The impact of Islamic events on herding behaviour in Saudi Arabian equities market

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Abstract

Using data from Saudi Arabia, a strictly religious society, we examine how Islamic events (i.e. Ramadan, Eid-ul-Fitr, Eid-ul-Adha and Ashoura) moderate the impact of social mood (positive and negative) on herding in the stock market. We use the cross-sectional absolute deviation (CSAD) of returns and find that investors' mood during Islamic events of Eid-ul-Fitr, Eid-ul-Adha and Ashoura significantly affects herding behaviour in the market. Our results, however, contrast with existing evidence of herding in the month of Ramadan. Overall, results are robust after controlling for market conditions (i.e. domestic and US market returns, liquidity, sentiments, oil price volatility) and crisis events (i.e. global financial crisis and Arab Spring). Though most prior research investigates the impact of individual Islamic events on stocks as seasonal anomalies, our study contributes by jointly exploring how four key Islamic events, associated with contrasting moods, induce diverse herding patterns in the Saudi stock market.

Keywords: Herding, Social mood, Ramadan, Eid-ul-Fitr, Ashoura, Eid-ul-Adha.
JEL classification: G02 G10 G15.

1 Introduction

Besides analyses, mood and emotions have significant impact on the decision making process (Lerner et al., 2015; Wright and Bower, 1992), more so is the case of financial markets which behave like a stereotypical individual with characteristic moods, thoughts and sentiments (Shefrin, 2008). These spirits and emotions, in most instances, are not justified by the *facts at hand* but reflect a mix of psychological biases which play a crucial role in investment decisions (Shiller, 2015; Baker and Wurgler, 2007; Daniel et al., 2002). In aggregation, investors' mood can potentially disturb market equilibrium through its impact on the stock prices and returns (Edmans et al., 2007; Goetzmann et al., 2015). For instance, when higher stock prices are associated with better mood and vice versa, it is imperative to capture investors' mood to understand how investment decisions are moderated by herding behaviour at the aggregate level (Gavriilidis et al., 2016; Shu, 2010).

Mood-as-information theory and its associated phenomenon of misattribution have led behavioural finance researchers to look at the influence of mood and irrelevant feelings on decision making in the equity markets (Lucey and Dowling, 2005). In this background, recent studies in behavioural finance explore factors which shape investors' mood and highlight that, alongside weather (Hirshleifer and Shumway, 2003; Saunders, 1993), sports (Edmans et al., 2007) and social events (e.g. Kamstra et al., 2000; Nofsinger, 2005; Frieder and Subrahmanyam, 2004), religion exerts a significant impact on equity investments (Al-Ississ, 2010). As each community celebrates its own religious months and days, collective mood of the investors begin to converge and reflects the specific nature of the religious event, or sequence thereof, on the calendar (Akhter et al., 2015).

Above line of thinking has prompted many researchers to investigate the link between religion, or religious calendar, and investor's mood and behaviour. For instance, Frieder and Subrahmanyam (2004) found that the Jewish High Holy days (i.e. Rosh Hashanah and Yom Kippur)[1] have a significant impact on the US investors' mood as investment

[1]Rosh Hashanah and Yom Kippur are religious occasions celebrated by the Jewish community. Rosh Hashanah, a joyous occasion similar to the secular New Year's Day, is the Jewish new year and signifies creation of the world. It is a day spent in prayer for a good year. Yom Kippur happens nine days after

returns follow a pattern consistent with collective sentiments on the religious event days. Though overall dollar volume – market trading – deteriorated on both holy days, stock returns were significantly up around Rosh Hashanah and significantly down around Yom Kippur. They linked the change in trading activity on these days to the non-financial opportunity cost of trading which appears to be large for many investors on the holy days and so found a significant impact of both religious days on stock returns.

Pantzalis and Ucar (2014) found that Easter week holiday distracts the US investors which causes a delayed response to earnings news in the form of a post-earnings announcement drift. Their research expected investors to be rational in processing and incorporating this type of information into stock prices, both completely and timely. Behavioural literature suggests that incomplete and or delayed information processing may often happen because of distraction, because people have limited information processing capabilities and finite attention.

Similarly, as with seasonal anomalies, the evidence on the impact of the month of Ramadan[2], the biggest Muslim festival globally, has been mixed. For instance, Al-Hajieh et al. (2011) used data from 1992 to 2007 and found that positive mood associated with Ramadan is linked to abnormal market returns in most Middle Eastern countries. However, Husain (1998), using data from Pakistani equity market, found that volatility declined significantly but there was no significant changes in mean returns during Ramadan.

During Eid-ul-Fitr[3] and Eid-ul-Adha[4], most Muslims are more optimistic and feel

Rosh Hashanah and, in contrast to the former, it is a solemn occasion and regarded as the most austere holy day in the Jewish canon. It is also the day of Atonement, the time to reflect on one's sins (often in worship) and the time to ask God's forgiveness so as to begin the next year with a "clean slate" (Frieder and Subrahmanyam, 2004).

[2]Ramadan is the ninth month in the Islamic calendar and it is the fourth of the five pillars of Islam. Its observance is mandatory for Muslims (Seyyed et al., 2005). It is described as "better than a thousand months" in the Qur'an. Eating, drinking, smoking and having other sensual pleasures are prohibited during Ramadan days, from dawn until sunset. Muslim behaviour during Ramadan is correlated with low levels of anxiety and increased levels of euphoria and social interactions (Knerr and Pearl, 2008; Daradkeh, 1992).

[3]After a month of fasting and religious practices in Ramadan, comes the month of Shawwal, which includes great festival of Eid. The word Eid is Arabic and means "festivity," while Fitr means "to break fast." Muslims often celebrate Eid-ul-Fitr with family and friends and it is a time of increased charity towards those in need (Al-Hajieh et al., 2011).

[4]The twelfth month is known as Dhu al-Hijjah, Eid-ul-Adha is the tenth of Dhu al-Hijjah and it is one of the crucial festivals in the Islamic calendar, a notable day of prayer and of donning new clothes

a sense of social identity and solidarity which may impact their decision-making facilitating enhanced trading activities and increasing the risk of herding. As Frieder and Subrahmanyam (2004) found with Jewish events, joyous festivals facilitate trading in risky assets as a result of the prevailing optimism reduces risk aversion among investors. However, compared to *Eid* events, Ashoura[5], according to Al-Ississ (2010), is dominated by negativity, especially for Shi'a Muslims.

Studies that have reported market effects arising from the influence of Eid-ul-Fitr, Eid-ul-Adha and Ashoura include Wong et al. (1990) who considered the influences of multiple seasonal affects, such as the Muslim festival of Eid-ul-Fitr and found that returns on Malaysian-stock investments are negatively associated with the effect of Eid-ul-Fitr. In another interesting study, Chowdhury and Mostari (2015) examined if Eid-ul-Adha affects the Dhaka market returns and found that before and after this event there is a higher mean index return and an anomaly index return. In another related study, Majeed et al. (2015) used daily data from the KSE-100 Index from 2001 to 2012 and found that Eid-ul-Adha has impact on Pakistani stock market returns; however Ramadan, Ashoura, Rabiul Awal and Eid-ul-Fitr all had significant effects.

We look at the mixed conclusions from various studies like above and extend the discussion on association between social mood and the herding observed during Muslim religious days namely Ramadan, Ashoura, Eid-ul-Fitr and Eid-ul-Adha. Use of data from Saudi stock market allows us to exploit factors like religious homogeneity of population (Muslim density exceeding 90 percent of the total) and comparatively more religiously observant society than many other Muslim countries. We argue that herding behaviour in Saudi stock markets is more pronounced and measurable on festive, compared to non-event days, as communal moods associated with religious festivals have been demonstrated to lead to equivalence in decision making and push market anomalies.

The extent and nature of herding is expected to be correlated with the mood occasioned by the event. We argue that two Eid events, Eid-ul-Fitr and Eid-ul-Adha, are

to visit family and friends.

