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Stock Return Seasonalities: Empirical Evidence from the Egyptian Stock Market

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This paper examines the existence of seasonal behavior in daily stock returns in mean and conditional variance for the Egyptian stock market over the period of 1st July 2007 to 30th November 2011. The paper applies Ordinary Least Squares technique as well as two different univariate specifications of the Generalized Autoregressive Conditional Heteroscedastic (GARCH) approach. Empirical results of the paper find in general, insignificant estimated parameters for all days of the week in both return and conditional variance equations. Also, the results indicate that the day of the week effect is not influenced by the stock market risk. The paper concludes that, day of the week effect is not present in the Egyptian stock market during the selected period, a finding which contradicts most of the empirical finance literature.

Keywords: Calendar Anomaly, Day of the week effect, Volatility, GARCH model.
Field of Research: Finance

1. Introduction

The presence of calendar anomalies in stock markets has become an important area of research that has attracted much interest of many researchers and market professionals for many years. These anomalies occur when the returns of financial asset, like stock returns, tent to show specific characteristics over specific days, weeks, months, or even years. The most important anomalies that have gain much interest are: (i) Day-of-the-week effect, according to which the average stock returns of Monday are negative, while the average stock returns of Friday are positive; (ii) January effect, according to which the average stock returns are higher in January than they are in the other months; and (iii) The holiday effect, according to which the stock returns before holidays are higher than they are in any other day of the year. Seasonality across days of the week is an interesting one among these anomalies. According to this phenomenon, the average daily returns of the market are not the same for all days of the week, as it would be expect on the basis of the efficient market hypothesis (EMH). The presence or absence of this effect has important implications for investors since investors can adjust their buying and selling strategies accordingly to increase their returns. Engle (1993) argued that investors who dislike risk may adjust their portfolios by reducing their investments in those assets whose volatility is expected to increase.

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Vast numbers of studies have been conducted to investigate the seasonal behavior of daily stock market returns in different financial markets all over the world. The issue appears in various forms in international finance literature such as market efficiency, calendar effects, and non-randomness of stock market returns, Monday effect and others. Most studies dealing with this anomaly use a simple dummy variable approach based on a linear regression with 5 dummy variables referring to the days of the week. Some other studies have examined the day of the week effect in terms of volatility by using generalized autoregressive conditional heteroscedastic (GARCH) models (French et al., 1987; Hamao et al., 1990, Nelson, 1991; Campbell and Hentschel, 1992; and Glosten et al., 1993).

The goal of the paper is to investigate if there is day-of-the-week effect in the Egyptian stock market for both return and conditional variance equations. The rest of this paper is organized as follows: Section 2 presents a brief literature review and Section 3 provides a general overview of Stock Exchange in Egypt. Section 3 describes the data and provides summary statistics. In section 4 the methodology is presented, while the results of the estimation are discussed in section 5, and finally, section 6 concludes the paper.

2. Literature Review

The presence of day of the week patterns of stock returns had been investigated widely in different markets. The earliest empirical examinations seem to go back to the studies by Fama (1965) Cross (1973), who find that both lowest mean return and highest variance occur on Monday offering a poor risk–return relationship compared to those of the other days of the week. Since these influential papers, several empirical studies emerged supporting the day-of-the-week effect in stock returns. upon comparing Monday, Friday and weekly average returns for the S&P 500 Index for the period of 1953-1977 French (1980) observed that Friday returns were greater than the average while Monday returns were lesser than the average. Based on a sample of 30 stocks from the Dow Jones Industrial Index, Gibbons and Hess (1981) also came to the conclusion that Mondays resulted in negative returns. For the Japanese and Australian stock markets, Jaffe and Westerfield (1985) find the lowest mean returns occur on Thursday. Ho and Cheung (1994) find that stock return variances of several Asia-Pacific markets are heterogeneous across day of the week with Monday having the highest volatility. After controlling for risks Brooks and Persand (2001) found some evidence of positive Monday effects on the Malaysian and Thailand stock exchange when tested for the day of the week effect on five South East Asian stocks. Moreover, Nath and Dalvi (2004) examined the week day effect in the Indian equity market and found evidence of Monday and Friday effects. By employing parametric and nonparametric tests, Ndu (2006) examine the day-of-the-week effect in Czech Republic, France; Italy; Slovakia; Spain; Turkey and United Kingdom. He confirmed that there is a presence of the day of the week effect for these financial markets as they experienced negative return on Monday. Agathee (2008) find that the Friday returns appeared to be higher relative to other trading days by using stock exchange index of Mauritius (SEMDEX) from 1998 to 2006.

