. RESULTS

5.1. Classic seasonality test

We conduct a classic seasonality test to examine whether the return performance is greater during *Ramadan* for the period between when the index was established and 30/12/1435 *Hijri* (25/10/2014 *Gregorian*).

Table 5 shows the results of the dummy variable regression. A significant positive coefficient for *D9*, the dummy variable for the ninth *Hijri* calendar month, would support the hypothesis of *Ramadan* return seasonality. The dummy variable test suggests there is *Ramadan* return seasonality in the long term for only two of the 12 markets (Jordan and Pakistan) at the 5% level of significance. These results are consistent with those of (Almudhaf, 2012) for the 12 markets (with the exception of Kuwait and Turkey). This might be due to the longer data set in our study. However, before dismissing *Ramadan* return seasonality, recall that our model assumes that seasonality is deterministic (i.e., does not change over time) and ignores the possible effect of changes in market trends. In other words, the dummy variables in this model might not describe the true stochastic process (Brenner, 1977, Al-Khazali *et al*., 2008).

5.2. Structural time-series test

To allow for a possible change in a "trend component", while examining for a "seasonal component" that can be stochastic, we apply a structural time-series seasonality test, as in (Harvey and Scott, 1994). Here, we apply the average continuous daily returns for each Islamic lunar calendar month for each index between the date the index was established and 30/12/1435 *Hijri* (25/10/2014 *Gregorian*).

The figures for the trend and seasonal components using the *Hijri* calendar are presented in Appendix I. Figures 2–13 confirm that the stock market return trend has been changing in the majority of the markets in our study, especially during the period 1429–1430 *Hijri* (2008–2009 Georgian). Table 6 shows the estimation results of the final state vector using a structural time-series model, where is the estimated level of the trend in the series, is the coefficient of the first-order autoregressive component, is similar to the coefficient of the intercept in classic models, is the seasonal term corresponding to the 12th month of the Islamic calendar, *Dhul-Hijjah*, is the seasonal term corresponding to the 11th month of the Islamic calendar, *Dhul-Qi'dah*, and so on, and is the seasonal coefficient for *Ramadan*. Panel B in Table 6 reports the results of the goodness of fit measures. Thus, is the seasonal mean coefficient of determination, *SE* is the standard error of the estimates, *DW* is the Durbin–Watson autocorrelation test, and is Ljung1978's (Ljung1978) auto correlation test.

The results of the goodness of fit measures suggest that the model is fairly determined. The results of the structural time-series seasonality test are consistent with the classic dummy variable test for all markets, except Jordan and Pakistan. Thus, we find no significant evidence of *Ramadan* return seasonality for any of the 12 markets over the long term. These results contrast with those of (Bia*et al*., 2012), but are similar to those of (Al-Khazali, 2014). We conclude that the trend component does not significantly impact our results, and that *Ramadan* return seasonality does not appear to influence absolute returns in the markets of countries with a Muslim majority.

6. FURTHER ANALYSIS

Given that previous studies suggest there is a significant drop in stock market volatility during *Ramadan* (Husain, 1998, Seyyed *et al*., 2005, Bia*et al*., 2012, Halari *et al*., 2015), we expect to see that lower return volatility during *Ramadan* leads to positive risk-adjusted returns.

Here, we consider risk-adjusted returns because these measure the performance of an index as the ratio of average excess returns to total risk, measured by the standard deviation of the returns.[7] The risk-adjusted return is calculated on a monthly basis as:

Table 5
Seasonality Return Tests using Dummy Variables

The results of the seasonality regression test using dummy variables and average monthly continuous returns for the period from when the index was established to 30/12/1435 *Hijri* (25/10/2014 *Gregorian*). *D9* represents the coefficient of the Islamic holy month *Ramadan* dummy variable. T-statistics are in parentheses. ***1 %; **5%; *10% denote significance levels.