[5]Ashoura is the tenth day of the first Hijri month of Muharram and marks the death of Hussein Ibn Ali. Sunni and Shi'a Muslims treat this event differently. Shi'a in Saudi Arabia treat it as a day of great remorse whereas the Sunni majority instead regard it as a day of relief and happiness (Al-Ississ, 2010).

positive and optimistic occasions when Muslims feel a sense of social identity and solidarity. Therefore, they are likely to exhibit an impact on the investment decision-making by enhancing trading activities and increasing the likelihood of herding. However, Ashoura causes mood depression for some investors which leads to negativity and pessimism, reducing trading activities in the stock market. Finally, the fourth event, Ramadan, spans over a month and it likely that herding may be reduced or absent because investors are distracted by religious devotion and compulsory practices, such as fasting and special prayers. Further, in Ramadan, working hours for employees are decreased thus, market activities are likely to go under compression. This study presents novel evidence on herding behaviour in Saudi stock market during these festivals, associated with contrasting social moods which previously have not been recognised.

Compared to many previously published studies, we go further to understand the scale of impacts of religious events by considering if different states of international and domestic markets have any impact on the association between herding and festive occasions, a potentially important issue given the sensitivity of herding to market conditions (Chang et al., 2000). To achieve this, we control for impact of important international events, such as the 2008—2009 financial crisis and the Arab Spring and various global factors, specifically fluctuations in oil prices (Crude oil CBOE index), US market returns, US investors' sentiment and the differences in behaviour of large- and small-stock portfolio holders. Domestically, we controlled for market liquidity, market returns and investment styles. Our findings contrast those of Gavriilidis et al. (2016), as we observed herding behaviour during Eid-al-Fitr, Eid-al-Adha and Ashoura but found no evidence of herding during Ramadan. We found evidence of herding during these event days when we controlled for variables, as mention above, reflecting status of international and domestic markets. The strongest evidence of herding was observed when domestic market returns, especially down-market returns, were controlled.

This research is the first to control for variables associated with the international equities market on the relationship between different Muslim holy days and the herding behaviour observed in the Saudi stock market, as effected by investor mood. Controlling

for the post-2008 financial crisis and the Arab Spring period also resulted in strong evidence for herding at times outside of the Islamic holy days. These findings support previous studies (e.g. Galariotis et al., 2015; Gavriilidis et al., 2016) which report that herding is both country and period specific and like Gavriilidis et al. (2016) found it to be mood related.

These results make a useful contribution to understanding the role of Islamic events on the stock market behaviour which may be of interest to market regulators seeking to understand the main contributors to market instability in Saudi Arabia, a major Islamic country. Thus, it might enable investors and regulators to form expectations about market direction during these Islamic events days and inform their decision making.

The remainder of the paper is organized as follows. Section 2 discusses the relevant literature on herding and mood and states our hypotheses. Section 3 presents the method and the data employed. Section 4 discusses the empirical findings, section 5 describes robustness checks and section 6 concludes.

2 Literature Review

2.1 ***Mood-as-information and misattribution***

In a classic study, Schwarz and Clore (1983) formalised the mood-as-information theory holding that mood tempers our decision making across many unrelated aspects of our lives. Hence many mood affecting phenomena, such as the weather, season, sports outcomes, religious events may have notably misattributed, i.e. unrelated to the matter in question, consequences for complex or risky decisions (Lucey and Dowling, 2005).

Various studies provide evidence for a link between mood, investment and the risk assessment (Hirshleifer, 2001; Daniel et al., 2002; Nofsinger, 2005; Dowling and Lucey, 2005). For instance, a positive mood generally has been linked with riskier investment decisions (Au et al., 2003; Shu, 2010), as it makes individuals less concerned about the potential negative consequences of their decisions and the commensurate lack of care and rationality intensifying risk-prone responses (Leith and Baumeister, 1996; Forgas, 1998). In an experimental setting, Zanotti (2010) tracked subjects' mood states through daily

surveys over six-weeks and showed that individuals in good moods were likelier to enter long positions and increase their financial leverage in a virtual stock market game.

Traditionally investors are assumed rational and utilitarian who maximize their profits by competing with each other in efficient markets (Fama, 1970). However, contrary to this view, many empirical studies find that investors follow cognitive and emotional biases and breach strict rationality (Aduda et al., 2012), particularly when market uncertainty is on the higher side (Lo, 2005). In a causal sense, when investor's behaviour is driven by emotions, financial losses and missed financial goals may occur (Shu, 2010). Such behaviour, when stocks deviate from the assumptions of the Efficient Market Hypotheses (EMH), is termed a financial market anomaly.[6]

Extending above line of arguments, Gavriilidis et al. (2020) assert that investors' mood (as proxied by day of the week, religious festival days, and the amount of sunlight) promotes herding, a behavioural bias that characterises investors following each other and causes observable impact in the financial markets. This line of arguments is not consistent with EMH (Christie and Huang, 1995; Baddeley, 2010; Saxena et al., 2016) and relies on heuristic decisions making in uncertain conditions, especially when extrapolation from limited and recent events leads to imagined patterns that do not exist in reality(Barberis et al., 1998).

2.2 ***Mood associated with religious events -– effects on financial decisions***

Calendar-specific religious events can influence investors' moods. For instance, Frieder and Subrahmanyam (2004) used data on Jewish holy days and presented interesting evidence from the US market where investment returns form patterns, notably going up on *Rosh Hashanah* and moving down on *Yom Kippur*. Similarly, (Pantzalis and Ucar, 2014) explored US data on the Easter week and showed that investors exhibit a slow and incomplete reaction to the publication of relevant information, reflecting that additional costs are imposed on trading on holy days.

The most prominent Muslim festival globally, Ramadan, has been the focus of finan-

[6]The literature on finance, especially related to capital markets, divides anomalies into three main categories calendar, technical and fundamental (Latif et al., 2011; Akhter et al., 2015). Many examples of anomalies have been reported, for more discussion see Kiymaz and Berument (2003); Rasugu (2005); Dodd and Gakhovich (2011). They include the day of the week and holiday effects.

cial market research as a mood factor. Like other seasonal anomalies, it potentially affects financial markets. However the existing evidence of its impact is mixed. Some studies argue that the Muslim investors' behaviour during Ramadan is correlated with low anxiety levels and increased euphoria and sociability (Daradkeh, 1992; Knerr and Pearl, 2008) and this may explain abnormal market returns (Al-Hajieh et al., 2011). However, there are many studies which do not find any significant evidence of the linkage mentioned above (Husain, 1998; Shah and Ahmed, 2014; Ali et al., 2017).

In an empirical study, Al-Ississ (2010) found trading volumes and daily returns of 17 Muslim countries increased as a result of Ramadan. He argued about absence of investors following a particular religion or the one-sided effect caused by sharing of an attitude towards investment decisions. Similarly, Husain (1998) found higher stock volatility but no impacts on normal or average returns in the Pakistan markets. Białkowski et al. (2012) investigating 14 Muslim countries did detect higher stock returns during Ramadan, as did Al-Khazali (2014) from 15 Muslim countries across differing time periods, however, the effect dissipated after the global financial crisis period (2007–2012). Seyyed et al. (2005) found seasonal behaviour in volatility and trading activities disappeared in Saudi Arabia's stock market during Ramadan, having analysed several sectoral indices.

Ali et al. (2017) found a significant positive impact on Asian financial markets from Eid-ul-Fitr, but none from Ashoura, Eid Milad-un-Nabi, Ramadan or Eid-ul-Adha. Conversely, neither Chan et al. (1996), nor McGowan Jr and Jakob (2010) between 2000—2003, found any impact from Eid-ul-Fitr in the Malaysian-stock market. Chowdhury and Mostari (2015) tested Dhaka markets and found that before and after Eid-ul-Adha there was a higher and anomalous mean index return. Akhter et al. (2015) studied Eid-ul-Adha effects on market returns and volatility in six Islamic stock markets and found returns decreased in Malaya but were unaffected elsewhere, while volatility was affected in the Turkish, Moroccan and Egyptian markets. Eid-ul-Adha was also shown from daily KSE-100 Index data, between 2001–2012, to be inconsequential to Pakistani stock market returns, but Ramadan, Ashoura, Rabiul Awal and Eid-ul-Fitr all had significant effects (Majeed et al., 2015). Al-Ississ (2010) who reported a positive effect on market returns

from Ramadan in 17 Muslim countries, found that the Ashoura effect was negative. On sectarian lines, Sunni and Shi'a Muslims respond differently to Ashoura, for the former, the majority in Saudi, it is a joyful event, whereas, for the latter, the opposite pertains.