However, there are many other studies such as Condoyanni, O'Hanlon and Ward (1987), Solnic and Bousqet (1990), in the French stock market, Athanassakos and Robinson (1994), in the stock markets of Australia and Japan, Kim (1988) in the stock markets of Japan and Korea, Dubois and Louvet (1996) in the stock markets of Japan and Australia,, Balaban (1995) in the stock market of Turkey, which supported that the negative average returns are observed on Tuesdays.

On the other hand, some researchers found no evidence of day of the week effect. For instance, Santemases (1986), Pena (1995) and Gardeazabal and Regulez (2002) have documented on insignificant week day effects on the Spanish stock market. Brooks and Persand (2001) found no day of the week effect for the Philippines. Marashdeh (1994) and Davidson and Peker (1996) conclude that there is no day of the week effect in the Malaysian stock market. The Demirer and Karan (2002) study of the Turkish stock market did not find clear evidence of "the effect" even though they noted that the Friday returns were "consistently high". In a study for the small off-shore market of Mauritius, Agathee (2008) suggests no significant existence of a calendar effect. For the case of Egypt Aly et al. (2004), investigate daily stock market anomalies in the Egyptian stock market. They concluded that Monday returns are positive and significant on average, but are not significantly different from returns of the rest of the week. Thus, no evidence was uncovered to support any daily seasonal patterns in the Egyptian stock market.

Despite the large number of studies in market anomalies, there is no consensus about underlying reasoning; some of the anomalies quickly disappear after being reported. However, some of the anomalies (such as the day of the week effect) are persistent; the most usual days where the day of the week effect appears in the various stock markets over the world are Mondays, Tuesdays, and Fridays. In addition to that, findings are contradictory in the sense that equity markets report different results due to their individual characteristics. Researchers have found the day of the week effect sensitive to the level of the markets' maturity and size, the economic cycle and the organizational structure.

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Liu, and Schulman (2005), Cai et al. (2006), Chukwuogor (2007), Kenourgios and Samitas (2008), Marrett, and Worthington, (2008), Anwar, and Mulyadi, (2009), Blau, et al. (2009), Christophe et al. (2009), Naliniprava (2010), Phaisarn and Wichian (2010), Worthington, (2010), Faryad et al (2011), Mine and Ikram (2011), Raja et al. (2011) and Talat and Ibrahim (2011) where the results confirm the findings of previous studies in the sense that the patterns of the effect are mixed with majority of them suggested a negative Monday and a positive Friday[1]

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3. Overview of Egyptian Stock Market

The Egyptian Stock Exchange (ESE) is one of the oldest stock markets established in the Middle East and Africa. Egypt's Stock Exchange has two locations: the main location is in Cairo (established 1903) and the other one is in Alexandria established (1883).These two exchanges were competing with each other since their formulation. They are governed by the same Chairman and board of directors and are commonly referred to as the Cairo and Alexandria Stock Exchange, and they share the same trading, clearing and settlement systems, so that market participants have access to stocks listed on both exchanges.

Trading was very active during the 1940s, with the Egyptian exchange ranking fifth most active in the world during that period. However, due to the Socialist policies adopted by the government, which led to a major nationalization program that started in 1959.These policies led to a considerable reduction in stock exchange activity, and the market remained largely dormant throughout 1980s (Mecagni and Sourial, 1999).

In 1990s, the Capital Market Authority (CMA) was established, as the primary regulatory body for the Egyptian stock exchange and it is responsible for the issuance of licenses to all financial intermediaries including the Central Clearing and Depository Company. The CMA is also responsible for the introduction and revision of any laws and regulations pertaining to the efficiency and transparency of the market.

The overall performance of the Egyptian stock market is measured by the Capital Market Authority (CMA) index, which covers all listed stocks weighted in relation to their market capitalization. It can be viewed as an All-Share index that covers the broadest base of stocks and is calculated and released daily by the CMA[2].

The trading activity of the ESE can be considered very active with respect to the value of shares traded, the number of executed transactions and market capitalization (See Table 1) which suggests an increase in investor confidence during this time period. Also, the ESE is regarded as one of the largest markets in the Arab World (See Table 2).