Country	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*	*D8*	*D9*	*D10*	*D11*	*D12*
Bahrain	25.30***	0.05	0.28	0.25	0.12	-0.15	0.05	0.21	0.04	-0.17	-0.21	0.08
	(3.44)	(0.01)	(0.04)	(0.03)	(0.02)	(-0.02)	(0.01)	(0.03)	(0.01)	(-0.02)	(-0.03)	(0.01)
UAE	0.08	0.46	0.32	0.71	0.40	-0.26	0.40	-0.35	0.67	-0.58	0.20	-1.00**
	(0.17)	(1.01)	(0.7)	(1.53)	(0.87)	(-0.56)	(0.88)	(-0.76)	(1.46)	(-1.27)	(0.45)	(-2.27)
Egypt	-0.43	0.14	0.90	0.69	-0.44	0.41	-0.25	0.40	0.30	-0.58	0.13	0.02
	(-0.83)	(0.28)	(1.64)	(1.34)	(-0.87)	(0.85)	(-0.51)	(0.82)	(0.62)	(-1.2)	(0.27)	(0.04)
Jordan	-0.06	-0.14	0.34*	0.33	0.12	-0.33	0.17	-0.05	0.43**	0.12	-0.25	0.30
	(-0.28)	(-0.67)	(1.66)	(1.57)	(0.58)	(-1.61)	(0.82)	(-0.27)	(2.08)	(0.56)	(-1.2)	(1.45)
Kuwait	-0.31	0.30	0.27	0.25	0.29	0.00	-0.07	0.22	0.31	-0.41	-0.37	0.07
	(-0.88)	(0.83)	(0.75)	(0.7)	(0.8)	(-0.01)	(-0.19)	(0.61)	(0.88)	(-1.16)	(-1.1)	(0.2)
Malaysia	-0.02	-0.08	-0.09	-0.03	0.29	-0.19	0.10	0.16	0.04	0.28	0.14	0.12
	(-0.1)	(-0.43)	(-0.53)	(-0.15)	(1.64)	(-1.05)	(0.55)	(0.92)	(0.23)	(1.56)	(0.8)	(0.69)
Oman	0.17	0.11	0.04	0.58*	0.28	-0.26	-0.02	0.13	0.13	-0.35	0.33	-0.11
	(0.71)	(0.44)	(0.16)	(2.36)	(1.13)	(-1.05)	(-0.08)	(0.53)	(0.53)	(-1.41)	(1.34)	(-0.43)
Pakistan	-0.03	-0.21	0.27	-0.12	-0.04	0.02	-0.03	0.06	0.75**	0.06	0.28	-0.18
	(-0.09)	(-0.65)	(0.84)	(-0.36)	(-0.12)	(0.07)	(-0.08)	(0.19)	(2.38)	(0.2)	(0.88)	(-0.56)
Qatar	-0.25	0.07	-0.23	0.59	0.50	0.22	0.37	-0.33	0.35	-0.81*	0.36	0.66
	(-0.54)	(0.15)	(-0.51)	(1.28)	(1.08)	(0.49)	(0.81)	(-0.72)	(0.75)	(-1.76)	(0.81)	(1.51)
Saudi Arabia	0.34	0.51	-0.45	0.72**	0.42	-0.45	0.25	-0.19	0.15	-0.06	-0.35	0.38
	(0.98)	(1.46)	(-1.27)	(2.05)	(1.2)	(-1.27)	(0.71)	(-0.53)	(0.45)	(-0.18)	(-1.02)	(1.13)
Turkey	-0.01	-0.30	0.20	0.69*	0.22	0.20	0.48	0.09	0.24	-0.46	0.20	-0.03
	(-0.02)	(-0.75)	(0.49)	(1.73)	(0.55)	(0.53)	(1.27)	(0.24)	(0.65)	(-1.22)	(0.54)	(-0.09)
Indonesia	-0.07	-0.24	0.38	0.72*	0.41	0.10	0.28	0.14	0.29	-0.90**	0.46	0.07
	(-0.18)	(-0.59)	(0.93)	(1.76)	(1)	(0.25)	(0.72)	(0.35)	(0.74)	(-2.31)	(1.19)	(0.19)

$$RA = (R_{it} - RF_t) / \sigma_{it}, \tag{6}$$

where R_{it} is the average continuous compounded return for index i over month t, RF_t is the average risk-free rate for country i over month t, and σ_{it} is the total risk, measured by the standard deviation of index i returns over month t.[8] Finally, we apply a classic dummy variable test with a monthly risk-adjusted return to determine whether the ninth month of the Islamic calendar (*Ramadan*) has higher risk-adjusted returns.

To test whether a *Ramadan* effect appears in the risk-adjusted returns, we conduct a classic dummy variable test using the same data for each index, from when the index was established to 30/12/1435 *Hijri* (25/10/2014 *Gregorian*). A significant regression coefficient for *D9*, the dummy variable denoting the ninth *Hijri* calendar month, would support the hypothesis of *Ramadan* risk-adjusted return seasonality.

Table 7 shows the results of the dummy variable regression using risk-adjusted returns. The dummy variable test suggests there are *Ramadan* risk-adjusted returns over the long term in six of the 12 markets: UAE, Kuwait, Oman, Pakistan, Qatar, and Turkey. These results are consistent with those of (Bia*et al.*, 2012) for all markets except Egypt, Jordan, and Malaysia. However, the difference in the results may be attributed to our use of a longer-term data set. These results suggest that the drop in stock market volatility (risk) during *Ramadan* leads to higher risk-adjusted returns.

7. CONCLUSION

Our study examines two interrelated issues associated with the *Ramadan* effect: (i) the existence of absolute *Ramadan* return seasonality, based on long-term data, and (ii) the existence of enhanced risk-return performance during *Ramadan*.

Using annualized returns and a structural time-series model, we find *Ramadan* return seasonality in only one of the 12 stock markets in countries with a Muslim majority. However, the analysis of *Ramadan* risk-adjusted return seasonality provides strong evidence supporting the hypothesis that stock markets in countries with a Muslim majority exhibit seasonality associated with the Islamic calendar holy month of *Ramadan*, caused by a decrease in stock volatility during this month.

Our results lead us to conclude that the existence of *Ramadan* seasonality in previous studies is caused by a drop in stock market volatility, and is not the result of an increase in absolute stock market returns caused by investor positive sentiment or positive equity evaluations, as suggested by previous studies. The drop in market volatility during *Ramadan* leads to higher risk-adjusted returns and a more efficient market. This drop in market volatility may be because excessive stock market speculation is either forbidden or is undesirable in Islam (Ahmed, 2000, Naughton and Naughton, 2000, Kamali, 1996, Al-Masri, 2007, Zaher and Kabir~Hassan, 2001). During *Ramadan*, Muslims devote their time to religious practices and their religious awareness increases. Hence, we may expect that they will speculate less in the stock market. Thus, further research is required to assess the impact of *Ramadan* on stock market speculation.

Table 6
Results of the Structural Time-Series Model

The table shows the results of the final state vector using a structural time-series model. Here, is the estimated level of the trend in the series, is the coefficient of the first-order autoregressive component, is similar to the coefficient of the intercept in classic models, is the seasonal term corresponding to the first Islamic calendar month (Muharram), is the seasonal term corresponding to the second Islamic calendar month (Safar), and so on. Panel B reports the results of the goodness of fit measures. Here, is the seasonal mean coefficient of determination, *SE* is the standard error of the estimates, *DW* is the Durbin–Watson autocorrelation test, and is Ljung's (1978) autocorrelation test.

