Fast profits in a fasting month? A markov regime switching approach in search of ramadan effect on stock markets

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Fast profits in a fasting month? A markov regime switching approach in search of ramadan effect on stock markets

Faruq Hasbullah[1] and Mansur Masih*

Abstract

Ramadan is deemed to be the holiest month which is observed by 1.6 billion Muslims across the world. We investigate the stock returns during Ramadan for 5 biggest stock markets in Muslim majority countries (Saudi Arabia, Malaysia, Turkey, Indonesia and Kuwait) by taking weekly data over the period of 5 years. By applying the Markov Regime Switching technique we found out that there is not enough evidence to conclude that Ramadan effect plays a significant part in providing investors with higher return during the one-month period. However, we found out that all the stock exchanges move in the same direction during the Ramadan 2012 and Ramadan 2015 which perhaps may be attributed to the Eurozone Crisis and oil price drops. These show that external factors may play a far bigger role in determining the returns from the stock market than a seasonality effect.

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1. Introduction

Stock market and religion. These two words are rarely spoken with regard to one another, let alone belonging in the same sentence. However, with the breakthrough of Behavioral Finance which places emphasis and combine behavioral and cognitive psychological theory with conventional economics and finance, there are perhaps answers on why people commit irrational financial decision. As we know it, the stock market is an elusive beast. Always sought after, but never been tamed. A lot of researches have been done for the sake of explaining its behavior, but there are never conclusive evidence to wholly explain why it acts the way it did. That is why any attempt to undress the phenomenon that is the stock market is welcomed not just in the finance world, but also among the academicians. Tying in stocks with religion to a certain degree might seem to be an unforgiving task a couple of decades back, however, the development of various econometric techniques as well as greater insight on the mechanism of the stock market have led to a glimmer of hope in unboxing the mystery of stock market. Case in point would be the researches that have been done to study the behavior of stock market around the religious festivities period, especially when it is an important event celebrated by the majority of the country. As a continuation of the good work by academicians all over the world, this study will humbly seek to contribute to the subject.

Explaining the Ramadan effect on the stock market is a task which had been undertaken numerous times over the past few decades. However, as it stands, all of the researches made use of the event study technique to study the cumulative abnormal return on the stock market for the period of Ramadan. While well established, event study methodology assumes market efficiency, where the market will accurately react to new information instantaneously. There is also a question of the reliability and stability of the relationship

between firms in question and the reference index. After all, a movement in the index might not reflect the actual movement of the majority of the stocks represented by the index itself. These limitations will bring about opportunity to address the same issue with other techniques, and this is where Markov Switching comes into play.

As a non-linear technique, Markov Switching examines whether there exists any regime shift in between various financial variable, for example crisis/non-crisis, bullish/bearish period, high volatility/low volatility and so on. Treading further, Markov Switching will allow for the calculation of the probabilities of a shift between the two regimes and their duration as well as ability to answer the question whether the correlations between variables vary across regimes. These characteristics bode well for this study, as by employing Markov Switching technique, we would be able to monitor if there is indeed any shift between the bullish and bearish period in the stock market with regard to the Holy Month of Ramadan.

There is also a question about the validity of Ramadan effect, as throughout the years, there are conflicting conclusions being made by researchers. While the theoretical basis seems plausible, the empirical results would prove inconclusive. Hence this study will humbly attempt to further ask the question of the authenticity of Ramadan effect on the stock market.

This study will look into the five biggest stock markets in the Muslim majority nations, namely: Saudi Arabia, Kuwait, Turkey, Malaysia and Indonesia, with the weekly data obtained from 2011 to 2015, for an instance of 25 periods of Ramadan. The result shows that there is no clear significant evidence of Ramadan effect to be happening in the stock exchange, although some are more obvious than the others. We find that this result is a mix bag of consistency with other studies on the same subject matter.

The remainder of this paper is organized as follows: Section 2 will discuss the previous literatures in detail with regard to fixed and non-fixed calendar events which includes prior papers on Ramadan effect. Section 3 will outline the data set as well as methodology while section 4 will elaborate on the result and finding. This will be followed by the final chapter which will discuss the implications of the paper, and the final section will conclude the paper.

2. Literature Review

The seasonal effect on stock market returns has long been the subject of studies over the past few decades. One of the most common topic which are well covered is the January effect and the day of the week effect anomalies (Reinganum, 1983, Fountas & Segredakis, 2002, Chu, Liu, & Rathinasamy, 2004). The findings have been remarkably consistent across all the studies where the authors have find out that stock returns are significantly higher in the month of January, especially when it comes to the firms with a smaller market capitalization. While there have been a multitude of explanations given for the anomaly including tax-loss selling hypothesis, institutional investors effort for window dressing their portfolio and the small-firm risk factors, the one which this study will focus on is with regard to the human behavior, where the feel good factor acts as a precursor to a higher stock return. One good example of the impact of psychological evidence and casual intuition predict that sunny weather is associated with upbeat mood has been covered by Hirshleifer & Shumway (2003). The authors have found out that there is indeed a correlation between the upbeat mood of the investors and the stock returns. While the January Effect concerns itself with the festivity mood surrounding Christmas and New Year holidays, the day of the week effect studies are more concerned on the investors mood on the first day of work of the week, Monday. Incidentally, as far as the

US markets are concerned, studies have found out that the average return on Monday is significantly less than on any given days of the week ((Jaffe & Westerfield, 1985, Solnik & Bousquet, 1990) .

While the January and the day of the week effect are referred to as the fixed calendar events and have been examined thoroughly for the past few decades, the effect of moving calendar events which are based on the lunar calendar, such as the month of Ramadan, on risk and return have not been looked at as extensively. The dearth of literatures covering the effect of the month of Ramadan to the stock market is glaring as it was not until 1998 that Husain, 1998 studied the Ramadan effect on the Karachi Stock Exchange. A few years after, Seyyed, Abraham, & Al-Hajji (2005) followed suit with an investigation on the Ramadan impact to the Saudi Stock Exchange during the period of 1985 to 2000. The conclusion for both studies are similar showing that there is no effect on the mean returns, albeit with a lower volatility during the month of Ramadan.

Contrary to the previous findings, Bialkowski, Etebari, & Wisniewski (2010), with the use of data from 14 countries reported that there is indeed significant increase in stock returns, while at the same time having lower volatility as well as no change of trading volume during the month of Ramadan. Supporting the positive outcome are the study by Al-Hajieh, Redhead, & Rodgers (2011), which study the market of Turkey, Jordan, Egypt, Kuwait and Saudi Arabia between the year 1992 to 2007. They concluded that there is indeed strong evidence of significant and positive seasonal effect for the whole of the month of Ramadan towards the Stock Market in those countries. Taking the Tunisia Stock Market as the focus on their study, Gouider, Kaddour, & Hmaid (2015) also concluded positively, with a notable increase in the returns within the period of study from 2006 to 2013.

Ramadan is an event capable of influencing the moods and decisions of the adherents. During Ramadan participating Muslims seek a closer relationship with Allah and follow a set of prescribed standards of behavior intended to make them become better Muslims and more responsible members of society, which can improve their feelings of self-worth. Thus, we expect Ramadan to produce an upbeat sentiment, overconfidence and a greater willingness to accept risk by Muslim investors.

a. Theoretical Underpinnings: Behavioral Finance

It has been a long standing argument in the behavioral finance literature that the actions and performances of people are heavily influenced by how they feel (Elliot and Echols, 1976). The stock market has indeed been thought of as a direct index of social mood for it reflects the combined level of optimism or pessimism in society at any given time. Nofsinger (2003) for example, argues that social mood influence the judgments made by all the stakeholders, mainly consumers, investors, and corporate managers. He stresses that the level and nature of business activity will follow social mood rather than leads it. People will spread moods to one another during social interaction; this is of particular importance in Muslim countries during the period of Ramadan. While it is common for people to receive information and opinions from personal contact, subsequently moods and emotions will also be transferred in the process of social interaction (Redhead, 2008). It goes without saying that positive mood is accompanied by a multitude of positive emotions such as optimism, happiness, and hope. On the opposite spectrum, negative mood is associated with the negative emotions such as fear and pessimism. Interestingly, Edmans, Garcia, & Norli(2007) provide evidence for the influence of social mood on share prices by measuring social mood using the results of international football matches. Defeats in the football, breeds negative returns in the stock market. Of course, the effects were associated to the significance of the matches, and to the weight of football to the

country, where for example it is highly important South America and Europe but very much less so for North America. With the month of Ramadan regarded as the holiest of month, it is argued that similar social mood effects will exist throughout the month in the Muslim countries.