Table 1: Summary of Trading Activity in the CASE 2007 – 2010

Years	No. Of Listed companies*	No. Of traded shares (In Million)	Volume of trading ($ millions)	No. of transactions	Market Capitalization ($ millions)
2007	435	10,512.79	49,388.19	8161607	134,903.52
2008	373	21,071.82	65,166.14	12321523	83,185.00
2009	306	28,243.25	50,812.70	13300653	86,267.22
2010	212	27,336.99	36,867.80	9606668	85,725.96

Source: Compiled by authors based on data from ESE website and AMF Annual reports.

Table 2: Key Indicators of Arab World Share Markets, End of 2009

Capital Market	No. of Listed Companies	Market* Capitalization	Ratio to Total (%)	Value of Shares Traded*	Market Depth	Turnover Ratio
Saudi Arabia	135	318,803	35.29	337.070	86.3	105.7
Kuwait	205	93,824	10.38	103.772	73.5	110.6
Egypt	306	91,092	10.8	81.173	48.1	89.1
Qatar	44	87,930	9.73	25.317	106.8	28.8
Abu Dhabi	67	80,201	8.88	18.766	35.7	23.4
Morocco	73	74,186	8.21	16.226	80.0	21.9
Dubai	67	58,095	6.43	47.239	25.8	81.3
Jordan	272	31,889	3.53	13.641	105.8	42.8
Oman	120	23,616	2.61	5.905	44.5	25.0
Bahrain	49	16,263	1.80	473.0	75.2	2.9
Lebanon	11	12,843	1.42	1.038	39.9	8.1
Tunisia	52	9,237	1.02	1.360	24.5	14.7
Sudan	53	3,033	0.34	1.006	5.5	33.2
Palestine	39	2,377	0.26	500.0	Na.	21.0
Algeria	2	91	0.01	187.5	0.1	206.1

* Million of U.S. dollars.
Source: Quarterly Bulletin, Arab Monetary Fund, 2009.

4. The Data and Basic Statistics

4.1 Data for Analysis

Daily observations of the general market index are used to investigate the seasonal behavior of daily stock returns in mean and conditional variance equations. The sample period ranges between July 1, 2007 and November 30, 2011 resulting in total observations of 1178 excluding public holidays. In this paper, daily returns r_t were calculated as the continuously compounded returns which are the first difference in logarithm of closing prices of CMA-index of successive days:

$$r_t = \log\left(\frac{P_t}{P_{t-1}}\right) \quad (1)$$

where P_t and P_{t-1} are the closing market index of CMA at the current day and previous day, respectively. Fig. 1 in the appendix provides the index series and returns for different days of the week.

4.2. Summary Statistics

Various descriptive statistics for the daily CMA index returns series r_t were calculated for each day of the week as well as for the entire study period, the results are reported in Table 3.

Table 3: Descriptive Statistics of the CMAI returns series

Statistic	Sunday	Monday	Tuesday	Wednesday	Thursday	All Days
Mean	-0.000606	-0.004221	-0.004559	-0.003657	-0.003972	-0.001147
Median	0.002921	0.001352	0.002333	0.000499	0.003134	0.002149
Maximum	0.411497	0.330485	0.399211	0.294608	1.158742	0.271107
Minimum	-0.909947	-0.515104	-0.715612	-0.739315	-0.983237	-0.515104
Std. Dev.	0.067794	0.051997	0.058713	0.067552	0.131453	0.028631
Skewness	-9.324719	-4.821377	-6.315618	-6.229366	-0.785530	-5.511881
Kurtosis	142.7399	61.80255	102.5303	74.30588	53.37688	108.4035
Jarque- Bera	197922.3*	34471.60*	98141.80*	50651.06*	24873.75*	550807.9*
Observations	239	233	234	237	235	1178

Notes: * denotes statistical significance at 1% level.

According to the results in Table 3, CMA index has negatively mean returns for all days of the week, a result which is not consistent with empirical finance literature behind the day of the week effect. The standard deviation on Sunday (the starting day of the week) is (0.067794) which is more than the standard deviations on other days. It shows that Sunday returns are more volatile. Also, the returns variable is not normally distributed; all Jarque-Bera statistics for normality test are significant at the 1% level, instead, the returns series has leptokurtic distribution with left long tail. Figure 1 in the appendix provides the trend graph of the index series and its return across different days of the week.