Panel A: Final-State Vector

	Bahrain	*UAE*	*Egypt*	*Jordan*	*Kuwait*	*Malaysia*	*Oman*	*Pakistan*	*Qatar*	*Saudi Arabia*	*Turkey*	*Indonesia*
Level	0.02	0.08	0.03	-0.07	0.06	0.05	-0.05	0.13	0.13	0.22	0.04	0.02
	(0.05)	(0.10)	(0.08)	(-0.24)	(0.14)	(0.45)	(-0.12)	(0.57)	(0.21)	(0.60)	(0.16)	(0.07)
	-0.26	0.00	-0.22	0.00	0.00	0.00	-0.21	0.00	0.00	0.00	0.00	-0.01
	(-0.53)	(0.00)	(-0.31)	(.NaN)	(0.00)	(.NaN)	(-0.56)	(0.00)	(0.00)	(0.00)	(.NaN)	(-0.03)

contd. table 6

	Bahrain	*UAE*	*Egypt*	*Jordan*	*Kuwait*	*Malaysia*	*Oman*	*Pakistan*	*Qatar*	*Saudi Arabia*	*Turkey*	*Indonesia*
Slope	0.00	-0.02	0.00	0.00	-0.01	0.00	0.00	0.00	-0.01	0.00	0.00	0.00
	(0.15)	(-0.44)	(-0.25)	(0.01)	(-0.37)	(-0.15)	(0.21)	(0.29)	(-0.51)	(0.21)	(-0.47)	(-0.41)
S1	-0.10	-0.30	-0.15	-0.01	-0.19	0.02	-0.02	0.00	-0.16	0.04	-0.24	-0.22
	(-1.20)	(-1.55)	(-0.63)	(-0.08)	(-1.34)	(0.24)	(-0.18)	(0.03)	(-0.86)	(0.27)	(-1.51)	(-1.17)
S2	0.09	0.17	0.19	0.01	0.11	-0.10	0.14	-0.17	0.08	0.19	0.06	0.17
	(1.09)	(0.90)	(0.79)	(0.18)	(0.80)	(-1.35)	(1.20)	(-1.31)	(0.45)	(1.33)	(0.39)	(0.90)
S3	-0.11	-0.35**	-0.25	-0.16	-0.17	0.01	-0.08	-0.16	0.22	0.01	0.03	0.03
	(-1.50)	(-2.27)	(-1.27)	(-1.96)	(-1.27)	(0.17)	(-0.78)	(-1.27)	(1.28)	(0.07)	(0.17)	(0.18)
S4	0.02	-0.02	-0.01	-0.06	0.05	-0.07	-0.05	-0.06	-0.11	0.03	-0.06	-0.10
	(0.24)	(-0.13)	(-0.06)	(-0.73)	(0.41)	(-1.02)	(-0.44)	(-0.43)	(-0.64)	(0.19)	(-0.38)	(-0.61)
S5	0.13	-0.06	0.2	0.15*	0.10	0.04	0.16*	-0.02	0.23	0.15	0.22	0.33**
	(1.8)	(-0.44)	(1.09)	(1.92)	(0.77)	(0.55)	(1.66)	(-0.15)	(1.31)	(1.07)	(1.38)	(2.26)
S6	-0.03	0.06	-0.2	0.04	0.08	0.03	0.05	0.03	0.03	0.25*	-0.07	-0.08
	(-0.34)	(0.4)	(-1.06)	(0.45)	(0.64)	(0.40)	(0.48)	(0.21)	(0.18)	(1.76)	(-0.44)	(-0.54)
S7	0.03	-0.15	0.27	0.11	0.12	-0.09	-0.15	0.15	0.13	-0.20	0.03	0.07
	(0.44)	(-1.07)	(1.5)	(1.31)	(0.89)	(-1.25)	(-1.5)	(1.12)	(0.73)	(-1.4)	(0.16)	(0.49)
S8	-0.04	0.01	-0.12	0.12	-0.13	-0.03	-0.05	-0.03	-0.08	0.12	0.07	-0.11
	(-0.49)	(0.06)	(-0.69)	(1.56)	(-1)	(-0.37)	(-0.54)	(-0.23)	(-0.48)	(0.88)	(0.44)	(-0.76)
S9	0.07	-0.07	-0.24	0.17**	0.10	0.10	-0.09	-0.09	0.11	0.23	-0.09	-0.12
	(0.97)	(-0.50)	(-1.33)	(2.08)	(0.75)	(1.31)	(-0.89)	(-0.65)	(0.65)	(1.63)	(-0.58)	(-0.84)
S10	0.01	-0.36**	-0.13	-0.02	-0.08	0.06	-0.15	-0.04	-0.39**	-0.24*	-0.16	-0.20
	(0.13)	(-2.53)	(-0.7)	(-0.27)	(-0.57)	(0.81)	(-1.54)	(-0.34)	(-2.26)	(-1.74)	(-0.99)	(-1.37)
S11	0.02	-0.25**	0.08	-0.04	0.03	-0.02	-0.10	-0.13	-0.05	0.05	-0.1	-0.16
	(0.3)	(-2.48)	(0.62)	(-0.78)	(0.31)	(-0.30)	(-1.29)	(-1.41)	(-0.41)	(0.46)	(-0.84)	(-1.54)

