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FINANCIAL ECONOMICS | RESEARCH ARTICLE

Ramadan effect on stock market return and trade volume: Evidence from Dhaka Stock Exchange (DSE)

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Abstract: A predictable pattern of stock market return is the violation of the efficient market hypothesis (EMH). It is well studied and evident in financial literature that stock markets around the world have predictable patterns, e.g. calendar effect, behavioural effect, and Religious festival effect. By analysing market return and trading volume data of Dhaka Stock Exchange (DSE) over the period of 1 January 2002 to 30 August 2018, this study attempts to investigate the association of Ramadan, the holy month for the Muslims, with the market return, volatility and trade volume in the of DSE. Applying *GJR-GARCH* (*p,q*) model on the market return of DSE, this study concludes that Ramadan month has no significant relationship with stock market return and volatility. However, Ramadan has a significant negative impact on the daily trade volume of DSE. This is might be the outcome of decreased trading and banking hour and religious perception of investors.

Subjects: South Asian Economics; Corporate Finance; Investment & Securities

Keywords: Calendar anomaly; GARCH; Moving calendar event; Ramadan effect; Dhaka Stock Exchange (DSE)
Subjects: G11; G12; G14; G40

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PUBLIC INTEREST STATEMENT

This article explores the pattern of stock market return of Dhaka Stock Exchange (DSE) during the month of Ramadan. Religious beliefs and practices during this month could have two possible opposing impacts on the capital market of Muslim majority country like Bangladesh. On the positive side, Muslim investor could be in an upbeat and positive mood produced from extended religious lifestyle. On the negative side, due to religious motive, many Muslims might restrain themselves from stock trading as Islam considers trading of some kinds of stock as gambling. This study employs a GJR-GARCH (p, q) model to find the association of Ramadan and stock market return over consecutive 4130 trading days and found that Ramadan month has no significant relationship with market return and volatility of market return. Nevertheless, due to decreased trading and banking hours and religious perception of investors, Ramadan has a significant negative impact on the daily trade volume.

1. Introduction

In a capital-starved developing country like Bangladesh, efficient distribution of resources is very important to achieve rapid economic expansion. In the last several decades, the country has emphasized on the privatization and the success of this privatization wave will severely depend on the efficient and active capital market. Moreover, being a Muslim major country, the capital market could provide a good alternative of *riba* (usury) to the people who think Islam prohibits fixed return. Currently, there are two stock markets in operation in the country, namely Dhaka Stock Exchange (hereinafter DSE) and Chittagong Stock Exchange (CSE). Unlike the stock markets in developed countries, the emerging country's stock markets are commonly characterised by smaller size in terms of trade volume and frequency, existence of influential large traders, weaker disclosure and governance, long settlement time and absence of adequate financial information (Islam & Khaled, 2005). These characteristics of stock markets prevent information to be reflected in the stock prices and make the market inefficient.

Beside the information asymmetry among the investors, behavioural factors are also responsible for the anomalies and disruptions of the stock markets of developing countries, those factors emerge time to time in the form of stock market bubbles (Kapoor & Prosad, 2017). Therefore, behavioural finance is an important perspective to test the efficiency of the stock markets of developing countries. The major breakthrough occurs in the field of behavioural finance after the introduction of the prospect theory, which replaces the utility function of the expected utility theory with the value function. This theory assumes that losses and gains are valued differently and thus investors make decision based on the perceived gain not based on the perceived losses. This development drives behavioural finance to deal with the influence of psychological biases on the behaviour of the investors and its impact on the stock market. Psychological biases, e.g. herd behaviour, overconfidence, mental accounting, and loss aversion leads to the several financial anomalies. Therfore, behavioural finance has become so critical that many people tend to forget the general principles of investment theory in analysing investment decision and are guided by the intuition and other criteria that conflict with rational investment theory (De Bondt, 1998).

This study applies one perspective of behavioural finance that is religion on the daily market return and trade volume data of DSE- the dominant and oldest stock market of Bangladesh- to measure the efficiency of the market. In general, religious faith plays an important role in the lives, behaviour and decisions of the people. Though religious beliefs and practices have a substantial effect on economic activities and development, economists largely ignored this association (Al-Ississ, 2010). However, the recent global trend in literature shows an increased use of religion in finance and investment analysis, still there is a lack of research in the context of Bangladesh. This study aims to fill this lacuna by investigating the association of Ramadan, the holy month for the Muslims, with the market return, volatility of return and volume in the context of DSE.