2.3 ***Attitude During Islamic Calendar Events and Herding***

Looking through the lens of religious conservatism, Muslim behaviour with regard to securities trading entails additional analysis. Many Muslims consider speculative trading in securities a form of gambling which is tagged as a "haram" (forbidden) activity. Securities trading is, therefore, particularly avoided by Muslims during Ramadan and trading volumes noticeably decline. Similarly, the accumulation of interest or "Riba" is prohibited, so leverage (margin trading) or trading in interest-based securities may also decline during this period (Seyyed et al., 2005). In Saudi Arabia the citizens, predominantly conservative Muslims, practice a highly austere form of Islam. Nonetheless, the Saudi stock exchange lists some non Shariah-compliant stocks because as yet there are no legal restrictions. Therefore, portfolio selection in the Saudi market is clearly an ethical issue, based on the attitude and preferences of investors, a situation which may not pertain in the same form in less strict Muslim or non-Muslim countries. Influence of religious events on behaviour or mood are, therefore, more likely to be observable in Saudi compared to other markets.

There is also a cross-sectoral reduction in working hours in Ramadan, further slowing of business activities (Seyyed et al., 2005). Compared to non-festival days, Muslims, during religious events, become more social, health conscious and spiritually oriented (Białkowski et al., 2012). Many researchers have argued that social interaction generally, and social mood specifically, are important in driving individual and collective behaviour, which, in turn, affects the financial decision making and market outcomes (Prechter Jr, 2001; Hong et al., 2004; Parker and Prechter, 2005; Olson, 2006; Liao et al., 2011; Blasco et al., 2012). Moreover, and seemingly on the flip side, the higher levels of social support Muslims receive during the festive months may encourage optimistic beliefs, and this optimism may extend to investment decisions (Beit-Hallahmi and Argyle, 1997; Puri and Robinson, 2007).

More recently, Gavriilidis et al. (2016) explored the influence of Islamic events from a behavioural perspective and found a significant link between market fluctuations and the effects of herding during Ramadan in seven Majority Muslim countries (Bangladesh, Egypt, Indonesia, Malaysia, Morocco, Pakistan, and Turkey). In most of these markets, they found that herding effects were greater during Ramadan compared to outside it, an outcome they linked to the prevalent social mood. In a similar vein, Al-Hajieh et al. (2011) identify Islamic religious events as triggers for market anomalies and herding behaviour, which may affect their financial decision-making.

2.4 ***Domestic and international market conditions***

Global events, such as the 1997 Asian crisis and the subsequent collapse of oil prices in 1998, the adoption of the price-band mechanism by OPEC in 2000, and the "9/11" attacks on the US consistently impacted the Gulf markets. Saadi-Sedik and Williams (2011) argue that Gulf Cooperation Council (GCC) markets are not immune from shock transmissions from the global and regional markets. Other studies by (Arouri and Rault, 2012) and (Ravichandran and Alkhathlan, 2010; Hammoudeh and Li, 2008) argue that oil price volatility transmission to the equity markets and the market returns, respectively, affect the GCC financial markets more when shocks are propagated by global rather than by local or regional factors.

Very few studies have investigated the interaction between herding behaviour in Saudi Arabia or more widely in the GCC countries and global market factors. Amongst others, global variables, comprising US stock market performance, the price of oil, the Chicago Board Options Exchange Volatility Index (CBOEVIX), market volatility and crash volatility, were found to be important drivers of herding behaviour in the GCC stock markets, including Saudi Arabia (Balcilar et al., 2013, 2014; Balcılar et al., 2017). Saudi Arabia's heavy oil dependency and uniqueness amongst emerging markets suggest such global economic factors are likely to affect the relationship between herding and Islamic events, leading to anomalous market outcomes.

3 Data and Methodology

3.1 Data

Research data for the study spans from 5 October 2005 to 25 February 2016 and it covers all 175 companies listed on the Saudi Tadawul all-share index.[7] All values are in US$ terms obtained from Thomson-Reuters *Datastream*.[8] Ashoura, Ramadan, Eid-ul-Fitr and Eid-ul-Adha dummy variables were calculated manually and, using Zoznan (1997), we have matched dates from the Islamic calendar to the corresponding Gregorian calendar days.[9] Daily equities and time series data for the S&P500 index, the CBOEVIX, and the CBOEOILVIX was obtained from the Thomson-Reuters *Datastream*. Definitions of domestic and international market factors are given in the Appendix Table A.

3.2 Methodology

We capture herding by using a quantitative approach implemented by Gavriilidis et al. (2016). This approach relies on returns dispersion in a portfolio of assets with similar characteristics. In essence, it is a modified form of the model proposed by Christie and Huang (1995) who argued that a relationship exists between the cross-sectional standard deviation of stock returns (CSSD). They assert that returns exhibit zero dispersion when herding behaviour strictly follows the market consensus. However, in the absence of herding, dispersion grows and returns vary from the market return or consensus. Later, Chang et al. (2000) upgraded the CSSD model by allowing a non-linear relationship between dispersion and absolute market returns. They predict that investors follow the aggregate market in stressed conditions, and if there is herding, the cross-sectional absolute deviation (CSAD) of returns would negatively bear on the overall market return. They also used squared market returns to capture non-linearity during the extreme market swings.

[7]To avoid survivorship bias, the Saudi companies include all active, dead and suspended companies.
[8]The Saudi Tadawul all-share index symbol in Datastream is TDWTASI.
[9]The Islamic calendar year is based on twelve lunar-months. Hence, the Islamic event dates are not fixed in the Gregorian calendar. Instead, we have used a popular online platform https://calendar.zoznam.sk to cross-match Islamic events dates year-by-year with their corresponding Gregorian calendar dates.

Following the above reasoning, we have used the CSAD model as presented below.

$$CSAD_t = \beta_0 + \beta_1|R_{m,t}| + \beta_2 R^2_{m,t} + \epsilon_t \tag{1}$$

For the purpose of this study, we calculate the dependent variable $CSAD_t$ as:

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}|R_{i,t} - R_{m,t}| \tag{2}$$

where N is total number of stocks traded on day t; $R_{i,t}$ is the return on individual stock i on day t; and $R_{m,t}$ – market return is the average of returns on all securities on day t.

A key advantage of using the CSAD model *a la* Gavriilidis et al. (2016) is that it allows testing for the differences in herding during the Islamic event days as opposed to non-event days. To achieve this objective, we create a dummy variable D_e with value of 1 for 'event days' and 0 for 'non-event days' and then tested for (four) events in the Islamic calendar:

$$\begin{aligned} CSAD_t = \beta_0 + \beta_1 D_e|R_{m,t}| + \beta_2(1 - D_e)|R_{m,t}| + \\ \beta_3 D_e R^2_{m,t} + \beta_4(1 - D_e)R^2_{m,t} + \epsilon_t \end{aligned} \tag{3}$$

Using above specification, each Islamic event day was tested separately with D_e for Ramadan spanning 1-30 calendar dates, Eid-ul-Fitr spanning 1-14 calendar dates, Eid-ul-Adha spanning 8-20 calendar dates, and Ashoura spanning 1-14 calendar dates. Above model specification asserts that negative significant values of β_3 (β_4) indicate herding behaviour within (outside) Islamic event days.

