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# Investor mood, herding and the Ramadan effect

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ABSTRACT

In view of evidence linking herding and social mood, we examine whether the positive mood documented during Ramadan translates into higher herding compared to non-Ramadan days. Drawing on a sample of seven majority Muslim countries, we report significant herding during Ramadan in most of our sample markets. Additionally, we show that herding appears significantly stronger within rather than outside Ramadan for most tests whereby its significance is manifested on both Ramadan- and non-Ramadan-days. Overall, herding significance within/outside Ramadan exhibits some variation in its levels across markets in relation to variables reflective of market states, both domestically (market returns; market volume) and internationally (US market returns; US investors' sentiment; global financial crisis) market states.



## 1. Introduction

Religion is identified in several studies as a key factor underlying aspects of the economic and financial environment. From individual investors' perspective, religion has been found to affect the propensity to save (Guiso et al., 2003; Renneboog and Spaenjers, 2012), the decision to invest in stocks (Renneboog and Spaenjers, 2012) and risk-attitudes (Miller and Hoffmann, 1995; Barsky et al., 1997; Hilary and Hui, 2009; Kumar, 2009; Kumar et al., 2011). From an aggregate market perspective, religion has been shown to affect IPO-underpricing (Kumar et al., 2011), economic growth (Barro and Mccleary, 2003) and creditor protection (Stulz and Williamson, 2003).

An area that has recently witnessed much research interest is that of investors' mood and how the latter is shaped by religious occasions. In general, the evidence suggests that mood and emotions play an important role in investor behavior.[1] In fact, Shu (2010) argues that the higher the complexity of a decision and the uncertainty of its outcome, the higher the impact of mood in decision making. A positive mood state can make investors more optimistic and willing to undertake riskier investment decisions (Wright and Bower, 1992). The proxy variables that have been used in the relevant studies in

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[1] Loewenstein et al. (2001), Lucey and Dowling (2005), Nofsinger (2005), Shu (2010), Summers and Duxbury (2012), Abu Bakar et al. (2014) and Siganos et al. (2014).

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**Table 7**
Estimates of herding for up- versus down-VIX days (Eqs. (10) and (11)).

| | Bangladesh | Egypt | Indonesia | Malaysia | Morocco | Pakistan | Turkey |
|---|---|---|---|---|---|---|---|
| *Panel A. Herding estimates for up-VIX days (Eq. (10))* | | | | | | | |
| $\alpha_0$ | 0.0130 | 0.0137 | 0.0157 | 0.0144 | 0.0064 | 0.0171 | 0.0167 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_1$ | 0.2405 | 0.4052 | 0.3894 | 0.4769 | 1.0500 | −0.0642 | 0.6827 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.5093) | (0.0000) |
| $\alpha_2$ | 0.3703 | 0.2579 | 0.6377 | 0.4228 | 0.7584 | 0.3248 | 0.4782 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_3$ | −0.1269 | −0.8988 | −0.8613 | −0.4614 | −0.2363 | 0.1166 | −0.3663 |
| | (0.0030) | (0.0029) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_4$ | −0.1253 | −0.8264 | −0.2899 | −0.1384 | 0.4163 | 0.6370 | −0.0356 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.8385) |
| $t$-stat$_1$ ($H_0$: $\alpha_1 = \alpha_2$) | 2.3018 | 1.4932 | 5.0704 | −1.2072 | −2.6731 | 4.0875 | −4.6024 |
| | (0.0214) | (0.1355) | (0.0000) | (0.2274) | (0.0076) | (0.0000) | (0.0000) |
| $t$-stat$_2$ ($H_0$: $\alpha_3 = \alpha_4$) | 3.7301 | 2.7094 | −11.7731 | 5.4385 | 4.8887 | −5.2089 | 9.1342 |
| | (0.0000) | (0.0068) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $R^2$ | 0.1817 | 0.1043 | 0.3032 | 0.2887 | 0.4841 | 0.1745 | 0.3978 |
| *Panel B. Herding estimates for down-VIX days (Eq. (11))* | | | | | | | |
| $\alpha_0$ | 0.0134 | 0.0131 | 0.0169 | 0.0143 | 0.0069 | 0.0169 | 0.0144 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_1$ | 0.4396 | 0.2576 | 0.5303 | 0.4573 | 0.8059 | 0.1968 | 0.7446 |
| | (0.0000) | (0.0014) | (0.0000) | (0.0000) | (0.0000) | (0.0640) | (0.0000) |
| $\alpha_2$ | 0.2802 | 0.3343 | 0.4557 | 0.4182 | 0.6600 | 0.3803 | 0.6953 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_3$ | −0.2180 | 0.2479 | −0.3784 | 0.5656 | −0.1083 | 0.1243 | −0.3748 |
| | (0.2020) | (0.8938) | (0.0001) | (0.0000) | (0.0063) | (0.7459) | (0.0000) |
| $\alpha_4$ | 0.1972 | −0.2047 | 0.8489 | −0.2171 | 0.7800 | −0.1299 | −0.2706 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $t$-stat$_1$ ($H_0$: $\alpha_1 = \alpha_2$) | −1.5854 | 0.9767 | −1.0078 | −1.2671 | −1.6432 | 1.7572 | −1.1775 |
| | (0.1130) | (0.3288) | (0.3136) | (0.2052) | (0.1005) | (0.0790) | (0.2391) |
| $t$-stat$_2$ ($H_0$: $\alpha_3 = \alpha_4$) | 1.3942 | −1.2380 | 4.8079 | −15.9713 | 4.6808 | 0.6635 | 1.9840 |
| | (0.1634) | (0.2158) | (0.0000) | (0.0000) | (0.0000) | (0.5071) | (0.0473) |
| $R^2$ | 0.3318 | 0.1113 | 0.5527 | 0.4406 | 0.4973 | 0.1654 | 0.4514 |