Ramadan is a time of reflection, self-reformation, worshipping Allah, donating, spiritual cleansing and enlightenment (Qur'an 51:21; 2:183, as cited in Bialkowski, Etebari, & Wisniewski, 2009), which significantly change the working hours, lifestyle and brings more religious mental attitude of the devotee. Sonjaya and Wahyudi (2016) have listed few factors from the literature related to Ramadan that could support the existence of Ramadan effect in the Muslim countries, such as social empathy, feeling happy and peaceful, investors' positive moods, health issues, and the encouragement to do good deeds and prevent evil deeds. Therefore, being a Muslim dominated country, stock markets of Bangladesh might also have some effect and produce a predictable pattern in favour of inefficient market. In this context, by analysing market return and trading volume data of Dhaka Stock Exchange (DSE), this study attempts to investigate the association of Ramadan with the market return, volatility and trade volume. The balance of the study organized as the literature review in the second part; methodology and results in the third and fourth chapter, respectively; and conclusion in the fifth chapter.

2. Literature review

After the traditional assumptions of finance come under threat from a number of quarters, the behavioural finance got the academic attention (Lo, 2005). Under uncertainty, investors' decision may vary

from rational market behaviour (ibid) and from the assumptions of the efficient market hypothesis, which is called abnormality of financial market (Latif, Arshad, Fatima, & Farooq, 2011). Numerous research shows that security returns respond to variables related to factors such as biorhythms, beliefs, social identity and even weather! For instance, Hirshleifer (2001), Lucey and Dowling (2005) and Kamstra, Kramer, and Levi (2000) have shown that seasonal variation and daylight savings time, biorhythms and disruptions in sleep affect the stock return. Edmans, Garcia, and Norli (2007) have found even the loss of international competition by the national soccer team cause significant decline in stock returns.

There is another wave of empirical behavioural finance study that has provided evidence about the presence of seasonal patterns, e.g. day-of-the-week, weekend, time-of-the-month, turn-of-the-month, month-of-the-year and Holiday effect (Cross, 1973; French, 1980; Gibbons & Hess, 1981; Keim, 1983; Tinic & West, 1984). Holiday effect refers to the observation that the average stock return is different on the trading immediately pre- or post-holiday periods than on the other days. Ariel (1990) has examined daily retuns on the "CRSP equally weighted and value-weighted indices of NYSE" and 'AMEX stocks from 1963-82' and found that the average return on pre-holidays is significantly higher than the remaining trading days. Similar results have found in Australia, Canada, Hong Kong, Japan and the US, but not evident in France, Italy, Switzerland, UK, West Germany (Cadsby & Ratner, 1992). Furthermore, Aly, Mehdian, and Perry (2004) have investigated daily market anomalies in the Egyptian stock market using its major stock index and got positive and significant Monday effect in the market returns. Whereas Al-Rjoub (2004) got Thursday return tend to be positive and higher.

Like various calendar anomalies, religious festival and cultural events are also investigated comprehensively to find their impact on the stock market return. Usually, religious festivals are celebrated according to the religions' own calendars. For instance, Jewish society follows the Hebrew calendar, Christens follow the Gregorian calendar and Muslims follow Hijri (moon cycle) calendar. It is evident in many instances that festive mode during religious festival time plays a vital role in making the investment decision. Frieder and Subrahmanyam (2004) have found a significant impact of Jewish High Holy days, i.e. Rosh Hashanah and Yom Kippur on the US investors' mode. Results of this study suggest that stock return is positively associated with Rosh Hashanah and negatively associated with the Yom Kippur. Pantzalis and Ucar (2014) have analysed the US investors mode during Easter week holiday and concluded that investors' are reluctant to react quickly upon the firms' news during this religious festival.