After running baseline model in 3, we examine the herding behaviour in the Saudi equity market during and outside the noted event days after accounting for local, regional and global market conditions *(see Table A for definitions)* by adjusting the baseline equation 3. For example, continuing to draw on Gavriilidis et al. (2016), we test for herding behavior during market-up or market-down conditions by running the following

specification:

$$CSAD_t = \beta_0 + \beta_1^j D_e|R_{m,t}| + \beta_2^j(1 - D_e)|R_{m,t} + \beta_3^j D_e R_{m,t}^2 + \beta_4^j(1 - D_e)R_{m,t}^2 + \epsilon_t \quad (4)$$

where superscripts 'j' represents two alternative movements in the market: (a) up, when the proxy variable is increasing, and (b) down, when the proxy variable is contracting (for definitions of variables, see Appendix Table A).

Likewise, we adjust the baseline model (eq. 3) and estimate herding behaviour after controlling for regional and international market conditions, investment styles, and international and regional events (e.g. global financial crisis and the Arab Spring). Estimates after controlling for domestic and international market conditions (returns, liquidity and changes in oil prices) have been reported in the 'Results and Discussion' section 4. Other factors, testing for robustness of results, have been discussed in section (5) and their estimates are in the appendix in the following order: (i) investment style are in Appendix and international market sentiments (proxied by CBOEVIX) are in Appendix B, and (ii) Global Financial Crisis and Arab Spring in Appendix C.

4 Results and Discussion

Table 1 provides descriptive statistics for the measures of market activity averaged across all days, Islamic event days and non-event days, for the Saudi stock market during the sample period. To improve readability, we have divided the Table 1 into Panels A, B and C showing summary statistics on $CSAD_t$, $R_{m,t}$ and *Liquidity*, and multiplied all series by 10^4. The 'Panel A' shows that mean $CSAD_t$ for event and non-event days combined is 0.685, with mean values on event days (Ashoura (0.03), Ramadan (0.014), Eid-ul-Fitr (0.023) and Eid-ul-Adha (0.019)) less than the whole sample mean (0.685) and their respective averages on non-event days. The 'Panel B' of the Table 1 shows that the mean annualised market return ($R_{m,t}$) is negative (0.015) and much lower during Islamic events days compared to non-event days. Despite a slow down in trading during Ramadan, the annualised average return per day is the highest (0.004) when compared

to Ashoura with the lowest return per day (-0.004). The 'Panel C' of Table 1 shows that the average liquidity for the whole period is 0.081, with much lower level of liquidity of religious event days compared to non-event days.

It is interesting to note that market liquidity during Ramadan is low yet the annualised average daily return (0.004) is the highest across four religious events. The former is consistent with Gavriilidis et al. (2016) who observed a decline in trading volumes in some countries during Ramadan, and the latter is consistent with Amihud and Mendelson (1986) who found that returns increase in illiquid markets. Overall, this study reports a decrease, albeit insignificant, in annual returns on the event days in the Saudi market. The last column of Table 1 shows that the difference in $CSAD_t$ and liquidity on event vs non-event days is significant for all four events pointing towards herding and depressed mood during the event-days.

PLEASE INSERT TABLE 1 HERE.

Using baseline model in equation 3, Table 2 shows that, on overall basis, herding is observed only outside Ramadan (significantly negative β_4) and there is no sign of herding during the holy month. This finding is not consistent with previous research (e.g. Gavriilidis et al., 2016) and points toward idiosyncratic behaviour of Saudi market in comparison to those in the surrounding Muslim countries. To further investigate the absence of herding during Ramadan, we split the month of Ramadan into three decades (i.e. average seven working days per decade) and repeated baseline model to estimate decade-wise coefficients. Our unreported[10] results show that 'β_3' coefficients for the first two decades of Ramadan (14 working days) are statistically significant, however for the last decade (7 working days) it is statistically insignificant, which matches with the outcome for the overall month. These findings point towards changing patterns of herding over a long span of 30-days during Ramadan. The significant herding observed during the first 14 working days (nearly matching the span of other religious events covered in this study) exhibits marked dilution over time with the statistically insignificant coefficient of the last decade completely off-setting herding in the first two decades of Ramadan. Table

[10]The regression outcomes for three decades of the month of Ramadan are available on demand.

2 also presents evidence of herding both during and outside Eid-ul-Fitr, Eid-ul-Adha, and Ashoura (β_3 and β_4 significantly negative), however it is stronger on event days compared to non-event days.

Previous research on the impact of Islamic event days on herding offers mix evidence. For instance, Chowdhury and Mostari (2015) found a positive impact of Eid-ul-Adha on the Dhaka stock exchange, and Wong et al. (1990); Ali et al. (2017) considered Eid-ul-Fitr a seasonal anomaly and also found that it has positive impact in several Muslim countries. However, some studies, e.g. Chan et al. (1996); McGowan Jr and Jakob (2010), failed to detect any evidence of influence of Eid-ul-Fitr on the stock markets. Similar is the case with studies focused on the effect of Ashoura on stock exchanges in Muslim countries. For example, Al-Ississ (2010) found negative returns when investigating the impact of Ramadan and Ashoura on markets in seventeen Muslim countries, whereas Majeed et al. (2015) found abnormal returns in the pre-period of Ashoura in the Pakistani stock market. Our findings are more aligned to Akhter et al. (2015) and Majeed et al. (2015) who found negative or no effects of Islamic event days by taking example of Eid-ul-Adha.

PLEASE INSERT TABLE 2 HERE.

4.1 Controlling for Domestic Market Factors:

Based on equations 4, Tables 3 present results after controlling for the influences of domestic factors on the scale of herding. The results present evidence of herding both during and outside of Ramadan on down-market days. This asymmetrical effect of Ramadan on herding points towards the role played by investors' fear in promoting imitative behaviour. Table 3 also reports significant herding during Eid-ul-Fitr and Eid-ul-Adha on both up- and down-market days; however outside the event days, it is significant during down-market days only. These results suggest that the euphoric mood set during the Eid days promotes herding in both bullish and bearish market conditions; however, in the absence of euphoria in 'outside' event-days, again it is investors' fear that induces herding in the down-market days. These findings are consistent with Gavriilidis et al. (2016) who argue that herding would be strong on days correlated with positive mood, like in up-market days. Lastly, strong herding is observed around Ashoura on down-market days

which is stronger during the event days than outside ($|\beta_3| > |\beta_4|$). Overall, we observe that herding is more likely in down-market conditions. This is consistent with Christie and Huang (1995); Chang et al. (2000); Gleason et al. (2004) who found that dispersion in security returns increased more in up-markets than in down-markets. Mabrouk Houda and Mohamed (2013); Sharma et al. (2015); Economou et al. (2018) also found strong, asymmetric herding behaviour only in down markets.

PLEASE INSERT TABLE 3 HERE.

Table 3 also shows that when market liquidity decreased, herding was detected outside Eid-ul-Fitr and both during and outside Eid-ul-Adha, but was stronger during the event days than outside Eid-ul-Adha ($|\beta_3| > |\beta_4|$). During Ashoura and Ramadan herding was detected, only on days outside of these events when market liquidity decreased. In contrast, Gavriilidis et al. (2016) found no evidence of herding either on or outside of Ramadan, whether market liquidity was increasing or decreasing and concluded that market liquidity did not seem to play an important role in the relationship between herding and Islamic events. This difference in results can be explained in terms of use of different sample and time-period. Gavriilidis et al. (2016) used data from Bangladesh, Egypt, Indonesia, Malaysia, Morocco, Pakistan and Turkey and this diversity of national characteristics may have been influential. Moreover, methodological differences between Amihud (2002), used here to control for market liquidity, and trading volume as expressed across thousands of stocks, used by Gavriilidis et al. (2016) may also have affected the outcomes.