5. Methodology

Most of the studies reported in the empirical finance literature investigate the day of the week effect phenomena in mean returns by employing the Ordinary Least Squares (OLS) methodology by regressing returns on five daily dummy variables, as done, for instance in Cross (1973), French (1980), Lakonishok and Levi (1982), Gibbons and Hess (1981), Keim and Stambough (1984), Jaffe and Westerfield (1985), Smirlock and Starks (1986), Abraham and Ikenberry (1994), and Agrawal and Tandon (1994). The OLS specification can be written as follows:

$$r_t = \beta_1 SUN_t + \beta_2 MON_t + \beta_3 TUE_t + \beta_4 WED_t + \beta_5 THU_t + \varepsilon_t \quad (2)$$

where:

r_t : the index returns on day t;

SUN_t : dummy variable equal to 1 if t is a Sunday and 0 otherwise;

MON_t : dummy variable equal to 1 if t is a Monday and 0 otherwise;

TUE_t : dummy variable equal to 1 if t is a Tuesday and 0 otherwise;

WED_t : dummy variable equal to 1 if t is a Wednesday and 0 otherwise;

THU_t : dummy variable equal to 1 if t is a Thursday and 0 otherwise;

ε_t : error term;

$\beta_1, \beta_2, \beta_3, \beta_4,$ and β_5 are the coefficients to be estimated.

However, as Connolly (1989, 1991) claim, several specific problems may arise while using this approach: (i) the returns are likely to be autocorrelated; (ii) the residuals are possibly non-normal; (iii) the issue of heteroscedasticity may arise; and (iv) outliers with high/low value of return may distort the overall picture.

To eliminate the possibility of having autocorrelated errors, we include lagged values of the return variable in a model with the following stochastic equation[3]:

$$r_t = \beta_1 SUN_t + \beta_2 MON_t + \beta_3 TUE_t + \beta_4 WED_t + \beta_5 THU_t + \sum_{i=1}^{P} r_{t-i} + \varepsilon_t \quad (3)$$

where the variables and their coefficients are explained as in Equation 2.

And, in order to address the problem of heteroscedasticity, we allow variances of the errors to be time dependent to include a conditional Heteroscedasticity[4] that captures time variation of variance in stock returns. Thus, error terms now have a mean of zero and a time changing variance of h_t^2 that is, $\varepsilon \sim (0, h_t^2)$. To do so, the generalized autoregressive conditional heteroscedastic (GARCH) model, proposed initially by Engle (1982) and further developed by Bollerslev (1986) is used.

In presenting GARCH model, there are two distinct equations, the first for the conditional mean and the other for the conditional variance[5]. In this model, the conditional variance is represented as a linear function of a long term mean of the variance, its own lags and the previous realized variance. The general specification of GARCH, GARCH (p, q) is given by:

Mean equation $$r_t = \mu + \varepsilon_t \quad (4)$$

Variance equation $$\sigma_t^2 = \omega + \sum_{j=1}^{q} \alpha_j \varepsilon_{t-1}^2 + \sum_{i=1}^{p} \beta_i \sigma_{t-1}^2 \quad (5)$$

where $\omega > 0$. And $\alpha_i \geq 0$ and $\beta_i \geq 0$, and:

r_t = return of the asset at time t.

μ = average return.

ε_t = residual returns, defined as:

$$\varepsilon_t = \sigma_t z_t \quad (6)$$

where z_t is standardized residual returns (i.e. *iid* random variable with zero mean and variance equals 1), and σ_t^2 is conditional variance. The constraints $\alpha_i \geq 0$ and $\beta_i \geq 0$ are needed to ensure that σ_t^2 is strictly positive (Poon, 2005).

Models to be estimated

Considering the discussion in the previous section, this paper investigate the day of the week effect for the Egyptian stock exchange in both returns and conditional variance equations, by using the usual OLS regression and two different generalized autoregressive conditional heteroscedastic (GARCH) specifications[6].

