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# ANOMALIES BEFORE ARAB SPRING: AN EMPIRICAL INVESTIGATION FROM MENA MARKETS

*Mohammad khataybeh*
*Department of Finance and Banking,*
*The Hashemite University*
*khataybeh@hu.edu.jo*

*Abstract*

***The purpose of this research is to fill in the gap by investigating some anomalies in: Amman Stock Exchange (ASE General Index), Egypt Stock Exchange (EGX-30), for the period of 2006 to 2011 to avoid Arab Spring consequences. Anomalies that have been studied are the Day-of-the-Week, the Month-of-the-Year and the Holy Month of Ramadan effects. Empirical researches have employed daily and monthly returns data of the sample markets, as well as Ordinary Least Square (OLS) and the Generalized Autoregressive Conditional Heteroscedastic (GARCH) models to allow for a time-varying variance. Among the most important findings, the study indicate, firstly, that Jordan is exhibits a significant Day-of-the-Week effect in returns, while the two markets exhibit a significant effect on volatility. Secondly, the Egyptian market exhibit the Month-of-the-Year effect in returns except but not the case of Jordan, and there was no significant effect on volatility observed for both markets. Finally, none of both markets exhibit the Holy month of Ramadan effect in returns, while a decline on volatility was observed for both of the markets.***
***Keywords: Market Efficiency; Anomaly; Day-of-the-Week effect; the Month-of-the-Year effect; the Holy Month of Ramadan effects.***
***JEL Codes: G02, G11, G14, G15***

## I. INTRODUCTION

According to the efficient market hypothesis (EMH), securities' prices reflect all information available for investors and all public information are not useful for investors to generate any abnormal profit. This argument assumes that prices are bid to fair level, and any increase or decrease in the prices levels are in response to any related new information, and so, information should not be predictable and prices should follow the random walk. Hence, returns on securities become one of the most widely investigated studies by investors in hope to reap any abnormal profits. However, researchers have found some investments strategies that contested the EMH, where investors can use publicly available information to generate profits, i.e. Calendar Anomalies.

Studying calendar anomalies in the equity markets has been registered under the behavioural finance literature. Literature on this field of research has pointed these anomalies and their impact on the investors' returns in different markets (Brooks, 2008; Bodie et al., 2009). Over the past three decades, calendar anomalies have been extensively investigated on the stock markets throughout the world. Financial literature has indicated that the most common anomalies are the Day-of-the-Week effect, Week-of-the-Month effect and the Month-of the Year effect, and some other Islamic calendar effects.

Patterns of such effects have been investigated in many markets, areas and during several periods. In the advanced countries, evidence of the Day-of the-Week existence has been documented, with results show that days of the week have a different distribution among each other's(e.g. Smirlock and Starcks, 1986; Athanssakos and Robinson, 1994; Berument and Kiymoz, 2001; Boynton et al.,2009;Mazviona, and Ndlovu, 2016). This evidence was also documented in the emerging markets by Brooks and Persand, 2001; Al-Loughani and Chappell.2001; Kamaly and Tooma, 2009; Lim el al., 2010; Deyshappriya, 2014. Further investigations have indicated that the months of the year are also differentiated in terms of the stocks return; evidence has been documented in the advanced and the emerging markets (e.g.Fountas et al., 2002; Hong and Hirschy, 2006; Agathee, 2008; Wiley and Zumpano, 2009; Park and Moskalev, 2010; Su et al., 2011; Easterday and Sen, 2016).

More specifically and regarding the Islamic calendar anomalies, Seyyed et al. (2005) for instance revealed that there was a constant anomaly appearance in the Saudi stock market during the month of Ramadan (average rates of return were unaffected), with a decline in trading activity. While, Oguzsoy and Gunen (2004) investigated the presence of the holy days effect (the feasts of Sacrifice and Ramadan) on the Istanbul Stock Exchange. Results showed that the average return of the national 100 composite index on basis of two days before the holiday, were considered as being significantly higher than all other days rather than a day before the holiday.

Reviewing various sources of academic publications related to markets anomalies and where many studies share the basic idea under this study. The less conducted research on the MENA markets support the intention of this research to focusing on the MENA market, in terms of how findings will be useful for researchers and investors to understand market variables and functions that could affect the investments decisions.

Accordingly, the objective of this research paper is to investigate the existence of the calendar anomalies in some MENA stock markets during the period of 2006-2011. The specific calendar anomalies that will be investigated in this paper are the day of the week, month of the year, and the holy Ramadan month effects. Starting from the importance of indicating such anomalies for investors, this study aims to indicate how these significant anomalies, the day of the week, month of the year and the holy month of Ramadan, affect the entire markets. The contribution of this paper will be considered by a combination of the following two features. Firstly, the methodology will consist of two models, which are OLS and GARCH. Such methodology will be used in order to fill the gap and to avoid biased results that could be obtained by using one single model. Secondly, considering the daily data during the holy month of Ramadan, this paper will investigate the effect of the holy month of Ramadan, where markets of Islamic countries experience noticeable changes in

trading activities during the fasting month of Ramadan. Achieving the aims of this research would help rational investors in taking advantage of designing proper trading strategies, which take into account such predictable markets anomalies, and so point to the general dimensions of their decision making prospective.