*Notes*: The table presents the estimates from the following equations:
$\text{CSAD}_t = \alpha_0 + \alpha_1^{\text{UPVIX}} D|r_{\text{m},t}| + \alpha_2^{\text{UPVIX}}(1-D)|r_{m,t}| + \alpha_3^{\text{UPVIX}} D r_{\text{m},t}^2 + \alpha_4^{\text{UPVIX}}(1-D) r_{\text{m},t}^2 + \varepsilon_t$
$\text{CSAD}_t = \alpha_0 + \alpha_1^{\text{DOWNVIX}} D|r_{\text{m},t}| + \alpha_2^{\text{DOWNVIX}}(1-D)|r_{m,t}| + \alpha_3^{\text{DOWNVIX}} D r_{\text{m},t}^2 + \alpha_4^{\text{DOWNVIX}}(1-D) r_{\text{m},t}^2 + \varepsilon_t$
CSAD refers to the cross sectional absolute deviation of returns for each market. The equations are estimated using Newey-West consistent estimators. $D$ is a dummy assuming the value of one for the days falling within Ramadan each year, zero otherwise. $P$-values are reported in parentheses. The difference in significance between the within- versus outside-Ramadan values of each coefficient is tested using $t$-test statistics. $r_{\text{m},t}$ refers to the each market's average return; the superscripts UPVIX and DOWNVIX denote that the model is estimated for days of increasing and decreasing VIX values, respectively.

where herding is significant during both up- and down-markets in Ramadan, our evidence on the relationship between herding and US market returns in Ramadan is mixed, with absolute values of $\alpha_3$ being larger during down- (up-) market days in Bangladesh and Morocco (Turkey).

Table 7 presents the results from Eqs. (10) and (11) where we condition herding upon daily changes of the US investors' sentiment index (VIX). Significant herding exists within Ramadan during increasing and decreasing days for the VIX in Indonesia, Morocco and Turkey and increasing VIX-days only in Bangladesh, Egypt and Malaysia. For Pakistan, there is significant herding only outside Ramadan days. Herding outside Ramadan is indicated during increasing VIX-days in Bangladesh and Indonesia, decreasing VIX-days in Turkey and increasing/decreasing VIX-days in Egypt and Malaysia. Any test for which herding is significant both within Ramadan and outside Ramadan days entails absolute values of $\alpha_3$ exceeding in absolute terms the corresponding $\alpha_4$ values, with the difference being significant in all tests. These results confirm the stronger presence of herding during Ramadan days.

From the estimates presented in Table 7, herding in Ramadan is significant during up-VIX days (six markets) compared to down-VIX ones (three markets). This is confirmed when looking at those markets for which herding in Ramadan is significant during both up- and down-VIX days (Indonesia; Morocco; Turkey). The absolute $\alpha_3$-values for Indonesia and Morocco are larger during up- compared to down-VIX days (indicating that herding in these two markets is stronger in Ramadan during days when the VIX has appreciated in value), with the reverse being the case for Turkey. Given that an increase in VIX is associated with a rise in "fear" among investors in the US (it predicts higher volatility during the next 30 days), our findings indicate that herding in Ramadan in our sample markets is related to rising VIX-values. The latter is reported for the first time in the literature and is in line with extant research (Chiang et al., 2013; Philippas et al., 2013) demonstrating the role of increasing VIX values in motivating herding internationally.