Panel B: Goodness-of-Fit Measures

T	179	122	102	239	122	314	180	239	122	208	103	103
p	5	5	5	5	5	5	5	5	5	5	5	5
Std Error	0.76	1.29	1.33	0.90	1.06	0.89	0.93	1.39	1.40	1.42	1.06	1.07
Normality	3.77	1.55	2.13	40.44	8.00	88.32	39.53	92.59	5.82	27.42	2.53	45.09
H(55)	0.96	0.56	0.63	1.96	0.24	0.39	0.54	1.05	0.26	2.01	0.29	0.13
DW	1.79	1.79	1.88	1.86	1.79	1.71	2.13	1.80	1.92	1.83	1.95	1.96
r(1)	0.10	0.07	0.00	0.07	0.09	0.14	-0.08	0.10	0.00	0.08	0.00	0.01
q	24	24	24	24	24	24	24	24	24	24	24	24
r(q)	0.04	0.05	-0.04	0.07	-0.10	0.09	0.00	-0.02	0.07	0.10	-0.05	-0.16
Q(q, q-p)	15.80	40.84	14.65	27.92	17.87	85.42	34.81	31.29	13.43	62.69	21.31	15.00
	0.35	0.28	0.48	0.43	0.41	0.43	0.37	0.46	0.42	0.46	0.54	0.48

Table 7
Results of the Seasonality Regression Test using Risk-Adjusted Returns

The results of the seasonality regression test using dummy variables and risk-adjusted returns for the period from when each index was established to 30/12/1435 *Hijri* (25/10/2014 *Gregorian*). *D9* represents the coefficient of the Islamic holy month *Ramadan* dummy variable. T-statistics are in parentheses. ***1 %; **5%; *10% denote significance levels.

Country	*D1*	*D2*	*D3*	*D4*	*D5*	*D6*	*D7*	*D8*	*D9*	*D10*	*D11*	*D12*
Bahrain	-0.06	0.01	0.15*	0.06	0.07	-0.03	0.01	0.11	0.03	0.01	-0.07	0.07
	(-0.64)	(0.13)	(1.72)	(0.62)	(0.77)	(-0.36)	(0.07)	(1.19)	(0.32)	(0.14)	(-0.78)	(0.82)
UAE	0.05	0.18*	0.14	0.26**	0.10	-0.04	0.11	-0.05	0.30***	-0.05	0.05	-0.16
	(0.49)	(1.71)	(1.32)	(2.46)	(0.98)	(-0.35)	(1)	(-0.48)	(2.81)	(-0.43)	(0.49)	(-1.6)
Egypt	-0.02	0.17	0.21*	0.18	-0.13	0.15	-0.09	0.09	0.17	0.04	0.11	0.07
	(-0.18)	(1.41)	(1.7)	(1.52)	(-1.07)	(1.37)	(-0.83)	(0.82)	(1.57)	(0.38)	(1.01)	(0.6)
Jordan	-0.06	-0.08	0.09	0.13*	0.00	-0.21***	0.02	-0.09	0.11	-0.04	-0.07	-0.02
	(-0.88)	(-1.22)	(1.27)	(1.88)	(0.04)	(-3.1)	(0.32)	(-1.34)	(1.64)	(-0.54)	(-1.09)	(-0.29)
Kuwait	0.02	0.12	0.05	0.08	0.10	-0.04	-0.03	0.08	0.21**	-0.06	-0.01	0.06
	(0.24)	(1.22)	(0.49)	(0.77)	(0.99)	(-0.44)	(-0.29)	(0.8)	(2.07)	(-0.62)	(-0.1)	(0.66)
Malaysia	0.03	0.00	0.02	0.11	0.06	-0.05	0.08	0.09	0.03	0.08	0.08	0.02
	(0.56)	(0.08)	(0.27)	(1.85)	(1.07)	(-0.81)	(1.33)	(1.51)	(0.53)	(1.36)	(1.31)	(0.38)
Oman	0.11	0.07	0.06	0.22**	0.06	-0.13	0.00	0.01	0.23**	-0.03	0.16	0.01
	(1.09)	(0.76)	(0.57)	(2.22)	(0.59)	(-1.38)	(-0.05)	(0.15)	(2.38)	(-0.34)	(1.65)	(0.14)
Pakistan	0.07	0.05	0.08	-0.05	0.01	0.03	-0.02	0.02	0.18**	-0.09	0.11	-0.01
	(0.74)	(0.58)	(0.95)	(-0.61)	(0.13)	(0.35)	(-0.24)	(0.2)	(2.06)	(-1.07)	(1.19)	(-0.14)
Qatar	-0.02	0.01	0.00	0.23**	0.09	0.05	0.05	-0.14	0.24**	-0.02	0.14	0.14
	(-0.21)	(0.1)	(-0.01)	(2.2)	(0.83)	(0.44)	(0.45)	(-1.34)	(2.23)	(-0.23)	(1.33)	(1.38)
SaudiArabia	0.20	0.21**	0.04	0.30***	0.18**	-0.06	0.10	-0.07	0.13	0.18**	-0.06	0.13
	(2.28)	(2.39)	(0.47)	(3.37)	(2.03)	(-0.72)	(1.18)	(-0.78)	(1.52)	(2.09)	(-0.67)	(1.51)
Turkey	0.07	-0.05	0.06	0.18**	0.02	0.01	0.16*	0.03	0.12	-0.01	0.01	-0.02
	(0.75)	(-0.54)	(0.66)	(2.01)	(0.17)	(0.14)	(1.83)	(0.3)	(1.39)	(-0.09)	(0.16)	(-0.27)
Indonesia	0.00	-0.07	0.17**	0.21***	0.08	0.02	0.09	0.05	0.17**	-0.01	0.09	-0.01
	(-0.04)	(-0.89)	(2.26)	(2.78)	(1)	(0.28)	(1.19)	(0.62)	(2.38)	(-0.2)	(1.2)	(-0.11)