Model 1: Day of the week effect in returns using OLS regression

In the first model, a dummy variable approach is employed which is based upon a linear regression with 5 dummy variables referring to the days of the week, the lagged values of the return variable is included to eliminate the possibility of having autocorrelated errors. Accordingly, the first model can be written as follows:

$$r_t = \beta_1 SUN_t + \beta_2 MON_t + \beta_3 TUE_t + \beta_4 WED_t + \beta_5 THU_t + \sum_{i=1}^{P} r_{t-i} + \varepsilon_t \quad (7)$$

Model 2: Day of the week effect in return using GARCH model

The second model is the GARCH (1,1), which will be used to address the possibility of having heteroscedasticity problem, the model has the following form:

Mean Equation $$r_t = \beta_1 SUN_t + \beta_2 MON_t + \beta_3 TUE_t + \beta_4 WED_t + \beta_5 THU_t + \sum_{i=1}^{P} r_{t-i} + \varepsilon_t \quad (8)$$

Variance Equation $$\sigma_t^2 = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (9)$$

Model 3: Day of the week effect in return and volatility using GARCH-M model

In the third model, the paper make use of the Generalized Autoregressive Conditional Heteroscedasticity in Mean (GARCH-M)[7] model. In which, we include some exogenous variable into the variance equation to allows one to incorporate volatility effect as well as risk premium, therefore, the third model of the following form:

Mean Equation $$r_t = \beta_1 SUN_t + \beta_2 MON_t + \beta_3 TUE_t + \beta_4 WED_t + \beta_5 THU_t + \sum_{i=1}^{P} r_{t-i} + \lambda \sigma_t^2 + \varepsilon_t \quad (10)$$

Variance Equation $$\sigma_{t-1}^2 = \beta_1 SUN_t + \beta_2 MON_t + \beta_3 TUE_t + \beta_4 WED_t + \beta_5 THU_t + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (11)$$

σ_t^2: The variance of the error term;

ε_{t-1}^2: Last period's volatility (the ARCH term);

σ_{t-1}^2: Last period's variance (the GARCH term).

and λ is called the risk premium parameter. A positive λ indicates that the return is positively related to its volatility. In other words, a rise in mean return is caused by an increase in conditional variance as a proxy of increased risk. ε_t is an error term with zero mean and conditional variance σ_t^2 (see Engle et al. 1987 for more details).

Testing for Heteroscedasticity

One of the most important issues before applying the (GARCH) methodology is to first examine the residuals for evidence of heteroscedasticity. To do so, the Lagrange Multiplier (LM) test proposed by Engle (1982) is applied. In summary, the test procedure is performed by first obtaining the residuals e_t from the ordinary least squares regression of the conditional mean equation, which might be an autoregressive (AR) process, moving average (MA) process or a combination of AR and MA processes; (ARMA) process. For example, in ARMA (1,1) process the conditional mean equation will be:

$$r_t = \phi_1 r_{t-1} + \varepsilon_t + \theta_1 \varepsilon_{t-1} \ . \quad (12)$$

After obtaining the residuals e_t, the next step is regressing the squared residuals on a constant and q lags as in the following equation:

$$e_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \alpha_2 e_{t-2}^2 + ... + \alpha_q e_{t-q}^2 + \nu_t \quad (13)$$

The null hypothesis that there is no ARCH effect up to order q can be formulated as:

$$H_0 : \alpha_1 = \alpha_2 .. = \alpha_q = 0$$

against the alternative:

$$H_1 : \alpha_i > 0$$

for at least one i = 1, 2, …, q.

The test statistic for the joint significance of the q-lagged squared residuals is the number of observations times the R-squared (TR^2) from the regression in Equation (13). TR^2 is evaluated against $\chi^2(q)$ distribution. This is an asymptotically locally most powerful test (Rachev et al., 2007)

6. Empirical Results

OLS regression

Equation (7) is estimated for the CMA Index using Ordinary Least Squares. The estimated parameters and related statistics are presented in Table 4. In addition to that, diagnostic checking tests are also provided.

Table 4: OLS results for the day of the week effect

Panel A: OLS Results				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
SUN	-0.000460	0.001817	-0.253421	0.8000
MON	-0.001372	0.001812	-0.757148	0.4491
TUS	-0.000304	0.001815	-0.16749	0.6335
WED	-0.000167	0.001933	-0.086279	0.9313
THU	-0.001719	0.001979	-0.868659	0.3852
r_{t-1}	-0.030424	0.029279	-1.039115	0.2990
Panel B: Diagnostic Checking: Wald Test				
Statistics	**Value**		**Probability**	
F-Statistic	1.982340		0.078631	
Chi-Square	9.911699		0.077776	
Panel C: Diagnostic Checking: ARCH-LM Test				
Lags	**ARCH-LM test statistic**		**Prob. Chi-square**	
5	115.4561		0.0000	
10	115.2898		0.0000	
15	114.8999		0.0000	
20	114.4310		0.0000	
25	113.9859		0.0000	
30	113.4896		0.0000	

The results in Panel A of Table 4 show that all t-statistics of the estimated parameters are negative and statistically insignificant for all days of the week. This result indicates that the average daily returns for Egyptian stock exchange is independent of the days of the week.