To an unassuming mind, Ramadan as a fasting month will leave the Muslims hungry and grumpy, translating into poor mod for the investors. However, more often than not it is the contrary as a person religiosity would dictate how he is coping with the hunger. As a matter of fact, the general consensus is that the investors feel better while trading during Ramadan. However, as indicated, Ramadan can also be a time of uncertainty which means that the emotions experienced are not all uniformly positive. If Ramadan is accompanied by greater emotional uncertainty, it is likely that the uncertainty would spread to many aspects of a person's life. Decisions, including and perhaps especially financial decisions, are affected by emotions arising from other aspects of a person's life. A religious holiday, or good news about a friend, can engender a good feeling, and the good feeling will ultimately affect investment decisions. The effect of emotions increases with the complexity and uncertainty surrounding the decision. Decisions about complex and uncertain matters are particularly influenced by emotions, such as those experienced by Muslims during Ramadan).

Based on these behavioral finance literatures, it can only be deduced that uncertainty will remain to be a key element in determining the direction of the stock market throughout the entire month. As such, whatever feel good factor generated from the Ramadan effect might come to naught should other negative factors step into consideration. Hence, the best way to validate the propositions brought forward by the underlying principles of behavioral finance is to put it to test, which is what this study is motivated to do.

3. Data & Methodology

As the representative of the Muslim world stock market, the top 5 biggest stock exchanges with regards to its market capitalization are chosen. They are: Saudi Arabia Stock Market (TASI), Kuwait Stock Exchange (KSE), Indonesia Stock Exchange (IDX), the Turkey stock market represented by Borsa Istanbul (BI) and finally the Malaysian stock market represented by Bursa Malaysia (KLCI). The weekly closing data for these markets are obtained for the period of 5 years between 2011 and 2015 bringing about 261 observations per year and 25 Ramadan periods in total. They are obtained from the Datastream extension of Microsoft Excel which are provided by Thomson-Reuters.

The determination of the month of Ramadan which is the ninth month in the Islamic Lunar Calendar is simply done by cross checking with Islamic Calendars which are done on the basis of calculation and sight, since the announcement of the arrival of Ramadan will need to be verified by the sight of the new moon on the eve of Ramadan by the scholars appointed by the authorities, failing which a reliance on the Mathematical formulation to validate the date will be necessary. As such, predicting the future date of Ramadan will not be a straight forward exercise but rather require careful consideration. However, since the study is done on hindsight, such problem does not arise. The month of Ramadan are celebrated by the Muslims within these time frames:

1. 31/7/2011 - 30/8/2011
2. 19/7/2012 – 18/8/2012
3. 8/7/2013 - 7/8/2013
4. 28/6/2014 – 28/7/2014
5. 17/6/2015 – 17/7/2015

In order to differentiate Ramadan from the other months, it is depicted as the grey area in all the graphs which are presented in this paper.

The Markov-switching model, developed by Hamilton (1989), provides an attractive alternative to model a time series subject to regime shifts and will be used extensively in this section. The Markov-switching model is a multiple-regime model which does not assume a prior the number of regimes, though there are studies of the stock markets using exactly two regimes in their Markov-switching models.(Turner, Nelson, & Startz, 1989) The number of regimes is data dependent and can be estimated. Furthermore, the regime shift is dominated by the Markov chain, a kind of stochastic process. More interestingly, the Markov-switching model permits optimal statistical inference about the estimated regimes. Specifically, this model derives the probability of the return of a given week belonging to a certain estimated regime

In the Markov-switching model, the path of time series data takes the form of a non-linear stationary process. In particular, the data is modeled as an autoregressive process with parameters subject to regime switching as determined by the outcome of a first-order Markov chain. Suppose the stock return follows a Markov-switching model. Then basing on Hamilton (1989) body of work:

$$R1 - \mu_1 = \varnothing_1 (R_{t-1} - \mu_{t-1}) + \varnothing_2 (R_{t-2} - \mu_{t-2}) + \ldots + \varnothing_1 (R_{t-r} - \mu_{t-r}) + \varepsilon_1$$

Where R_t is the stock return at time t and ε_1 is assumed to be normally distributed with zero mean and finite variance σ^2. The regime-dependent mean μ_1 has its own dynamics, specified as a K-state first order Markov chain.

$$\mu_t = \beta_{st},$$

where S_t is an unobserved state variable at time t with values in a finite state space S= {1,2…K). Since elements of S are the possible regimes of the mean return, S_t represents the regime at time t. When the regime at time t is equal to j(S_t = j), the mean return at time t is equal to β_j i.e $\mu_t = \beta_j$.

Instead of being a non-stochastic dummy variable, S_t is characterized by a first-order Markov chain.

Prob (S_t= j I S_{t-1} = I, S_{t-2} = k…, R_{t-1}, R_{t-2} …)

= Prob (St = j I S_{t-1} =i) = P_{ij} for i,j = 1,2…K

The sequence (S0, S1, S2…} represents the historical regimes of the mean return that evolve according to the probability law shown above. One distinct property is that the conditional distribution of the next regime S_{t+1} given the present regime S, must not depend on the distant past information set {S_{t-1}, S_{t-2}…., R_{t-1}, R_{t-2}….}. The transition probability, p_{ij}, is the probability of observing regime j at time t, given that the regime at time t-1 is equal to i. These probabilities characterize regime shifts of the time series data. The transition probabilities, pij, for a K*K transition probability matrix P =[p_{ij}]. It is possible to extend the first order Markov chain to a higher order to allow for longer memory in the stock return regime shift. However, doing this will involve enormous unknown parameters when large number of regimes are considered, as in this paper. Hence we avoid this complication in this paper.

The first order Markov-switching model is represented by the Equations 1 through 3. It contains two kinds of dynamics; the dynamics of the conditional mean, which is modeled by the autoregressive process; and the dynamics for the state variable St, which is modeled by the first-order Markov chain. The parameters in the Markov-switching model in Equations 1 through 3 include the lag coefficients $ø_{1, } ø_{2, ...,}$ and $ø_{t,}$ the mean returns for

different regimes β_1, β_2, … and β_K, the transition probabilities p_{ij}, I,j = 1,2,… K, and σ^2. These unknown parameters can be estimated using the maximum likelihood method. As a by-product, probabilistic inferences about the unobserved regimes can also be drawn via the "r-lag smoother". The r-lag smoother is the inferential probability of St given the observations up to time t+r, ie. P(St I .) = P (S_t I R_{1+r}, R_{t+r-1} …) P(St I .). These estimation and inference procedures are derived from the basic filtering algorithm in Hamilton.