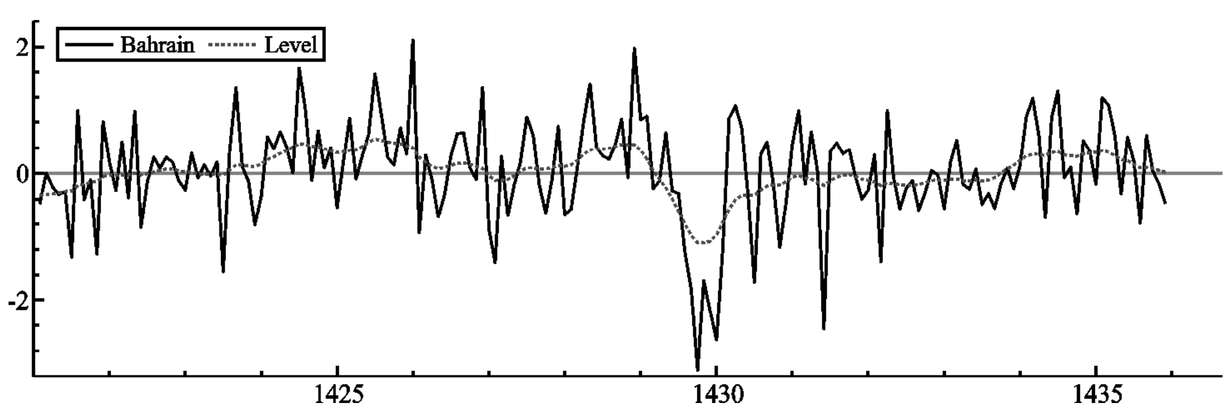

Figure 2: Observed returns and trend for Bahrain

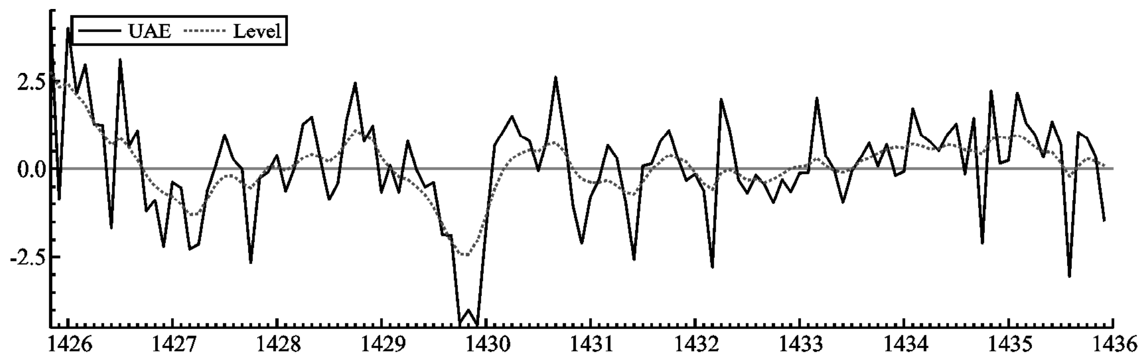

Figure 3: Observed returns and trend for UAE

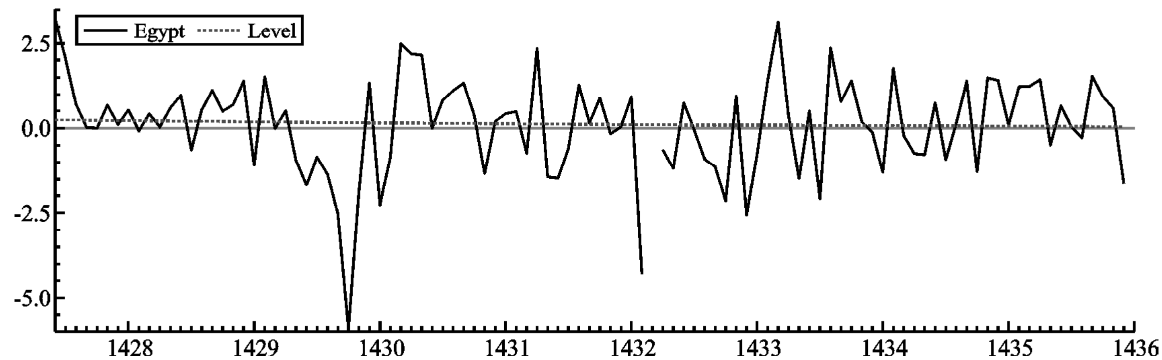

Figure 4: Observed returns and trend for Egypt

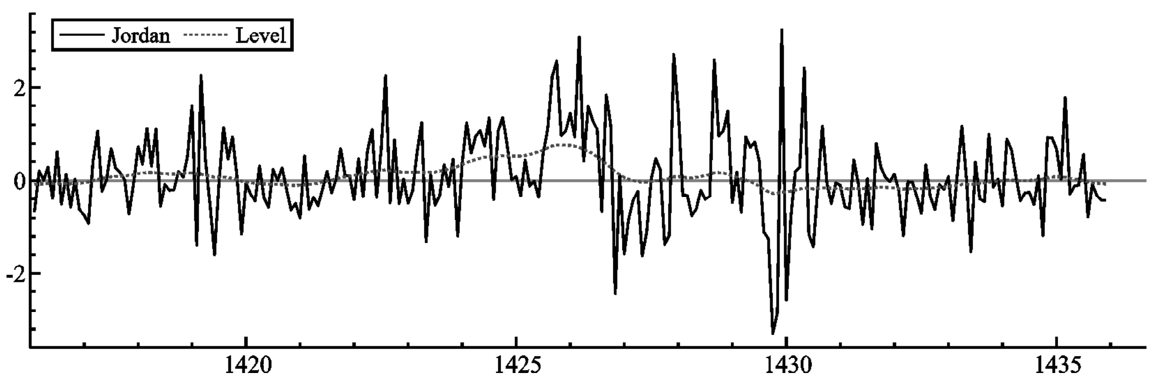

Figure 5: Observed returns and trend for Jordan

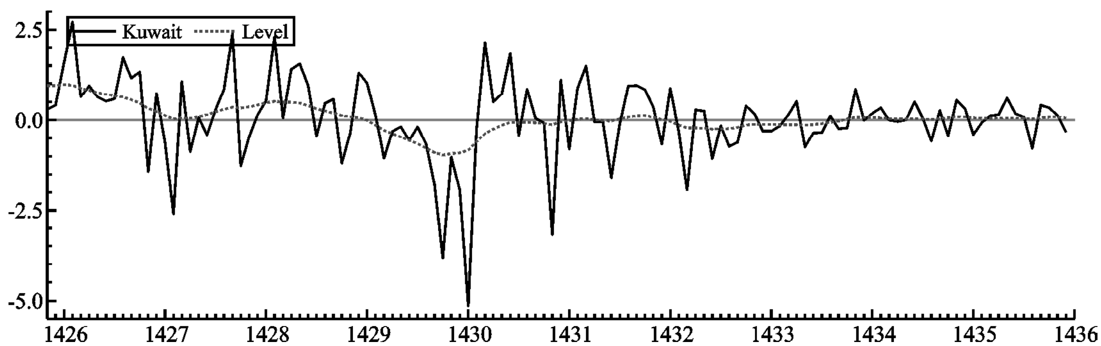

Figure 6: Observed returns and trend for Kuwait

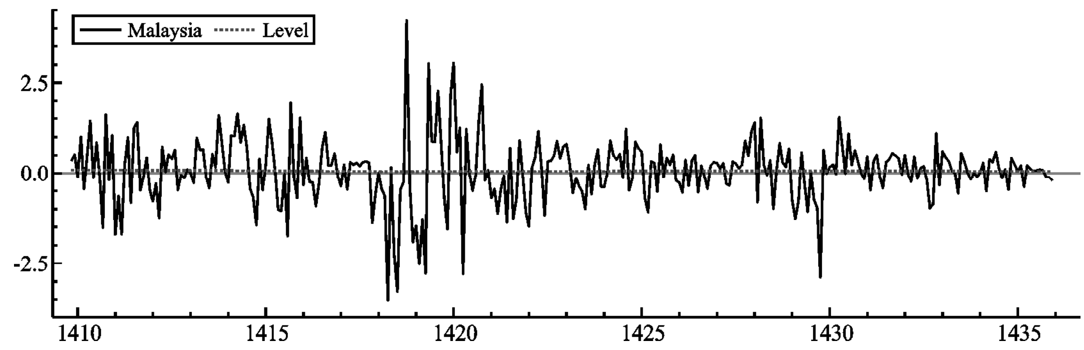

Figure 7: Observed returns and trend for Malaysia

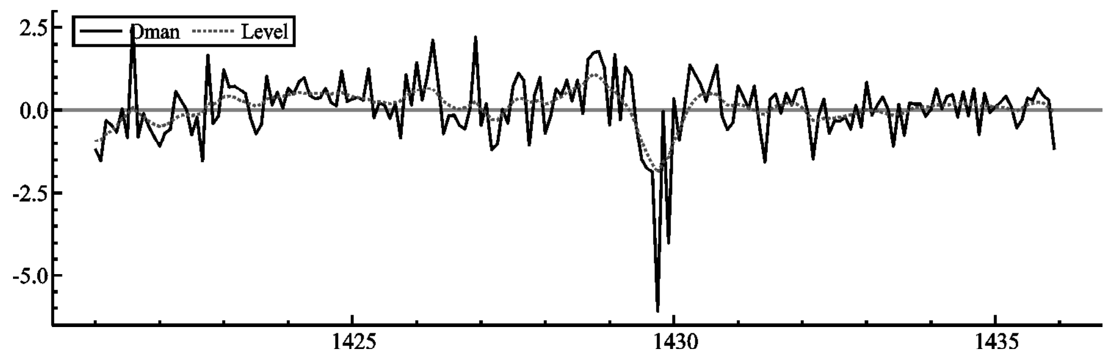

Figure 8: Observed returns and trend for Oman