4.2 Controlling for International Market Factors:

Like in the case of domestic market return and liquidity, equations 4 calculate affect of US market return, US market sentiments (proxied by COBEVIX) and Oil market volatility (proxied by CBOEOILVIX). Table 4 presents results after controlling for daily movements in the US market (indicated by the S&P500 index). We observe herding during and outside Ramadan and Eid-ul-Fitr in 'up' US market returns with $|\beta_3| > |\beta_4|$ showing that impact is strong during compared to the outside event days. The results

also suggest significant herding outside of Eid-ul-Adha and Ashoura days, only when the US market was up. We also observe herding during Eid-ul-Fitr and Ashoura on down US market days. Gavriilidis et al. (2016) found herding was significant within Ramadan on both up and down US market days, for most of their sample markets including Bangladesh, Morocco and Turkey, but just on down-market days in Egypt and Malaysia and just on up-market days in Indonesia. Although they also found evidence of herding outside Ramadan in some markets, it was always more intense during Ramadan.

PLEASE INSERT TABLE 4 HERE.

Effects of variation in daily movements of daily changes of the US investors' crude oil index (CBOEOILVIX) were tested, probably for the first time in any research. The Saudi economy depends on oil, so an impact from US oil markets on Saudi investors was expected. Similar studies, such as Gavriilidis et al. (2016), considered CBOEVIX as a global factor effecting herding in Islamic markets; however their focus is on non or small oil exporting economies, despite finding that it was critical in initiating herding behaviour during Ramadan in some Islamic markets. Our results show that herding was significant outside Ramadan when CBOEOILVIX was increasing and occurred during and outside Ramadan when CBOEOILVIX was decreasing. It was stronger during Ramadan ($|\beta_3| > |\beta_4|$) when CBOEOILVIX was down. During Eid-ul-Fitr herding was only associated with rising CBOEOILVIX but during Ashoura it occurred when CBOEOILVIX increased or decreased. No herding was evident during Eid-ul-Adha but it was found outside Eid-ul-Adha when CBOEOILVIX was increasing.

5 Robustness

5.1 Controlling for Investment Style and International Sentiments (CBOEVIX)

To test for additional dimensions in which herding behaviour may arise, we repeat our baseline model 3 for large and small capitalisation stocks. Previous research by Lakonishok et al. (1992); Wermers (1999) reports pronounced herding in smaller capitalisation stocks. Therefore, it may be the case that herding behaviour reported during event days is sensitive to an investment style: herding during events days, as found in our work, is

because of increased trading in small stocks vs. large stocks. To carry out this consistency check, we take the top and bottom deciles, based on their end of the year market capitalisation, from the cross-section of companies listed on the Saudi equity market.

Our results, reported in Appendix B, show herding in both large and small stock portfolios with significantly negative β_3 during Ashoura, Eid-ul-Fitr and Eid-ul-Adha event days, but not during Ramadan. In general, these findings show that the herding behaviour during the event days is not driven by small stocks only. Hence, we find support for the view that greater herding for both portfolio types during the events is potentially attributable to common interactions of cognitive and emotional responses exhibited by all investors on the event days (Baddeley, 2010) and intentional herding may occur in conditions where information is very limited (Banerjee, 1992). These results may also arise from unintentional herding during events days or, all stock movements could arise from responses to the same issue, for example investors window-dressing their portfolios by selling overvalued shares (Lakonishok et al., 1992).

Appendix B also presents results of a known measure to capture changes in global risk profiles or investor sentiment i.e. changes to the implied volatility index underwritten over S&P500 stocks - CBOEVIX. We repeat our analysis in the spirit of **??**. We find that herding occurred outside Ramadan in both up and down states of the CBOEVIX, reinforcing our main results. For Eid-ul-Fitr, significant herding is reported ($|\beta_3| > |\beta_4|$) on and outside event days when the global sentiment, as measured by changes to CBOEVIX, is on the rise. But on decreasing CBOEVIX days, significant herding is only seen outside Eid-ul-Fitr days. Herding occurs, both during and outside Ashoura when global market uncertainty is on the rise, but is stronger during Ashoura ($|\beta_3| > |\beta_4|$). Again, this contradicts Gavriilidis et al. (2016) who found strong evidence of herding outside of Islamic events but no evidence of it during Ramadan when global market risk barometer is on the rise[11] days, they attributed this to a rise in "fear" among US investors when CBOEVIX is up. Strong evidence of herding was also found during Eid-ul-Adha on down-CBOEVIX days. Consistent with Chiang et al. (2013); Philippas et al. (2013);

[11] Up-VIX predicts higher volatility during the next 30 days.

Gavriilidis et al. (2016) who found evidence that increasing CBOEVIX instigate herding, our results offer some evidence of how international investors' sentiments promote herding in the Saudi market on Islamic event days.

5.2 Controlling for Global Financial Crisis and Arab Spring

To account for international and regional crises that fall during the sample period of our study, i.e. Global Financial Crisis (GFC) and the Arab Spring, estimates using adjustments to baseline equation 3, are reported in Appendix C. The results controlling for global financial crisis period find evidence of significant herding during and outside Eid-ul-Adha in the pre- and post-GFC periods for Eid-ul-Adha ($|\beta_3| > |\beta_4|$). For Ashoura, significant herding is only reported in the pre-GFC period, (significantly negative β_3).

Similar to the GFC, our results controlling for the Arab Spring[12] period show that herding is pronounced and significant during Eid-ul-Fitr only prior to the outbreak of the Arab Spring crisis, (significant negative β_3). There herding during Ashoura is found only prior to the Arab Spring. Outside of Ramadan, Eid-ul-Adha, and Ashoura there was herding, but only after the Arab Spring period.

6 Conclusions

Saudi Arabia, a major Islamic country, has the largest economy in the region. Its skewed dependence on oil revenues and conservative domestic cultural norms, rooted in religious observance, significantly impact its financial markets. This study exploits Saudi context, a relatively unexplored setting, particularly in respect of the impacts of Islamic events on investors' herding behaviour. This study is the first to use behavioural perspective and explore impact of short Islamic events (e.g. Eid-ul-Fitr, Eid-ul-Adha and Ashora) and the better known month-long period of Ramadan, on investors' herding in the Saudi stock market. A large body of research is focused on understanding impact of individual Islamic events on stock returns and trading volumes as seasonal anomalies. Our study fills the gap in literature by presenting evidence on how Islamic events, after

[12]The Arab Spring uprising that began on 17 December 2010, had wide-reaching impact beyond just the field of business finance and insufficient research has been conducted to date to clarify its complex legacy. It was associated with political uncertainty and had consequences for stock market volatility and depressed confidence among foreign investors.

controlling for key domestic and global factors, induce herding in the Saudi stock market.

In this study we found herding behaviour during Eid-al-Fitr, Eid-al-Adha and Ashoura, however no evidence of herding found during Ramadan. This result is in contrasts with Gavriilidis et al. (2016) study and extends discussions on country-specific impact of religious events, and analyzing Ramadan through different decades. We split the data in 'up' and 'down' markets, and after controlling for the influence of domestic and international market factors, we observe strong evidence of herding in down-market returns. This suggests investors' fear drives imitative behaviour. We also find that international factors facilitate herding behaviour of Saudi investors mostly on non-event days. In that sense, our work provides qualitative support to previous studies (e.g. Galariotis et al., 2015; Gavriilidis et al., 2016) which argue that herding is mood-dependent, and specific to space (country) and time.

Recognition of observable and unobservable national differences can explain why determining the exact influence of investors' mood is complex, especially in dynamic settings like the stock markets. While exploring how and why some, if not all, religious occasions influence investors, it is important to note that unrelated factors, such as weather and holidays, affect investors' moods. Akerlof (1980) and Romer (1984) argued that individuals follow behavioural norms, beliefs and actions of members of their community. Our study complies with this theory by recognizing that herding is associated with religious events and tends to reflect the event's mood in a rather complex manner. Despite the importance of understanding how different moods are associated with different cultural events, our knowledge is incomplete even for well-known markets such as the UK and US. For future, the scale and distribution of herding might be better understood using different samples, like the MENA or GCC countries, or by further differentiating religious events regarding their positive and negative moods, or further exploring the mediating role of liquidity and other market factors by directly interacting them with the proxies for herding. Our understanding can also improve by furthering research into the effects of other financially significant anomalies, such as weather and holidays.