The regression with the Ramadan dummy and the Markov-switching model share some similarities; although they also differ in other respects. Both approaches are the regime shift models and the regime shifts are temporal dependent. In a two-regime case, the regime shift in the regression with the Ramadan dummy is determined by the calendar. The regime shifts in the Markov-switching model is determined by the regimes in the consecutive periods. More specifically, the dummy variable regression can be viewed as a special case of the Markov-switching model. The regression with a Ramadan dummy implies that St=1 for Ramadan and St = 2 otherwise. In other words, P(St=1) =1 when in Ramadan and P(St=1) = 0 otherwise. Hence, the regime switches are certain (non-stochastic) and exogenously determined by the calendar. In contrast, the Markov-switching model permits two possible regimes at each time t, both in Ramadan and non-Ramadan. Above all, regime switches are modeled by a stochastic Markov chain. Each regime in any given time period can shift to either regime in the next period. The characteristic of the regime shift is then endogenously determined by the observed data. As the differences suggests, the Markov-switching model is a more flexible model of regime shifts than is the dummy variable regression approach.

4. Results and Findings

Summary of AIC Statistics

	AR(1)	AR(2)	AR(3)	AR(4)	AR(5)
BI	-3.987957	-4.009253	-3.987015	-4.007192	-3.998860
IDX	-4.724443	-4.716034	-4.734745	-4.727155	-4.634395
KLCI	-5.710692	-5.704939	-5.650144	-5.650081	-5.717749
KSE	-5.439320	-5.434870	-5.423410	-5.430848	-5.420639
TASI	-4.538094	-4.530028	-4.524271	-4.528450	-4.522555

In order to obtain the most optimum specification for the 2 regime model, the data of all 5 stock market indices were run with varying auto regressive (AR) component from 1 to 5. The figures of AIC statistics are recorded and the one with the biggest figure (disregarding the negative symbol) are selected as the lag component of the respective indices. As shown in the table above, AR(1) was selected for both Kuwait and Saudi Stock Exchange, while for Turkey, AR(2) was selected. The series for Indonesia Stock Exchange were run with 3 autoregressive lags, while finally AR(5) is chosen for the Malaysian Stock Exchange (KLCI)

a. Borsa Istanbul

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	-0.064668	0.017236	-3.751842	0.0002
Regime 2				
C	0.003671	0.002333	1.573781	0.1155

Table 1: Regime Coefficients

Based on the table above, we can clearly see that the bear regime is represented by Regime 1 with a coefficient of -0.064668 which indicates weak returns while the bull regime is represented by Regime 2 with a coefficient of 0.003671. The table below meanwhile indicates that for regime 1, it has a 26% chance to stay in the same regime for the following period with an 80% chance of switching to the bull regime. A bull regime on the other hand has 96% chance to stay within the same regime, with only 3.8% to switch to regime 2 in the following period. Duration wise, a bear regime will remain in the same state for 1.35 weeks while the positive regime tends to linger within the same state for 26.4 weeks.

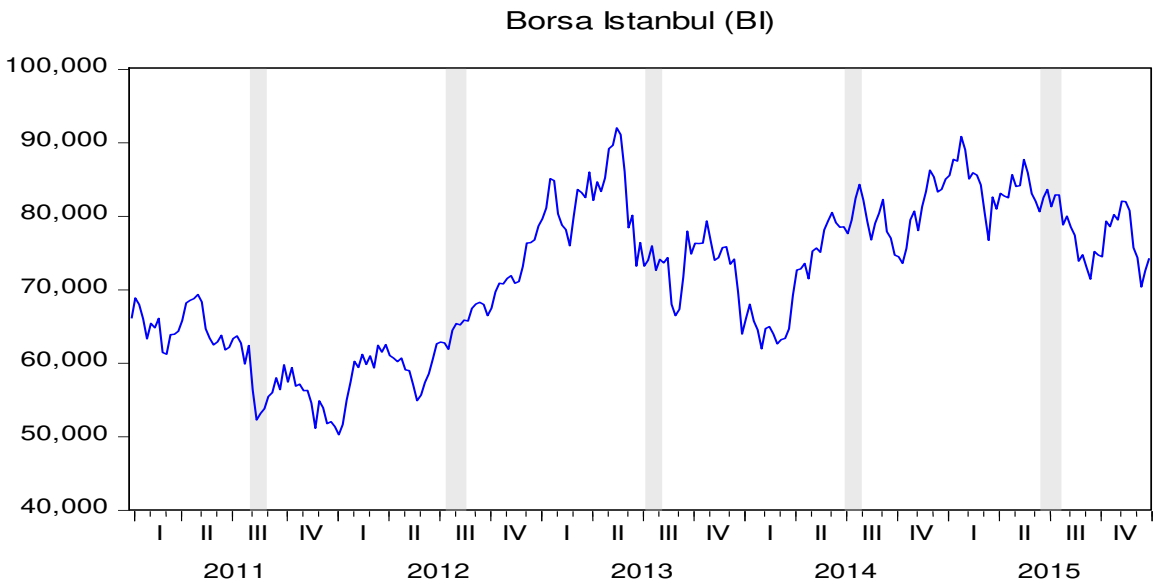
Constant transition probabilities:

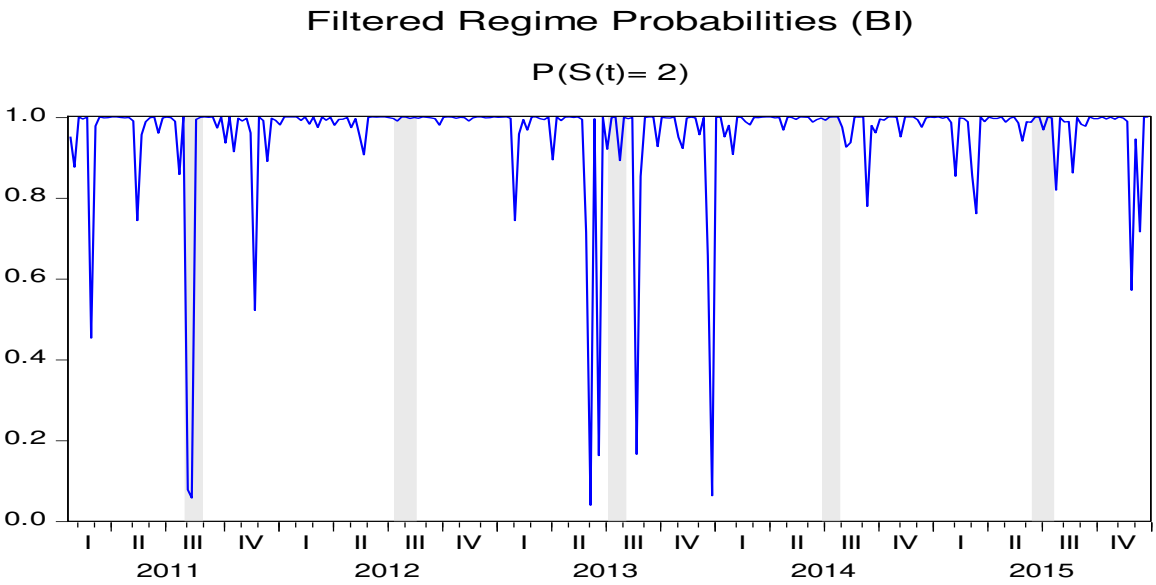
	1	2
1	0.260451	0.739549
2	0.037842	0.962158