These findings of religious holidays do not only exist in Jewish or Christian communities but also exist in Muslim communities. Among various Islamic festivals, Ramadan is the subject of interest of this study. Ramadan is the 9th month of the Hijri calendar that tremendously changes the behaviour of the Muslims. During this period, practicing Muslims try to maintain a close relationship with Allah that encourages optimistic beliefs of the devotees and become more satisfied and happy. This optimistic belief may extend to the investment decisions of the devotees (Beit-Hallahmi & Argyle, 1997). According to Bialkowski et al. (2009) "People follow a set of prescribed standards of behaviour during Ramadan with an intention of becoming better Muslim and responsible member of the society, which can improve their feelings of self-worth and produce an upbeat sentiment, overconfidence and a greater willingness to accept risk". They have studied 14 predominantly Muslim countries and have found that stock return during Ramadan is significantly higher and less volatile compared to the return and volatility of other months of the year. Similarly, Gavriilidis, Kallinterakis, and Tsalavoutas (2016) and Białkowski, Bohl, Kaufmann, and Wisniewski (2013) have studied on Amman Stock exchange and concluded that stock returns are significantly higher during the Ramadan than the return of other months of the calender. More studies have reported the similar results such as Al-Ississ (2010), Al-Hajieh, Redhead, and Rodgers (2011), Almudhaf (2012) and Ramezani, Pouraghajan, and Mardani (2013).

Furthermore, During Ramadan overall economy of the Muslim countries increases due to the increase of "iftar" related grocery sales and the electricity consumption as the consequence of late-night socio-religious activities (Seyyed, Abraham, & Al-Hajji, 2005). However, apart from the religious and festival-related economic activities, many economic sectors including stock market trading might have sluggish trend due to the reduced banking hours and other Islamic views towards the investment. For instance,

because of religious motive, many Muslims restrained themselves from trading of some categories of stock. Among all categories of stocks, the majority of contemporary Muslim jurists are in agreement on the permissibility of trading with common stocks (el-Din & el-Din, 2002). Nevertheless, the prohibition on some categories might reduce the overall stock trading during the month of Ramadan in the Muslim majority countries.

There are several studies exist to support this pessimistic view of Ramadan effect. Results of these studies suggest that Ramadan has negative or no effect on the stock market return, volatility or trade volume. Iqbal, Kouser, and Azeem (2013) have reported a significant negative effect of Ramadan in Karachi Stock Exchange (KSE) return and reduction in the volatility of monthly return. They have identified some factors that lead to the lower interest in trading, such as reduced banking hours, Islamic prohibition against speculation and use of interest that would affect margin trading and greater religious orientation of market participants. Zhu (2015) has also reported that Ramadan has a negative influence on the European Islamic Investment Bank (EIIB) stock return and the stock price volatility is significantly larger during this month.

Besides, many studies have also found no effect of Ramadan on the stock market outcomes. Husain (1998) has concluded that Ramadan does not significantly affect the average return in the Karachi Stock Exchange (KSE) but reduce the volatility of stock returns significantly during this month. Similar results have reported by Shah and Ahmed (2014). Furthermore, Seyyed et al. (2005) have concluded the average rate of return are unaffected during the month of Ramadan but found less volatility in weekly market return in the case of Saudi Arabia. Alper and Aruoba (2001) have studied the Istanbul stock market and also suggested that returns of the stock are not showing any significant behaviour during Ramadan. In another study, Al-Khazali (2014) has observed that investor would not get benefit from a wealth perspective by investing during the month of Ramadan. However, the study found that risk averse investor prefers to invest during the month of Ramadan.

Overall, Ramadan is an uplifting holiday for Muslims like Rosh Hashanah for Jews. Several studies were conducted across the Muslim countries and those are concluded that Ramadan has associateship with the abnormal stock return. Though many scholars studied the pattern of market return of DSE based on the behavioural finance framework, there is no study found regarding the effect of Ramadan on the stock market return and volatility. The existing literature suggests that there might have a Ramadan pattern (Ramadan effect) in DSE as similar pattern found in several predominantly Muslim countries. Based on the previous studies and information on current issues, this study intends to examine whether the Ramadan has any effect on stock market return, volatility of return and trade volume of DSE.

3. Data and methodology

This study attempts to estimate the Ramadan effect on the return and trade volume by using daily market data of DSE over the period of 1 January 2002 to 30 August 2018. This period consists of 4130 trading days. One important fact to note that since 28 January 2013 DSE is issuing new market indices in collaboration with NASDAQ, namely DSEX instead of DSE general index. However, it is evident from the correlation analysis that these two indices are almost perfectly similar with a correlation coefficient of 0.99 over the first three months of their inception. Therefore, consistency of the time series due to the change in indices should not be a great concern.