## II. DATA AND METHODOLOGY

This paper has used a series of daily and monthly closing prices, from Amman stock exchange (ASE General Index), Egypt stock exchange (EGX30), for the period of June 1, 2006 to June 1, 2011. These data sets have been obtained from the database "DataStream" in terms of dollar values, in order to preserve data type consistency. Applied criteria have been relayed upon their mutual features, in terms of the same trading days applied (i.e. markets with Sunday-Thursday trading days).

The daily returns ($R_t$) of each market have been computed according to the first natural logarithms' difference, as expressed in following equation:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

Where $R_t$the daily is return index at time $t$, $P_t$ and $P_{t-1}$ are the indices values for the $t$ and $t-1$ days respectively.

Some of the most investigated calendar anomalies that have been carried out so far are the day of the week and month of the year effects. Others related to the Muslim calendars like the holy month of Ramadan or the pre feast holiday effects, have not been studied extensively in most of the Islamic countries. This study has investigated the first two anomalies as well as the holy month of Ramadan effect, as to be a part of the research contribution. For the study analysis it was assumed that the produced yields of each of the markets were independent of the day of the week, month of the year, as well as, the holy month of Ramadan effects. Following previous survey studies (Kamalyand Tooma, 2009; Apolonario et al, 2006 and Choudhry, 2001), the standard Ordinary Least Squares (OLS) Model has been used as the methodology mean equation. Where dummy variables represent the entire calendars' events, they have been used to represent all of the studied markets.

Similarly to (Liu and Kamath, 2010; Apolinario et al, 2006) the regression model for the day of the week effect test has included five dummy variables representing each of the week trading days in that order.

$$R_t = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + \epsilon_t \quad (1)$$

Where:
$R_t$: is the daily return of each market (index).

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$D_{jt}$: are the dummy variables, as the dummy takes the value of 1 regarding the corresponding returns of day $t$ are Sunday, Monday, Tuesday, Wednesday, Thursday, in that order, and 0 if otherwise.
***Sut, Mt, Tt, Wt, Tht***: are the coefficients of the average return of each of the trading days.
$\epsilon_t$: is the error term.

Similarly and following Agathee (2008) OLS regression model for the month of the year effect. The equation has included 12 dummy variables representing all of the year's months.

$$R_t = B_1 D_{t1\ Jan} + B_2 D_{t2\ Feb} + B_3 D_{t3\ Mar} + B_4 D_{t4\ Apr} + B_5 D_{t5\ May} + B_6 D_{t6\ Jun} + B_7 D_{t7\ July} + B_8 D_{t8\ Aug} + B_9 D_{t9\ Sep} + B_{10} D_{t10\ Oct} + B_{11} D_{t11\ Nov} + B_{12} D_{t12\ Dec} + \epsilon_t \quad (2)$$

Where:
$D_{t1}$: are the dummy variables that take the value of 1 if the corresponding return is on $t$ months are, January, February, March April,……, November and December as in our case of study, or 0 if otherwise.
$B_1, B_2, B_3 \ldots B_{11}, B_{12}$ are the parameters that represent the average return of each of the year months.
$\epsilon_t$: is the error term.
Finally, for the holy month of Ramadan effect test, equation 1 has been reformulated, as an extra dummy variable has been added to the equation, in order to represent the yielding returns during Ramadan trading days.

$$R_t = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + d_6 Dum + \epsilon_t \quad (3)$$

*Where:*
$R_t$: is the daily return of each market (index).
$d_{jt}$: are the dummy variables, as the dummy take the value of 1 regarding the corresponding returns of day $t$ are Sunday, Monday, Tuesday, Wednesday, Thursday, in that order, and 0 if otherwise.
***Sut, Mt, Tt, Wt, Tht***: are the coefficients of the average return of each of the trading days.
***Dum***: is the coefficient of the average return for Ramadan trading days and $\epsilon_t$ is the error term.

Where the holy month of Ramadan is a month consisted in the Islamic calendar (Moon Calendar), representing the fasting days for the Muslim countries. Compared to the Gregorian calendar, the Islamic calendar is 10 to 11 days shorter than the Gregorian one, as in terms that the Islamic calendar is being counted according to moon's born for every single month. Consequently, the Islamic calendar has been used for the determination of the Muslims' fasting days in accordance to the Gregorian calendar, as the second is considered to be the official calendar.

Kamaly and Tooma (2009) have argued that emerging markets returns are significantly correlated, as asymmetric information and the markets inefficiency are existed in the markets sample. However, the OLS model assumes that the variances of the error terms are constant, whereas in reality it could be heteroscedastic or time varying. This being so, the need for the Generalized Autoregressive Conditional Heteroskedstic (GARCH) model becomes an advantage for our analysis validity, as according to Liu and Kamath, 2010; Choudhary, 2001), analysis results could take an advantage by using GARCH model,

especially when the OLS errors get adjusted for heteroskedasticity (bias). However, if the returns' autocorrelation are existed and have not been corrected, occurrence of the model misspecification could be present.