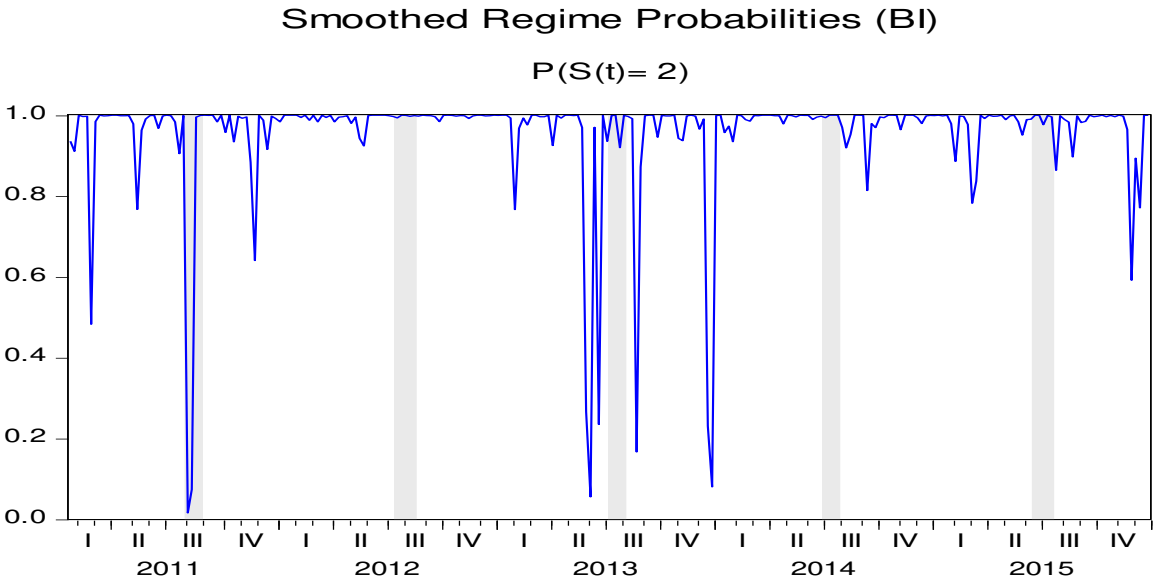
Constant expected durations:

	1	2
	1.352175	26.42585

Table 2: Regime Transition Probabilities and Expected Durations


Borsa Istanbul (BI)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Filtered Regime Probabilities (BI)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Smoothed Regime Probabilities (BI)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015

The drop in the stock market in Ramadan 2011, which coincides with the selloff are brought about by the fears of contagion due to the European sovereign debt crisis to Spain and Italy. As such the abrupt change in regime has offset any positive vibe which might be originated from Ramadan effect. However, it can still be seen that the recovery has been quick and happens within the fasting month. As for the other Ramadan period from 2012 to 2015, there seems to be a strong inclination for higher returns especially in 2014 where there is a shift from bear to bull at the beginning of Ramadan. Even if the momentum is being carried over from the month prior, it still highlights the strength that a Ramadan effect might possess. As such, we cannot rule out the existence of Ramadan effect for the Borsa Istanbul.

b. Indonesia Stock Exchange

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	0.003542	0.001369	2.586851	0.0097
Regime 2				
C	-0.049465	0.014201	-3.483257	0.0005

Table 3: Regime Coefficients

Based on the table above, we can clearly see that for the Indonesia Stock Exchange, the bear regime is represented by Regime 2 with a coefficient of -0.049465 which indicates weak returns while the bull regime is represented by Regime 1 with a coefficient of 0.003542. The table below meanwhile indicates that for regime 1, it has a 96.6% chance to stay in the same regime for the following period with a 3.4% chance of switching to the bear regime. A bear regime on the other hand has 30.9% chance to stay within the same regime, with 69.1% chance to switch to regime 1 in the following period. Duration wise, a bear regime will remain in the same state for 1.45 weeks while the positive regime tends to linger within the same state for 29.6 weeks.

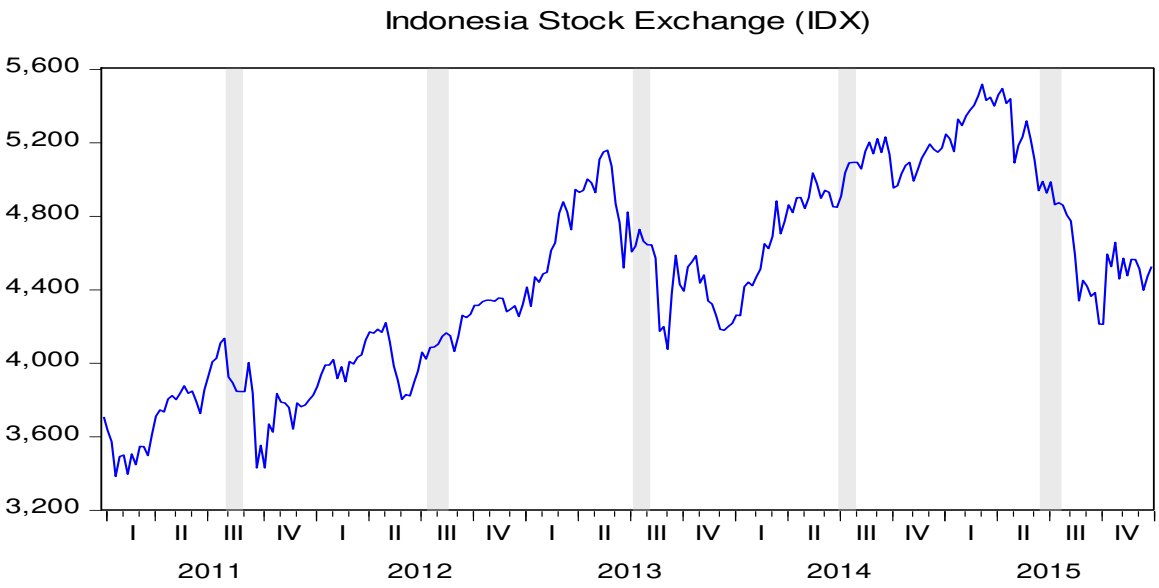
Constant transition probabilities:

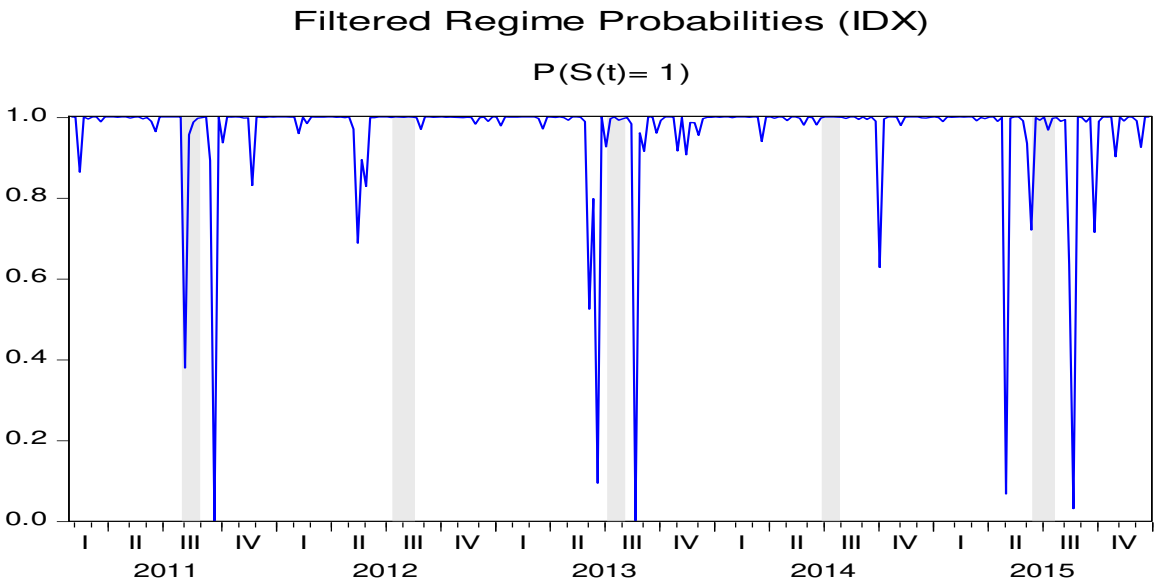
	1	2
1	0.966217	0.033783
2	0.690966	0.309034

