Lunar Effect: Analysis on Emerging Countries Stock Returns, Prior and During Financial Crisis

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Abstract

The random walk hypothesis is a theory which states that market prices are not influenced by prior price movements and therefore, prices in the stock market cannot simply be predicted. The stock market is considered efficient and follows the random walk theory when intelligent market participants lead the situation and reflect all available information based on the past or future events. The phenomena of calendar anomalies in stock markets are proven from the previous study, where behavior of returns tend to be high or low during specific calendar periods. Thus, for this study, we aims to investigate relationships between lunar effect and average stock returns for ten emerging countries for the period of January 2004 until December 2010. A lunar effect is a phenomenon where mean returns around the new moon is higher than mean returns around the full moon. Using non-parametric and basic multiple linear regression analysis, the result shows that returns on the full moon were slightly lower as compared to the returns on the new moon prior to the financial crisis and vice versa during the financial crisis.

Keywords: Lunar Effect; Calendar Anomalies; Investor Behaviour; Financial Crisis; Random Walk Theory

1. Introduction

Fama (1970) defines theoretical analysis of market efficiency as "prices reflected with all available information" such as internal information, dividend announcement, public information and past prices information According to the efficient market hypothesis, all market participants are privy to the same information thus, no one can out-profit anyone else or in other words, it is almost impossible to achieve abnormal returns. The relationship between historical stock returns towards certain calendar effects such as holiday effect (Lakonishok & Levi, 1982), January effect (Thaler,1987) and monthly effect (Arial,1987) have been studied and the effect has been widely proven. Seasonal patterns and effects on historical stock prices allusively provide significant impact to market practitioners and financial scholars.

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In recent years, researchers around the world have started to pay more attention on the lunar effect towards investors' psychological traits. Moon effect or lunar effect is a phenomenon where the mean returns around the new moon is higher than the mean returns around the full moon (Yuan, Zheng & Zhu, 2006). Full moon occurs when the moon is on the opposite side of the earth from the sun while new moon is the situation when the moon is located between the earth and the sun.

Hammami and Abaoub (2010), in their research stated that the moon and its cycles have long been regarded as an important factor in several human activities. Some societies believe the full moon strongly affects human behavior, especially when they can lead to unpleasant luck or unwarranted behavior. Scientifically, researchers such as Thakur and Sharma (1984) claimed that during the full moon, the impulse to take or to give poison may increase due to increased "human tidal waves" caused by the gravitational pull of the moon. Human tidal waves may cause physical, physiological, and biochemical changes in the body resulting to an increased tendency to take poisons and commit crimes. In trading activities, Kourtidis, Sevic and Chatzoglou (2008) found high scores on psychological biases and personality traits which were associated with significant scores in trading behavior. Besides, Maus et al. (1999) found people are more affected by the new moon rather than the full moon, where people are most likely to change their behavior between the shift from the new moon to the full moon rather than the full moon to the new moon.

There are strong global evidence indicating a significant relationship between lunar effects and stock returns where returns are lower on days around a full moon than on days around a new moon (Yuan et al., 2006). According to Dichev and Janes (2001), strong lunar cycle affects stock returns where returns in the 15 days around the new moon dates are about double the returns than in the 15 days around the full moon dates. This was supported by the empirical evidence where lunar cycle shows the significant and negative influence on stock returns, and stock volatility demonstrates statistically significant and positive influence (Wang, Lin & Chen, 2010). Religious ceremonies are always adjusted to correspond to specific phases of the lunar cycles (for example, Islamic ceremonies such as the determination of the fasting month and Eid-Ul-Fitr date during Ramadhan and Syawal). However, it would be difficult to find rational reasons for any association between lunar effects and stock returns. Therefore, for significant results it is also beneficial to recognize the possibility that the relation between lunar effects and stock returns could be spurious. Although studies on calendar effect have been researched quite extensively, not many have been found on Islamic calendar effect and its effect on other countries. Studies have been conducted on the lunar phases effect in Chinese stock returns (Gao, 2009), testing the significance of solar term effect in the Taiwan stock market (Cheng & Ying, 2009), and calendar anomalies in the Turkish foreign exchange markets (Aydoğan & Booth, 1999).