The effect of Ramadan month on the stock market return is estimated in this study by using the model from the ARCH family, which has been extensively used in financial time series and has demonstrated enormous success in forecasting conditional variance (Seyyed et al., 2005). At first, the daily market return (Ret_t) is calculated by the logarithmic function of the market index-

$$Ret_t = \ln(dse\_ind_t) - \ln(dse\_ind_{t-1})$$

where dse_ind_t is the closing value of the market index on $t-$ th day and dse_ind_{t-1} is the closing value of the previous ($t-1$) day. This Ret_t series is the dependent variable in this study and found stationary or

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stable from the Augmented Dickey–Fuller (ADF) unit root test. However, this series is not "normally distributed" according to Jarque–Bera statistics. Furthermore, return series (Ret_t) has autocorrelation and partial autocorrelation. So following Equation (1) is used to estimate the Ramadan effect, modelled as a dummy variable (Ram_Day_t) that takes the value 1 if the trading day is in Ramadan month or takes 0 if otherwise. The lagged values of the return (Ret_{t-i}) and lagged error (ε_{t-j}) values capture the auto-regressive (AR) effects and moving average (MA) effects, respectively. The AR and MA order k is included in the equation to eliminate the autocorrelated residuals. Ljung–Box test statistics is used to evaluate the order of AR and MA terms. Therefore, the ARMA model is as follows:

$$Ret_t = \mu_0 + \alpha_t Ram\_Day_t + \sum_{i=1}^{k} \varnothing_i Ret_{t-i} + \sum_{j=1}^{k} \theta_j \varepsilon_{t-j} + \varepsilon_t \tag{1}$$

ARCH-LM test reveals the existence of a sequence of squared residuals (ε_t^2) order autocorrelaton, which means the model error sequence have autoregressive conditional heteroscedasticity, i.e. ARCH effect. Thus, it is suitable to use models from ARCH family. Based on the maximum likelihood statistics and Akaike Information Criterion (AIC), GJR-GARCH model has selected to estimate the time-varying volatility of market return of DSE, which is modelled as a $GJR - GARCH$ (p, q) process to estimate the parameters of the variance Equation (2), that can be written as follows:

$$h_t = v_0 + \beta_t Ram\_Day_t + \sum_{i=1}^{p} (\gamma_i + \omega_i I_{t-i}) \varepsilon_{t-i}^2 + \sum_{j=1}^{q} \delta_j h_{t-j} \tag{2}$$

where

$$I_{t-i} = \begin{cases} 1 \ if \ \varepsilon_{t-i} < 0 \\ 0 \ if \ \varepsilon_{t-i} \geq 0 \end{cases}$$

The orders of p and q in conditional variance are a linear function of past squared error and lagged variance. Equations (1–2) are estimated jointly to determine the effect of Ramadan on the return and volatility of the market return of DSE. Where v_0, γ_i, ω_i and δ_j are the parameters to be estimated by the $GJR - GARCH$ (P, Q) model, while $p>0$ and $q>0$ define the order of the process and β_t captures the Ramadan effect on the volatility of return.

Furthermore, the impact of Ramadan month on the trading volume is estimated using the following regression (Equation (3)). Trade volume data of DSE is available only since 2 January 2003 thus included observations are 3843 up to the date of 30 August 2018. The following equation is estimated by simple OLS regression, where $Trade\_Vol_t$ is the number of trade took place on t-th date and Ram_Day_t is the dummy variable for Ramadan month.

$$Trade\_Vol_t = \beta_0 + \beta_1 Ram\_Day_t + \varepsilon_t \tag{3}$$

where β_0 is the intercept of the regression equation that indicates the average daily transactions during the months other than Ramadan, β_1 reflects the marginal effect on trade volume due to the Ramadan months and ε_t is the error term.

