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The Ramadan effect: Illusion or reality?

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ABSTRACT

Empirical tests of the efficient market hypothesis (EMH) have been repeated by many researchers with varying results, with several supporting it and others finding no clear evidence for it. One of the results that weakens the EMH is the study of such anomalies as the Ramadan effect. Anomaly studies are also denied by recent studies that demonstrated proof of the weakening and even disappearance of anomalous effects. This research tests the persistence of the Ramadan effect in the stock returns in 10 Muslim-majority countries. We have found that the Ramadan effect is present, but it is not persistent. This finding is consistent with the finding from the test of efficient market form, which indicated that the markets of all 10 Muslim-majority countries are not efficient. When economic crisis is considered as an influencing factor, the Ramadan effect is still not persistently present.

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1. Introduction

There are two types of calendar anomalies: religious-related anomalies, such as Christmas and Good Friday effects (Cadsby & Ratner, 1992), Jewish High Holy Days effects (i.e., Rosh HaShanah and Yom Kippur) (Frieder & Subrahmanyam, 2004), or the Easter week holiday effect (Pantazis & Ucar, 2014), and Ramadan effect (Bialkowski, Etebari, & Wisniewski, 2012); and non-religious-related, such as the January effect, Wednesday effect, and weekend effect (Schwert, 2003). For the Ramadan effect in particular, in addition to the significant impact of the moving calendar on abnormal returns (Alper & Arouba, 2001), a combination of factors not found in other religious-calendar anomalies also impact abnormal returns during Ramadan. These factors include investor health due to Ramadan fasting (Rosen & Wu, 2004; Saleh, Elsharouni, Cherian, & Mourou, 2005), social empathy (positive social mood) with the poor due to the hunger experienced while fasting (Bialkowski et al., 2012), feeling happy and peaceful (Lakonishok & Smidt, 1988), investors' positive moods (Cadsby & Ratner, 1992), and the encouragement to do good deeds and prevent evil deeds

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(Bialkowski et al., 2012). The positive mood that is the hallmark of the Ramadan effect is different from the Easter week holiday effect, which is marked by investor distraction, causing delayed responses to firm news (Pantazis & Ucar, 2014), or the Jewish High Holidays effects, when Jewish investors' sentiments cause significant decreases in dollar volume on both named holidays (stock returns on Rosh HaShanah are significantly positive versus significantly negative on Yom Kippur).

Bialkowski et al. (2012) suspect that the emotion and mood factors of investors play a significant role in their judgment and decision making, especially that related to the buying and selling of stock, the preference for risk and return, and the response to uncertainty. These psychological factors and the reality that the investors require significant funds during Ramadan, especially toward the end of Ramadan and Idul Fitri, to meet their religious needs (zakat, infaq and shadaqah) and celebrate the Eid (buying clothes, banquet foods, etc.), prompt investors to behave rationally by buying stocks at the beginning of Ramadan and selling them at the end of Ramadan, or shortly after the Eid-ul-Fitr (Bialkowski et al., 2012; Al-Khazali, 2014). In addition to individuals' behavior, during Ramadan, Islam teaches that believers must empathize and share with the poor through giving and worship in order that the positive social mood will increase the social and spiritual orientation (Bialkowski et al., 2012). This positive personal mood will encourage investors to be happier and more optimistic (Beit-Hallahmi & Argyle, 1997; Gavrilidis, Kallinterakis, & Tsalavoutas, 2015). In addition to the investor psychology, Bialkowski et al. (2012) also states that the health factor of investors when they fast during Ramadan, affects their physical and mental health (Saleh et al., 2005), and then affects their positive valuation of stock prices in the market (Rosen & Wu, 2004). Specifically, Gavrilidis et al. (2015) cites certain impacts of religious factors on the economic and financial environment that affect the propensity to save, the decision to invest in stocks (Renneboog & Spaenjers, 2012), the risk-attitude of the investor (Kumar, Page, & Spalt, 2011), and economic growth (Barro & McCleary, 2003).

As with other studies of EMH anomalies, there is evidence for and against the existence of the Ramadan effect. Bialkowski et al. (2012) uses the event study on the cumulative abnormal returns and finds that stock returns during Ramadan are higher than in the other 11 months in 11 Muslim countries (from a total sample of 14 Muslim countries). Their study argued that the Ramadan effect is purely caused by investor psychology, executing an investment strategy of buying stocks before Ramadan arrives and then selling them at the end of Ramadan, or shortly after Eid-ul-Fitr (see also Al-Khazali, 2014). Al-Mudhaf (2012) finds empirical evidence of the Ramadan effect in only four Muslim countries from a sample of 12, while Al-Hajieh, Redhead, and Rodgers (2011) uses run tests and finds the Ramadan effect in 6 out of 8 markets. In the Karachi stock market, Mustafa (2011) finds the Ramadan effect, while in other empirical studies using the GARCH model, the Ramadan effect is found not to significantly affect mean returns in some countries, including Pakistan (Husain, 1998), Saudi Arabia (Seyyed, Abraham, & Al-Hajji, 2005) and Indonesia (Rainly, 2006), although they document a decrease in return volatility during Ramadan. Al-Khazali (2014) uses the non-parametric stochastic dominant method and finds evidence of the Ramadan effect in the 15 Muslim countries, although the results were not sufficient to conclude that the returns during Ramadan outperform the return beyond Ramadan.

Unfortunately, there has not yet been a satisfactory explanation of the phenomenon of the Ramadan effect (Al-Khazali, 2014), especially related to the violation of the trading hypothesis during Ramadan. As a result, the discussions tend to focus on the accuracy of the method used. Al-Khazali (2014) criticized the use of the mean-variance method, as performed by Husain (1998), Seyyed et al. (2005), Rainly (2006), and Bialkowski et al. (2012). According to Al-Khazali (2014), the use of parametric statistic (mean and variance) and GARCH often relies on the normality assumption, which is difficult to fulfill in emerging markets, including Muslim countries. Second, the use of mean and variance ignores the effect of positive and negative skewness that represents the risk preference of the investor. Third, the mean-variance method requires the use of the quadratic-utility function. Al-Khazali (2014) also admits, however, that any group of methods, such as the mean-variance method and stochastic dominant, can be complementary.

Regardless of the debates over the most appropriate method for examining the Ramadan effect, in this research, we use index data from 10 Muslim-majority countries to first test whether their markets are efficient. Logically, when the market is efficient, no investors can persistently exploit abnormal returns (Fama, 1965) because the price fully reflects the information equilibrium in the market. When the market is efficient, however, and some investors are still able to exploit market information to gain abnormal returns, there is assumed to be an anomaly in the market (Stulz & Williamson, 2003). Further, when the market is not efficient and the investor can exploit the information, it is argued that behavioral finance (Thaler, 1993), which is typically driven by psychological factors, such as herding, emotions, mood, and the investors' religious beliefs (Bialkowski et al., 2012), is to blame. Fama (1970) and Jensen (1978) state that if market is not efficient (even in a weak form), the presence of abnormal returns is to be expected as the price does not immediately reflect the available information in the market.

We then examine the existence of the Ramadan effect in 10 Muslim-majority countries and test the persistence of the Ramadan effect by dividing the observation period into 5 sub-periods. Identifying the existence of Ramadan effect, we conduct a comparative analysis by computing the annualized returns between Ramadan and the 11 other months in the Muslim lunar calendar in order to obtain the abnormal returns during Ramadan. Then, we divide the observation period into several sub-periods to examine whether the Ramadan effect persistently exists in each sub-period, conduct t-tests on the significant cumulative abnormal return, and observe the pattern of the Ramadan effect. In this stage, using the regression analysis, we also examine the coincidence of the Ramadan effect with other calendar effects, such as the January effect, the weekend (Friday) effect, and the Christmas effect. According to Bialkowski et al. (2012), during Ramadan, the positive societal mood will affect the positive effect on the stock price, while there is simultaneously no coincidence between the Ramadan effect and the Gregorian calendar effects. In this stage, we also examine the impact of local and global crises on the Ramadan effect. Al-Khazali (2014) finds that the magnitude of the Ramadan

effect decreases during global crises. Previously, [Bialkowski et al. \(2012\)](#) have cited the Asian crisis as the reason that the Ramadan effect does not appear in the Indonesian stock market.