Before proceeding to the main discussion of this study, it is worth discussing in a glance about the global financial crisis and the emerging economies. During the financial crisis in mid-2007, the stock markets fell, and most of the large financial institutions collapsed or were bought over. According to Thomas (2009), the global financial crisis and the sharp reduction of trade flows gave rise to the question of access to capital and its effect on imports and exports. This situation affected stock markets of the whole world including emerging countries stock markets which were normally unstable and shallow, leading to the fact that macroeconomic dynamics play a vital role in the stock market performances (Erdogan & Ozale, 2005). In addition, Harvey (1995) found that the standard global asset pricing models, which assume complete integration of capital markets, fail to explain the cross-section of average returns in emerging countries. As compared to the developed nations, an analysis of predictability of returns reveals that emerging market returns are more likely to be influenced by local information such as company announcement and external factors such as the financial crisis.

Hence, based on previous studies and information on current issues, the present study intends to examine whether the correlation of the lunar effects towards stock returns can be explained by the macroeconomic events such as financial crises (before and during) in ten emerging countries for the period of 2004 to 2010. Besides investigating on the lunar effects, it would also be intriguing to explore the relationships between investors' psychological behavior associated with the lunar phases. The approach adopted is the basic multiple linear regression analysis to avoid a spurious regression before using a non-parametric method. The rest of this paper will discuss on the literature review of the on calendar effects, the data collected, the empirical methodology and finally, the results and conclusion of the study.

2. Literature Review

Since the introduction of the random walk theory by Fama from 1965 until 1970, a large body of literature has evolved to document abnormal daily returns for many stock markets around the globe. All kinds of calendar anomalies in the stock market return have been documented extensively in the finance literature since the 1970s. For instance, Holden, Thompson and Ruangrit (2005) used various models to investigate whether there is evidence of calendar effects due to the day of the week, the month of the year, days before or after holidays and within month effects. At the end of their study, they concluded that the inclusion of calendar effects improves the forecast accuracy. Gao and Kling (2005) investigated the relationship between lunar phases and stock market returns of China over the last 16 years and the finding indicated that in Shanghai and Shenzhen, the year-end effect was strong in 1991 and Fridays are the most profitable (daily effect). Moreover, stock returns are lower on the days around a new moon than on the days around a full moon. This finding was consistent with Hammami and Abaoub (2010), who investigated the relationship between lunar phases and Tunisians' stock market returns from January 1998 till December 2008. In their research, it was also found that there was no statistically significant evidence of either a full moon or a new moon. However, their findings were contrary with Yuan et. al. (2006), where they found strong global evidence that stock returns are lower on days around a full moon than on days around a new moon.

The positive association suggested that it may be valuable to go beyond a rational asset pricing framework to explore the psychological effect of investor behavior on stock returns. Cheng and Ying (2009) used non-parametric method and found that all of the solar terms with negative average stock returns occur during the period of Grain Fills through Winter Solstice in Taiwan. However, the result of their study appeared to show that the solar term effect is a mere superstition and have no evidence to suggest that there are stock anomalies linked to different solar terms. Gao (2009) documented a lunar phase effect in stock returns in China over the last 16 years for two main Chinese stock indices. It was concluded that returns on those days one day before the full moon day are much higher than the returns on those days one day after the new moon day and culture is one of the factors which affect the investors' sentiment and behavior and then affect stock returns. Keef and Khaled (2011) employed an alternative model specification to revise the influences of the new moon and the full moon on the daily returns of 62 international stock indices for the period of 1988 to 2008. The fixed effects panel model incorporates the prior day effect and two calendar anomalies which is the Monday effect and the turn-of-the-month effect, to assess variations in the lunar moons. It was found that the prior day effect is greater for less developed countries, an overall full moon effect is absent while the effects of lunar are weakly influenced by the calendar anomalies. Bohl et al. (2010) examined whether the change in the investor structure in form of the market entrance of domestic individual investors has an effect on daily return seasonality in China's B-share markets from 1994 to 2007. They found evidence of negative Tuesday and to a lesser extent negative Wednesday and Thursday effects and these effects are significantly mitigated in the post-liberalization period. Moreover, their empirical results regarding day-of-the-week effects are in line with previous evidence on investor structure and return seasonality in the United States.