For the autocorrelation problem, a proposal by (Apolonario et al 2006; Choudhry 2001) has suggested that introducing the markets' return with a proper delay into the regression model can be the resolution, as by applying the equation below the problem will be corrected.

$$R_t = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + \sum_{j=1}^{n} B_{j+5}.R_{t-j} + \epsilon t$$

However, for the correction of the residuals variances' variability, the ARCH model has been proposed by Engle (1982), where the model has the advantage of and ability for the conditional variance to be expressed in terms of past errors. It is assumed that variance of residual term is not constant and residuals follow the $\epsilon_t \sim iid\ (0,\sigma^2)$ distribution. The generalisation of the ARCH model has the advantage of providing flexible capturing framework of the conditional variance. The GARCH (p, q) model can be represented as follows:

$$R_t = \mu + \phi X_t + \varepsilon_t$$
$$\varepsilon_t \,|\Psi t\text{-}1 \sim N\ (0,\ \sigma^2)$$
$$\sigma^2 = a_0 + \sum_{i=1}^{q} a_i\, \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2$$

Where:
$R_t$: Represents the markets return.
$X_t$: represents a victor of the dummy variables.
$\varepsilon_t$: is the regression error term depends on the past information Ψt-1, and $\sigma^2$ is the conditional variance dependent relatively on the past squared errors, where $a_i \geq 0$, $\gamma_i \geq 0$ and $a_0 > 0$ are being compulsory for the positive conditional variance assurance.

Others works done by (Kamaly and Tooma 2009; Apolonario et al 2006 and Seyyed et al 2005) have also included the dummy variable within the variance equation, which accounts for possibility of the stationary effects. And so, such an approach results obtained the joint estimates of the applying study effects, in terms of mean as well as in the conditional variance.

By applying the GARCH (p, q) model, return equations can be expressed in the following manner as for the day of the week, month of the year and the Ramadan effects respectively.

**For the day of the week effect**

$$R_t = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + \sum_{j=1}^{n} B_{j+5}.r_{t-j} + \varepsilon_t$$

$$\varepsilon_t \sim iid\ (0,\sigma_t^2)$$

$$\sigma^2 = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + \sum_{i=1}^{q} a_{5+i}.\varepsilon_{t-i}^2 + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2 \quad (4)$$

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**For the month of the year effect**

$$R_t = \sum_{i=1}^{12} B_i D_i + \sum_{j=1}^{n} B_{j+5} . r_{t-j} + \varepsilon_t$$
$$\varepsilon_t \sim iid\ (0, \sigma_t^2)$$
$$\sigma^2 = \sum_{i=1}^{12} B_i D_i + \sum_{i=1}^{q} a_{5+i} . \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2 \quad (5)$$

Where $D_i$represent a victor of the Dummy variables.

**For Ramadan effect**

$$R_t = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + d_6 Dum + \sum_{j=1}^{n} B_{j+5} . r_{t-j} + \varepsilon_t$$
$$\varepsilon_t \sim iid\ (0, \sigma_t^2)$$
$$\sigma^2 = d_1 Su_t + d_2 M_t + d_3 T_t + d_4 W_t + d_5 Th_t + d_6 Dum + \sum_{i=1}^{q} a_{5+i} . \varepsilon_{t-i}^2 + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2 \quad (6)$$

## III. EMPIRICAL RESULTS

**The day of the week effects on return.**

Table (**1**) summaries the obtained results from the estimating equation (1) on the markets' daily return data. Both markets have followed the Autoregressive (AR) process. Kamaly and Tooma (2009) have mentioned that it is common for the stock markets' return to follow the AR process, especially when dealing with daily and emerging markets data. For the day-of-the-week effect, results showed that Amman stock exchange has significant day dummies (i.e. Thursday). Negative Coefficient indicates that the return is significantly lower at this day.

**Table (1): day of the week effect on markets return (OLS).**

| | *Jordan* | *Egypt* |
|---|---|---|
| *AR (-1)* | *0.0622* | *0.1159* |
| *(Probability)* | *(0.0210)* | *(0.0000)* |
| *AR (-2)* | *0.0445* | |
| *(Probability)* | *(0.0984)* | - |
| *AR (-3)* | *-0.2486* | |
| *(Probability)* | *(0.0000)* | - |
| *Sunday* | *0.0004* | *0.0002* |
| *(Probability)* | *(0.6406)* | *(0.8049)* |
| *Monday* | *0.0003* | *-0.0009* |
| *(Probability)* | *(0.7036)* | *(0.3915)* |
| *Tuesday* | *-0.0002* | *0.0004* |
| *(Probability)* | *(0.8361)* | *(0.6730)* |
| *Wednesday* | *0.0203* | *0.0002* |
| *(Probability)* | *(0.8308)* | *(0.8201)* |
| *Thursday* | *-0.0022* | *-0.0002* |
| *(Probability)* | ***(0.0203)* | *(0.8429)* |

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| | | |
|---|---|---|
| *D.W stat* | *1.9701* | *2.004* |
| *R-squared* | *0.0697* | *0.0338* |
| *Adj R-squared* | *0.0697* | *0.0103* |

*Note: *, ** and*** represent significance at 1,5 and 10% level, respectively.*

The table above presents two interesting noted points that are: Firstly, the significant dummy belongs to the end of the trading days in Jordan; In fact, the results showed that ASE has a significant day of the week effect. Secondly, it could observed that the selected market (Egypt stock exchange ) is considered to be the most mature markets among the other MENA ones, taking the consideration of the market capitalization and the number of listed companies. Consequently, observation of the non-significant markets could support the notion that markets are abiding more to the efficient market hypothesis.