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Table 1 Descriptive statistics for Domestic Factors: Islamic Religious Event and Non-event Days

This table provide summary statistics on $CSAD_t$, $R_{m,t}$ and *Liquidity* across Panels A, B and C, respectively. Each panel covers four religious events – Eid-ul-Adha, Ashoura, Eid-ul-Fitr and Ramadan – covering event days vs non-event days (populated in [ ]).

	Mean	Median	Min	Max	SD	Obs	T-test (p-value)
Panel A: $CSAD_t$							
Whole Sample	0.685	0.566	0.000	5.709	0.460	2,666	
Ashoura	0.030	0.000	0.000]	1.578	0.159	114	-59.734* (0.000)
	[0.654]	[0.551]	[0.000]	[5.709]	[0.475]	2,552	
Ramadan	0.014	0.000	0.000	1.308	0.098	79	-68.208* (0.000)
	[0.671]	[0.560]	[0.000]	[5.709]	[0.470]	2,575	
Eid-ul-Fitr	0.023	0.000	0.000	2.427	0.156	94	-63.399* (0.000)
	[0.662]	[0.559]	[0.000]	[5.709]	[0.466]	2,572	
Eid-ul-Adha	0.019	0.000	0.000	1.868	0.131	91	-65.373* (0.000)
	[0.666]	[0.558]	[0.000]	[5.709]	[0.468]	2,575	
Panel B: $R_{m,t}$							
Whole Sample	-0.015	0.024	-5.075	7.042	0.737	2,666	
Ashoura	-0.004	0.000	-4.386	1.947	0.154	114	0.531 (0.595)
	[-0.011]	[0.007]	[-5.075]	[7.042]	[0.721]	2,552	
Ramadan	0.004	0.000	-1.940	2.797	0.092	79	1.615 (0.110)
	[-0.019]	[0.014]	[-5.075]	[7.042]	[0.731]	2,575	
Eid-ul-Fitr	-0.001	0.000	-4.518	3.998	0.189	94	0.853 (0.393)
	[-0.013]	[0.012]	[-5.075]	[7.042]	[0.712]	2,572	
Eid-ul-Adha	-0.001	0.000	-2.922	1.740	0.107	91	0.886 (0.375)
	[-0.014]	[0.015]	[-5.075]	[7.042]	[0.729]	2,575	
Panel C: ***Liquidity***							
Whole Sample	0.081	0.047	0.000	3.430	0.195	2,666	
Ashoura	0.003	0.000	0.000	0.362	0.018	114	-19.518* (0.000)
	[0.078]	[0.044]	[0.000]	[3.430]	[0.196]	2,552	
Ramadan	0.002	0.000	0.000	0.426	0.018	79	-20.152* (0.000)
	[0.079]	[0.046]	[0.000]	[3.430]	[0.195]	2,575	
Eid-ul-Fitr	0.004	0.000	0.000	3.036	0.064	94	-18.915* (0.000)
	[0.077]	[0.045]	[0.000]	[3.430]	[0.186]	2,572	
Eid-ul-Adha	0.002	0.000	0.000	0.269	0.016	91	-20.133* (0.000)
	[0.079]	[0.046]	[0.000]	[3.430]	[0.195]	2,575	

$CSAD_t$ represents Cross-Sectional Absolute Deviation of total stock market returns and defined in equation 2. $R_{m,t}$ represents changes in the broad-based Saudi market index, and *Liquidity*, calculated using Amihud (2002) method, is aggregated price impact response of all listed companies on the Saudi equity market for both Islamic event and non-event days. For consistency [and meaning where applicable], all series are multiplied by 10^4. Stock market returns describe basis points [bps] not percentage returns. Abbreviations used: Min. – Minimum; Max. – Maximum; SD – Standard Deviation; Obs. – Observations; Diff. – Test of Differences.

Table 2 Estimates of Herding from average Saudi Arabian Market Returns on Event versus Non-event Days

Regression analyses were used to test the differences in values for $CSAD_t$ within/outside Islamic events. Analyses were carried out for each Islamic event (Ashoura, Ramadan, Eid-ul-Fitr and Eid ul-Adha) separately. Calculations of Cross-sectional Absolute Deviation ($CSAD_t$) for these events were undertaken for the Saudi Arabian Stock Market during October 2005 - February 2016.

Islamic Event	β_0	**t-stat**	β_1	**t-stat**	β_2	**t-stat**	β_3	**t-stat**	β_4	**t-stat**	$R^2(\%)$
Ramadan	0.004 ***	18.66	0.441 ***	3.021	0.556 ***	6.433	-4.907	-0.887	-7.131 **	-1.980	22.48
Eid-ul-Fitr	0.005**	23.17	0.348 *	1.706	0.459 ***	7.366	-18.925 ***	-3.482	-3.837 *	-1.875	20.58
Eid-ul-Adha	0.004 ***	18.66	0.636 ***	2.92	0.551 ***	6.444	-17.009 *	-1.872	-6.996 **	-1.965	22.48
Ashoura	0.004 ***	19.11	0.642 ***	5.404	0.544 ***	6.521	-14.229 ***	-4.718	-6.638 *	-1.896	22.63

*, **, *** indicate the result is significant at p = 0.1, 0.05, and 0.01, respectively. The t-value measures the size of the difference relative to the variation in the sample data. R^2 (coefficient of determination) indicates how close the data are to the fitted regression line. $CSAD_t$ was obtained from calculations using the Equation (3) $CSAD_t = \beta_0 + \beta_1 D_e|R_{m,t}| + \beta_2(1 - D_e)|R_{m,t}| + \beta_3 D_e R^2_{m,t} + \beta_4(1 - D_e)R^2_{m,t} + \epsilon_t$; data was sourced as described in methods. The negative and significant coefficients $\beta_3(\beta_4)$ indicate herding behaviour during (outside) event days.

Table 3 Estimates of Herding with Domestic Market (a) Returns, and (b) Liquidity Controlled

This table presents regression analyses testing the differences in values for Cross-sectional Absolute Deviation ($CSAD_t$) within/outside Islamic event days. Analyses were carried for four Islamic events (i.e. Ashoura, Ramadan, Eid-ul-Fitr and Eid ul-Adha) separately. Calculations of ($CSAD_t$) for these events were undertaken for the Saudi Arabian Stock Market during October 2005 - February 2016.

Islamic Event	β_0	**t-stat**	β_1	**t-stat**	β_2	**t-stat**	β_3	**t-stat**	β_4	**t-stat**	R^2(%)
Panel A: Market Returns Up											
Ramadan	0.005 ***	25.14	0.346 ***	3.56	0.420 ***	5.396	-4.671	-1.266	-2.789	-1.222	16.93
Eid-ul-Fitr	0.005	28.95	0.291	1.407	0.353 ***	5.474	-16.331 ***	-3.029	-0.530	-0.332	15.72
Eid-ul-Adha	0.005 ***	24.91	0.930 ***	0	0.412 ***	5.324	-46.550 ***	-2.775	-2.641	-0.243	17.02
Ashoura	0.005 ***	24.95	0.407***	2.719	0.408 ***	5.238	7.803	0.883	-2.595	-1.137	16.9
Panel B: Market Returns Down											
Ramadan	0.004 ***	22.97	0.573 ***	4.666	0.743 ***	11.1	-8.344 *	-1.788	-13.448 ***	-6.341	28.99
Eid-ul-Fitr	0.004 ***	22.46	0.331 *	1.76	0.589 ***	7.401	-20.821 ***	-4.492	-8.337 ***	-3.014	25.64
Eid-ul-Adha	0.004 ***	23.07	0.583 ***	0	0.742 ***	0	-13.181 ***	-3.037	-13.371 ***	-6.287	29.04
Ashoura	0.004 ***	23.02	0.686 ***	8.683	0.729 ***	10.74	-15.291 ***	-8.004	-12.791 ***	-5.623	29.1
Panel C: Liquidity Up											
Ramadan	0.004 ***	18.56	0.152	1.453	0.401 ***	4.414	5.556	1.336	-3.764	-1.077	19.85
Eid-ul-Fitr	0.005 ***	24.47	0.399 **	2.512	0.324 ***	5.025	0.324 ***	5.025	-16.799 ***	-4.261	19.12
Eid-ul-Adha	0.004 ***	18.57	0.290 *	1.848	0.399 ***	4.457	-3.305	-0.572	-3.665	-1.064	19.68
Ashoura	0.004 ***	19.45	0.533 ***	6.523	0.389 ***	4.617	-11.467	-0.406	-3.152	-0.963	20.02
Panel D: Liquidity Down											
Ramadan	0.004 ***	16.63	0.802 ***	5.047	0.874 ***	9.743	-4.94	-0.373	-14.26 ***	-3.41	31.5
Eid-ul-Fitr	0.004 ***	17.07	0.289	0.661	0.749 ***	8.619	-27.329	-1.126	-9.887 ***	-2.71	27.19
Eid-ul-Adha	0.004 ***	16.72	2.135 ***	4.054	0.878 ***	9.902	-155.524 **	-2.571	-14.290 ***	-3.437	31.18
Ashoura	0.004 ***	16.54	1.034 ***	3.357	0.880 ***	9.853	-36.747	-1.307	-14.369 ***	-3.439	31.51