The studies on lunar effect have been widely relates with the psychological, biological and faith literature. Most of the researchers belief that mood affect people's ability to make a good decision and process information. Researchers of financial behavior have started focusing on the effect of moon cycles towards the stock market behaviors. Yuan et al. (2006) concluded that lunar phases do affect stock returns in China, and culture is one of the factors which affect the investors' sentiment and behavior and their stock returns. Bialkowski, Etebari and Wisniewski (2007) believe that the Ramadhan effect can best be explained by a change in investor psychology. Optimistic beliefs during the holy Ramadhan month may affect investor sentiment and decision leading to the price run-ups reported in their research.

Seyyed, Abraham and Al-Hajji (2005) studied on the Ramadan effect towards the Saudi Arabian stock market using GARCH specification. They documented a systematic pattern of decline in volatility during Ramadan which implies a predictable variation in the market price of risk. The examination of trading data shows that the anomaly appears to be consistent with a decline in trading activity during Ramadan. However, the authors did not look into the effect before and after Ramadan. Investigation on the Islamic calendar effect has also been done by Mustafa (2005) in Karachi stock market by using both conditional and unconditional risk analyses. Five models were used and it was found that Ziqad effects are found in all models being used while Shawal effect was found in all except one model. It was found that there is after Ramadan effect in Karachi Stock Market. Bialkowski et al. (2007) investigated stock returns during Ramadan for 14 predominantly Muslim countries from 1989 to 2007 and found returns during that month are almost nine times higher and less volatile than during the rest of the year. Further, Al-Ississ (2010) examined the effect of religious experience during the Muslim holy days of Ramadan and Ashoura on the daily returns and trading volumes of seventeen Muslim financial markets. The study documented statistically significant drops in the trading volume and changes in daily stock returns associated with religious experiences on these holy days. The findings on Ramadan effect are identical to that of Seyyed et al. (2005).

Ali and Akbar (2009) studied on calendar anomalies in the Pakistani stock market by taking a data of stock returns of fifteen years from November 1991 to October 2006. Using a one factor ANOVA, it was found that returns on daily, weekly and monthly basis are found to be insignificant. Autoregressive Integrated Moving Averages (ARIMA) and Ordinary Least Squares (OLS) were also extended as an alternate procedure to look for any above average returns reaped by market players. It was concluded that there are no weekly effects or monthly effects in stock returns in Pakistani equity market but there is existence of daily effects where the fourth and fifth days of a week show abnormal returns using autoregressive modelling. Bohl, SchuppliI and Siklos (2010) when investigating whether seasonality in daily stock returns are related to the trading behaviour of individuals and institutional investors, found that day-of-the-week are attenuated after the market entrance of Chinese individual investors who had previously not been allowed to trade in B-shares. The results suggested that institutional rather than individual investors are the main driving force behind the anomalies. Since the regression analysis of dummy variables and the GARCH relied on parametric tests, Al-Khazali, Kourmanakos and Pyun (2008) used nonparametric methods of analysis such as stochastic dominance (SD) analysis to examine calendar anomalies in the Athens Stock Exchange (ASE) for the period between 1985 and 2004. They found a temporal predictability of returns in the ASE with a strong "day" effect and a weak "week" and "January" effect. Furthermore the results of their study also have significant implications for the fast growing emerging stock markets. In the Malaysian scene, studies on calendar effects have been given little attention or have been minimally explored. Shuja, Lazim and Wah (2001) proposed Seasonal Adjustment for Malaysia (SEAM) procedure to adjust the moving holiday effects towards ten Malaysian economic time series such as monthly total imports, monthly total exports, monthly sales value of own manufactured products, monthly production of crude palm oil, monthly exports of machinery and transport equipment, monthly new local companies registered, monthly electricity local consumption and

monthly consumer price index. In their study, the F-test was used to test for the presence of stable seasonality within the original series while the F-test was used to test for the presence of moving seasonality. When both tests were combined, it was found that consumer price index and electricity local consumption were not affected by the seasonality effect while the other eight series were found to have significant presence of seasonality effects. This study was considered as an innovation in the calendar effect literatures where the economic time series instead of stock market was used.