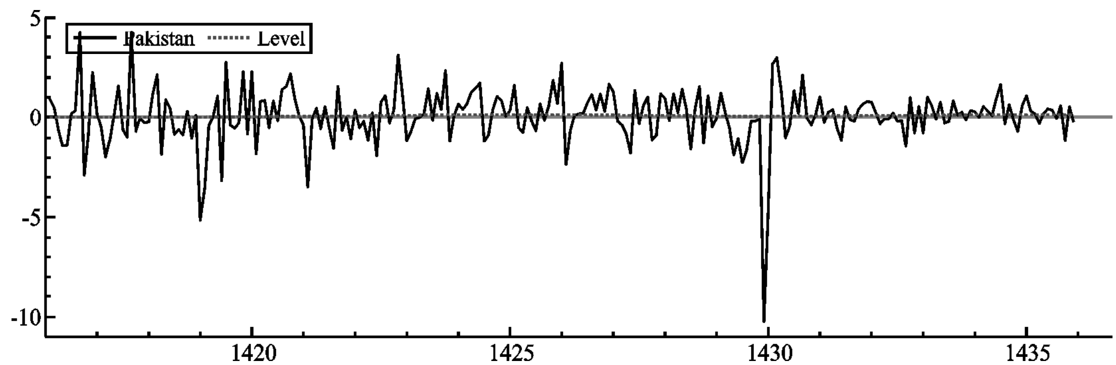

Figure 9: Observed returns and trend for Pakistan

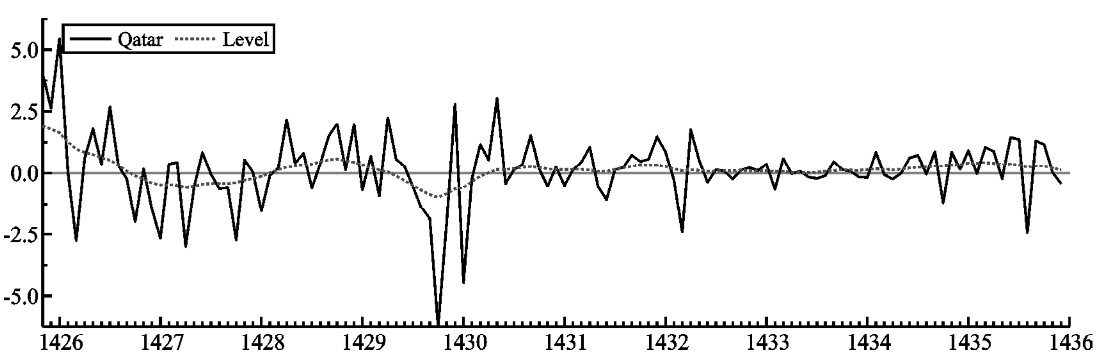

Figure 10: Observed returns and trend for Qatar

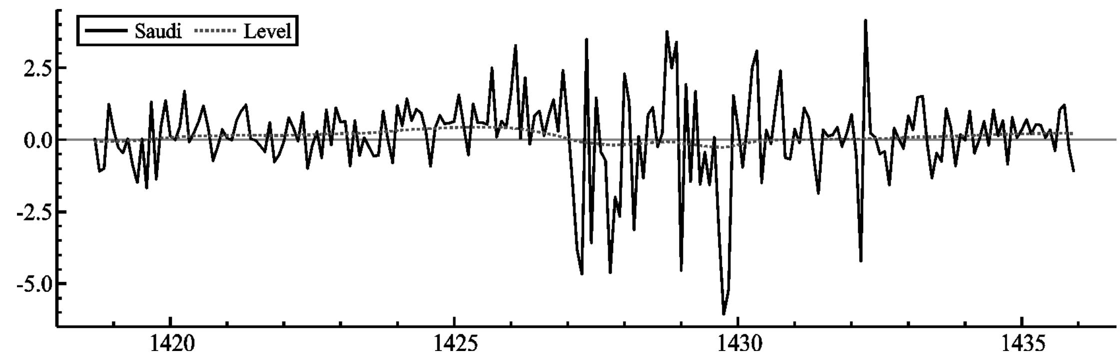

Figure 11: Observed returns and trend for Saudi Arabia

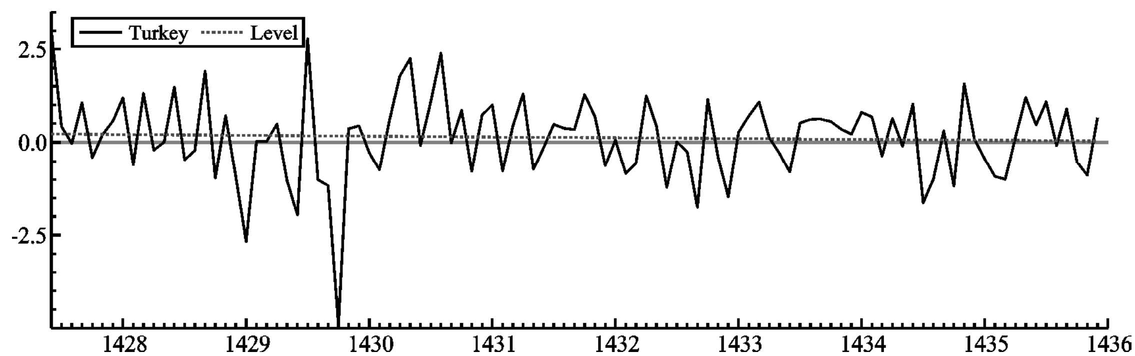

Figure 12: Observed returns and trend for Turkey

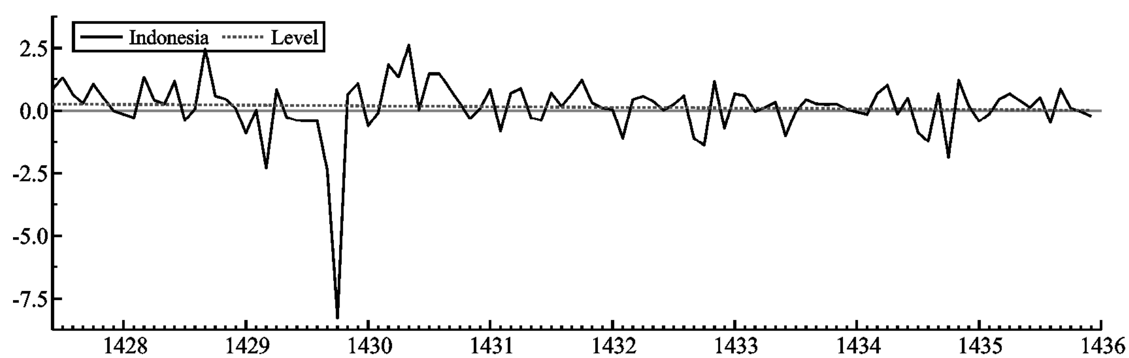

Figure 13: Observed returns and trend for Indonesia

NOTES

1. Studies examining the Ramadan return seasonality using long-term data (the whole period of the available data set) and/or short-term data (that divide the data set into sub-periods).
2. We are motivated to extend our analysis in this direction by previous research that suggests that *Ramadan* is associated with a significant drop in market volatility (Husain, 1998, Seyyed *et al.*, 2005, Bia *et al.*, 2012, Halari *et al.*, 2015).
3. Specifically, they tested the holy days of *Rosh Hashanah* and *Yom Kippur* for the Jewish religion, and St. Patrick's Day for the Catholic Irish.
4. Previous studies have applied similar ratios as a risk-adjusted method to measure the performance of equity indices (Hassan and Girard, 2010, Ho *et al.*, 2014).