4. Empirical results

Table 1 depicts the descriptive statistics of daily return on different day-of-week, month-of-year and Ramadan period of DSE during the study period. The last column of the table exhibits the contrast of return between two periods. Ramadan period provides more return (0.0767%) compare to the non-Ramadan periods (0.0437%); however, this difference (0.0330%) is not statistically significant. Return differences among the day-of-week are statistically significant for all day except Saturday, which can be ignored as this day is no longer the trading day of DSE. First two days of the week (Sunday and Monday) have a negative difference and rest of the days have positive difference. Among the month-of-year, January, February and April have significant negative differences and June, August and

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Table 1. Descriptive statistics of daily return on different days, months and Ramadan periods

Day/month	N = 4130	Mean Return (%)	Standard Deviation	Minimum Return	Maximum Return	Skewness	Kurtosis	Return contrast with all other day or month
Non-Ramadan	3,804	0.0437	1.3518	−9.3300	20.3821	0.9061	25.6593	0.0330
Ramadan	326	0.0767	0.9653	−3.2141	3.6709	−0.0421	4.6198	
Saturday[1]	162	0.1076	0.9485	−3.4323	2.7475	−0.4266	5.3676	0.0638
Sunday	783	−0.2023	1.4830	−8.0768	7.5266	−0.7993	8.2428	−0.3068**
Monday	801	−0.0701	1.4868	−9.3300	20.3821	2.4454	50.8678	−0.1444**
Tuesday	795	0.2055	1.3955	−7.3589	14.4799	2.0619	22.0649	0.1972**
Wednesday	803	0.0764	1.1608	−6.6379	7.0225	0.2143	8.9427	0.0374**
Thursday	786	0.2083	1.0657	−8.8737	5.4090	0.0421	13.9862	0.2000**
January	371	−0.0746	1.7821	−9.3300	14.4799	0.5586	20.8354	−0.1328*
February	323	−0.1142	1.7889	−8.1357	8.7113	0.0049	9.4828	−0.1741**
March	365	−0.0087	1.3771	−7.1747	7.3800	0.1462	9.0078	−0.0604
April	357	−0.0926	1.1252	−4.5850	4.8481	0.0430	5.7427	−0.1521**
May	360	0.1199	1.2294	−6.8778	5.7591	−0.2885	7.9200	0.0806
June	367	0.1589	1.0582	−5.3763	5.4098	−0.2348	7.5703	0.1236*
July	361	−0.0135	1.1060	−4.2468	3.7886	−0.3072	5.2175	−0.0655
August	347	0.1750	1.0110	−4.9638	3.6952	−0.0378	5.9697	0.1405*
September	321	0.1271	0.8685	−2.9869	3.5058	−0.0525	5.3316	0.0875
October	325	0.0066	1.1479	−4.4617	5.3013	−0.1719	5.7085	−0.0431
November	321	0.1742	1.7801	−5.9054	20.3821	4.6224	54.7157	0.1386*
December	312	0.1152	1.1797	−6.9605	4.3014	−0.4309	8.1192	0.0744

Source: Authors' estimation.
Note: 1. Saturday is no longer the trading day in Dhaka Stock Exchange (DSE) as they moved to 5-day trading from 6-day. Friday is the weekly day-off over the period of investigation. 2. **, * represents significant at 5% and 10%, respectively.

November have the significant positive differences in months' average daily return in comparison to the other months. Rest of the months' return differences are not statistically significant.

Table 1 also exhibits skewness and kurtosis of the return series of different days, months and Ramadan period. All sub-sample distributions are skewed at different degrees, indicating that they are asymmetric. Moreover, they all exhibit high levels of kurtosis, i.e. these distributions have fat tails, which indicates that return series are not normally distributed. Bartlett's test is also used to see whether the variance is persistent or not and it is evident from the result (not reported) that the variances of Ramadan period and non-Ramadan period are not equal. These initial findings show that daily returns are leptokurtic and asymmetric and possess some behavioural origins, i.e. investors of the market have excessive optimism or pessimism that leads to large swing in the market return.

Table 2 reports the estimation results of the GJR-GARCH (1, 1) model. Results are estimated twice by assuming different error distributions. Gaussian normal error distribution has avoided, as the DSE index return is not normally distributed. First part of the table exhibits the mean equation (Equation 1) where both AR and MA components are found statistically significant at 1% level of significance. However, the dummy variable for Ramadan days is not statistically significant. Moreover, the beta coefficient of the Ramadan dummy is positive. These results are consistent with the results reported by Seyyed et al. (2005) for the Saudi stock market.