Like [Frieder and Subrahmanyam \(2004\)](#), our results show that Ramadan is the religious event that can affect investors' moods and investment decisions ([Bialkowski et al., 2012](#)) through the combination of two herding factors that prompts less risk-averse action and enhances social interaction among investors ([Gavriilidis et al., 2015](#)). We find that the Ramadan effect is persistently present in three countries (Kuwait, Oman and Tunisia), and the magnitude is always larger than in other months. Five other countries (Indonesia, Malaysia, Jordan, Morocco and Qatar) also experience the Ramadan effect, but it is not persistent. Finally, two countries (Bahrain and Saudi Arabia) have never experienced the Ramadan effect, showing negative annualized returns during Ramadan in all periods. As with the other EMH anomalies, we find that the Ramadan effect tends to disappear and is not persistent, except in the three countries cited above (Kuwait, Oman and Tunisia). The regression analysis shows that the Ramadan effect does not significantly affect annualized stock returns. From the perspective of Islamic finance, our findings, similar to those from earlier studies (e.g., [Al-Khazali, 2014](#); [Bialkowski et al., 2012](#); [Gavriilidis et al., 2015](#)), provide practical implications for investors to exploit the abnormal stock returns in some Muslim countries (Kuwait, Oman and Tunisia) during Ramadan. Moreover, investors must be cautious regarding the destabilizing potential of herding behavior that promotes systemic risk in the market.

The remainder of the paper is organized follows: Section 2 provides a literature review. Section 3 presents the data and methodology. Section 4 contains the results and analyses. Section 5 provides the study's conclusions and managerial implications, while Section 6 gives suggestions for further research.

2. Literature review

2.1. Ramadan and its effect on investor behavior

Ramadan is the 9th month of the Hijriyah, the Muslim lunar calendar. At the present, many Muslim-majority countries use two calendars (Hijriyah and the Gregorian calendar). The Gregorian calendar is used for business and administrative purposes, while the Hijriyah calendar is used for religious observance, including the month of fasting during Ramadan and Eid-ul-Fitr (the first day of the Syawal month). The Hijriyah calendar moves every year and is approximately 10-11 days faster than the Gregorian calendar. This drift of the Hijriyah calendar compared to the Gregorian calendar is used as an argument to show that the presence of abnormal returns in Ramadan is truly a calendar effect, unlike the January effect, which is a moving calendar effect. A moving calendar event can significantly affect economic and financial variables, including abnormal returns ([Alper & Arouba, 2001](#)).

During Ramadan, Muslims fast, bearing hunger and thirst as well as other desires from just before dawn and until sunset. Many Muslims honor Ramadan by reducing the number of hours they work per day to maintain performance and aid observance. Fasting during Ramadan has been clinically proven to improve health through a natural detoxification process ([Fuhrman, 1998](#)) and the reduction of weight, cholesterol ([Saleh et al., 2005](#)), blood pressure, and anxiety ([Daradkeh, 1992](#)). The collective feeling of religious observance as well as more intense social interaction compared to other days also contributes to this improvement in health ([Bialkowski et al., 2012](#)).

Other than fasting, Ramadan is also a time that is highly anticipated by Muslims, both in the context of the vertical relationship with God as well as the horizontal relationship with their fellow people. During Ramadan, Muslims are more social and religious as they expect their good deeds to be multiplied during the holiday, as promised in the Quran (Quran 97:3). As during Ramadan, the celebration of religious holidays such as Islam's Eid-ul-Fitr increases the happiness of religious believers (Muslims), which has been proven to significantly affect the capital market in countries with large numbers of the religious believers ([Frieder & Subrahmanyam, 2004](#); [Lakonishok & Smidt, 1988](#)). This social and religious orientation generates positive moods affecting investor psychology individually and collectively, and it also affects an investor's self-esteem in taking risks and investing ([Lucey &](#)

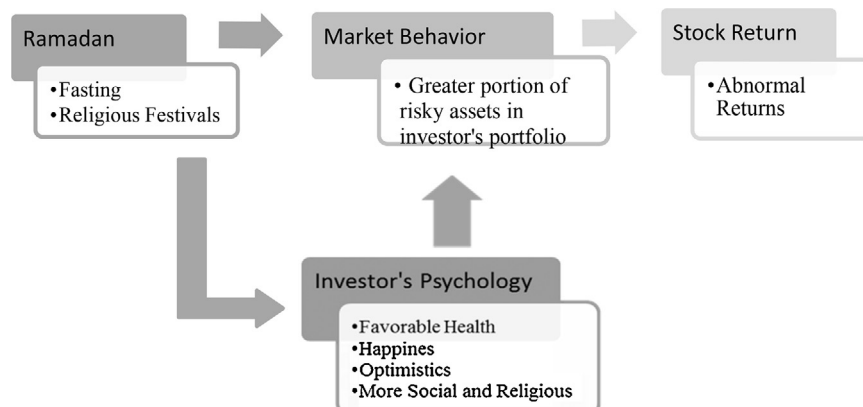


Fig. 1 – The behavior of Muslim investors during Ramadan.

Dowling, 2005; Rosen and Wu, 2004). Those positive moods encourage investors to take risks, thus increasing the proportion of risky assets in their investment portfolio, which will raise stock prices and create the possibility of abnormal returns (Fig. 1).

2.2. EMH anomaly: the calendar effects

Previous studies on the anomalies of efficient markets have provided a collection of empirical proofs that there are certain deviations in the movement of price(s) from what can be expected if the efficient market hypothesis holds. A market is efficient when the price reflects all relevant information in the market, under the assumptions that the investors are rational and have homogenous expectations and that given this equilibrium between price and information, it is impossible for investors to persistently gain abnormal returns (Fama, 1970). In reality, however, some events are able to trigger under and over reactions, causing shifts in stock prices that enable abnormal returns to be earned, indicating market inefficiency and thus a hole in the EMH (Stulz & Williamson, 2003). The occurrence of various events that can trigger abnormal returns is a starting point of academic interest in the study of EMH anomalies, such as the January effect (Branch, 1977), neglected firms effect (Arbel & Strebel, 1983), exchange listing effect (Ritter, 1991), and size effect (Reinganum, 1992).

Fundamentally, an anomaly is defined as the relative deviation from a model of normal return behavior (Schwert, 2003) where normal return behavior is based on different levels of market efficiency, as has been expressed by Fama (1970) through three market forms: the weak-form, semi-strong-form and strong-form efficiency. If the market is not efficient, even in the weakest form, then the presence of abnormal returns is still reasonable because the price that is formed does not reflect the available information (Jensen, 1978).

Additionally, the term “anomaly” itself is sometimes misused and misapplied. Anomaly is interpreted as a failure of the EMH as a paradigm of modern finance theory in explaining price movement, the same dissatisfaction that fueled the development of behavioral finance. The original meaning of anomaly is irregularity, deviation from the common order or natural order, and as such it is possible for an anomaly to exist simply because there is an unexpected mismatch between what is expected to happen according to theory and what actually happens. It is a “puzzle,” if you will, and if that puzzle is solved, then what had seemed to be an anomaly before can be understood, with the result that the anomaly no longer exists (Kuhn, 1977). To help maintain neutrality, the use of the word “effect” is well recognized in academic literature to illustrate the “puzzle” of EMH theory (Frankfurter & McGoun, 2001).

Interestingly, recent studies show that several famous and well-documented anomalies in the academic literature have actually weakened in effect and some has even disappeared over time. Anomalies, such as the weekend effect and the January effect, are found to be present only inconsistently in the entire sample period, and several other anomalies, such as the size effect and value effect, have been found to disappear since they were first documented (Schwert, 2003).

2.3. Ramadan effect: investor mood and herding behavior

The effect of Ramadan is proved to affect the positive mood and trading behavior of investors, which is reflected in the significantly higher stock returns during Ramadan compared to non-Ramadan days (Al-Hajieh et al., 2011; Al-Khazali, 2014; Bialkowski et al., 2012). The positive mood resulting from fasting increases the investor's health (Saleh et al., 2005) and the spirit of communal worship promotes the herding behavior through optimism and enhanced social interaction (positive social mood) (Bialkowski et al., 2012). Further, Gavrilidis et al. (2015) find that herding is significant within Ramadan in most (five out of seven) sample markets and the magnitude is greater during Ramadan. Based on social norm theory, individuals follow behavioral norms, beliefs and/or activity of the community members (Akerlof, 1980), here, religious social norms (Gavrilidis et al., 2015).

The religious aspect of Ramadan plays a significant role in the risk-taking behavior of investors (Bialkowski et al., 2012; Hilary & Hui, 2009). More than 1.6 billion Muslims across the world celebrate this month (Al-Khazali, 2014) by fasting, refraining from eating, drinking, smoking and sexual activity from dawn until sunset (Gavrilidis et al., 2015). Clinically, fasting causes the investor to become healthier (Knerr & Pearl, 2008; Saleh et al., 2005), decreases the level of anxiety, enhances optimism and social interaction, and cultivates a positive mood during Ramadan (Bialkowski et al., 2012). This psychological factor prompts the investor to herding behavior through a combination of two factors that encourage investors to be less risk-averse (Nofsinger, 2002; Wright & Bower, 1992). Enhanced social interaction during Ramadan also promotes common behavior among investors (Gavrilidis et al., 2015). Historically, higher returns during Ramadan induce investors to underestimate risk and increase their optimism. Enhanced social interaction among investors during Ramadan ensures this behavior is followed by other investors in the market (herding) due to the shared emotion and positive social mood.