Even though there are several empirical evidences cited, there are insufficient attention given by previous researchers and it has been found that the relationship between stock return on lunar with real economic conditions such as financial crisis have not been studied exhaustively. Thus as discussed earlier, Al-Ississ (2010) only discussed Muslim holy days of Ramadan and Ashoura on the daily stock returns and trading volumes. Other researchers such as Bohl et al.(2010) investigated whether seasonality in daily stock returns are related to the trading behavior of individual and institutional investors. Ali and Akbar (2009) examined calendar anomalies in the Pakistani stock market by taking a data of stock returns. Further, Holden et al. (2005) examined daily returns of the Thai Stock Market Index to see whether there is evidence of calendar effects due to the day of the week, the month of the year, days before or after holidays and within month effects. Particular attention on their research is prior to, during and after the Asian crisis. This study differs from previous studies as discussed above in terms of the following:

   i. How significant is the relationship between lunar phases before and during financial crisis with average stock returns in emerging countries?
   ii. Is there any relationship between lunar phases and human psychological behaviour?

The following hypotheses are developed based on the above questions and after considering the previous research:

   i. H_0: There is no significant relationship between averages returns on lunar before and during financial crisis in emerging countries.
       H_1: There is a significant relationship between averages returns on lunar before and during financial crisis in emerging countries
   ii. H_0: There is no significant relationship between lunar phases and human psychological behavior.
       H_1: There is a significant relationship between lunar phases and human psychological behavior.

3. Data and Methodology

The data of this study consists of stock market data and the lunar phase's calendar over the period of January 2004 until December 2010. Data for stock market consist of the daily closing price stock indices (DJIN & KLCI) of the emerging country such as Argentina, Brazil, China, Colombia, Czech, India, Jordan, Mexico, Oman, Romania and Malaysia. The data were obtained from Datastream and separated into two sub period as the following:

   • Before Crisis   : January 2004-June 2007
   • During Crisis   : July 2007-December 2010

The daily stock returns, R_t were calculated as follows:

$$R_t = \log (P_t/P_{t-1})*100 \quad (1)$$

Where P_t is the stock price index at day t and P_{t-1} is the stock price index at day t-1. The calculation of dividend is excluded from the formula because we believed that the effect of dividend are not important in this study.

3.1 Determination of Lunar Phases

The determination of lunar phases derived from Islamic Calendar (Hijri Calendar) gathered from Jabatan Kemajuan Islam Malaysia (JAKIM). Hijri calendar is a lunar calendar, based on the lunar year of 354 or 355 days (see Table 1). In this paper, a full moon period was defined as N days before the full moon day + the full moon day + N days after the full (new) moon day (N = 7). The Lunar dummy is equal to one during a full moon period and zero otherwise (Yuan, Zheng & Zhu, 2006). Other than that, a wide range of lunar effects was considered and at the same time, the most reliable data for evidence was chosen for useful forecasting.

Table 1. Hijri Calendar

Num.	Islamic Month	Days
1	Muharram **	30
2	Safar	29
3	Rabi' al-Awwal	30
4	Rabi' al-Thani	29
5	Jumada al-Awwal	30
6	Jumada al-Thani	29
7	Rajab**	30
8	Sha'aban	29
9	Ramadhan***	30
10	Syawwal	29
11	Dhu al-Qi'dah **	30
12	Dhu al-Hijjah**	29*

*If the year is a leap year, the month of Dhul-Hijjah will be 30 days,
** indicated as holy month/s and
*** indicated as fasting month

We employed a time series observation which was ordered from January 2004 till December 2010. The regression analysis was used to model relationships between random variables, determine the magnitude of the relationships between variables and make predictions based on the models. Ordinary Least Squares (OLS) regression was carried out for the whole sample and the sub-samples. Since this research focuses on financial crisis event, after lunar patterns were found, two types of crisis which are before and during crisis were further investigated. The following regression allows one to test for differences in mean returns across the three events of crisis. Thus, the regression equation can be written as:

$$R_t = \alpha_i + \alpha_i R_{t-1} + \beta_1 \text{Full Moon}_t + \beta_2 \text{Crisis}_t + e_{it}, \quad (2)$$

Where R_t is $\text{Log}(Pt/Pt-1)*100$, α_i is a constant variable for the regression equation, β_1, β_2 are the coefficient for each event, Full Moon$_t$ is full moon zero-one dummy in time t, Crisis$_t$ is during crisis zero-one dummy in time t, e_{it}, is the error term and t represent the time-series component.