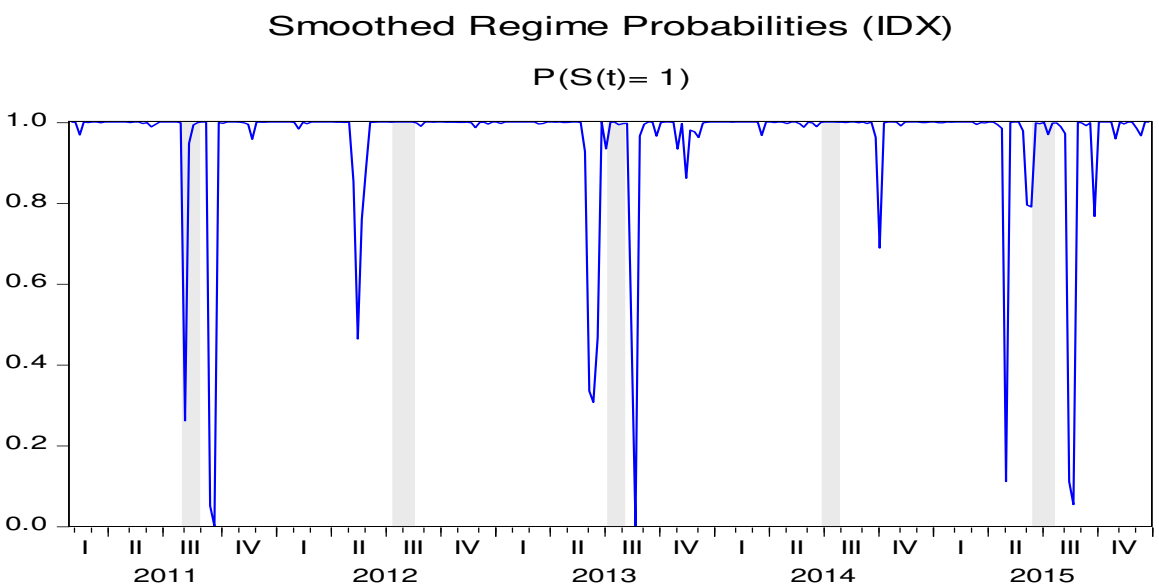
Constant expected durations:

	1	2
	29.60032	1.447249

Table 4: Regime Transition Probabilities and Expected Durations


Indonesia Stock Exchange (IDX)
5,600
5,200
4,800
4,400
4,000
3,600
3,200
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Filtered Regime Probabilities (IDX)
P(S(t)= 1)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Smoothed Regime Probabilities (IDX)
P(S(t)= 1)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015

Similar to Borsa Istanbul, the IDX also faced the same predicament with the selloff during the 2011 Ramadan, rendering the effect less effective, although it must be said that the bear regime did not persist long enough to cause major hit to the index. However, for the next 4 Ramadan, it can be seen that the bull regime is unperturbed even if the 2015 Ramadan there was a switch to the bear regime going into the fasting month. The Ramadan 2012 and 2014 is somewhat impressive, when crosschecked with the index, as the bull regime switches to an even higher gear for a better return during that period of time. However the pullback experience during Ramadan 2013 and 2015 simply offsets the premise that the IDX might experience from a consistent Ramadan effect.

c. Bursa Malaysia

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	0.001592	0.000779	2.042076	0.0411
Regime 2				
C	-0.034579	0.006519	-5.304580	0.0000

Table 5: Regime Coefficients

The above table indicates that for Bursa Malaysia, the bull regime is represented by Regime 1 with coefficient of 0.001592 while regime 2 is bear regime with a coefficient of -0.034579. The table below on the other hand indicates that for regime 1, it has a 97% chance to stay in the same regime for the following period with a 3% chance of switching to the bear regime. A bear regime in the meantime has 17.7% chance to stay within the same regime, with 82.3% chance to switch to regime 1 in the following period. Duration

wise, a bear regime will remain in the same state for 1.2 weeks while the positive regime tends to linger within the same state for a much longer period of 33.9 weeks.

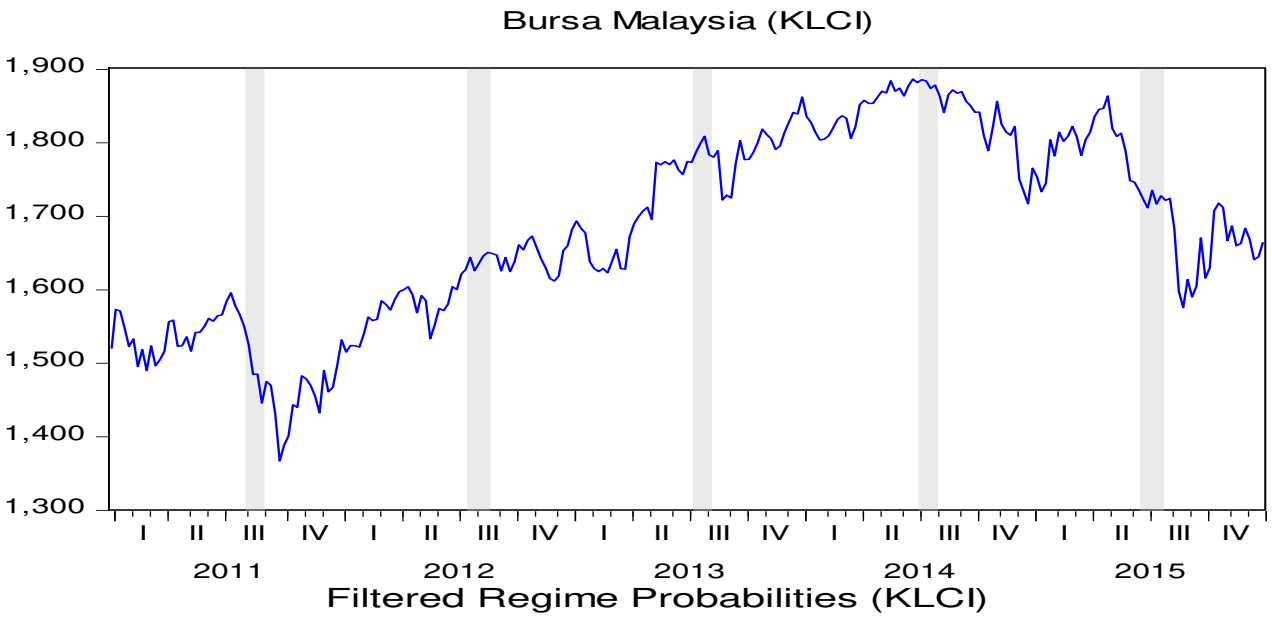
Constant transition probabilities:

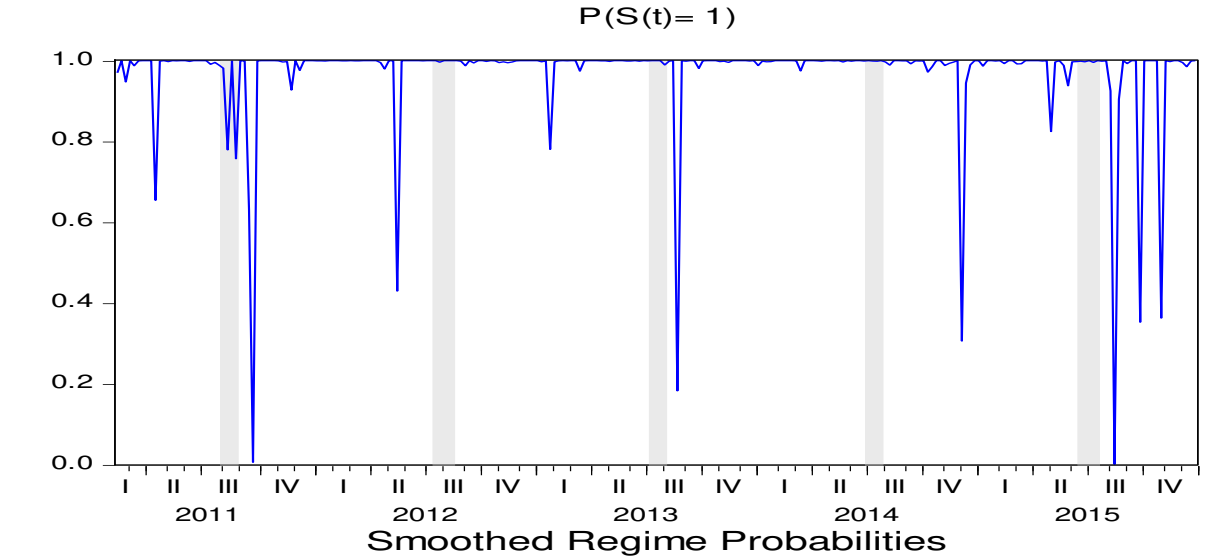
	1	2
1	0.970407	0.029593
2	0.823209	0.176791