Recent studies have sought to examine the relationship between the mood-effect of Ramadan and investment behavior during Ramadan. Using the GARCH model, Husain (1998) examines the Ramadan effect in the Pakistani stock market and finds that there is a decrease in stock return volatility in Ramadan; however, the mean returns are not significantly different during Ramadan versus the rest of the year. Seyyed et al. (2005) uses stock market data from Saudi Arabia during the period from 1985 to 2000 and finds that there is no significant change in stock returns during and after Ramadan; however, they document a decrease in return volatility during Ramadan. Al-Hajieh et al. (2011) use a data from 8 Middle Eastern countries for the period from 1992 to 2007 and find significant positive abnormal returns during Ramadan in 6 of 8 countries. They attribute the findings to the positive investor mood during Ramadan and enhanced social interaction among investors. In the Karachi stock market, Mustafa (2011) also finds evidence of the Ramadan effect. Bialkowski et al. (2012) find evidence of the Ramadan effect in 11 of 14 Muslim countries in their

sample. They suspect that Ramadan promotes feelings of social empathy and social solidarity, hence enhancing the optimism of investors and affecting the investment decision. Al-Mudhaf (2012), however, finds the Ramadan effect in only four of 12 countries analyzed. Al-Khazali (2014), using 15 Muslim countries with various time periods as the sample, confirms the findings of Bialkowski et al. (2012) that stock returns during Ramadan are higher than those the rest of the year; however, the effect disappears during the global financial crisis. Finally, Gavriilidis et al. (2015) find evidence of herding behavior during Ramadan in five of seven Muslim countries in the sample, and further find that herding behavior is more prevalent during Ramadan.

3. Data and methodology

3.1. Data

This study is based on previous studies of the Ramadan effect, especially those by Bialkowski et al. (2012), Al-Khazali (2014) and Gavriilidis et al. (2015). Here, we perform a comprehensive analysis of 10 Muslim-majority countries, improving on previous studies on Ramadan effect examining a single country, e.g., Pakistan (Husain, 1998), Saudi Arabia (Seyyed et al., 2005), and Indonesia (Rainly, 2006). Some of the studies limited to one country conclude that the Ramadan effect on stock returns is insignificant, while Bialkowski et al. (2012), Al-Khazali (2014), and Gavriilidis et al. (2015) conclude that the Ramadan effect is significant based on a comparison of multiple countries. In several countries, however, such as Bahrain, Saudi Arabia and Indonesia, Bialkowski et al. (2012) also find that the Ramadan effect is insignificant due to data irregularity (Bahrain and Saudi Arabia) or because it occurred at approximately the same time as a crisis (Indonesia).

This research uses stock market index data taken from the Morgan Stanley Capital International (MSCI) Datastream. Sampled countries must have a Muslim population of more than 50% (based on the CIA World Factbook 2013). Ten countries are included in this research: Bahrain, Indonesia, Jordan, Malaysia, Morocco, Kuwait, Oman, Qatar, Saudi Arabia, and Tunisia. The research period covers 139 Ramadan events through the period from 1989 to 2013. The sample period is then divided further into five sub-periods to observe the persistence of the Ramadan effect: 1989–1993, 1994–1998, 1999–2003, 2004–2008, and 2009–2013. The determination of the beginning and ending of Ramadan in the Gregorian calendar is based on information from each country's official website that states the official beginning and ending of Ramadan. Data taken from the MSCI Index is already USD-denominated, and as such there is no stock price bias due to inflation in each country.

3.2. Model specification

Stock price data are processed into returns using the formula for simple returns, $R_t = (P_t/P_{t-1}) - 1$. To compare average returns, the returns are annualized, during Ramadan as well as in other months.

The first step in this research is to test which efficient market form is taken by the capital market in the observed countries. The efficient market test is performed at the lowest level of EMH, the weak-form efficiency, which is tested using the autocorrelation test (Reilly & Brown, 2012). The results of the weak-form efficiency test, along with the abnormal returns test using the event study method and cumulative abnormal return (CAR), are used to conclude whether the Ramadan effect is purely psychological or if it can be explained by EMH.

The event study method is applied to the Ramadan effect analysis to show the effects of the presence of abnormal return in the monitored event. Abnormal returns (AR_{it}) are defined as the actual return of the index in the event window period deducted from the normal return, which is the expected return, without including the event window period in the estimation value (MacKinlay, 1997):

$$AR_{it} = R_{it} - E(R_{it}|X_{it}) \quad (1)$$

where AR_{it} is the abnormal return of index i in period t , and $E(R_{it}|X_{it})$ is the expected value of normal return.

This research also uses three models to estimate normal returns: the market, constant-mean and market-adjusted models (Brown & Warner, 1985; MacKinlay, 1997). In the market model, the expected normal return can be estimated with the equation:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \quad (2)$$

where R_{it} is the index return of the event window periods, R_{mt} is the global market return (MSCI world index), \hat{R}_{it} is an estimation of normal returns using the market model with α_i and β_i as model parameters, and ϵ_{it} is the error factor of the model with the assumption of white noise ($E(\epsilon_{it}) = 0$, $var(\epsilon_{it}) = \sigma_{\epsilon_i}^2$) (MacKinlay, 1997).

In the constant-mean model, normal returns come from expected value (mean) R_{it} in the non-event period (estimation window). The estimation of normal returns both using the market model and the constant-mean model spans 200 days before the event window. In the constant-mean model, the expectation of normal returns is estimated with the equation:

$$R_{it} = E(R_{it}) + \epsilon_{it}, \quad \text{where } E(\epsilon_{it}) = 0 \text{ and } var(\epsilon_{it}) = \sigma_{\epsilon_i}^2 \quad (3)$$

In the market-adjusted model, the expectation of normal returns is the value of the market index (MSCI world index), which is:

$$R_{it} = R_{mt} \quad (4)$$

The cumulative abnormal return (CAR) is found by adding the average abnormal return of each index i in period t to T (MacKinlay, 1997):

$$AAR = \sum_{t=1}^N AR_{it} \quad (5)$$

$$CAR(n_1, n_2) = \sum_{t=1}^T AAR \quad (6)$$

$$t(CAR(n_1, n_2)) = \frac{CAR(n_1, n_2)}{\sigma(AR) \times \sqrt{n_2 - n_1 + 1}} \quad (7)$$

where $CAR(n_1, n_2)$ is the cumulative abnormal return in the event window from n_1 to n_2 , $\sigma(AR)$ is the standard deviation of the mean abnormal return calculated through time series in event window n_1 to n_2 , while n_1 and n_2 are the beginning and end of the event window period, respectively. The statistical significance test for CAR uses the parametric t-test (Kothari & Warner, 2007).

The statistical significance of the event study method only generates abnormal return results that are contemporaneously correlated (Bialkowski et al., 2012). It is thus necessary to perform portfolio return regressions that are formed from the indices of the sample countries to the Ramadan dummy variable and the MSCI world index as the reference market return:

$$return_{portfolio_t} = \alpha_t + \beta.Ramadan_t + \gamma.return_{world_t} + \epsilon_t \quad (8)$$

Bialkowski et al. (2012) states that one of the reasons for the insignificance of the Ramadan effect in Indonesia is the economic crisis factor. To prove this statement, testing the significance of the Ramadan effect on stock returns will include the economic crisis factor as a dummy variable:

$$return_{portfolio_t} = \alpha_t + \beta.Ramadan_t + \gamma.return_{world_t} + \delta.crisis_t + \epsilon_t \quad (9)$$

4. Results and analysis

4.1. Efficient market testing

The weak-form efficient market is tested using the autocorrelation test (Reilly & Brown, 2012) on the index return in each country and each period. In the full period from 1989 to 2013, Table 4.1 displays the efficient market test results showing that the market is not efficient in all countries, even when the weak form is being tested, except for Saudi Arabia. This is due to inadequate data in Saudi Arabia, contributing to the inaccuracy of the test result. Several countries in some sub-periods actually demonstrated that their market is already efficient in the weak form, even if it is not always consistent across all sub-periods. This finding indicates that even the weak form of the efficient market is not steady in those countries (Frankfurter & McGoun, 2001; Reilly & Brown, 2012).

Table 4.1 – Efficient market test.