This analysis begins with the use of the normality test (Jacque-Berra), followed by the linearity test (Ramsey) and heteroscedasticity test (White) to investigate a sequence or a vector of random variables. Autocorrelation test (B-g test) is used to detect the presence of autocorrelation in the residuals from a regression analysis and is the most broadly used test since it is based on observed residuals. These tests

are essential to avoid spurious regression and if the result of the analysis does not rely on an assumption of normality, therefore the Mann-Whitney test is used as a non-parametric alternative. An assumption for the Mann-Whitney test is that the data are independent random samples from two populations that have the same shape that is the same variance and a scale that is continuous or ordinal which possesses natural ordering if discrete. In this study, full moon is indicated as number one (1) and new moon is indicated as number zero (0).

4. Results and Discussion

This section describes the empirical results of the hypothesis assumed that stock returns are associated with the lunar phases before and during crisis. The general time series patterns of the ten emerging market prices from January 2004 till December 2010 are shown in Figure 1 to Figure 10.

Fig. 1. Actual price (Argentina)

Fig. 2. Actual price (Brazil)

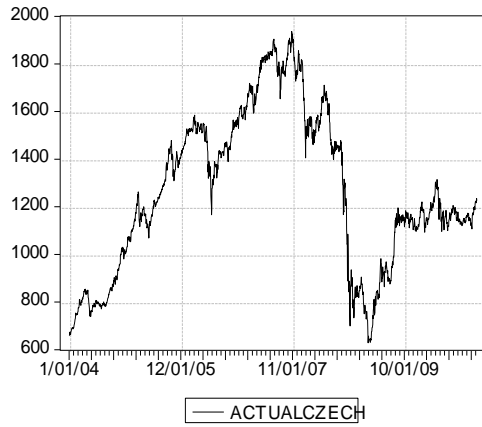Fig. 3. Actual price (China)

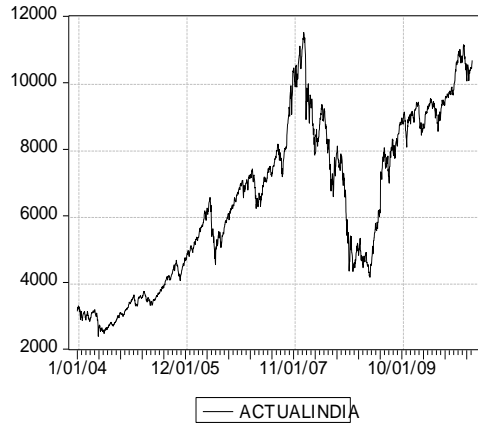Fig. 4. Actual price (Colombia)

Fig. 5. Actual price (Czech)
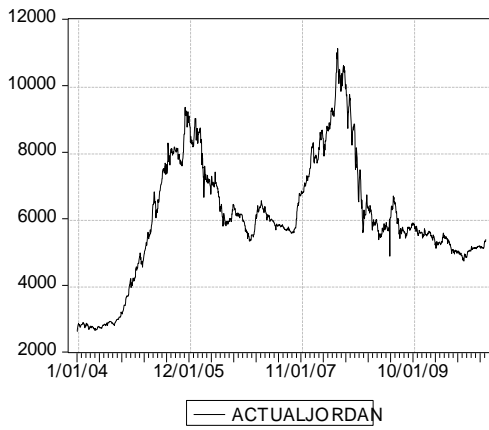
Fig. 6. Actual price (India)
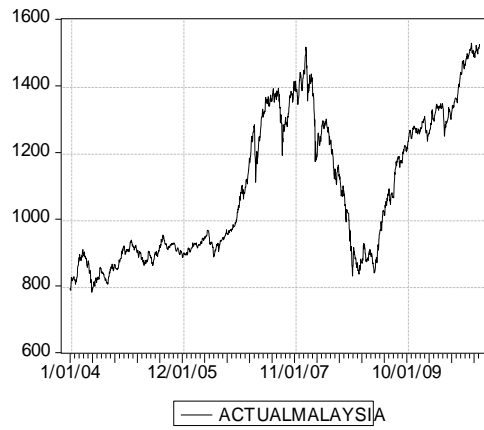
Fig. 7. Actual price (Jordan)