The second part of the table, depicts the results of the variance equation (equation (2)), where again the dummy variable for Ramadan is not statistically significant and beta coefficient of the dummy variable is positive, which is inconsistent with the previous study by Husain (1998) and Seyyed et al. (2005). Both of these studies have found a negative effect of Ramadan in the variance equation. Again, ARCH, GARCH and Threshold terms of GJR-GARCH model have found statistically significant at 1% level of significance. From the diagnostic perspective, this GJR-GARCH model does not suffer from

Table 2. Estimated returns and conditional variance- GJR-GARCH (1, 1) model with ARMA (2,1) components and Ramadan month dummy variables				
DV: Daily Return	**Student's *t* Error Distribution**		**Generalized Error Distribution**	
Variable	**Coefficient**	**Standard Error**	**Coefficient**	**Standard Error**
Part 1: Mean Equation				
Constant	0.000267*	0.000133	0.000130	0.000238
Ramadan Dummy	0.000422	0.000449	0.000491	0.000446
AR(1)	−0.580100**	0.120857	1.111722**	0.021054
AR(2)	0.082739**	0.030574	−0.129175**	0.017118
MA(1)	0.749539**	0.117995	−0.961244**	0.012648
Part 2: Variance Equation				
Constant	0.000001**	0.000000	0.000002**	0.000000
Ramadan Dummy	0.000001	0.000001	0.000001	0.000001
ARCH Term	0.151014**	0.017043	0.152489**	0.018859
ARCH Term*Dummy for negative lagged residual	0.094319**	0.022550	0.133341**	0.026096
GARCH Term	0.816488**	0.012014	0.808196**	0.013165
Part 3: Model Statistics				
Log-likelihood	13,426.52		13,365.06	
Akaike info criterion	−6.496621		−6.466855	
Schwarz criterion	−6.479772		−6.450006	

Source: Authors' estimation.
Note: 1. **, * represents significant at 1% and 5%, respectively.

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Table 3. Regression result of trade equation with Ramadan month dummy variable		
Dependent Variable: Trade Volume in million		
Variable	Coefficient	Standard Error
Constant	72.13967**	1.400481
Ramadan Dummy	−15.98742**	4.979384

Source: Authors' estimation.
Note: 1. **, * represents significant at 1% and 5%, respectively.

autocorrelation problem and does not have any ARCH effect. However, the error of this model is not normally distributed, which has not assumed as well.

Table 3 reports the results of the trade volume regression. Results show that Ramadan dummy has a significant negative impact on the daily trade volume of DSE during the study period. These results are consistent with the previous results reported by Seyyed et al. (2005). Some of the factors might have contributed to this negative effect of Ramadan, such as, reduced trading and banking hours and greater religious orientation of the market participants.

Overall, Ramadan does not have any statistically significant effect on the daily market return in case of DSE during the study period of 1 January 2002 to 31 August 2018. In the case of daily return volatility, Ramadan also does not have a significant effect. However, average trade volume DSE is significantly reduced during the period of Ramadan.

5. Conclusion
It has been well researched and evident that behavioural factors of the investors played an important role in the processing investment decision. These factors could be range from biorhythms to social identities, mental accounting to religious beliefs. Numerous recent studies have considered religion as an influential factor behind the investment decision though it was largely ignored previously. Being a Muslim majority country, stock market of Bangladesh might have the same religious influence as like some other Muslim countries have around the world. Especially Ramadan, a holy month for the Muslims that change the socio-religious behaviour of people, should have some impact on the stock market return and volatility. However, this associationship never addressed before. This study fills this lacuna by enquiring the relationship of this religious month with the stock market return, volatility of return and trade volume of DSE.

By applying $GJR - GARCH\,(p,q)$ model on DSE market return, this study finds no significant relationship between Ramadan month and stock market return. These results are similar to some of the previous studies, notably Husain (1998); Alper and Aruoba (2001); and Seyyed et al. (2005). Moreover, in the case of DSE, time-varying volatility of the market return is also not associated with the Ramadan month. However, trade volume during the month of Ramadan has reduced significantly, which is consistent with the earlier research. Reduced banking hours and greater engagement to socio-religious activities by the market participants may be the prime reasons behind this slow-down. Overall, uplifted religious morality during Ramadan does not show any significant effect on the market return or volatility in the context of Dhaka Stock Exchange (DSE).

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