	Indonesia	Jordan	Malaysia	Morocco	Bahrain	Kuwait	Oman	Qatar	Saudi	Tunisia
1989-2013	Not efficient	Not efficient	Not efficient	Not efficient	Not efficient	Not efficient	Not efficient	Not efficient	Efficient	Not efficient
1989-1993	Not efficient	Efficient	Not efficient							
1994-1998	Not efficient	Efficient	Not efficient	Not efficient						
1999-2003	Not efficient	Efficient	Not efficient	Not efficient						
2004-2008	Not efficient	Not efficient	Not efficient	Not efficient	Efficient	Not efficient	Not efficient	Efficient	Efficient	Not efficient
2009-2013	Efficient	Not efficient	Not efficient	Efficient	Not efficient	Efficient	Not efficient	Not efficient	Not efficient	Not efficient

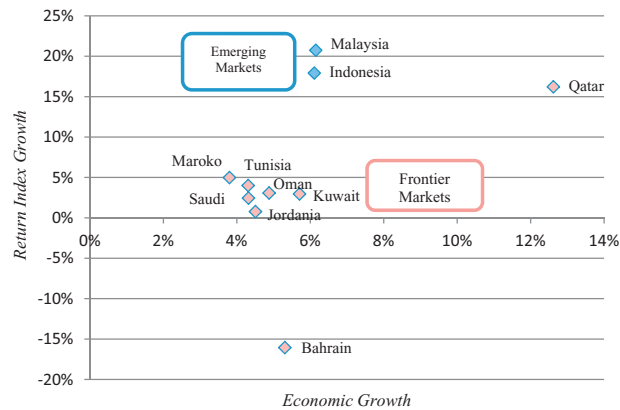


Fig. 4.1 – The classification of emerging and frontier markets.

The efficiency level of the capital market is closely related to a country's economic condition. High growth of the capital market index's return is one of the indicators that a country's economy is experiencing high growth (Kannan & Henry, 2008). High growth is also one of the differentiating factors between developed markets and emerging markets (Kvint, 2009). Over the last 10 years, the growth rate of developed markets has remained under 3.00%, as in Japan (1.32%), the US (2.56%), and Great Britain (2.17%), while the growth of emerging market economies has exceeded 6.00%, as in Indonesia (6.11%) and Malaysia (6.15%) (World Bank, 2013).

The results of the efficient market test (weak-form) show that none of the observed countries have achieved an efficient market, not even a weak-form one. Based on the classification of economic growth, all the observation countries can also be categorized into emerging markets and frontier markets, as displayed in Fig. 4.1. The results of this test are consistent with several previous studies that attempted to test the market efficiency level of emerging and frontier markets, as in the studies of Chang, Lima, and Tabak (2004), Worthington and Higgs (2006), and Segot and Lucey (2006). They found that no emerging and frontier markets are significant in the random walk test (variance ratio test), which indicates the markets in all these countries are not efficient, not even weak-form efficient.

4.2. Presence of Ramadan effect

4.2.1. Annualized stock return during Ramadan

The Ramadan effect can be defined as the occurrence of abnormal returns enjoyed by investors due to psychological-religious effect that drives the movement of stock market prices (Bialkowski et al., 2012). The presence of the Ramadan effect can be observed through two methods: (1) comparison of annualized returns between Ramadan and other months, or (2) observing the presence of abnormal returns before, during, and after Ramadan. The comparison of annualized returns can be used to find out whether the Ramadhan effect can provide larger returns relative to returns in other months (Bialkowski et al., 2012). The identification of abnormal return can provide a guide for investors to track the movement pattern of the price and understand the possibilities for exploiting the abnormal returns offered by the Ramadan effect (Al-Ississ, 2010).

This study found three country groups, each with a different type of relationship between the Ramadan annualized returns and the annualized returns from other months. The first group shows a positive Ramadan annualized return that is larger than the annualized returns of other months. This group is stated to have experienced the Ramadan effect, where there is a potential to gain higher average returns during Ramadan compared to the rest of the year. This group consists of six countries: Tunisia, Qatar, Jordan, Kuwait, Oman, and Morocco (Fig.4.2).

The second group comprises countries with a positive Ramadan annualized return that is nonetheless smaller than the annualized returns of other months. For this reason, the single country in this group, Malaysia, does not experience the Ramadan

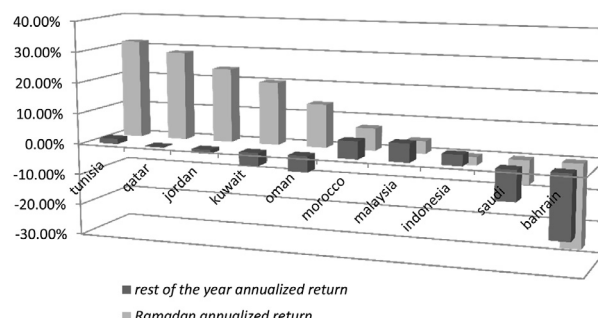


Fig. 4.2 – Annualized return of indexes in ten Muslim countries.

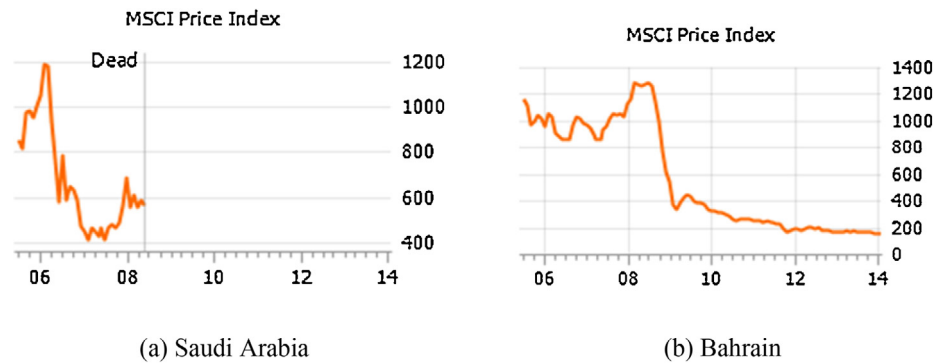


Fig. 4.3 – Movement of the stock market index.
Source: Thomson Reuters Datastream

effect. The third group contains countries with negative Ramadan annualized return. This country group is stated not to experience the Ramadan effect, because on average, these countries actually experience negative returns during Ramadan. There are three countries in this group: Indonesia, Bahrain, and Saudi Arabia.

Malaysia exhibits positive Ramadan annualized returns, but its returns behave differently than those of the other six countries whose Ramadan annualized returns are also positive. The other six countries display the normal, expected behavior of their Ramadan annualized returns in that it is positive, and the annualized returns for the rest of the year are smaller than the total annualized returns, signifying that the Ramadan effect does exist and affects the total annualized return of the aforementioned market. This behavior, however, is nonexistent in Malaysia.

The lack of a Ramadan effect in Malaysia can be analyzed in light of the Southeast Asian economic crisis of 1997-1998, faced by both Indonesia and Malaysia (Hunter, Kaufman, & Krueger, 1999). The effect of the Southeast Asian crisis in Malaysia was not sizeable, as it was not accompanied by a political crisis, as occurred in Indonesia. Malaysia still managed to generate a positive Ramadan annualized return, while Indonesia experienced a negative Ramadan annualized return because of an economic and political crisis that took place at approximately the same time as Ramadan.

The countries in the third group (Indonesia, Saudi Arabia and Bahrain) have a negative Ramadan annualized return, unlike the other seven countries. This supports the previous two studies of the Ramadan effect in Saudi Arabia by Seyyed et al. (2005) and in Indonesia by Rainly (2006), which found that the Ramadan effect does not significantly affect the stock returns in those two countries.

The insignificance of the Ramadan effect in Bahrain is caused by fundamental factors, where the movement of the country's stock market index continuously decreases (Fig. 4.3). The stock market index is downward sloping year after year; thus both in general and on a monthly basis, the value of the returns on Bahrain's index tends to move toward zero. In the case of Saudi Arabia, the insignificance of the Ramadan effect is affected by the lack of data due to the cessation of the stock market index provided by the capital market in Saudi Arabia (Table 4.2).

4.2.2. Pattern of abnormal returns during Ramadan

The fluctuations of stock prices during Ramadan are inseparable from the price fluctuations in the market. Using the theory of behavioral finance, Bialkowski et al. (2012) attempt to explain the fluctuation of stock prices during Ramadan based on psychological-religious factors affecting the investors, who drive the stock price to attractive levels based on their mood. This

Table 4.2 – The annualized return of indexes in 10 Muslim countries.

No.	Country	Rest of the year annualized return	Ramadan annualized return	Total annualized return	Events
1	Tunisia	1.69%	31.77%	3.98%	8
2	Qatar	-0.24%	28.64%	2.03%	8
3	Jordan	-1.25%	23.89%	0.71%	26
4	Kuwait	-4.20%	20.17%	-2.31%	8
5	Oman	-5.11%	13.92%	-3.61%	8
6	Morocco	5.67%	7.11%	5.76%	19
7	Malaysia	5.93%	4.01%	5.78%	26
8	Indonesia	3.48%	-2.70%	2.86%	26
9	Saudi A.	-9.81%	-7.70%	-9.64%	2
10	Bahrain	-20.62%	-26.74%	-21.17%	8
Total observation (year)					139

Table 4.3 – The presence of abnormal returns in 10 Muslim countries.