*, **, *** indicate the result is significant at p = 0.1, 0.05, and 0.01, respectively. The t-value measures the size of the difference relative to the variation in the sample data. R^2 (coefficient of determination) indicates how close the data are to the fitted regression line. $CSAD_t$ was obtained from calculations using the Equation(4) $CSAD_t = \beta 0 + \beta_1^j D_e|R_{m,t}| + \beta_2^j(1-D_e)|R_{m,t}| + \beta_3^j D_e R_{m,t}^2 + \beta_4^j(1-D_e)R_{m,t}^2 + \epsilon_t$, where j: proxy for the Saudi market 'Up' and 'down' conditions in Panel A & B, respectively, and Liquidity ''Up' and 'Down' in Panel C & D, respectively. The negative and significant coefficients $\beta_3(\beta_4)$ indicate herding behaviour during (outside) event days.

Table 4 Estimates of Herding with (a) US Market Returns, and (b) Oil Price Volatility (CBOEOILVIX) Controlled

This table presents regression analyses testing the differences in values for Cross-sectional Absolute Deviation ($CSAD_t$) within/outside Islamic event days. Analyses were carried for four Islamic events (i.e. Ashoura, Ramadan, Eid-ul-Fitr and Eid ul-Adha) separately. Calculations of ($CSAD_t$) for these events were undertaken for the Saudi Arabian Stock Market during October 2005 - February 2016.

Islamic Event	β_0	**t-stat**	β_1	**t-stat**	β_2	**t-stat**	β_3	**t-stat**	β_4	**t-stat**	R^2(%)
Panel A: US Market Returns Up											
Ramadan	0.004 ***	22.93	0.561 ***	5.356	0.626 ***	6.765	-10.102 **	-2.109	-9.983 **	-2.571	22.74
Eid-ul-Fitr	0.005 ***	29.45	0.24	1.165	0.505 ***	6.709	-19.222 ***	-3.656	-5.498 *	-1.850	20.4
Eid-ul-Adha	0.004 ***	22.5	0.689 ***	4.43	0.614 ***	6.743	0.019	0.117	-9.682 **	-2.536	22.71
Ashoura	0.004 ***	22.67	0.406 **	2.414	0.618 ***	6.673	15.167	1.025	-9.830 **	-2.540	22.71
Panel B: US Market Returns Down											
Ramadan	0.005 ***	18.59	0.309 **	2.57	0.489 ***	4.804	0.288	0.064	-5.291	-1.362	21.21
Eid-ul-Fitr	0.005 ***	24.06	0.441 **	2.418	0.410 ***	5.637	-19.390 ***	-4.464	-2.731	-1.025	20.21
Eid-ul-Adha	0.005 ***	18.46	0.353 **	2.505	0.491 ***	4.856	-5.830	-1.121	-5.275	-1.368	21.12
Ashoura	0.005 ***	19.69	0.593 ***	6.021	0.480 ***	5.093	-13.506 ***	-5.727	-4.659	-1.256	21.77
Panel C: CBOEOILVIX Up											
Ramadan	0.004 ***	32.39	0.205 ***	2.66	0.531 ***	11.81	3.283	0.962	-9.389 ***	-4.413	30.9
Eid-ul-Fitr	0.005 ***	30.01	0.392 **	2.105	0.355 ***	5.713	-17.667 ***	-3.745	-2.723	-0.912	26.01
Eid-ul-Adha	0.004 ***	31.92	0.255 *	1.724	0.524 ***	11.57	0.38	0.042	-9.141 ***	-4.311	30.51
Ashoura	0.004 ***	31.38	0.653 ***	7.539	0.502 ***	10.28	-14.707 ***	-7.701	-8.225 ***	-3.464	30.6
Panel D: CBOEOILVIX Down											
Ramadan	0.003 ***	40.47	0.470 ***	2.638	0.483 ***	12.76	-10.427 ***	-3.389	-5.544 **	-2.353	30.33
Eid-ul-Fitr	0.004 ***	38.13	-0.404 ***	-3.125	0.235 ***	4.262	78.954 ***	3.932	8.475 *	1.942	23.57
Eid-ul-Adha	0.003 ***	40.54	0.334 ***	2.865	0.474 ***	11.02	-4.125	-1.031	-4.344	-1.422	30.64
Ashoura	0.004 ***	40.07	0.421 ***	4.702	0.465 ***	10.2	-4.027**	-2.165	-3.780	-1.034	30.48

*, **, *** indicate the result is significant at p = 0.1, 0.05, and 0.01, respectively. The t-value measures the size of the difference relative to the variation in the sample data. R^2 (coefficient of determination) indicates how close the data are to the fitted regression line. $CSAD_t$ was obtained from calculations using the Equation(4) $CSAD_t = \beta 0 + \beta_1^j D_e|R_{m,t}| + \beta_2^j(1-D_e)|R_{m,t}| + \beta_3^j D_e R_{m,t}^2 + \beta_4^j(1-D_e)R_{m,t}^2 + \epsilon_t$, where j: proxy for the US market 'Up' and 'down' conditions in Panel A & B, respectively, and CBOEOILVIX 'Up' and 'Down' in Panel C & D, respectively. The negative and significant coefficients $\beta_3(\beta_4)$ indicate herding behaviour during (outside) event days.

Appendix A Domestic and Global factors affecting herding on Islamic event days

This table presents definitions of domestic and global market factors controlled in this study.

Factors	Proxy Variable
Domestic:	
Individual stock return	$R_{i,t}$ is the return on individual stock i on day t.
Market Returns	$R_{m,t}$ is the average return on day t for all securities.
Market Liquidity	Following Amihud (2002), we have used price impact measure, which relies on equal weights for all stocks available on a given day. For individual stock we have calculated average of daily ratio of stock return to trading volume calculated over all positive-volume days in a year. Formula: Illiquidity = Average $(\|r_t\|/Volume_t)$
Global:	
US daily stock market returns	Daily returns of the S&P500 index
US investor sentiment	Chicago Board Options Exchange Volatility Index (CBOEVIX)
The Chicago Board Options Exchange Crude Oil Index	Chicago Board Options Exchange Crude Oil Index (CBOEOILVIX)
The 2008 Global Financial Crisis	Market returns before and after the start (September 2008)
The Arab Spring Crisis	Market returns before and after the outbreak (17 December 2010).

Appendix B Estimates of Herding for (a) different Investment Styles (Large and Small Investors), and (b) US Market CBOEVIX Controlled

This table presents regression analyses testing the differences in values for Cross-sectional Absolute Deviation ($CSAD_t$) within/outside Islamic event days. Analyses were carried for four Islamic events (i.e. Ashoura, Ramadan, Eid-ul-Fitr and Eid ul-Adha) separately. Calculations of ($CSAD_t$) for these events were undertaken for the Saudi Arabian Stock Market during October 2005 - February 2016.