In order to control for the effect of the global financial crisis that began in September 2008, we estimate Eqs. (12) and (13) and present the corresponding results in Table 8. Significant herding within Ramadan is indicated in Bangladesh and

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**Table 8**
Estimates of herding before and after the crisis' outbreak (Eqs. (12) and (13)).

| | Bangladesh | Egypt | Indonesia | Malaysia | Morocco | Pakistan | Turkey |
|---|---|---|---|---|---|---|---|
| *Panel A. Herding estimates pre outbreak (Eq. (12))* | | | | | | | |
| $\alpha_0$ | 0.0126 | 0.0140 | 0.0154 | 0.0134 | 0.0054 | 0.0157 | 0.0168 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_1$ | 0.4425 | 0.2476 | 0.6289 | 0.3473 | 1.0512 | −0.0182 | 0.7703 |
| | (0.0000) | (0.0538) | (0.0000) | (0.0000) | (0.0000) | (0.8147) | (0.0000) |
| $\alpha_2$ | 0.3040 | 0.3024 | 0.6701 | 0.4243 | 0.8012 | 0.3839 | 0.5530 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_3$ | −0.2295 | −0.4183 | −0.4737 | 0.8176 | −0.2470 | 0.1132 | −0.6679 |
| | (0.0000) | (0.9460) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_4$ | 0.1368 | −0.9978 | −0.4628 | −0.1360 | 0.5465 | −0.1075 | −0.4101 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $t$-stat$_1$ ($H_0$: $\alpha_1 = \alpha_2$) | −2.1588 | 0.4340 | 0.8091 | 3.3500 | −2.8750 | 5.2821 | −6.3829 |
| | (0.0309) | (0.6643) | (0.4185) | (0.0008) | (0.0041) | (0.0000) | (0.0000) |
| $t$-stat$_2$ ($H_0$: $\alpha_3 = \alpha_4$) | 4.5365 | −0.0938 | −0.2268 | 15.5397 | 6.1571 | −5.6812 | 10.5347 |
| | (0.0000) | (0.9252) | (0.8206) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $R^2$ | 0.3007 | 0.1107 | 0.3512 | 0.4346 | 0.5682 | 0.1912 | 0.4122 |
| *Panel B. Herding estimates post outbreak (Eq. (13))* | | | | | | | |
| $\alpha_0$ | 0.0174 | 0.0123 | 0.0165 | 0.0175 | 0.0112 | 0.0194 | 0.0141 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_1$ | 0.0467 | 0.2550 | 0.3636 | 0.3168 | 0.3236 | 0.1782 | 0.2355 |
| | (0.4627) | (0.0023) | (0.0000) | (0.0147) | (0.0000) | (0.1353) | (0.0000) |
| $\alpha_2$ | 0.1407 | 0.2482 | 0.4782 | 0.3211 | 0.3479 | 0.4501 | 0.2889 |
| | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) | (0.0000) |
| $\alpha_3$ | −0.2010 | −0.1036 | −0.4826 | −0.4029 | −0.5381 | 0.2857 | −0.3662 |
| | (0.0502) | (0.5522) | (0.0000) | (0.3841) | (0.8636) | (0.3683) | (0.3987) |
| $\alpha_4$ | −0.1133 | −0.1178 | −0.3626 | −0.2639 | 0.1233 | −0.2444 | −0.7424 |
| | (0.0013) | (0.0023) | (0.0000) | (0.0000) | (0.5627) | (0.0000) | (0.0028) |
| $t$-stat$_1$ ($H_0$: $\alpha_1 = \alpha_2$) | 1.5256 | −0.0835 | 2.1721 | 0.0341 | 0.3025 | 2.3431 | 1.6520 |
| | (0.1273) | (0.9335) | (0.0300) | (0.9728) | (0.7623) | (0.0193) | (0.0988) |
| $t$-stat$_2$ ($H_0$: $\alpha_3 = \alpha_4$) | 0.8410 | −0.0823 | −2.0698 | 0.3015 | 0.5058 | −1.6792 | −0.7957 |
| | (0.4005) | (0.9344) | (0.0386) | (0.7631) | (0.6130) | (0.0933) | (0.4263) |
| $R^2$ | 0.0381 | 0.1173 | 0.1783 | 0.0950 | 0.2117 | 0.1544 | 0.4364 |