Observation period	Indonesia	Malaysia	Jordan	Morocco	Kuwait	Oman	Qatar	Tunisia	Bahrain	Saudi
Ramadan All	0.00%	0.00%	0.06%	0.02%	0.14%	0.13%	0.17%	0.14%	-0.13%	-0.05%
H-7 Ramadan	-0.01%	0.05%	0.04%	-0.07%	-0.08%	-0.07%	-0.31%	-0.01%	-0.12%	-0.10%
Ramadan 1-10	-0.20%	-0.20%	-0.04%	-0.02%	0.15%	-0.07%	-0.02%	0.04%	-0.10%	-0.09%
Ramadan 11-20	0.16%	0.20%	0.13%	0.02%	0.15%	0.17%	0.24%	0.08%	-0.33%	-0.08%
Ramadan 26-30	0.04%	0.04%	0.09%	0.05%	0.11%	0.30%	0.29%	0.30%	0.03%	0.04%
H+7 Ramadan	-0.14%	0.19%	0.12%	0.12%	-0.34%	-0.26%	-0.09%	0.23%	-0.30%	-0.17%

mood-driven stock price movement during Ramadan is believed to be a contributing factor to the occurrence of abnormal returns. Table 4.3 illustrates the presence of abnormal returns in each country using the market model to estimate the expected return model.

Just as the analysis of the comparison of countries' annualized returns generated three different groups, the analysis of the abnormal returns also generated three different groups of countries. The first group of countries has on average a positive abnormal return during Ramadan, demonstrating that the Ramadan effect applies there. The members of this group are Tunisia, Qatar, Jordan, Kuwait, Oman, and Morocco. In the second group, the average abnormal return across years is 0.00% during Ramadan, demonstrating that the Ramadan effect is not present here. The countries in this group are Indonesia and Malaysia. The third group comprises countries experiencing a negative abnormal return during the month of Ramadan on average, demonstrating that the Ramadan effect is not present in this group. The countries in this category are Bahrain and Saudi Arabia.

Even if the average abnormal return during Ramadan in Bahrain and Saudi Arabia is negative, the average abnormal return in the last 10 days in these two countries is positive, indicating that these two countries also have the potential to experience the Ramadan effect. The size of the possible Ramadan effect experienced does not seem to be noticeable initially, and thus the possible statistical significance is probably also small.

The pattern of abnormal returns in various countries appears similar to the presence of abnormal returns in the portfolio (Table 4.4). During the first ten days of Ramadan, the presence of abnormal returns is negative in all countries but Kuwait and Tunisia, where it is already positive. In the second ten days of Ramadan, abnormal returns are positive in all countries but Bahrain and Saudi Arabia, where it is negative. In the final ten days, abnormal returns are positive and tend to be larger than they were in the previous ten days. This ten-day pattern will be analyzed as a guideline for investors watching the index during Ramadan.

The month of Ramadan consists of 3 phases, each containing 10 days. A hadith explains that these phases consist of the phase of grace, the phase of forgiveness, and the phase of exemption from hellfire. These three phases also illustrate the physical and psychological condition of Muslims during Ramadan, affecting their behavior and decision-making heuristics over investment decisions in the capital market. This research has succeeded in identifying different abnormal return patterns during the first, second and third ten day periods of Ramadan. To remove bias, the daily abnormal return analysis must be adjusted with regard to the trading days, which only occur in five days out of seven.

Table 4.4 displays the abnormal return performance of the portfolio during Ramadan along with several other observation periods that generate different patterns in each observation group. The observation period is divided into H-7 Ramadan, H+7 Ramadan, the first 10 days of Ramadan, the second 10 days of Ramadan, the last 10 days of Ramadan, the first 5 days of Ramadan, and the last 5 days of Ramadan, and Ramadan itself as a whole. The identification of abnormal return performance uses three different expected (normal) return estimation models to test the consistency of the abnormal return results (Fama, 1998).

During the first 5-10 days of Ramadan, abnormal returns are negative. A negative abnormal return indicates that the actual return is smaller than the expected return. This result is inconsistent with the results from using the three models of expected returns explained in Fama (1998). Abnormal returns in this period are negative using the market model and the constant mean model, but positive if market-adjusted model is used. Even so, the three of them present the same pattern, which is downward sloping in this period.

Table 4.4 – The presence of abnormal returns in a portfolio.

Observation period	Market model	Constant mean	Market adjusted
Ramadan All	0.06%	0.07%	0.06%
Ramadan 1-5	-0.06%	-0.08%	0.08%
Ramadan 1-10	-0.03%	-0.02%	0.05%
Ramadan 11-20	0.18%	0.17%	0.10%
Ramadan 21-30	0.03%	0.05%	0.04%
Ramadan 21-25	-0.17%	-0.16%	-0.13%
Ramadan 26-30	0.23%	0.26%	0.20%
H-7 Ramadan	0.02%	0.02%	-0.04%
H+7 Ramadan	0.12%	0.11%	0.10%

This finding can be explained through several factors. The first is related to the human body's adaptation process when it has just entered Ramadan and must become accustomed to the fast. This physical condition generates a negative mood and emotions, contributing to negative movement of returns at the beginning of Ramadan (Bialkowski et al., 2012).

There are also religious reasons affecting investor behavior during the first ten-day phase of Ramadan (the blessing phase). The decrease in abnormal return is partially attributable to the Ramadan euphoria. Ramadan is welcomed by Muslims as an opportunity to prioritize religious worship and observance, contributing to a reduction in market activity and sell action, thus decreasing returns (Al-Ississ, 2010). From H-7 Ramadan, abnormal returns show a decreasing pattern until it touches negative values during the first 10 days of Ramadan. This trend illustrates that the stock price movement is also negative, and the price tends to be low position during this period.

During the second 10 days of Ramadan, the abnormal return of the index is positive and tends to increase, especially on the 17th of Ramadan (the *Nuzulul Quran* day), as much as 0.48%, 8 times larger than the average abnormal return during Ramadan. This can be explained by the presence of stability, as Muslims' physical bodies have stabilized and they are beginning to experience the benefits of fasting, thus becoming more optimistic and confident. Rosen and Wu (2004) stated that this phase is related to the influence of health levels on investor risk-taking behavior.

Moreover, several studies generate a study explaining the implications of a person's emotional and mood changes for the results of their appraisal of an asset. This is also known as the Appraisal Tendency Framework (ATF). The framework states that a positive emotion, such as optimism and social satisfaction or happiness, can create a cognitive change in the form of improvement in self-confidence and boldness in assessing a risky asset as well as in making investment decisions (Han, Lerner, & Keltner, 2007).

During this period, Muslim investors feel healthier, happier and more optimistic, driving the behavior of increasing the risky asset portion of their portfolio. This takes the form of purchasing more attractive stocks, driving stock prices up in the second ten-day period of Ramadan. The increase in stock prices exceeds market expectations and contributes to the presence of a positive abnormal return. As displayed in Table 4.4, abnormal returns in the second ten-day phase of Ramadan reach 0.18%, three times larger than the average abnormal return during Ramadan, which is only 0.06% (market model). The abnormal returns generated by the three expected return models is positive valued and generates the same pattern: it tends to increase in value.

The third ten-day phase of Ramadan shows more fluctuation. In this period, there is a command to increase good deeds and behavior because of the night of *Lailatul Qadr*, when the reward for good deeds is over 1000 months. On the other hand, the most common behavior of many Muslims at this time is to increase preparations for the Eid-ul-Fitr, thus increasing consumption. For that, we use graphic analysis to analyze abnormal return by splitting the last 10 days of Ramadan into two parts: the first 5 days (21-25 Ramadan), and the last 5 days (26-30 Ramadan).

Preparations for Eid-ul-Fitr are often begun a week before the holy day arrives. Various household necessities are purchased and prepared ahead of time to ensure that the great festivities can unfold smoothly. To fulfill this increase in consumption, the liquidity need of the public also increases. Thus, selling actions in the capital market increase from 21 to 25 Ramadan, driving the index down and generating a negative abnormal return.

After the necessities needed to prepare the holy day have been purchased, many Muslims yearn to achieve their best personal record for *Lailatul Qadr* in the last ten nights. A study by Al-Ississ (2010) found that on the 27th of Ramadan (the historical date of *Lailatul Qadr*) abnormal returns are 7 times higher than the average return of Ramadan and the last 5 days of Ramadan provides 3.6 times the abnormal return during Ramadan.