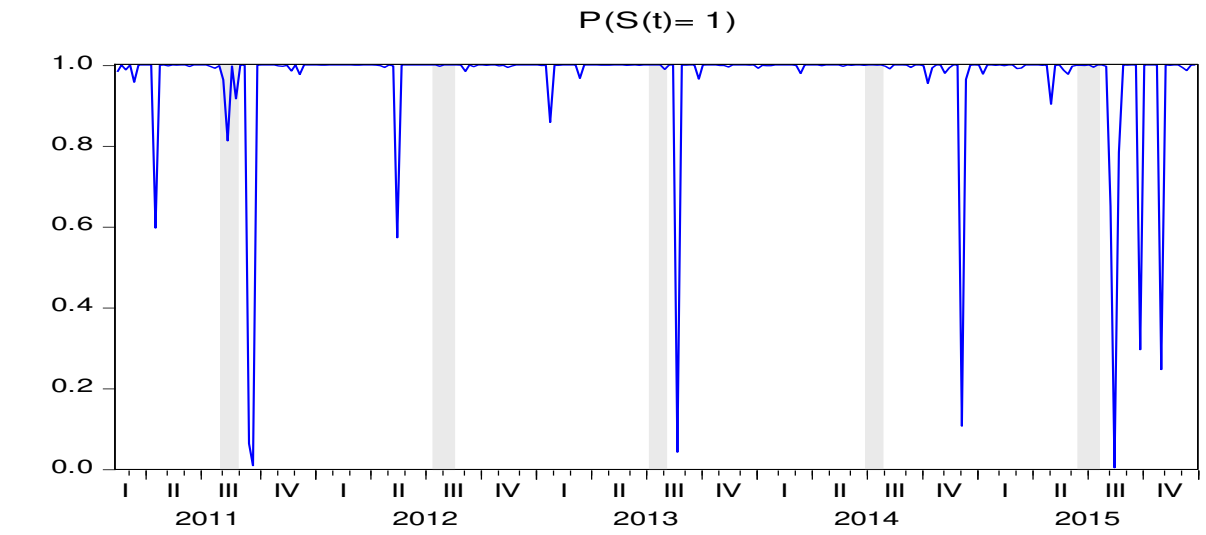
Constant expected durations:

	1	2
	33.79218	1.214758

Table 6: Regime Transition Probabilities and Expected Durations


Bursa Malaysia (KLCI)
1,900
1,800
1,700
1,600
1,500
1,400
1,300
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Filtered Regime Probabilities (KLCI)
P(S(t)= 1)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Smoothed Regime Probabilities
P(S(t)= 1)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015

Interestingly the change in regime during the European sell off in August 2011 was not as severe as the other stock exchanges in this study, although the follow through intensified after a quick recovery. As for the rest of Ramadan from 2012 to 2015, there are no obvious changes to the ongoing regime. As such it is difficult to gauge the strength of a Ramadan effect as the bullishness of the market might just be caused by the momentum from the previous period. It must be said however that upon observation by crosschecking the regime probabilities and the KLCI that Ramadan's effect is insignificant in this market. This may be explained by the fact that even if Malaysia is a Muslim majority nation, the bulk of its wealth is actually controlled by the non-Muslim, mainly the non-Muslim Malaysian Chinese. Hence, when it comes to Malaysia it is perhaps more apt to study not the Ramadan effect, but instead the Chinese New Year, which is also based on lunar calendar to see if it does have effect on the stock market.

d. Kuwait Stock Exchange

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	-0.051514	0.005608	-9.186562	0.0000
Regime 2				
C	0.001300	0.001137	1.143424	0.2529

Table 7: Regime Coefficients

The above table indicates that for the Kuwait Stock Exchange, the bull regime is represented by Regime 2 with coefficient of 0.0013 while regime 2 is the bear regime with a coefficient of -0.051514. The table below on the other hand indicates that for regime 1, it has a 10% chance to stay in the same regime for the following period with a 90% chance of switching to the bull regime. The bull regime in the meantime has 96.3% chance to stay within the same regime, with 3.7% chance to switch to regime 1 in the following period. Duration wise, a bear regime will remain in the same state for 1.1 weeks while the positive regime tends to linger within the same state for a much longer period of 26.9 weeks.

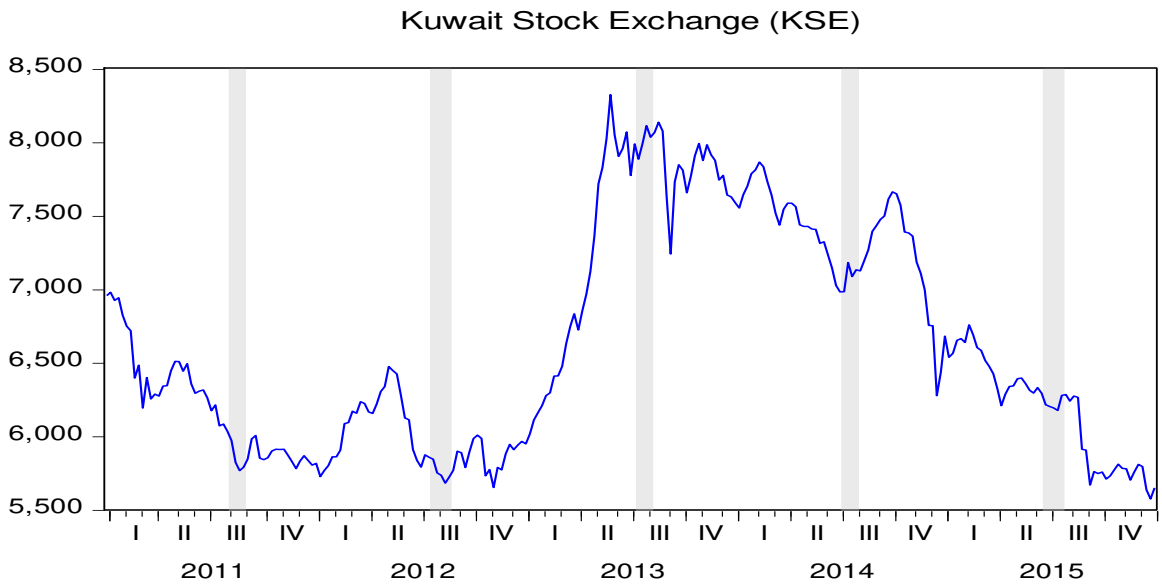
Constant transition probabilities:

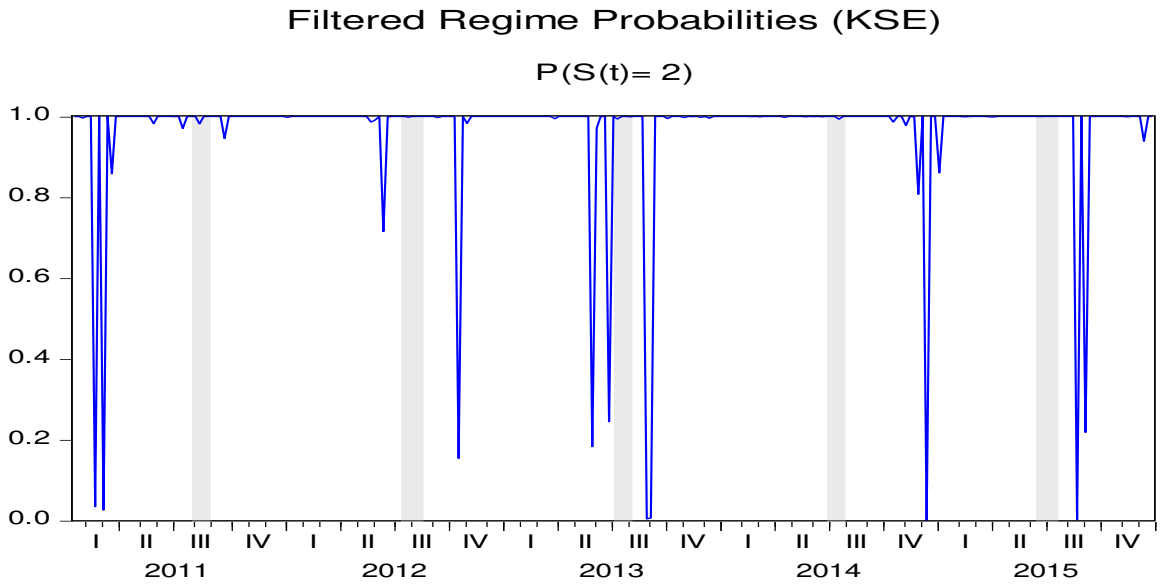
	1	2
1	0.100349	0.899651
2	0.037235	0.962765

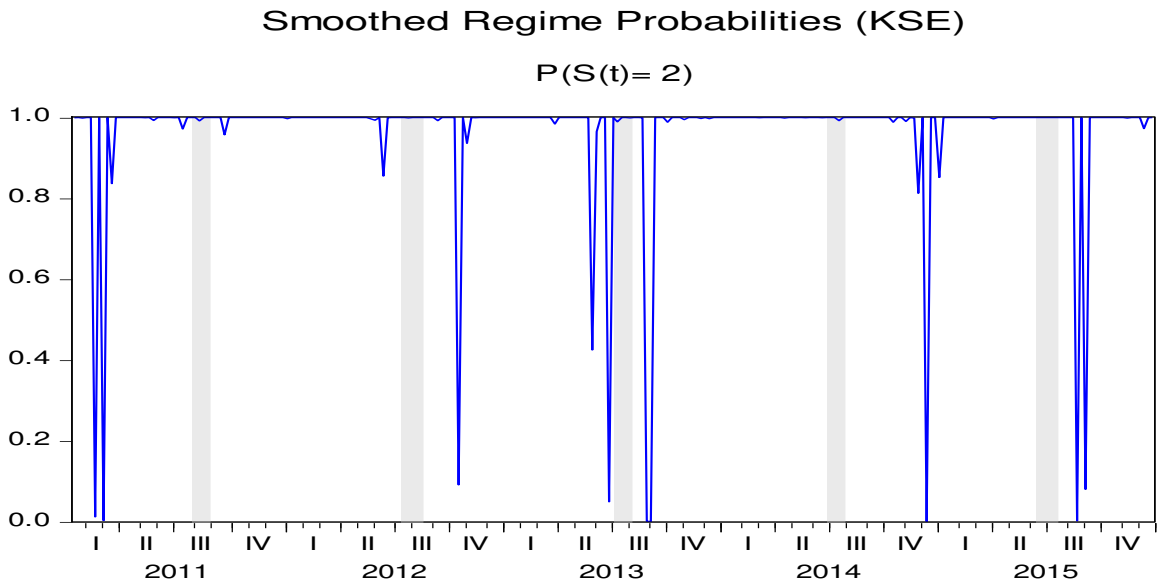
Constant expected durations:

	1	2
	1.111542	26.85634

Table 8: Regime Transition Probabilities and Expected Durations


Kuwait Stock Exchange (KSE)
8,500
8,000
7,500
7,000
6,500
6,000
5,500
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Filtered Regime Probabilities (KSE)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Smoothed Regime Probabilities (KSE)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015

Comparing the 3 charts above, it can be seen that apart from 2013 bear to bull regime changes during the month of Ramadan, there has been a lack of proof on the significance of Ramadan effect to the Kuwait Stock Exchange. In the year 2012, the downward momentum from the previous three months carried through Ramadan negating all the market positivity emanating from the holy month. In the following year, Ramadan emerges after an outstanding run up of more than 2000 points. The market was clearly exhaustive at that point of time and the market was gearing up for a pullback which follows not long after. In the year 2014, Ramadan came just at the right time, halting the index rundown and establish a support to embark on a couple of months' climb. If there is any subtle proof of a Ramadan effect in KSE, then this would be it, however the same cannot be said for the Ramadan of 2015 where the market meekly performed. Such weak performance during this period of time can be linked to the drastic drop in oil prices which significantly reduce the wealth of Kuwait as a nation. It is thus understandable that even if there is a Ramadan effect, the negative vibe generated by the loss of wealth so suddenly will outweigh the positivity stemmed from the month of Ramadan.

e. Saudi Stock Exchange

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Regime 1				
C	-0.073853	0.010423	-7.085354	0.0000
Regime 2				
C	0.002987	0.001465	2.038896	0.0415

Table 9: Regime Coefficients

Based on the table above, we can clearly see that the bear regime is represented by Regime 1 with a coefficient of -0.073853 which indicates weak returns while the bull regime is represented by Regime 2 with a coefficient of 0.002987. There is a rather peculiar occurrence in the table below where the bear regime transition probability to the bull regime is recorded at 100%. This would mean that the bear effect in the Saudi Stock Market, will not last more than 1 week as reinforced by Table 10. As far as duration for the bull market is concerned, it is expected to last for 25.9 weeks.

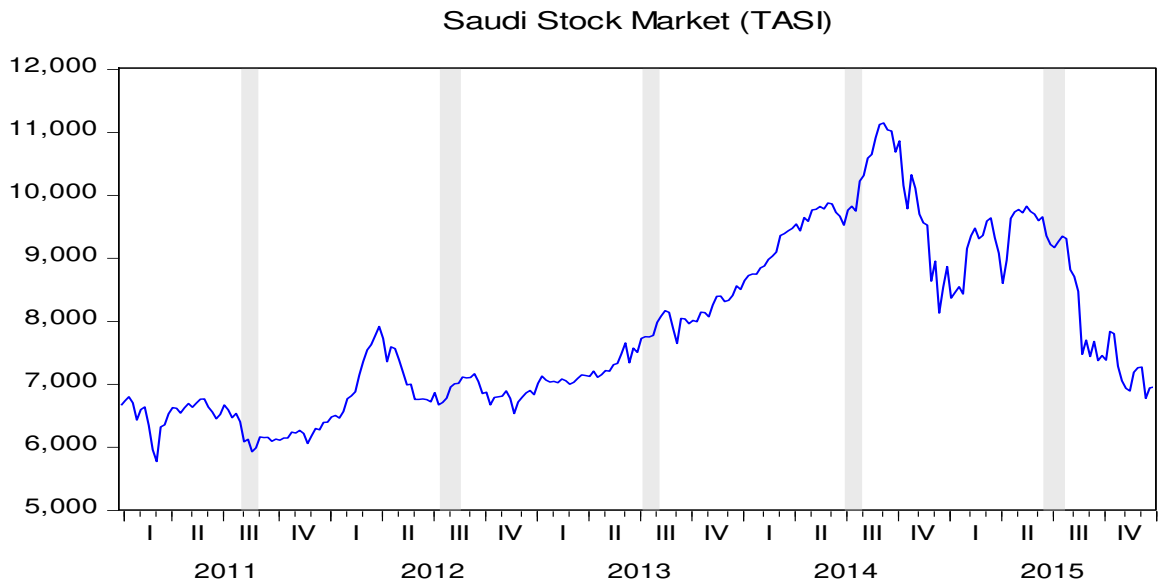
Constant transition probabilities:

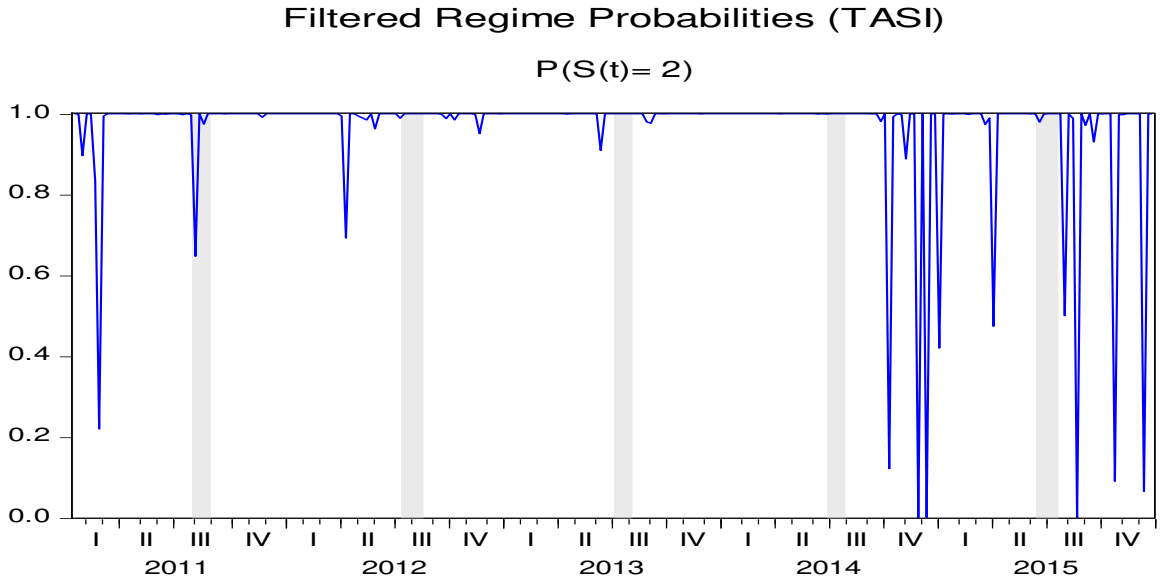
	1	2
1	2.83E-08	1.000000
2	0.038662	0.961338

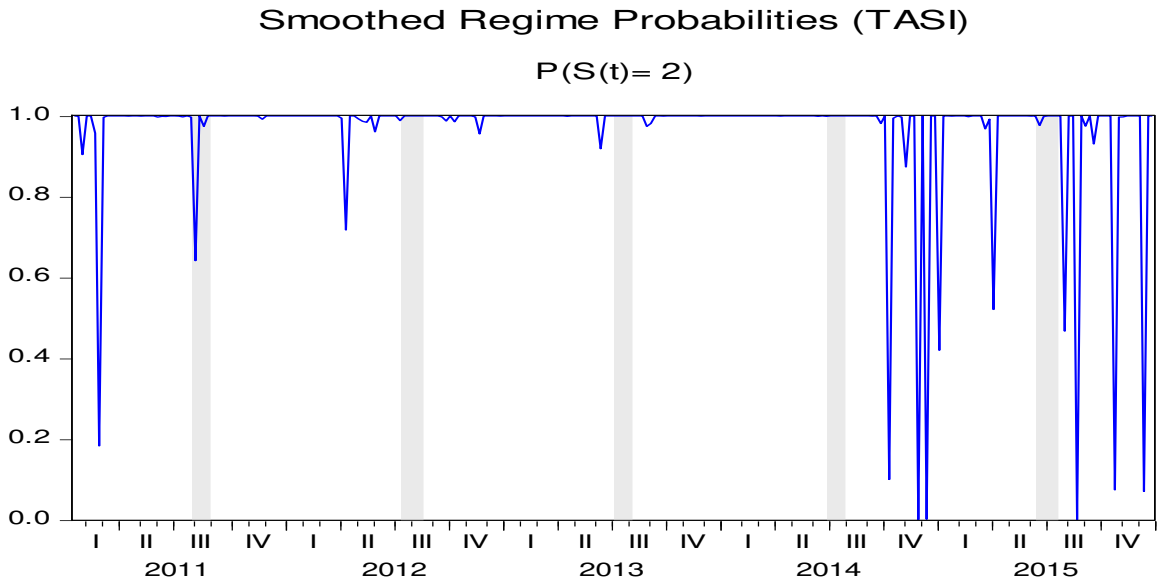
Constant expected durations:

	1	2
	1.000000	25.86532

Table 10: Regime Transition Probabilities and Expected Durations


Saudi Stock Market (TASI)
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Filtered Regime Probabilities (TASI)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015


Smoothed Regime Probabilities (TASI)
P(S(t)= 2)
1.0
0.8
0.6
0.4
0.2
0.0
I II III IV I II III IV I II III IV I II III IV I II III IV
2011
2012
2013
2014
2015

Contrary to the other exchanges listed in this study, the Saudi Stock Market appears to exhibit some notion of Ramadan effect on 3 occasion, 2012, 2013 and 2014. The higher mean return throughout the period without significant momentum indicates that the market is given a jolt from a consistent factor which played up at all three period of time. As a matter of fact, even the selloff in 2011 seems to be tapering off within the same month, shifting the bearish regime back to bullish. As far as the samples in this study, it is perhaps the Saudi Stock Market which best indicates the impact of a Ramadan effect can have to the direction of the index. Echoing the performance in Ramadan 2015 of Kuwait Stock Exchange can be explained by exactly the same reason: oil price. Since Saudi Arabia economy relies almost entirely on petroleum, a drop in price of the magnitude that the world is experiencing will hit the entire Kingdom hard. As such, any positive Ramadan effect will be negated.

5. Conclusion

In this paper, by applying the Markov-switching model to the 5 biggest stock exchanges in the Muslim majority nations, we have not found conclusive evidence that there is any significant Ramadan effect taking place across the market as a whole. Although there are regime shifts from bearish to bullish recorded, the inconsistency throughout the study does not support the findings of prior studies which conclude that Ramadan effect occurs which leads to higher return at a lower volatility. All 5 markets can be seen moving in the same direction during Ramadan 2011 and 2015 which coincides with the Eurozone Crisis and the Oil Price drastic drop respectively. This points out to the possibility that the external factor may carry more weight in determining the direction of the stock market compared to the seasonality effect.

However, there are some implications especially for the investors who decide to venture into these markets. Firstly, the markets' duration of a bullish and bearish regime differs from one another. While most other stock market bullish regime durations are recorded in the high 20s (weeks), the highest duration is recorded by Bursa Malaysia at 33 weeks. This indicates relentlessness as well as stability especially with a paired bearish duration at around 1.2 weeks which is very similar with the rest in the list. Secondly, investors should not be focusing too much on search of Ramadan effect as this paper has indicated that there is no evidence of the effects occurring consistently throughout the study period. As such, investors looking for a quick profit should abandon hope of netting easy gains during Ramadan, as such tactic can backfire spectacularly.

There is also an opportunity to extend the scope of this research especially when it comes to the determination of regimes as two regimes can be too restrictive as a stock market state can either be classified as bullish and bearish whereas in reality, there might be other relevant states. Another option is to apply Markov Switching with Time Varying Transitions which will allow for the regimes not to rely on a constant regime probabilities.

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