5. Similar to previous studies, we use a proxy for the risk-free rate (Hassan and Girard, 2010, Ho *et al.*, 2014, Al-Khazali *et al.*, 2014). Specifically, we use the monthly discount rates of domestic central banks.

REFERENCES

Ahmed, S. A. (2000). Global need for a new economic concept: Islamic economics. *International Journal of Islamic Financial Services*, 1(4):13–27.

Al-Awadhi, A. M., Dempsey, M. (2017). Social Norms and Market Outcomes: The Effects of Religious Beliefs on Stock Markets. *Journal of International Financial Markets, Institutions & Money,* 50C, 119–134.

Al-Hajieh, H., Redhead, K., and Rodgers, T. (2011). Investor sentiment and calendar anomaly effects: A case study of the impact of Ramadan on Islamic Middle Eastern markets. *Research in International Business and Finance*, 25(3):345–356.

Al-Ississ, M. (2015). The holy day effect. *Journal of Behavioral and Experimental Finance*, 5:60–80.

Al-Khazali, O. M., Koumanakos, E. P., and Pyun, C. S. (2008). Calendar anomaly in the greek stock market: Stochastic dominance analysis. *International Review of Financial Analysis*, 17(3):461–474.

Al-Khazali, O., Lean, H. H., and Samet, A. (2014). Do Islamic stock indexes outperform conventional stock indexes? A stochastic dominance approach. *Pacific-Basin Finance Journal*, 28:29–46.

Al-Khazali, O. (2014). Revisiting fast profit investor sentiment and stock returns during Ramadan. *International Review of Financial Analysis*, 33:158–170.

Al-Masri, R. Y. (2007). Speculation between proponents and opponents. *Islamic Economics*, 20(1):43–52.

Al-Saad, K. and Moosa, I. A. (2005). Seasonality in stock returns: evidence from an emerging market. *Applied Financial Economics*, 15(1):63–71.

Almudhaf, F. (2012). The Islamic calendar effect: Evidence from twelve stock markets. *International Research Journal of Finance and Economics*, 87:185–191.

Biakowski, J., Etebari, A., and Wisniewski, T. P. (2012). Fast profits: Investor sentiment and stock returns during Ramadan. *Journal of Banking & Finance*, 36(3):835–845.

Brenner, M. (1977). The effect of model misspecification on tests of the efficient market hypothesis. *The Journal of Finance*, 32(1):57–66.

Canepa, A. & Ibnrubbian, A. (2014), Does faith move stock markets? Evidence from Saudi Arabia, *The Quarterly Review of Economics and Finance,* 54(4): 538–550.

Durand, R. B., Koh, S. & Limkriangkrai, M. (2013), Saints versus sinners. Does morality matter?, *Journal of International Financial Markets, Institutions and Money*, 24, 166–183.

Edmans, A., Garcia, D., and Norli, Ø. (2007). Sports sentiment and stock returns. *The Journal of Finance*, 62(4):1967–1998.

Fraser, P. & Power, D. M. (1992), Predictability, trends and seasonalities: an empirical analysis of UK investment trust portfolios 1970–1989, *Applied Financial Economics*, 2(3): 161–171.

Frieder, L. and Subrahmanyam, A. (2004). Nonsecular regularities in returns and volume. *Financial Analysts Journal*, 60(4):29–34.

Halari, A., Tantisantiwong, N., Power, D. M., and Helliar, C. (2015). Islamic calendar anomalies: Evidence from Pakistani firm-level data. *The Quarterly Review of Economics and Finance*, 58:64–73.

Harvey, A. C. (1990). *Forecasting, structural time series models and the Kalman filter*. Cambridge university press.

Harvey, A. and Scott, A. (1994). Seasonality in dynamic regression models. *The Economic Journal*, pages 1324–1345.

Harvey, A. (1997). Trends, cycles and autoregressions. *The Economic Journal*, pages 192–201.

Hassan, M. K. and Girard, E. (2010). Faith-based ethical investing: The case of Dow Jones Islamic indexes. *Islamic Economic Studies*, 17(2):1–31.

Ho, C. S. F., Rahman, N. A. A., Yusuf, N. H. M., and Zamzamin, Z. (2014). Performance of global Islamic versus conventional share indices: International evidence. *Pacific-Basin Finance Journal*, 28:110–121.

Hui, T.-K. (2005). Day-of-the-week effects in US and Asia–Pacific stock markets during the Asian financial crisis: A non-parametric approach. *Omega*, 33(3):277–282.

Husain, F. (1998). A seasonality in the Pakistani equity market: The Ramadhan effect. *Pakistan Development Review*, 37(1):77–81.

Kamali, M. H. (1996). Islamic commercial law: An analysis of futures. *American Journal of Islamic Social Sciences*, 13(2):197–224.

Ljung, G. M. & Box, G. E. (1978), On a measure of lack of fit in time series models, *Biometrika,* 65(2): 297–303.

Naughton, S. and Naughton, T. (2000). Religion, ethics and stock trading: The case of an Islamicequities market. *Journal of Business Ethics*, 23(2):145–159.

Priestley, R. (1997), Seasonality, stock returns and the macroeconomy, *The Economic Journal* 107(445), 1742–1750.

Seyyed, F. J., Abraham, A., and Al-Hajji, M. (2005). Seasonality in stock returns and volatility: The Ramadan effect. *Research in International Business and Finance*, 19(3): 374–383.

Shefrin, H. (2010). *Behavioralizing Finance*. Now Publishers Inc.

Sokal, R. R., Rohlf, F. J. *et al*. (1969), The Principles and Practice of Statistics in Biological Research, *WH Freeman and Company San Francisco*.

Zaher, T. S. and Kabir Hassan, M. (2001). A comparative literature survey of Islamic finance and banking. *Financial Markets, Institutions & Instruments*, 10(4):155–199.