**Day of the Week effects on Volatility.**

Summarizing the results obtained by applying the GARCH model mentioned in equation 4. Table **(2)** shows that both markets are characterized by GARCH (1, 1) structure. According to Apollinario et al., (2006); Kamaly and Tooma, (2009), structure is commonly used to describe financial markets returns. Results showed that the day-of the week effect on volatility is significant for both markets, inverse to the case of the effect on return, where the effect was exhibited in the case of Jordan only. However, as opposed to the case of returns, Jordan's market has a marked abnormal high volatility at the end of the trading week rather than a negative. On the other hand, Egypt exhibited an excess volatility on Sunday and Wednesday, it is also characterized by excess volatility on the last trading day (i.e. negative and significant for the last trading day). Jordan has marked abnormal returns on Monday and Thursday as compared to the Egyptian markets. The findings support the results of a similar study by Kamaly and Tooma (2009), in terms of proofing the significant effect in return and volatility for Jordan and Egypt.

**Table (2) : day of the week effect on volatility.**

| | | Significant Variables | |
|---|---|---|---|
| | **GARCH order** | **Return Equation** | **Variance Equation** |
| Jordan | GARCH (1,1) | AR(-3),$D^{*}_{Mon}$ (+ve), $D^{**}_{Thu}$(+ve) | $Constant^{*}$(-ve), $D^{*}_{Mon}$(+ve),$D^{*}_{Wed}$(+ve), $D^{*}_{Thu}$(+ve) |
| Egypt | GARCH (1,1) | AR(-1), $D^{*}_{Sun}$(+ve) | $Constant^{*}$(+ve), $D^{*}_{Sun}$(+ve),$D^{*}_{Wed}$(-ve), $D^{*}_{Thu}$(+ve) |

Note: *,** represent significance at 1 and 5% level, respectively

Another observation worth noting is that the significance of the day of the week effect on volatility is higher than the similar effect on returns as shown in table (3). Evidence of the observation can be viewed by comparing the significant dummy coefficients in table (3) associated with volatility, and those mentioned in table (2) for returns.

**Table (3): significant variables coefficient: day of the week (GARCH).**

| **Return Equation** | | |
|---|---|---|
| | **Jordan** | **Egypt** |
| AR (-1) | 0.0850 | 0.0831 |

| | | |
|---|---|---|
| (Probability) | (0.0042) | (0.0043) |
| AR (-2) | -0.0236 | |
| (Probability) | (0.4425) | - |
| AR(-3) | 0.0782 | |
| (Probability) | (0.0000) | - |
| $D_{Sum}$ | -0.0002 | *0.0038 |
| (Probability) | (0.6027) | (0.0001) |
| $D_{Mon}$ | *0.0009 | ***-0.0011 |
| (Probability) | (0.0371) | (0.0804) |
| $D_{Tue}$ | *-0.0006 | -0.0004 |
| (Probability) | (0.0071) | (0.1469) |
| $D_{Wed}$ | 0.0000 | 0.0000 |
| (Probability) | (0.5853) | (0.9200) |
| $D_{Thu}$ | -0.0011 | 0.0007 |
| (Probability) | (0.2403) | (0.5496) |
| **Conditional Variance Equation** | | |
| | **Jordan** | **Egypt** |
| $Constant$ | 0.0000 | 0.0000 |
| (Probability) | (0.0000) | (0.0000) |
| RESID(-1)^2 | 0.2018 | 0.1147 |
| (Probability) | (0.0000) | (0.0000) |
| GARCH(-1) | 0.3393 | 0.4294 |
| (Probability) | (0.0000) | (0.0000) |
| $D_{Sum}$ | 0.0000 | *0.0000 |
| (Probability) | **(0.0239) | (0.0005) |
| $D_{Mon}$ | *0.0004 | 0.0000 |
| (Probability) | (0.0000) | (0.1712) |
| $D_{Tue}$ | | |
| (Probability) | - | - |
| $D_{Wed}$ | *0.0000 | *-0.0001 |
| (Probability) | (0.0001) | (0.0000) |
| $D_{Thu}$ | *0.0003 | *0.0005 |
| (Probability) | (0.0000) | (0.0000) |
| $Q_5$ | 29.989 | 8.7505 |
| $Q_{10}$ | 36.006 | 15.098 |
| $Q_{20}$ | 42.927 | 27.402 |
| Note: *, ** and*** represent significance at 1,5 and 10% level, respectively. | | |

Table (4) has summarized the ARCH-LM and the Jarque-Bera statistics (for 5, 10 and 20 lags), that indicate the validity of the residuals' normality assumption. The ARCH-LM test has showed that standardized errors are normally distributed and no exceptions were revealed.