*Notes*: The table presents the estimates from the following equations:
$\text{CSAD}_t = \alpha_0 + \alpha_1^{\text{PREOUTBREAK}} D|r_{\text{m},t}| + \alpha_2^{\text{PREOUTBREAK}}(1-D)|r_{m,t}| + \alpha_3^{\text{PREOUTBREAK}} D r_{\text{m},t}^2 + \alpha_4^{\text{PREOUTBREAK}}(1-D) r_{\text{m},t}^2 + \varepsilon_t$
$\text{CSAD}_t = \alpha_0 + \alpha_1^{\text{POSTOUTBREAK}} D|r_{\text{m},t}| + \alpha_2^{\text{POSTOUTBREAK}}(1-D)|r_{m,t}| + \alpha_3^{\text{POSTOUTBREAK}} D r_{\text{m},t}^2 + \alpha_4^{\text{POSTOUTBREAK}}(1-D) r_{\text{m},t}^2 + \varepsilon_t$
CSAD refers to the cross sectional absolute deviation of returns for each market. The equations are estimated using Newey-West consistent estimators. $D$ is a dummy assuming the value of one for those days falling within Ramadan each year, zero otherwise. $P$-values are reported in parentheses. The difference in significance between the within- versus outside-Ramadan values of each coefficient is tested using $t$-test statistics. $r_{\text{m},t}$ refers to the each market's average return; the superscripts PREOUTBREAK and POSTOUTBREAK denote that the model is estimated prior to and after the outbreak of the crisis, respectively.

Indonesia both pre- and post-2008 and in Morocco and Turkey pre-2008. In these markets, herding is significant during non-Ramadan days pre and post-2008 in Indonesia and Turkey and post-2008 in Bangladesh. The other three markets (Egypt, Malaysia and Pakistan) show evidence of herding significance only outside Ramadan days, irrespective of period. Where herding is significant within and outside Ramadan, the absolute values of $\alpha_3$ are larger than those of $\alpha_4$ (with the difference being statistically significant in Indonesia post-2008 and Turkey pre-2008), confirming that herding is more pronounced during Ramadan days.

The outbreak of the 2008 crisis affected investment patterns generally across world markets. It is possible that this has affected the propensity of investors in majority Muslim countries to herd during Ramadan. The reduction of the Ramadan effect in herding post-2008 is interesting, more so in view of evidence from Al-Khazali (2014) showing that the Ramadan effect in stock returns also scaled back substantially in majority Muslim markets after 2008.[23]

### 4.2. Discussion – contributions

The results outlined in Tables 2–8 generally demonstrate that herding is present during Ramadan. In most of our sample markets, herding appears significantly stronger within rather than outside Ramadan (for most cases whereby it is significant

[23] To account for the possibility that the time-difference between the sample countries and the US affects our estimates from the tests controlling for US variables (S&P500/VIX), we repeated all tests controlling for these variables, this time conditioning herding upon their lagged values. Results overall confirm the patterns reported in Tables 6 and 7. We also tested for the possibility of the size-effect in our findings by performing all tests using value-weighted CSADs; results from these tests confirmed overall the findings presented in Tables 2–8. Finally, in order to test for the impact of the political instability in Egypt in 2011, we rerun the regressions from Eqs. (3)–(9) for the Egyptian market (we thank the guest editors for this suggestion). The results of these tests are qualitatively similar to those reported here. Results for all the above tests are not reported here in the interest of brevity and are available upon request.

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on both Ramadan and non-Ramadan days). These findings are reported for the first time in the literature. Thus, we contribute to the herding as well as Islamic finance literature in the following ways.

Unlike most studies that examine Ramadan from a market efficiency viewpoint (i.e. as a seasonal anomaly; see the review by Al-Khazali, 2014) our work takes a behavioral perspective, thereby addressing a literature gap in the wider debate over the role of religion in investors' behavior.[24] To the extent that Ramadan is associated with specific behavioral facets – in particular enhanced social interactions and optimism (Białkowski et al., 2012) – our results are in line with research on the role of social interactions (Hong et al., 2004, 2005) and positive sentiment (Liao et al., 2011) over the propensity to herd. Given that this research has been undertaken mainly within a micro context (i.e., based on data from individual – retail as well as institutional – market participants' trades and accounts), the evidence presented in this study offers new insight on these issues from an aggregate market perspective.[25] By showing the relationship between herding and a sentiment-related occasion like Ramadan, our study demonstrates that Ramadan should be considered as a sentiment-proxy when researching herding (as well as other sentiment-related behavioral phenomena, such as feedback trading and momentum) in majority Muslim markets.