Fig. 8. Actual price (Malaysia)
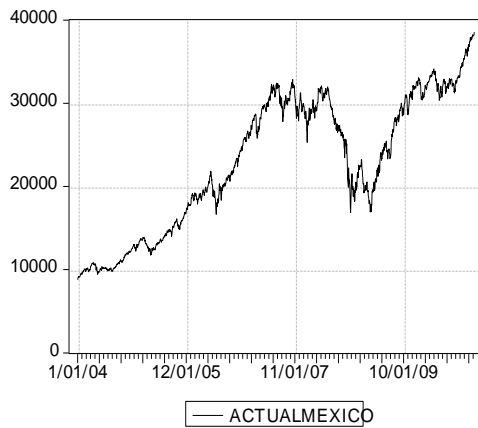
Fig. 9. Actual price (Mexico)

Fig. 10. Actual price (Oman)

As shown in Figure 1 until Figure 10, it is clear that returns before the crisis are higher compared to return during the crisis for all ten emerging countries.
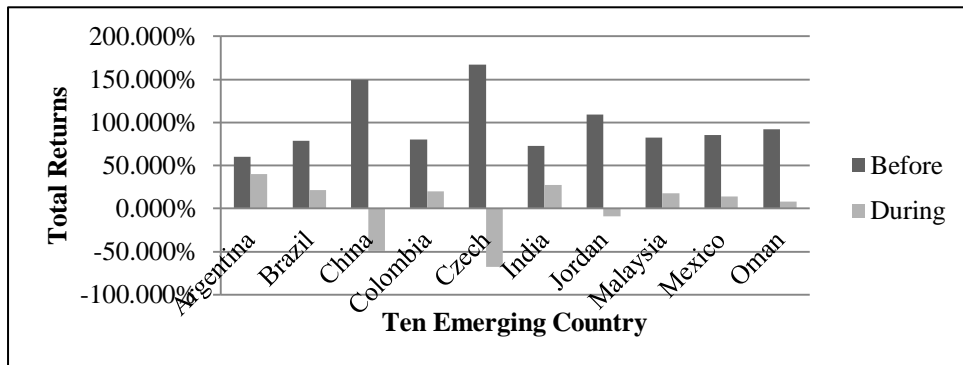

Fig. 11.Total returns per period for 10 Emerging Country Stock Indices (Before and During Crisis)

Descriptive statistics for the whole period is reported in Table 2, where it is the summary statistics (data on returns) for 10 emerging country stock indices listed at Dow Jones indices in May 2010 starting from January 1, 2004 until December 31, 2010 (1828 observations). The result shows that each country does not have normal distribution based on the Jacque-Berra test. However, this result is common because of the large number of samples that are randomly selected.

Table 2. Summary Statistics

Country	Mean	Standard Deviation	Skewness	Kurtosis	Jacque Berra
Argentina	0.028	0.827	-0.585	8.240	2194.209*
Brazil	0.027	0.838	-0.051	8.643	2424.772*
China	0.015	0.787	-0.306	6.150	783.947*
Colombia	0.045	0.662	-0.355	14.868	10761.170*
Czech	0.015	0.719	-0.575	17.323	15717.110*
India	0.030	0.767	-0.285	10.690	4527.424*
Jordan	0.017	0.638	-0.321	43.633	125716.800*
Malaysia	0.015	0.358	-1.249	17.989	17578.27*
Mexico	0.035	0.623	0.108	8.648	2431.578*
Oman	0.022	0.529	-0.863	15.792	12682.700*

After separating and determining all information, the results for mean daily returns around the full moon and the new moon dates from January 2004 to December 2010 can be seen in Table 3 and Table 4 after considering both financial crisis events. Specifically, the difference between stock returns of the new moon days and full moon days before and during the crisis are volatile around -50% up to 97%. In Table 3, the overall mean daily returns around the new moon are higher compared to the mean daily returns around the full moon except for the country Jordan. However, the results in Table 4 show that during the crisis the results for five countries, Argentina, Brazil, China, Malaysia and Mexico contradicted. These results are similar to that of Dichev and Janes (2001), where they have found that the effect of lunar cycles is not statistically significant on the returns volatility.