**Table 3(4): residuals test.**

| | **ARCH test** | | | |
|---|---|---|---|---|
| **Jarque-Bera (Probability)** | **lag 5 F-Static Probability** | **lag 10 F-Static Probability** | **lag 20 F-Static Probability** | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Jordan | 1331765 | (0.000) | 5.701430 | (0.0000) | 2.927429 | (0.0012) | 1.626417 | (0.0398) |
| Egypt | 4900 | (0.000) | 7.127177 | (0.0000) | 4.564854 | (0.0000) | 4.493903 | (0.0000) |

**Month of the Year effects on Return.**

For the month of the year effect test, table (5) summaries the results obtained by applying the equation (2) on the markets' monthly data. As with the case of the daily return, an Autoregressive process has been followed monthly return data. As shown in table (5), both markets have followed the first order of the (AR), where it is considered being common, as a result of dealing with monthly data (Choudhry Taufiq, 2000).

**Table (5): month of the year effect on markets return (OLS).**

| | Jordan | Egypt |
|---|---|---|
| AR (-1) | -0.1214 | 0.4950 |
| (Probability) | (0.4110) | (0.0046) |
| D Jan | 0.0137 | *-0.1278 |
| (Probability) | (0.7322) | (0.0062) |
| D Feb | 0.0011 | 0.0758 |
| (Probability) | (0.9779) | (0.1007) |
| D Mar | -0.0050 | 0.0089 |
| (Probability) | (0.8991) | (0.8385) |
| D Apr | 0.0124 | 0.0471 |
| (Probability) | (0.7571) | (0.2851) |
| D May | 0.0001 | -0.0170 |
| (Probability) | (0.9973) | (0.7008) |
| D Jun | 0.0046 | -0.0424 |
| (Probability) | (0.9070) | (0.3773) |
| D Jul | -0.0242 | 0.0538 |
| (Probability) | (0.5889) | (0.2773) |
| D Aug | 0.0382 | -0.0214 |
| (Probability) | (0.3438) | (0.6304) |
| D Sep | -0.0542 | 0.0009 |
| (Probability) | (0.1854) | (0.9819) |
| D Oct | -0.0376 | -0.0557 |
| (Probability) | (0.3613) | (0.2067) |
| D Nov | -0.0566 | -0.0353 |
| (Probability) | (0.1651) | (0.4267) |
| D Dec | 0.0101 | *0.0997 |
| (Probability) | (0.8037) | (0.0286) |
| D.W stat | 1.7535 | 2.0071 |
| R-squared | 0.1259 | 0.3536 |
| Adj R-squared | -0.1020 | 0.1884 |

Note: *, ** and*** represent significance at 1, 5 and 10% level, respectively.

Results show that Jordan exhibit not significant month dummies, and for Egypt, results showed that there was an existence of the effect shown at the months of December and January, with a negative and positive return for both months respectively. A note of table (5) deserves to be mentioned, which is that while Egyptian market exhibited a significant

month of the year effect, which was not the Jordanian case and could argue that it supports the notion that ASE is abiding more to the efficient market hypothesis.

**The Month of the Year effects on Volatility.**

Applying the GARCH model as in mentioned equation (5), results are summarized in table (6) below. Findings showed that both of the studied markets are characterized by the GARCH (0, 1) structure. Results show that the month of the year effect on volatility was clearly significant in the case of Jordan in July and August. On other hand, it was significant in the case of Egypt in January, June and December.

**Table (6): the month of the year on volatility.**

| | GARCH order | Significant Variables | |
|---|---|---|---|
| | | Return Equation | Variance Equation |
| Jordan | GARCH (0,1) | AR(3),$D^{***}_{jul}$ (-ve), $D^{*}_{Aug}$(-ve), | – |
| Egypt | GARCH (0,1) | AR(1), $D^{*}_{jan}$(-ve), $D^{**}_{jUn}$(-ve),$D^{*}_{Dec}$(+ve) | – |

Note: *, ** and*** represent significance at 1, 5 and 10% level, respectively.

**Table (7): significant variables coefficient: month of the year (GARCH).**

| Return Equation | | |
|---|---|---|
| | Jordan | Egypt |
| AR (-1) | 0.1117 | *0.3410 |
| (Probability) | (0.3156) | (0.0074) |
| D Jan | -0.0023 | ***-0.1218 |
| (Probability) | (0.9179) | (0.0549) |
| D Feb | -0.0072 | 0.0683 |
| (Probability) | (0.6771) | (0.1787) |
| D Mar | 0.0002 | 0.0117 |
| (Probability) | (0.9926) | (0.8714) |
| D Apr | 0.0198 | 0.0490 |
| (Probability) | (0.2236) | (0.1568) |
| D May | -0.0029 | -0.0125 |
| (Probability) | (0.8973) | (0.7906) |
| D Jun | 0.0048 | **-0.0419 |
| (Probability) | (0.8769) | (0.0362) |
| D Jul | **-0.0269 | 0.0502 |
| (Probability) | (0.0929) | (0.3147) |
| D Aug | *-0.0351 | -0.0165 |
| (Probability) | (0.0111) | (0.5831) |
| D Sep | 0.0098 | 0.0013 |
| (Probability) | (0.8014) | (0.9751) |
| D Oct | -0.3417 | -0.0552 |
| (Probability) | (0.6707) | (0.8433) |
| D Nov | -0.0436 | -0.0396 |
| (Probability) | (0.6073) | (0.8882) |
| D Dec | 0.0272 | 0.0952 |