Islamic Event	β_0	**t-stat**	β_1	**t-stat**	β_2	**t-stat**	β_3	**t-stat**	β_4	**t-stat**	R^2(%)
Panel A: Large Investors											
Ramadan	0.003 ***	17.6	0.322 ***	3.47	0.447 ***	5.771	-1.924	-0.548	-4.257	-1.298	24.37
Eid-ul-Fitr	0.003 ***	18.77	0.705 ***	4.181	0.429 ***	6.173	-16.208 ***	-3.483	-3.347	-1.130	25.02
Eid-ul-Adha	0.003 ***	17.55	0.463 ***	-3.935	0.442 ***	5.766	-10.909 **	-2.317	-4.134	-1.273	24.32
Ashoura	0.003 ***	18.1	0.470 ***	5.648	0.437 ***	5.875	-10.051 ***	-4.638	-3.795	-1.195	24.58
Panel B: Small Investors											
Ramadan	0.005 ***	17.89	0.566 ***	2.679	0.674 ***	0	-7.209	-0.913	-9.645 **	-2.549	8.44
Eid-ul-Fitr	0.005 ***	21.1	0.387	1.271	0.560 ***	7.916	-22.087 ***	-2.783	-5.829 **	-2.267	16.6
Eid-ul-Adha	0.005 ***	17.96	0.814 **	2.423	0.670 ***	7.238	-24.126 *	-1.668	-9.511 **	-2.546	18.49
Ashoura	0.005 ***	18.24	0.807 ***	4.875	0.662 ***	7.253	-17.302 ***	-4.177	-9.156 **	-2.473	18.53
Panel C: CBOEVIX Up											
Ramadan	0.004 ***	30.36	0.276 ***	3.838	0.617 ***	13.41	0.653	0.221	-11.936 ***	-6.075	33.4
Eid-ul-Fitr	0.004 ***	30.24	0.387 **	2.276	0.414 ***	0.414	-18.972 ***	-4.226	-4.639 *	-1.782	26.73
Eid-ul-Adha	0.004 ***	30.8	0.288 ***	6.777	0.611 ***	13.25	0.062	1.579	-11.707 ***	-5.948	33.06
Ashoura	0.004 ***	29.54	0.834 ***	11.65	0.588 ***	11.65	-18.685 ***	-10.45	-10.891 ***	-4.869	33.01
Panel D: CBOEVIX Down											
Ramadan	0.005 ***	22.46	0.647 ***	5.223	0.601 ***	7.11	-6.523	-1.022	-5.687 *	-1.784	21.43
Eid-ul-Fitr	0.005 ***	23.73	0.072	0.165	0.552 ***	7.3	-6.428	-0.328	-4.464 *	-1.661	19.86
Eid-ul-Adha	0.005 ***	22.5	2.078 ***	3.74	0.600 ***	7.188	-144.619 **	-2.569	-5.636 *	-1.788	21.81
Ashoura	0.005 ***	22.23	0.557 ***	3.121	0.612 ***	7.142	-16.781	-1.054	-5.923	-1.823	21.54

*, **, *** indicate the result is significant at p = 0.1, 0.05, and 0.01, respectively. The t-value measures the size of the difference relative to the variation in the sample data. R^2 (coefficient of determination) indicates how close the data are to the fitted regression line. $CSAD_t$ was obtained from calculations using the Equation(4) $CSAD_t = \beta 0 + \beta_1^j D_e|R_{m,t}| + \beta_2^j(1-D_e)|R_{m,t}| + \beta_3^j D_e R_{m,t}^2 + \beta_4^j(1-D_e)R_{m,t}^2 + \epsilon_t$, where j: proxy for 'Large' and 'Small' investors in Panel A & B respectively, and the US CBOEVIX 'Up' and 'Down' in Panel C & D, respectively. The negative and significant coefficients $\beta_3(\beta_4)$ indicate herding behaviour during (outside) event days.

Appendix C Estimate of Herding with effects of (a) the Global Financial Crisis, and (b) the Arab Spring Controlled

This table presents regression analyses testing the differences in values for Cross-sectional Absolute Deviation ($CSAD_t$) within/outside Islamic event days. Analyses were carried for four Islamic events (i.e. Ashoura, Ramadan, Eid-ul-Fitr and Eid ul-Adha) separately. Calculations of ($CSAD_t$) for these events were undertaken for the Saudi Arabian Stock Market during October 2005 - February 2016.

Islamic Event	β_0	**t-stat**	β_1	**t-stat**	β_2	**t-stat**	β_3	**t-stat**	β_4	**t-stat**	R^2(%)
Panel A: Pre-crisis											
Ramadan	0.008 ***	13.19	0.306	1.465	0.373 ***	3.106	2.612	0.281	-3.368	-0.912	10.26
Eid-ul-Fitr	0.008 ***	15.66	0.202	0.419	0.289 ***	2.85	-6.594	-0.312	-1.401	-0.484	8.7
Eid-ul-Adha	0.008 ***	13.19	1.030 *	1.906	0.377 ***	3.14	-71.833 ***	-1.449	-3.404 ***	-0.922	10.33
Ashoura	0.008 ***	13.74	0.469 ***	2.991	0.375 ***	3.367	-12.168 ***	-3.254	-2.863	-0.860	11.02
Panel B: Post-crisis											
Ramadan	0.003 ***	31.91	0.240 ***	2.96	0.455 ***	9.351	3.993	1.218	-5.711 **	-2.406	31.82
Eid-ul-Fitr	0.004 ***	30.23	-0.335 ***	-3.857	0.358 ***	5.464	28.783 ***	6.76	-1.249 **	-2.365	29.92
Eid-ul-Adha	0.003 ***	31.43	0.186 ***	2.795	0.450 ***	8.993	0.96	0.394	-5.317 **	-2.097	31.84
Ashoura	0.003 ***	31.67	0.367 ***	2.914	0.448 ***	9.106	-2.994	-0.248	-5.391 **	-2.249	31.52
Panel C: Pre-Arab Spring											
Ramadan	0.006***	13.06	0.343***	1.818	0.511***	4.511	-2.839	-0.403	-6.553	-1.604	16.51
Eid-ul-Fitr	0.006***	16.02	0.518***	2.784	0.410***	4.863	-23.240***	-4.779	-3.392	-1.188	15.46
Eid-ul-Adha	0.006***	13.04	0.750**	2.196	0.505***	4.478	-31.545	-1.517	-6.412	-1.579	16.34
Ashoura	0.006***	13.43	0.675***	5.541	0.496***	4.598	-15.858***	-5.207	-5.937	-1.517	16.73
Panel D: Post-Arab Spring											
Ramadan	0.004***	30.85	0.259***	2.6	0.442***	8.812	2.869	0.723	-5.895**	-2.390	30.53
Eid-ul-Fitr	0.004***	28.8	-0.325***	-3.131	0.341***	4.832	25.248***	3.178	-1.168	-0.317	28.03
Eid-ul-Adha	0.004***	30.33	0.192**	2.193	0.439***	8.409	0.485	0.152	-5.576**	-2.101	30.61
Ashoura	0.004***	30.6	0.410***	3.571	0.438***	8.562	-7.391	-0.669	-5.673**	-2.269	30.35

*, **, *** indicate the result is significant at p = 0.1, 0.05, and 0.01, respectively. The t-value measures the size of the difference relative to the variation in the sample data. R^2 (coefficient of determination) indicates how close the data are to the fitted regression line. $CSAD_t$ was obtained from calculations using the Equation(4) $CSAD_t = \beta 0 + \beta_1^j D_e|R_{m,t}| + \beta_2^j(1-D_e)|R_{m,t}| + \beta_3^j D_e R_{m,t}^2 + \beta_4^j(1-D_e)R_{m,t}^2 + \epsilon_t$, where j: proxy for 'pre-crisis' market and 'post-crisis' market in Panels A & B, respectively, and 'pre-Arab Spring' and 'post-Arab-Spring' in Panel C & D, respectively. The negative and significant coefficients $\beta_3(\beta_4)$ indicate herding behaviour during (outside) event days.