Herding significance within/outside Ramadan exhibits some variation in its robustness across markets to different market states, whether domestic (market returns; market volume) or international (US market returns; US investors' sentiment; global financial crisis). The significance of herding within Ramadan appears more consistent in Bangladesh, Indonesia, Morocco and Turkey compared to Egypt.[26] Herding outside Ramadan is consistently significant in some markets (Egypt; Malaysia; Pakistan) and less so in others (Indonesia; Turkey).[27] This highlights the versatility of the relationship between herding and Ramadan, while lending support to research showcasing the sensitivity of herding to market conditions (Chang et al., 2000; Chiang and Zheng, 2010; Holmes et al., 2013). Given their emerging market status, the fact that all seven markets exhibit widespread evidence of herding (within and/or outside Ramadan) is in line with findings (e.g. Chang et al., 2000) that market participants are more susceptible to herding in emerging stock exchanges.

## 5. Conclusion

This paper examines the relationship between herding and Ramadan motivated by emotional/behavioral expressions (enhanced social interactions; optimism) which have been observed to facilitate herding and particularly during Ramadan. Drawing on a sample of seven stock markets from majority Muslim countries, we document the presence of significant herding during Ramadan in most of our sample markets. We also show that herding appears significantly stronger within Ramadan for most tests where it is significant on both Ramadan and non-Ramadan days. Overall, herding significance within/outside Ramadan exhibits some variation in its robustness across markets to variables reflective of domestic (market returns; market volume) or international (US market returns; US investors' sentiment; global financial crisis) market states.

Our work produces original contributions on the impact of religion in financial decisions, by demonstrating that a religious occasion (Ramadan) is a determinant of herding significance. Previous research has only indirectly made inferences about the impact of Ramadan on investor behavior (by examining Ramadan as a seasonal anomaly). To the extent that social interactions and positive sentiment constitute Ramadan's two key behavioral features, our results confirm at the aggregate market level prior evidence from micro-level research on the effect of these two features upon herding. The role of Ramadan, as a sentiment-related occasion in motivating herding suggests that Ramadan constitutes a sentiment-proxy worth considering when researching herding in majority Muslim markets. This also contributes to the wider herding debate and the impact of social norms on markets by laying the ground for further research into whether major religious occasions (e.g., Catholic or Orthodox Easter week) can affect herding behavior. From the perspective of practitioners, our study contains implications for the investment community, in particular for traders with exposure to equity markets in majority Muslim countries.

[24] The effect of Ramadan over investors' behavior has been rather scantly investigated to date. A study relevant to this issue is the one by Białkowski et al. (2013) which links mutual funds' performance in Turkey with the Ramadan-effect.

[25] Our study is based on aggregate market data (i.e. equity prices), whereas the studies mentioned here assess investors' behavior using transaction data.

[26] We refer specifically to those five markets, because they are the ones with significant herding within-Ramadan in the unconditional herding test of Eq. (3). There are very few exceptions to the observed herding significance within-Ramadan in Bangladesh (domestic up-market days; down-VIX days), Indonesia (US up-market days), Morocco (post-crisis' outbreak) and Turkey (post-crisis' outbreak); conversely, the significance of herding within-Ramadan in Egypt is only observed during US down-market days and up-VIX days.

[27] We refer specifically to those five markets, because they are the ones with significant herding outside-Ramadan in the unconditional herding test of Eq. (3). Herding outside-Ramadan is insignificant only during decreasing domestic volume days in Malaysia; conversely, the significance of herding outside-Ramadan is not observed on several occasions in Indonesia (domestic down-market days; decreasing domestic volume days; US up-market days; down-VIX days) and Turkey (domestic down-market days; increasing domestic volume days; US down-market days; up-VIX days). It is perhaps worth noting that the two markets (Malaysia and Pakistan) for which no evidence of herding was identified during Ramadan are those whose in-Ramadan average market returns are lower compared to outside-Ramadan average market returns; the $r_{m,t}$ of the Chang et al. (2000) model was used as a proxy of average market returns. The in- (outside-) Ramadan average market returns are as follows: Bangladesh: 4.2% (3.2%); Egypt: 4.6% (1.9%); Indonesia: 6.1% (5.6%); Malaysia: −2.3% (0.3%); Morocco: 10.1% (4.2%); Pakistan: 4.5% (4.7%); Turkey: 4.7% (2%). Given the extant evidence mentioned earlier in this study of Ramadan being linked to highly positive returns compared to the rest of the year's days in majority Muslim countries, it is possible that the absence of herding in-Ramadan for these two countries may be the result of them bearing lower average returns in-Ramadan compared to non-Ramadan days.

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