| | | |
|---|---|---|
| (Probability) | (0.01210) | (0.0089) |
| **Conditional Variance Equation** | | |
| | **Jordan** | **Egypt** |
| *Constant* | -0.0009 | 0.0019 |
| (Probability) | (0.8719) | (0.9958) |
| GARCH(-1) | *0.5945 | 0.0443 |
| (Probability) | (0.0000) | (0.9995) |
| D Jan | 0.0014 | 0.0166 |
| (Probability) | (0.8330) | (0.9388) |
| D Feb | 0.0014 | -0.0003 |
| (Probability) | (0.8165) | (0.9997) |
| D Mar | 0.0011 | 0.0022 |
| (Probability) | (0.8725) | (0.9907) |
| D Apr | 0.0008 | 0.0036 |
| (Probability) | (0.8919) | (0.9547) |
| D May | 0.0024 | 0.0081 |
| (Probability) | (0.6954) | (0.8355) |
| D Jun | 0.0017 | -0.0015 |
| (Probability) | (0.7853) | (0.9967) |
| D Jul | 0.0001 | -0.0003 |
| (Probability) | (0.9868) | (0.9990) |
| D Aug | 0.0011 | 0.0017 |
| (Probability) | (0.8460) | (0.9946) |
| D Sep | 0.0023 | 0.0066 |
| (Probability) | (0.7362) | (0.9496) |
| D Oct | 0.0147 | 0.0213 |
| (Probability) | (0.4175) | (0.9341) |
| D Nov | -0.0041 | 0.0022 |
| (Probability) | (0.8214) | (0.9986) |
| $Q_5$ | 1.9984 | 11.641 |
| $Q_{10}$ | 7.3341 | 23.478 |
| $Q_{20}$ | 15.113 | 42.416 |
| Note: *, ** and*** represent significance at 1, 5 and 10% level, respectively. | | |

Table (8) shows the corresponding values of the Q statistic and the ARCH-LM tests of the standard residuals. With lags of 1, 3 and 5 for ARCH test and 5, 10 and 20 for the Q statistics, the ARCH-LM test has been used to verify the present of an ARCH effect on the residuals. Test results showed that an ARCH effect is not present on residual of both market's' estimates.

**Table (8): residuals test (Monthly).**

| | **Q statistic (GARCH)** | | | **ARCH-LM test** | | |
|---|---|---|---|---|---|---|
| | | | | **Lag 1** | **Lag 3** | **Lag 5** |
| | | | | **F-Static** | **F-Static** | **F-Static** |
| | **Lag 5** | **Lag 10** | **Lag 20** | **Probability** | **Probability** | **Probability** |
| Jordan | (1.9984) | 7.3341 | 15.113 | 1.215612 | 3.096967 | 3.491764 |
| | (0.849) | (0.694) | (0.770) | (0.274938) | (0.034659) | (0.009010) |
| Egypt | 11.641 | 23.478 | 42.416 | 0.59975 | 1.150255 | 0.697512 |

| | | | | | |
|---|---|---|---|---|---|
| (0.040) | (0.009) | (0.008) | (0.441929) | (0.337639) | (0.627926) |

Note: Statistical probability shown in parentheses.

**The Holy Month of Ramadan effects on Return.**

Summarizing the results obtained from the estimated equation (3) for the holy month of Ramadan effect, table (9) below shows the results obtained by using the daily data used, as the same sort of data have been used for thedayoftheweek effect, except that an extra dummy variable has been added to the return equation as mentioned earlier. For the holy month of Ramadan effect, results show that none of the tested markets had a significant dummy effect, even at the 10% confidence level.

**Table (9): The holy month effect on markets return (OLS).**

| | Jordan | Egypt |
|---|---|---|
| AR (-1)<br>(Probability) | -<br> | 0.1159<br>(0.0000) |
| AR (-2)<br>(Probability) | -<br> | -<br> |
| AR (-3)<br>(Probability) | *-0.2447<br>(0.0000) | -<br> |
| Sunday<br>(Probability) | -0.0007<br>(0.4381) | 0.0002<br>(0.8075) |
| Monday<br>(Probability) | 0.0000<br>(0.9640) | -0.0009<br>(0.3915) |
| Tuesday<br>(Probability) | 0.0000<br>(0.9591) | 0.0004<br>(0.6751) |
| Wednesday<br>(Probability) | -0.0003<br>(0.7338) | 0.0002<br>(0.8212) |
| Thursday<br>(Probability) | -0.0023<br>**(0.0150) | -0.0002<br>(0.8452) |
| **Ramadan (Dummy)**<br>**(Probability)** | **0.0020**<br>**(0.1897)** | **0.0000**<br>**(0.9938)** |
| D.W stat | 1.8433 | 2.0049 |
| R-squared | 0.0648 | 0.0141 |
| Adj R-squared | 0.0605 | 0.0095 |

Note: *, ** and*** represent significance at 1, 5 and 10% level, respectively.