Table 3. Mean daily returns before crisis

Country	New Moon	Full Moon	Difference
Argentina	39.32%	10.99%	28.32%
Brazil	34.53%	9.52%	25.01%
China	87.98%	-8.28%	96.26%
Colombia	30.67%	14.25%	16.42%
Czech	48.39%	42.67%	5.72%
India	25.68%	13.14%	12.55%
Jordan	4.12%	23.02%	-18.90%
Malaysia	46.42%	24.36%	22.06%
Mexico	30.35%	17.65%	12.70%
Oman	49.16%	13.43%	35.74%

Table 4. Mean daily returns during crisis

Country	New Moon	Full Moon	Difference
Argentina	-3.33%	41.07%	-44.40%
Brazil	-16.54%	30.80%	-47.35%
China	-37.82%	22.11%	-59.92%
Colombia	18.62%	9.94%	8.68%
Czech	4.23%	-10.72%	14.95%
India	28.73%	11.31%	17.42%
Jordan	16.23%	-46.35%	62.58%
Malaysia	-4.29%	11.50%	-15.79%
Mexico	-1.34%	22.20%	-23.55%
Oman	24.10%	-3.81%	27.90%

The test measurement to scrutinize the relationship between dependent and independent variables are Multiple Linear Regression (dummy variable) analysis and Mann-Whitney method for non-parametric category. Both methodology are used to indicate the most relevant and accurate findings that significantly showed the best results. The test measurement to scrutinize the relationship between dependent and independent variables are Multiple Linear Regression (dummy variable) analysis and Mann-Whitney method for non-parametric category. In Section 4, both methodologies were used to indicate the most relevant and accurate findings that significantly showed the best results

Table 5 provides an important element of equation (1). The results for R-squared are low for all countries. This result is similar to all studies of daily returns due to the large variance of the dependent variable, which is mainly random (Holden et al., 2005). Based on the Ramsey test for linearity, the results are insignificant for all countries. Thus, this equation is linear and further investigation on non-linear structure is not necessary. In the normality test, the Jacque-Berra test results for all countries are significant at five percent level. Thus the distribution of the returns each day is not normal. This is due to the results in the actual data in Table 2. Otherwise there are also problems in heteroscedacity and serial

correlation and this is due to returns in calculation. The spurious regression results for equation (1) were not reported in this paper.

Table 5. Diagnostic tests for equation (1)

			Diagnostic Test		
Country	R-squared	Linearity	Normality	Heteroscedascity	Serial Correlation
Argentina	0.000885	0.110(0.741)	2182(0.000)	4.391(0.001)	1.364(0.243)
Brazil	0.0005	1.351(0.245)	2441(0.000)	5.440(0.000)	0.413(0.520)
China	0.001568	2.514(0.113)	778(0.000)	8.958(0.000)	0.09(0.762)
Colombia	0.003589	0.151(0.698)	10906(0.000)	2.620(0.023)	39.209(0.000)
Czech	0.039029	0.069(0.793)	15589(0.000)	8.143(0.000)	12.174(0.000)
India	0.001193	0.467(0.494)	4598(0.000)	4.730(0.000)	6.741(0.009)
Jordan	0.002058	0.551(0.458)	126604(0.000)	2.913(0.013)	0.001(0.971)
Malaysia	0.016461	1.845(0.175)	17791(0.000)	3.931(0.015)	25.895(0.000)
Oman	0.025523	0.045(0.831)	12385(0.000)	8.826(0.000)	68.845(0.000)
Mexico	0.045891	0.531(0.466)	2451(0.000)	7.134(0.000)	13.924(0.000)