In order to further investigate the presence of the day of the week effect, Wald test is performed to test the null hypothesis that the day of the week dummy variables are jointly equal to zero. As can be seen in Table 4, this null hypothesis is not rejected. Hence, day-of-the-week effect is not present in the CMA index returns during the selected period a result which is inconsistent with those reported in the empirical finance literature for a large number of countries, where significantly lower or negative Monday returns are reported.

To confirm the use of the GARCH methodology, it is very important to test for ARCH effects in the residuals series of Equation (7). The paper applies ARCH-LM test up to lag 30. The results in Panel C of Table 4 provide strong evidence for rejecting the null hypothesis of no ARCH effects for lags included. Rejecting this null hypothesis indicate that the variance of the residuals series of CMA index is non-constant.

Estimation results of the GARCH (1,1) model

Since the findings by using OLS indicate the presence of autoregressive conditional heteroscedasticity components in squared variances, we model the conditional variance of return equation as a GARCH (1,1) process and re-estimate the return equation with the conditional variance equation jointly. Table 5 summarizes the results of this reexamination.

Table 5: The day of the week effect in returns equation: GARCH(1,1)

Panel A: Coefficient Estimates				
Mean Equation				
Variable	**Coefficient**	**Std. Error**	**Z-Statistic**	**Probability**
SUN	0.003957	0.001036	3.820003	0.0001
MON	-0.000860	0.001013	-0.849168	0.3958
TUS	-0.003086	0.000971	-3.177050	0.0015
WED	0.002600	0.001494	1.740489	0.0818
THU	-0.014233	0.000293	-48.60191	0.0000
r_{t-1}	-0.027612	0.033528	-0.823551	0.4102
Variance Equation				
ω	1.42E-05	3.15E-06	4.509783	0.0000
α	0.261370	0.052602	4.97E+00	0.0000
β	0.715797	0.021177	33.79996	0.0000
Panel B: Diagnostic Checking: ARCH-LM Test				
Lags	ARCH-LM test statistic		Prob. Chi-square	
5	11.83800		0.037076	
10	12.47772		0.254356	
15	12.65956		0.628575	
20	12.81026		0.885376	
25	13.05352		0.975839	
30	13.18046		0.996650	

The estimation results in Panel A of Table 5 indicate that the highest return is observed on Sunday (0.003957). The estimated coefficient for the first day returns is positive and statistically significant (1% level), indicating a positive mean return for Sundays in the Egyptian stock market which contradicts the day of the week literature. These results provide evidence that the GARCH (1,1) model is similar to the OLS model of indicating the absence of the day of the effect for the Egyptian stock market.

In the variance equation results from Table 5, the sum of the coefficients of the GARCH equation without a constant term is less than one, and both of them are positive and statistically significant which indicates that the conditional variance process (volatility) is quite persistent. In Panel B of Table 5, ARCH-LM test does not indicate the presence of a significant ARCH effect in the residual series which means that the conditional variance equitation is well specified.

Estimation results of the GARCH-M(1,1) model

In this paper GARCH-M(1,1) model is applied to test whether the day of the week effect is influenced by the stock market risk, the results are presented in Table 6.