**The Holy Month of Ramadan effects on Volatility.**

Applying the GARCH model as in the equation 6, tables (10) and (11) have summarized the obtained results, where both of the tested markets are characterized by the GARCH (1, 1) structure. However, the results report that the holy month of Ramadan effect on the return equation is not significant for all of the dummy coefficients, implying that the daily returns

are not significantly different during the month of Ramadan, as compared to the other months, for both markets.

**Table (10): The holy month of Ramadan on volatility.**

| | GARCH order | Significant Variables | |
|---|---|---|---|
| | | Return Equation | Variance Equation |
| Jordan | GARCH (1,1) | AR(3) | $Constant^{*}$(+ve), $D^{*}_{Ram}$(-ve) |
| Egypt | GARCH (1,1) | AR(1 | $Constant^{*}$(+ve), $D^{*}_{Ram}$(-ve) |

Note: *, ** and*** represent significance at 1, 5 and 10% level, respectively.

**Table (11): significant variables coefficient: The holy month of Ramadan effect (GARCH).**

| | Return Equation | |
|---|---|---|
| | **Jordan** | **Egypt** |
| AR (-1) | | *0.1236 |
| (Probability) | - | (0.0007) |
| AR (-2) | | |
| (Probability) | - | - |
| AR(-3) | *0.0782 | |
| (Probability) | (0.0000) | - |
| **Ramadan (Dummy)** | 0.0010 | 0.0010 |
| **(Probability)** | (0.0000) | (0.3630) |
| | Conditional Variance Equation | |
| *Constant* | *0.0002 | *0.0003 |
| (Probability) | (0.0000) | (0.0000) |
| RESID(-1)^2 | *0.1385 | *0.1155 |
| (Probability) | (0.0022) | (0.0000) |
| GARCH(-1) | *0.5783 | *0.5725 |
| (Probability) | (0.0000) | (0.0000) |
| **Ramadan (Dummy)** | ***-0.0001** | ***0.0000** |
| **(Probability)** | **(0.0000)** | **(0.0000)** |
| $Q_5$ | 34,686 | 6.9869 |
| $Q_{10}$ | 39.310 | 11.904 |
| $Q_{20}$ | 50.891 | 24.539 |

Note: *, ** and*** represent significance at 1, 5 and 10% level, respectively.

Unlike the impact of the month of Ramadan effect on the daily returns, estimation of the conditional variance ($h_t$) equation indicated that the effect on volatility is significant for both of the markets, as a significant reduction in volatility is observed during the month of Ramadan. A reduction in volatility is significant at the 1% level, for Jordan and Egypt.

However, the reduction in the return volatility can be referred to the fact that investors' behaviour is subject to change, or due to the reduction in the trading activity during the holy month of Ramadan. According to Seyyed et al., (2004,) changes in the investors' behaviour during the month of Ramadan comes according to various factors, including: reducing the banks' working hours, the prohibition of the speculation and the use of interest by Islamic

religion, as well as the religious orientation of the investors during the month, which leads to a lower trading interest margin acceptance. These findings have supported the findings of a similar study by Seyyed et al., (2004), which tested the effect of the holy month of Ramadan on the Saudi equity market, where results have also proven a significant existence of the effect.

## IV. CONCLUSION

Various calendar anomalies have been much attention in stock markets returns. This research presents and examines the daily and month return data during the period of June 1, 2006 to June 1, 2011 for Amman Stock exchange and Egypt stock exchange. Using the Ordinary Least Square (OLS) and the GARCH specification, the day of the week effect, month of the year effect and the holy month-of-Ramadan effect have been tested. Using the applied methodology shows that the day of the week effect is observed for both of the tested markets on return as well as on volatility. The month of the year, results show that the effect is observed on returns but not on the volatility, as significant patterns have been observed in July and August in the case of Jordan, January, June and December in the case of Egypt. However, an unknown behavioural factor has been noted among these two markets.

Whereas the average rates of return during the month of Ramadan have not been affected, significant volatility decline has been observed for both of the markets. However, as one could expect a slowdown in market activity, during the holy month of Ramadan, our examination shows that the decline in the volatility appears to be consistent with the decrease in the market activity, due to the decline in the number of transactions during the month.

These findings have important implication for the emerging markets' regulators and investors, as the volatility effects obtained could be critically important for the use of the investments strategies' applications. The findings of the existence of significant calendar anomalies in both markets contradict the efficient market hypothesis.