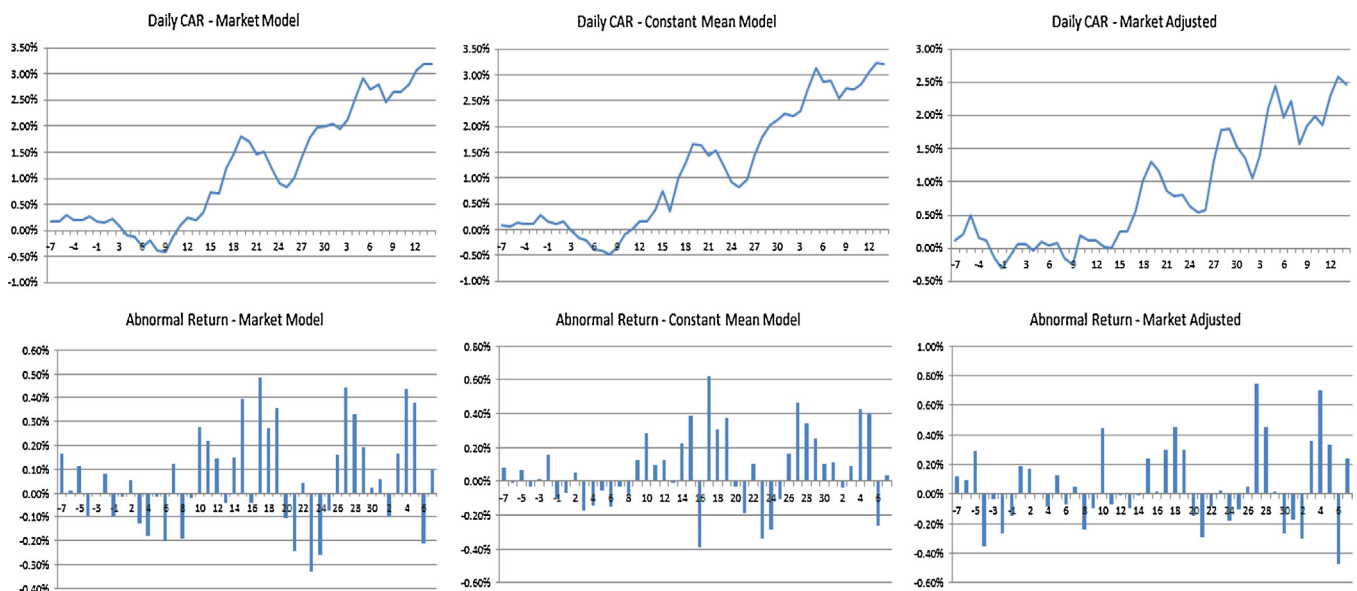


Fig. 4.4 – Abnormal returns and cumulative abnormal returns during Ramadan.

In line with that study, we have also found that the last 5 days of Ramadan display a fourfold increase in abnormal returns from the Ramadan rate, and the 27th of Ramadan further shows 7.5 times the abnormal return during Ramadan. The three models of expected return provide the same result in the form of a positive abnormal return. In this phase, the index tends to move at a high price level, especially on the 27th that many believe to be the night of the *Lailatul Qadr*.

This preliminary result illustrates that the Ramadan effect can be identified through the movement of stock prices based on the behavior patterns of Muslims in the month of Ramadan. Investors can exploit this pattern in order to gain abnormal return, buying or selling according to the pattern that can be observed in Fig. 4.4.

Cumulatively, the abnormal returns generated during Ramadan provide an attractive value for investors if they are interested in following the strategy detailed in Bialkowski et al. (2012), i.e., to buy at the beginning of Ramadan and sell at the end of the month or shortly after Eid-ul-Fitr. This study also discovered a similar effect, with the addition of finding micro-patterns in the different 10-day phases of Ramadan. Due to limitations in the ability to exploit these findings, this study does not recommend investors sell or buy in any of the identified phases. This study is only performed to test the significance of the Ramadan effect with the next stage of statistical tests.

4.3. Persistence of the Ramadan effect

To learn more about the persistence of the Ramadan effect in each country, we divide the annualized return data into 5-year sub-periods. Table 4.5 shows that the Ramadan effect is not always persistently present in many of the observed countries.

The Ramadan effect is only persistently present in three countries (Kuwait, Oman and Tunisia). In these countries, the Ramadan annualized return is always positive during the full period as well as the various sub-periods, and the value is always larger than the annualized return of other months. Other countries, such as Indonesia, Malaysia, Jordan, Morocco, and Qatar, have experienced Ramadan effect, where the Ramadan annualized return is positive and larger than the annualized return of other months, but it is not persistently present in all sub-periods. The final two countries (Bahrain and Saudi Arabia) have never experienced the Ramadan effect due to having a Ramadan annualized return that is consistently negative in all periods.

Based on the findings shown in Tables 4.2 and 4.5, it can be said that the Ramadan effect is present in several of the sample countries, but it is not persistent across time. The presence of the Ramadan effect cannot be directly declared as an anomaly because the efficient market test states that the markets in the observation countries are not yet efficient in general, even in the weak form of efficiency.

In order to support the temporary conclusion, the student's *t* significance test is performed on the cumulative abnormal return (Kothari & Warner, 2007), analyzed with three models of different normal return estimate: the market model (MM), the constant mean model (CM) and the market adjusted model (MA) (Brown & Warner, 1985; MacKinlay, 1997). The results of this analysis are shown in Table 4.6.

The significance testing of the Ramadan effect in each period sample, whether the full period or the five sub-periods, is performed by using three models of normal return estimation. If the *t*-statistic is significant for the three estimation models, then the Ramadan effect is significant. If only one of the models returns an insignificant result, however, then the Ramadan effect is considered not significant in its presence.

Other than dividing the study period into sub-periods, the persistence of the Ramadan effect can also be observed by splitting the event window period of the cumulative abnormal return in Ramadan represented by $CAR(n_1, n_2)$, where n_1 is the first day of the

Table 4.5 – The persistence of Ramadan annualized returns.

Ramadan annualized return										
	Indonesia	Malaysia	Jordan	Morocco	Bahrain	Kuwait	Oman	Qatar	Saudi	Tunisia
1989-1993	-4.77%	-14.25%	-2.77%							
1994-1998	-63.95%	-5.05%	12.32%	36.72%						
1999-2003	28.33%	20.84%	43.71%	36.99%						
2004-2008	32.13%	8.21%	69.40%	-25.45%	-40.67%	22.49%	3.47%	-7.66%	-7.70%	27.87%
2009-2013	41.33%	11.18%	4.70%	-6.60%	-12.90%	18.30%	23.27%	71.09%		35.06%
1989-2013	-2.70%	4.01%	23.89%	7.11%	-26.74%	20.17%	13.92%	13.92%	-7.70%	31.77%
Annualized returns of other months										
	Indonesia	Malaysia	Jordan	Morocco	Bahrain	Kuwait	Oman	Qatar	Saudi	Tunisia
1989-1993	16.39%	32.17%	5.56%							
1994-1998	-24.69%	-27.04%	-8.08%	25.83%						
1999-2003	5.67%	17.57%	6.42%	-11.35%						
2004-2008	10.35%	-7.02%	3.10%	26.44%	-18.73%	-2.91%	-12.61%	-6.83%	-9.81%	6.45%
2009-2013	16.36%	17.42%	-11.57%	-8.65%	-21.94%	-5.99%	3.18%	4.71%		4.37%
1989-2013	3.48%	5.93%	-1.25%	5.67%	-20.62%	-4.20%	-5.11%	-0.24%	-9.81%	1.69%

Table 4.6 – The significance of cumulative abnormal returns.

Sample period	Normal return estimation model	CAR(0.5)	CAR(0.10)	CAR(0.20)	CAR(0.21)
Full period	Market model	-0.1327***	-0.0884***	0.0311***	0.0240
	Constant mean model	-0.1659***	-0.1001***	0.0466***	0.0429**
	Market adjusted model	-0.0493**	-0.1214***	-0.0464***	-0.0541***
1989-1993	Market model	-0.0082	-0.0099	-0.0143	-0.0140
	Constant mean model	0.0089	0.0004	0.0051	0.0039
	Market adjusted model	0.0236*	0.0008	-0.0015	-0.0023
1994-1998	Market model	-0.1031**	-0.0027	0.0035	0.0078
	Constant mean model	0.0199	0.0224	0.0115	0.0096
	Market adjusted model	-0.0071	-0.007	-0.0049	-0.0048
1999-2003	Market model	0.018	0.0211*	0.0434***	0.0407***
	Constant mean model	-0.1836***	-0.1122***	-0.0296	-0.0288
	Market adjusted model	-0.2162***	-0.1347***	-0.0576***	-0.0574***
2004-2008	Market model	-0.0454***	-0.0998***	-0.0031	-0.0018
	Constant mean model	0.0294**	0.0150	0.0377***	0.0370***
	Market adjusted model	0.0711***	0.0461**	0.0271*	0.0212
2009-2013	Market model	0.0060	0.0030	0.0067	0.0045
	Constant mean model	-0.0405***	-0.0257**	0.0219**	0.0212**
	Market adjusted model	-0.0493**	-0.1214***	-0.0464***	-0.0541***

* Significant at 10%.