Table 6: The day of the week effect in return equation: GARCM-M(1,1)

Panel A: Coefficient Estimates				
Mean Equation				
Variable	**Coefficient**	**Std. Error**	**Z-Statistic**	**Probability**
SUN	-0.002227	0.004581	-0.486140	0.6269
MON	-0.003580	0.001471	-2.434303	0.0149
TUS	-0.005895	0.001649	-3.573939	0.0004
WED	-0.000186	0.001253	-0.148426	0.8820
THU	-0.003668	0.003530	-1.038873	0.2989
r_{t-1}	0.091284	0.041293	2.210635	0.0271
λ	6.375535	0.887616	7.182761	0.0000
Variance Equation				
SUN	-0.000134	0.000438	-0.306732	0.7590
MON	-0.000289	0.000437	-0.661773	0.5081
TUS	-0.000262	0.000436	-0.601111	0.5478
WED	-0.000299	0.000436	-0.687231	0.4919
THU	-0.000171	0.000439	-0.390091	0.6965
ω	0.000327	0.000437	0.748425	0.4542
α	0.119916	0.019130	6.268607	0.0000
β	0.774832	0.027705	27.96720	0.0000
Panel B: Diagnostic Tests				
Lags	**ARCH-LM test statistic**		**Prob. Chi-square**	
5	0.495477		0.992288	
10	0.511725		0.999993	
15	0.600537		1.000000	
20	0.791385		1.000000	
25	0.855247		1.000000	
30	0.976993		1.000000	

The GARCH-M (1,1) model is estimated by allowing the mean equation of the return series to depend on a function of the conditional variance. From estimation results in Table 6, the estimated coefficient (risk premium) of σ^2 in the mean equation (λ) is positive, which indicates that the mean of the return sequence depends on past innovations and the past conditional variance. In other words, conditional variance used as a proxy for risk of returns is positively related to the level of returns. This result is consistent with the theory of a positive risk premium on stock indices which states that higher returns are expected for asset with higher level of risk.

Unlike the GARCH (1,1), the GARCH-M (1,1) results indicate that the estimated coefficient for the first day returns is negative but, statistically insignificant for both mean and conditional variance equations, the AECH-LM test statistic reject the null hypothesis of no ARCH effect left.

7. Conclusions

This study employs Ordinary Least Squares technique as well as two different univariate specifications of the generalized autoregressive conditional heteroscedastic (GARCH) model to empirically investigate the existence of day-of-the-week effect in the Egyptian stock market for both return and conditional variance using daily observations of the general price index series over the period of 1st July 2007 to 30th November 2011. The paper applied the GARCH–M (1,1) model to test whether the day of the week effect is influenced by the market risk.

The findings based on these models can be summarized as follows. First, Empirical results show; in general, insignificant estimated parameters for all days of the week in both return and conditional variance equations. Second, the results indicate that the day of the week effect is not influenced by the stock market risk based on using GARCH-M(1,1).

The paper concludes that, the day of the week effect is not present in the Egyptian stock market during the selected period, a finding which contradicts most of the empirical finance. The same result was obtained by Aly et al. (2004) who investigated daily stock market anomalies in the Egyptian stock market from the period of April 26, 1998 to June 6, 2001.

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Endnotes

1. The most satisfactory explanation that has been given for the negative returns on Mondays is that usually the most unfavorable news appears during the weekends. These unfavorable news influence the majority of the investors negatively, causing them to sell on the following Monday.

2. For a detailed discussion of the Egyptian Stock Market see for example, Sourial and Mecagni (1999) and Aly, et al. (2004).
3. In the OLS model, we have excluded the intercept term, in order to avoid the problem of dummy variable trap (see Damodar and Dawn, 2009 for more details). Because trading is started on Sunday, the first dummy variable in this model represents this day. In most of literature this variable is Monday.
4. Because the data are daily and so are of high frequency we expect that ARCH effects exist. It is a well documented fact that financial market returns suffer time-dependent changes in volatility (Fama, 1965, Lau et al., 1990, Kim and Kon, 1994). Applying ordinary least squares we confirm this assumption.
5. In GARCH model, the mean equation is written as a function of a constant with an error term. Since σ_t^2 is the one – period ahead forecast variance based on past information, it is called the conditional variance. The conditional variance equation is specified as a function of three terms: (i) A constant term: ω, (ii) News about volatility from the previous period, measured as the lag of the squared residual from the mean equation: ε_{t-1}^2 (the ARCH term), and (iii) Last period forecast variance: σ_{t-1}^2 (the GARCH term).
6. The parameters of the two specifications are estimated following the quasi-maximum likelihood (QML) estimation introduced by Bollerslev and Wooldridge (1992).
7. GARCH-M model is an extension of the basic GARCH framework which allows the conditional mean of a sequence to depend on its conditional variance or standard deviation. It was developed by Engle, Lilien, and Robins (1987)

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Appendix

Fig. 1: Index Series and its Returns for Different Days of the Week