## REFERENCES

[1] Agathee, U, S. (2008), "Calendar effects and the month of the year: evidence from the Mauritian stock exchange", International research journal of finance and economics, 18, 254-261.
[2] Al-Loughani, N and Chappell, D. (2001), "Modelling the Day-of-the-Week Effect in the Kuwait Stock Exchange: A nonlinear GARCH representation", Applied Financial Economics, 11,353-359.
[3] Amman Stock Exchange, available at http://www.ase.com.jo/.
[4] Apolinario,R.M. and Caro, A.R. (2006), "Day of the Week Effect on European Stock Markets", International Research Journal of Finance and Economics, 2.
[5] Athanassakos, G.AndRobinson, M.(Sep 1994), "The-day-of-the-week anomaly: the Toronto stock exchange experience", Journal of business finance &accounting,21 :(6):833-856.

[6] Berument, H. and Kiymaz,H.(2001),"The Day of the Week Effect on Stock Market Volatility", Journal of Economics and Finance, 25 :( 2): 181-193.
[7] Bodie, Z. et al. (2009) "investments" (8th edition). Singapore: McGraw-Hill.
[8] Boynton, W. et al. (2009), "The-Day-of-the-Week Anomaly: The Role of Institutional Investors in Japan", Applied Economics Letters, 16,669-676.
[9] Brooks, C. and Persand, G. (2001), "Seasonality in Southeast Asian Stock Markets: Some New Evidence on Day-of-the-Week Effect", Applied Economics Letters, 8,155-158.
[10] Brooks. Chris. (2008), "Introductory Econometrics for Finance" (2nd edition). U.K, Cambridge: Cambridge University Press.
[11] Choudhary, T. (2001), "Month of the Year Effect and January Effect in pre-WW1 Returns: Evidence from a Non-linear GARCH Model", international journal of finance & economics, 6, 1-11.
[12] Choudhary, Taufiq (2000), "Day of the Week Effect in Emerging Asian Stock Markets: Evidence from the GARCH Model", Applied Financial Economics 10,135-142.
[13] Deyshappriya, N.R.(2014),"An empirical investigation on stock market anomalies: The evidence from Colombo Stock Exchange in Sri Lanka" ,International Journal of Economics and Finance, 6(3), 177-187.
[14] Easterday, K.E. and Sen, P.K. (2016), "Is the January effect rational? Insights from the accounting valuation model", The Quarterly Review of Economics and Finance, 59,168-185.
[15] Engle, R.F. (1982), "Autoregressive Conditional Heterokedasticity with estimates of the Variance of United Kingdom Inflation", Econometrica, 50, 987- 1007.
[16] Fama, E.F. and French, K.R. (1992) The Cross-Section of Expected Stock Returns. The Journal of Finance, 47: (2):427-465.
[17] Founta,S. et al. (2002), "Emerging Stock Markets Return Seasonalities: the January Effect and the Tax-Loss Selling Hypothesis", Applied Financial Economics, 12, 291-299.
[18] Hang, M. and Hirschey, M. (2006), "The January effect", financial analyst's journal, 62: (3): 78-88.
[19] Houg, M. and Hirschey, M. (2006), "The January Effect", Financial Analysts Journal, 62: (5): 78-88.
[20] Kamaly, A. and Tooma,E.A.(2009), "Calendar Anomalies and Stock Market Volatility in Selected Arab Stock Exchange", Applied Financial Economics, 19, 881-892.
[21] Kamath, R.R. et al. (1998), "Return Distributions and the Day-of-the-Week Effects in the Stock Exchange of Thailand", Journal of Economics and Finance, 22, 97-106.
[22] Lim, S. et al. (2010), "An Empirical Analysis of Calendar Anomalies in the Malaysian Stock Market", Applied Financial Economics, 20, 255-264.
[23] Liu,C. And Kamath,R. (2010), "An Investigation of the Day-of-the-Week Effect on the Istanbul Stock Exchange of Turkey", Journal of International Business Research, 9 :(1): 15-27.
[24] Mazviona, B.W. and Ndlovu, M.W. (2016),"Modelling Day of the Week Effect on the Zimbabwe Stock Exchange", Journal of Applied Finance and Banking,6(3),.55-67.

[25] Oguzsoy, C.B. and Guven, S. (2004), "Holy Days Effect on Istanbul Stock Exchange" Journal of Emerging Market Finance, 3: (1): 63-75.
[26] Park, S. and Moskalev, S. A. (2010), "The 52-Week High and the January Effect", Journal of Business & Economics Research, 8: (3): 43-58.
[27] Sanford J. Grossman and Joseph E. Stiglitz (1980), "On the Impossibility of Informationally Efficient Markets", American Economic Review, 70.
[28] Seyyed, F., Abraham, A. and Al-Hajji, M. (2005), "Seasonality in stock returns and volatility: the Ramadan effect", Research in International Business and Finance, 19,374-83.
[29] Smirlock, M. and Starks, L. (1986), "Day-of-the-Week and Intraday Effects in Stock Returns", Journal of Financial Economics, 17, 197-210.
[30] Su, R. et al. (2011), "Financial Anomalies: Evidence from Chinese A-Share Markets", International Journal of Economics and Finance, 3: (2):76-88.
[31] The Egyptian Exchange (EGX), available at http://www.egyptse.com.
[32] Wiley, J.A. and Zumpano, L.V. (2009), "Institutional Investment and the Turn-of-the-Month Effect: Evidence from REITs", Journal of Real State Finance & Economics, 39,180-201.