** Significant at 5%.

*** Significant at 1%.

event window (n_1 is the 1st of Ramadan), and n_2 is the last day of the event window, which in this study means the 5th, 10th, 20th and 21st day as the last day of the event window. Each event window utilized is useful to check the date range during which the Ramadan effect is significant.

Based on the results above, the t-test illustrates that the Ramadan effect is significant during the full-period based on only two models of normal return estimation, the market model and the constant-mean model in CAR(0.20). Further, it is significant only in the constant mean model CAR(0.1) with a CAR range of approximately 3.11–4.66%. This result approaches the findings of Bialkowski et al. (2012), which have a range of 2.44–4.99% using the market model and the constant-mean model in CAR(0.20). The insignificance of the Ramadan effect with the parametric t-test explains that the difference between actual returns and expected returns during Ramadan does not generate meaningful abnormal returns that can be enjoyed by investors.

On the same note, based on their persistence, several sub-periods generate insignificant Ramadan effects: (i) two early sub-periods (1989–1993 and 1994–1998) generally provide an insignificant t-test result for the three models of normal return estimation, and (ii) in other sub-periods, the t-test result shows inconsistent significance results between the three models of normal return estimation. The results of the CAR t-test illustrate that the Ramadan effect is present and significant during the full period. Based on the efficient market test of the full period, it is found that the market in general has yet to reach an efficient level, not even the weak-form efficiency. With this in mind, the significance of the cumulative abnormal return in a market that is not yet efficient is a phenomenon that can reasonably be expected to occur instead of a market anomaly.

The evaluation of the statistical significance using the event study framework can cause several problems, i.e., inaccuracies in determining the event window due to differences in the dates set as the start and end of Ramadan in each country (Bialkowski et al., 2012). Several researchers argue that this event-clustering problem can be anticipated by aggregating returns into a portfolio and then performing regressions on the portfolio return to the event dummy variable, which in this case is Ramadan (Bartholdy, Boyle, & Stover, 2004; Binder, 1985, 1998).

4.4. Effect of financial crisis on annualized return

One of the indications of a negative annualized return is an occurring crisis in one of the countries (Bialkowski et al., 2012), such as the one experienced by Indonesia and Malaysia, as expressed in Table 4.5. In the sub-period from 1994 to 1998, the Ramadan annualized return in Indonesia and Malaysia is negative, while at the same time, Jordan and Morocco have a Ramadan annualized return that is positive. One possible source of this difference is the financial crisis that befell Southesast Asia from 1997 to 1998. Table 4.7 clearly shows that Indonesia and Malaysia's total annualized returns during that period are also negative.

Using the annualized return calculation method, we have found that the crisis factor does affect the presence of the Ramadan annualized return. During crisis periods in Indonesia and Malaysia, the annualized returns of both countries are negative,

Table 4.7 – The effect of the Asian financial crisis on Ramadan annualized returns.

	Total	Ramadan	Other months
<i>Annualized returns including crisis</i>			
Indonesia	–29.68%	–63.95%	–28.44%
Malaysia	–27.35%	–5.05%	–27.04%
<i>Annualized returns excluding crisis</i>			
Indonesia	1.05%	11.40%	0.63%
Malaysia	–2.95%	67.36%	–7.02%

whether the entire year, Ramadan, or months other than Ramadan are considered. When the crisis period (July 1997–December 1998) is excluded from calculation, the opposite result is achieved: Indonesia and Malaysia experience positive Ramadan annualized returns that are larger than the annualized returns of other months and the total annualized returns with normal behavior.

The normal behavior shown by Indonesia and Malaysia during the sub-period from 1994 to 1998 when the crisis factors are excluded is the same as the normal behavior of the other six countries, as discussed above. This indicates that the crisis factor affects the presence of the Ramadan effect. We use t-tests and a regression model to calculate its significance.

Other than the Southeast Asian crisis of 1997–1998, a global financial crisis also occurred in 2008, originating from the implosion of the subprime mortgage market in the US. Unlike the Southeast Asian crisis, whose effects are directly visible in the disappearance of the Ramadan effect from Indonesia and Malaysia, the effect of the global crisis on the Ramadan effect is only visible in four countries that generate negative Ramadan annualized returns. These countries are Bahrain, Saudi Arabia, Morocco, and Qatar. The other six countries in the sample continue to experience positive Ramadan annualized returns (Table 4.8).

The root of the Southeast Asian crisis was the weak macroeconomic fundamentals in that region. The crisis was triggered by erroneous government policy following on the heels of a currency crisis, cascading into a market overreaction that contributed to plummeting currency and asset values in Southeast Asian countries (Corsetti, Pesenti, & Roubini, 1999). The 2008 crisis began in the US, but contagion effects were felt in Europe and across the world. The effect of the 2008 crisis on Southeast Asia and the Middle East was less severe than that experienced by European emerging markets because of the distance of the financial linkages between Southeast Asia and the Middle East with the US (Shirai, 2009).

Unlike the Southeast Asian crisis, which significantly impacted the Ramadan effect, the global financial crisis generally did not impact the Ramadan effect. This lack of impact can be observed in the result of data processing, demonstrating that 6 out of 10 observation countries have positive Ramadan annualized return that also behaved as expected compared to the annualized returns of the total months and other months apart from Ramadan. When Saudi Arabia and Bahrain are excluded from the data for

Table 4.8 – The effect of the global crisis on Ramadan annualized returns.

Country	Total	Ramadan	Other months
<i>Annualized returns including crisis</i>			
Bahrain	–21.07%	–40.67%	–18.73%
Indonesia	11.99%	32.13%	10.35%
Jordan	7.43%	69.40%	3.10%
Kuwait	–3.65%	22.49%	–5.99%
Malaysia	3.25%	8.21%	2.82%
Morocco	21.03%	–25.45%	26.44%
Oman	–11.23%	3.47%	–12.61%
Qatar	–6.91%	–7.66%	–6.83%
Saudi	–9.64%	–7.70%	–9.81%
Tunisia	8.28%	27.87%	6.45%
<i>Annualized returns excluding crisis</i>			
Bahrain	–2.06%	–9.10%	–1.28%
Indonesia	42.68%	48.96%	33.97%
Jordan	22.14%	69.97%	13.83%
Kuwait	22.24%	69.31%	14.96%
Malaysia	19.95%	48.20%	17.72%
Morocco	31.44%	10.02%	31.03%
Oman	8.26%	92.32%	1.73%
Qatar	2.93%	48.26%	–0.08%
Saudi	–9.64%	–7.70%	–9.81%
Tunisia	15.04%	22.11%	14.28%

Table 4.9 – Regression results with the crisis variable.

	C	Ramadan	R-world	R ²	F-stat
<i>Including crisis</i>					
1989-1993	0.0008*** (3.0733)	-0.0011 (-1.0884)	0.1818*** (5.2197)	0.026	0.0001 (14.29)
1994-1998	-0.0005 (-1.3470)	0.0000 (0.0343)	0.5387*** (9.7143)	0.068	0.0000 (47.19)
1999-2003	0.0003 (1.1605)	0.0009 (1.1191)	0.0689*** (2.9111)	0.007	0.0075 (4.91)
2004-2008	0.0002 (0.6574)	0.0002 (0.2083)	0.0243*** (11.6726)	0.095	0.0000 (68.19)
2009-2013	0.0000 (-0.3316)	0.0009 (1.5719)	0.2410*** (15.5531)	0.158	0.0000 (122.18)
1989-2013	0.0002*** (1.5471)	0.0001 (0.3524)	0.2017*** (17.8155)	0.046	0.0000 (158.81)
<i>Excluding crisis</i>					
1989-1993	0.0008*** (3.0733)	-0.0011 (-1.0884)	0.1818*** (5.2197)	0.026	0.0001 (14.29)
1994-1998	0.0000 (0.0356)	0.0005 (0.9049)	0.1161*** (4.9028)	0.019	0.0000 (12.49)
1999-2003	0.0003 (1.1605)	0.0009 (1.1191)	0.0689*** (2.9111)	0.007	0.0075 (4.91)
2004-2008	0.0006*** (2.8282)	0.0005 (0.6251)	0.0399 (1.1733)	0.096	0.3971 (0.9243)
2009-2013	0.0000 (0.3316)	0.001 (1.572)	0.2410*** (15.5531)	0.158	0.0000 (122.18)
1989-2013	0.0002*** (2.5522)	0.0003 (0.7566)	0.1624*** (14.6807)	0.033	0.0000 (108.14)
* Significant at 10%.					
** Significant at 5%.					
*** Significant at 1%.					

reasons of data availability, only Morocco and Qatar experienced negative repercussions stemming from the global financial crisis on their Ramadan annualized returns.

By excluding the crisis factor, we conduct the subsequent analysis. The results obtained illustrate that all countries apart from Bahrain and Saudi Arabia experienced a positive Ramadan annualized return that behaved as expected compared to the annualized return in the total months as well as of other months apart from Ramadan. This shows that without the crisis, the potential increase in annualized returns due to the Ramadan effect is larger.