Since equation (1) is not normal, it was decided that the non-parametric method is used to solve the problems. We used the Mann-Whitney test in order to test the relationship between lunar phases towards stock returns by separating both crises. A two-sample rank test was run to test of the equality of the two population medians, and to calculate the corresponding point estimate and confidence interval. Thus, the hypotheses for this method are:

H_o: return on full moon = return on new moon
H_1: return on full moon < return on new moon

Table 6. Mann-Whitney Test

Country	Return Before Crisis	Return After Crisis
Argentina	0.2896**	ns
Brazil	ns	ns
China	0.3035**	ns
Colombia	ns	0.4487**
Czech	0.3096**	ns
India	0.4253**	ns
Jordan	ns	0.0386**
Malaysia	0.0015**	ns
Mexico	0.3572**	ns
Oman	0.1005**	0.3473**

***significant at 5 percent level and ns is indicated as insignificant

The result in Table 6 shows that returns for all countries except Brazil and Jordan are significant at the five percent level where returns on the full moon are less compared to returns on the new moon. Nevertheless, the result for after crisis is different from the result for before crisis. Most of the countries except Colombia, Jordan and Oman show insignificant results where returns on the full moon are more than returns on the new moon. The drop in the returns volatility during the new moon during the crisis

may be due to reduced trading activity or change in investor behavior because of various factors. Some of the factors contributing to the change in investor behavior during the crisis are speculation and use of interest which would affect margin trading and market participants leading to lower interest in trading.

The two-sample rank test (Mann-Whitney) is less powerful because the confidence interval is wider on the average. Furthermore, this two-sample rank test is slightly less powerful than the two-sample test with pooled sample variance when the populations are normal and considerably more powerful because the confidence interval is narrower, on the average, for many other populations. If the populations have different shapes or different standard deviations, a two-sample t without pooling variances may be more appropriate.

5. Conclusion

This paper strives for the evidence of the relationship between lunar phases and stock returns for ten emerging countries before and during the financial crisis. The overall evidence shows that the returns of the stock market before the crisis is lower on the days surrounding the dates of the full moon rather than on the days surrounding the dates of new moon, and this result is consistent with previous literature. However, results in a full moon are different for five countries as shown in Table 4. This result is in contrast to the evidence presented by the literature and to the presumed assumptions and hyphotheses. Although one of the objectives of this study is to examine the relationship between psychological behaviour and lunar phases, the exact interpretation based on empirical results are not enough to show the investors psychological and mood affects perceptions and preferences towards investment in stock returns. Basically, it can be concluded that returns on the new moon is higher because of the moon effect towards human behaviour as stated in previous literature. However, the evidence is not strong enough to show their relationship. Therefore, future researchers perhaps interested to study in depth the effect of psychological behaviour towards stock returns by implementing psychological methods in research.

Furthermore, there are four limitations that need to be acknowledged and addressed regarding this study. The first limitation concerns the cross disciplinary natures of this study i.e. implementing psychological effect on human behavior towards the stock returns. Therefore, the results on this study possibly biased to finance scholars who will appreciate our results better than psychological scholars or vice versa. Since our study randomly selected ten emerging countries as our research sample, external environmental factors such as policies and restrictions, political view and culture are assumed to be constant at the given time frame and may not contribute to our findings and results. The assumption is crucial because generally different countries have different environments. Internal environment such as human faith and believe are considered to be related to behavior and physiology. In Malaysia for example, people are not concerned about the moon faith unlike people in China. Therefore, the results might differ from one country to another.

The model used in this study does not attempt to explain how an individual behaves, but rather provides the figures for investigating stock returns in the context of investor behavior in investing stocks. There are no new psychometric measurements instruments that have been constructed in this study. Further empirical evaluations, however, are needed to replicate the findings in different contexts and surroundings. Finally, since the numbers of data are too large, missing value may be appeared in statistical analyses. For example, in the case of surveys, rarely do missing values occur totally at random. Occasionally in the case of secondary data such as stock prices, missing values has appeared due to the rocess of typing and transferring the data into the other statistical program=\.

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