The regression results of the returns portfolio in [Tables 4.9 and 4.10](#) show that the Ramadan dummy variable is not significant in affecting the returns portfolio. The independent variable of world returns, on the other hand, significantly affects the returns portfolio. This regression result strengthens the conclusion that the Ramadan effect is only a methodological illusion.

With the significant R^2 and F -stat criteria, it can be said that all models can adequately explain the relationship between the dependent and independent variables. Thus, the insignificance of an individual variable (Ramadan effect) is not caused by the model's lack of validity, but is truly because the variable does not have a significant effect on the dependent variable (return portfolio).

The same result is also found in the regression analysis of the return portfolio by excluding the crisis period, when it is found that the Ramadan effect does not statistically influence the return portfolio. The crisis periods are defined as the period of the Southeast Asian crisis (July 1997–December 1998), as defined by [Hunter et al. \(1999\)](#), and the global financial crisis (August 2007–

Table 4.10 – Regression results using the crisis dummy variable.

	C	Ramadan	R-world	Crisis	R ²	F-stat
1989-2013	0.0003 ^{***} (2.5293)	0.0002 (0.4930)	0.2182 ^{***} (17.4329)	-0.0010 ^{***} (-3.1045)	0.0453	0.0000 (105.35)
<p>* Significant at 10%.</p> <p>** Significant at 5%.</p> <p>*** Significant at 1%.</p>						

Table 4.11 – Coincidence effect between the Ramadan and other Gregorian calendar effects.

Period	C	Ramadan effect	Rworld	January effect	Weekend effect	Christmas effect	R ²	F-stat	DW-stat
1989–1993	0.0005 [*] (1.6363)	−0.0010 (−1.0410)	0.1827 ^{***} (5.2482)	0.0006 (0.6651)	0.0013 ^{**} (2.0808)	−0.0008 (−0.1714)	0.0228	0.0000 (6.6864)	1.45
1994–1998	−0.0002 (−0.3823)	0.0003 (0.2297)	0.5403 ^{***} (9.9625)	−0.0006 (−0.4374)	0.0016 [*] (1.7671)	−0.0008 (−0.0121)	0.0784	0.0000 (18.5819)	1.78
1999–2003	0.00001 0.0442	0.0007 (0.8222)	0.0586 ^{**} (2.4786)	0.0005 (0.5465)	0.0012 (2.0226)	−0.0002 (−0.0369)	0.0086	0.0479 (2.2424)	1.74
2004–2008	−0.000008 (−0.0325)	0.0003 (0.3313)	0.2309 (11.6151)	0.0017 ^{**} (2.1964)	0.0006 (1.331)	−0.0046 (−1.0264)	0.0985	0.0000 (28.3849)	1.77
2009–2013	−0.000006 (−0.3490)	0.0006 (1.0469)	0.2277 ^{***} (15.9849)	−0.0011 ^{**} (−2.0678)	0.0003 (0.9085)	−0.0011 (−0.3646)	0.1686	0.0000 (52.6719)	2.03
1989–2013	0.0002 [*] (1.3393)	0.0002 (0.3590)	0.2164 ^{**} (17.3390)	0.0003 (0.6965)	0.0010 ^{***} (3.5636)	−0.0011 (−0.4989)	0.0522	0.0000 (61.0247)	1.69

^{*} Significant at 10%.

^{**} Significant at 5%.

^{***} Significant at 1%.

December 2008), as defined by Calomiris, Love, and Peria (2012). In this study, crisis is therefore present in the sub-periods of 1994 to 1998 and 2004 to 2008.

The impact of crisis on the Ramadan effect is analyzed in two ways: (i) by constructing the same regression model on the previous model with the addition of a crisis dummy variable, and (ii) by constructing a regression model that excludes returns of crisis periods. The two regression models above provide consistent results such that Ramadan variable still has an insignificant effect on the dependent variable (return portfolio) in all sample periods, while other independent variables (R-world and crisis) significantly affect the return portfolio. The F-test and R-squared test of the two models are also significant, showing that the model is capable of explaining the relationship between the dependent variable with the independent variable. As such, the insignificance of the Ramadan effect is due to the variable itself having an insignificant effect on the return portfolio.

4.5. Robustness

To check the robustness of the Ramadan effect, we conduct the estimation of ARMA and GARCH models and find that with any combinations of p and q , the results are same; i.e., the Ramadan effect does not significantly affect the return portfolio. Similarly, when we enter the other Gregorian calendar effects, the results are consistent: there is no Ramadan effect on the return portfolio. To check whether the Ramadan effect is an anomaly that occurs independently and is not influenced by other calendar effects, we then perform the regression analysis as shown in Table 4.11. The tested calendar effects include the January effect, weekend effect, and Christmas effect. Simultaneously, we regress these effects as the dummy variables. In the full period, we find that only the weekend effect is significantly not independent from the Ramadan effect. In all subperiods and over the full period, however, we find that only the Christmas effect is persistently independent from the Ramadan effect, while the January and weekend effects are seemingly not persistent and independent from the Ramadan effect.

5. Conclusions and implications

Based on a series of analytical and statistical tests, this study found that the Ramadan effect is indeed a financial phenomenon present among various other anomalies in the financial market, especially capital markets in Muslim-majority countries. Similar to Rosh HaShanah and Yom Kippur, Ramadan is a religious event that can affect investors' moods and investment decisions (Bialkowski et al., 2012) through the combination of two herding factors that prompt risk-taking behavior and enhance social interaction among investors (Gavrilidis et al., 2015). Yet the effect is not strong enough to be the basis of an argument for the presence of the EMH anomaly or behavioral finance because the presence of the Ramadan effect is proven to be not persistent statistically in certain sub-periods, both in times of crisis and non-crisis. Even if the Ramadan effect is present, as described in previous studies (Bialkowski et al., 2012), this study shows that not all the countries observed have an efficient market, or even a weak-form efficient market. Thus, the presence of abnormal returns in particular periods has yet to be able to be justified as an EMH anomaly.

In our results, the Ramadan effect is persistently present in only three countries: Kuwait, Oman, and Tunisia, and the magnitude is always larger than in other months. Moreover, other countries (i.e., Indonesia, Malaysia, Jordan, Morocco and Qatar) have experienced the Ramadan effect, but it is not persistently present in all sub-periods. Two final sample countries, Bahrain and Saudi Arabia, have never experienced Ramadan effect, displaying negative annualized returns within Ramadan in all periods. Akin to many EMH anomalies that have a weakened impact and even disappear after being documented in the literature (Schwert,

2003), we find that the Ramadan effect also has a non-persistent impact, except in three countries (Kuwait, Oman and Tunisia). The Ramadan effect is not significant when regression analysis is performed on portfolio returns.

This research implies that investor psychology does affect investment behavior in the capital market, but relies on a single event that could affect price movement in the capital market. This study supports the argument that the Ramadan effect can still be explained by the efficient market hypothesis and does not necessarily need to be explained by behavioral finance. This study also finds the significance of the influence of the crisis factor on the Ramadan effect for both global and local crises. From the perspective of Islamic finance, these findings suggest the investment utility of exploiting the abnormal stock returns in some Muslim countries during Ramadan. Moreover, investors must be cautious about the effect of destabilizing potential of herding behavior that promotes systemic risk in the market.

6. Suggestions for further research

The Ramadan effect is influenced by at least three factors: (i) the individual investor, (ii) the collective investors, and (iii) market fundamentals. In the literature, it is often assumed that the Ramadan effect can be impacted only by individual and collective investor factors arising directly from the fasting experience during Ramadan; the literature generally ignores the impact of economic and market fundamentals on the Ramadan effect. We therefore recommend the inclusion of these factors in future research on the Ramadan effect.

In the study by Bialkowski et al. (2012), a significant Ramadan effect is found in 11 Muslim-majority countries, where one of the determinants of the occurrence of the Ramadan effect is suspected to be the psycho-religious factor of the investor, which is hypothesized to contribute to an increase in risk-taking behavior. Yet the use of cumulative abnormal returns cannot directly capture the impact of the Muslim investor's risk-taking behavior unless other statistical measures are also used, i.e., skewness. Further research is recommended to utilize skewness to analyze risk-taking behavior in the Ramadan effect.

Finally, other than risk-taking behavior, any study of the Ramadan effect should be sensitive to market liquidity as measured by transaction volume. Hopefully, future studies on the Ramadan effect will integrate the concept of market liquidity into the measurement of the Ramadan effect.

Compliance with ethical standards

This paper was presented at the conference on Finance and Development in Islamic Economies held at Bangor Business School, Bangor University on September 15, 2014, in collaboration with the Islamic Research Training Institute (IRTI) of the Islamic Development Bank (IDB).

Conflicts of interest

The authors declare that they have no conflicts of interest.

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