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Financial market anomalies: evidence from Tunisia stock market

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ABSTRACT

The aim of this study is to investigate the presence of seasonal market anomalies (calendar anomalies) and to analyze their effects on the behavior of financial investors in terms of decisions and profit on the Tunisian market during the entire period that starts on January 2003 and ends on 31 December 2015. This work examines four calendar effects which are the new week of the year (WOY), the day of the week (DOW), the week of the month (WOM) and month of the year (MOY) effects using daily data of Tunisian Stock Market Index (TUNINDEX closing price) and dummy variables based on a GARCH (1,1) regression model adopted by Levy and Yagil (2012) to demonstrate whether the anomalies exist on the Tunisian market. The findings show that the returns for Friday are always positively significant. In contrast, the returns for October are almost negatively significant and low compared to other months. We also find that market calendar anomalies are clues to help investors improving their trading strategies and timing their investments to make abnormal profits.

Contribution/ Originality
In this article, we examine the effect of financial market anomalies in the context of Tunisian financial market, specifically four calendar anomalies which are the week of the year effect, the month of the year effect, the week of the month effect and day of the week effect on the behavior of financial investors in terms of decisions and profit.

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1. INTRODUCTION

The efficiency of financial markets has been the basis of numerous studies and the existing financial literature has dealt with it extensively from the 1960s. Nevertheless, Fama remains the researcher to whom this theory is attributed as a result of his publications in The Journal of Business 1965 and The Journal of Finance 1970 and 1991.Those papers gave the first very clear and precise definition of the efficiency concept. At that time, the efficiency was a subject very much sought by several theorists, economists and mathematicians who developed many models allowing the evaluation of financial assets on the stock markets in order to make predictions about the securities returns and thus allow investors to generate even more profits. But the more important this notion became, more the number of criticisms addressed to it increased. Despite these criticisms, no one can deny the importance of this theory in the economic world. The best examples are the fact that today, several states in various countries use this theory in their economic policy and many participants in the financial markets are still using it for the optimization of their investments.

It is true that by the notion of efficiency, researchers have been able to develop classical models that allow the prediction and explanation of returns on financial assets. However, in some cases these models fail to explain some of the phenomena observed in the stock markets. These phenomena produce abnormal returns called anomalies which cannot be explained by the theory of efficiency. More precisely, it is hypothesized that to realize efficiency in markets (HEM), the stock process must reveal all information available on their basic value. This hypothesis was contradicted by anomalies, namely the calendar anomalies and the cross-sectional anomalies.

The calendar anomalies can be presented as coherent models that could not be defined through a theory of finance. The irregularity of these anomalies that it may be manifested at regular intervals just as it may occur at a fixed period of the year. Several recent studies have focused on seasonal anomalies and Levy and Yagil (2012) are among those who have studied this topic in their article entitled (The week of the year effect: Evidence from around the globe). According to their results, the week of the year anomaly plays a very important role in explaining stock market returns. The existence of the January effect and its importance is also confirmed by the findings of the present study.

After observing the various anomalies in the financial markets, several theorists began to criticize the CAPM models reproaching them their inability to explain the abnormal returns that could be related to these phenomena. As a consequence, more and more researchers become curious to understand these anomalies and have begun to study them profoundly. Among these researchers, Gibbons and Hess 's (1981) findings showed that stock returns on US stock markets are crucially lower on Mondays and higher on Fridays. Similarly, Jaffe and Westerfield (1985) demonstrated the same result. Based on the literature, a number of researchers (Condoyanni *et al.*, 1987) provide international evidence on stock markets. Ajayi *et al.* (2004) and Khan *et al.* (2014) focused on emerging markets. Add to that, Kato and Schallheim (1985) showed evidence of January effect. Jordan and Jordan (1991) and Nippani and Arize (2007) conducted other empirical studies reporting similar results They also studied bond markets and they demonstrated the Day of the week impact on corporate bond returns. Previous studies have focused on the US market and other developing markets including Japan and UK. It seems that there are very few studies that investigated the emerging markets. The present study, therefore, tries to show whether the types of anomalies also appear in those markets or not.

On this basis, the aim of the current study is the identification of calendar anomalies on Tunisian stock market and to check if they could be explained by the efficiency theory. It is divided into five sections. The first section presents the background to the study. The second section reviews previous studies that have been carried out in this field of research. The methodology developed for our econometric models is described in section three. The fourth section presents the data sources, investigates and discusses the findings. The fifth section summarized the major results of the study.

2. LITERATURE REVIEW

Calendar anomalies can be defined as the regularities that appear in the trading of stocks at the stock exchange. These anomalies imply some rise or fall on stock market returns indicating the presence of abnormal gains compared to the regular revenues at the market. This fluctuation would be due to seasonal effects that harshly hurt the theory of efficiency which stipulates that financial market participants cannot obtain excess returns in the market. The traditional theories do not take into account these anomalies despite their importance in the market and this is why the returns generated by the securities are often different from those which are predicted by any of the traditional asset pricing models such as CAPM and APT. Some researchers have studied the issue of calendar and meteorological anomalies because they play the role of psychological stimulators of buying and selling behavior in the market. They have documented different time patterns influencing stock returns. MJ Fields through his study issued in the Journal of Business in 1931 was the first to be interested in this anomaly and he noted that most stock market securities show negative results at the end of the week, i.e. from the closing day Friday to the opening day Monday. Lawrence Harris (1986) finds that the Monday effect usually manifests itself during the first 45 minutes of Monday's session. Indeed, during this period prices go down unlike other days where prices tend to increase during the same period. Following these works, many other studies showed that profits on Mondays are worse than the other days of the week. The failure to trade over the weekend is expected to make these small traders to close their uncertain positions on Fridays and restore new short positions on Mondays, generating stock prices to grow on Fridays and drop on Mondays. A trend of researchers including Syed and Sadorsky (2006), Cho *et al.* (2007) and Lim *et al.* (2010) provide a reconfirmation of the weekend effect. However, others such as Brusa *et al*. (2003) and Apolinario *et al*. (2006) ignore it. In addition to that, Chan *et al.* (2004) study showed that in capitals with a modest number of institutional holdings, the Monday seasonal is strong.

Another weekly return pattern for different weeks of a month reflects the week of the month effect (WOM), also known as the turn of the month (TOM) effect is detected by Ariel (1987). Taking into consideration the stock prices of the last day in a month and the first three days in the next month, he found that the variation of these stock prices is positive. Then, researchers interested in this kind of anomaly in their turns applied a strategy derived from Ariel's findings to make more clear that stock market returns are generally higher on the last day of the month and the first days of the next month. More precisely, the returns during the first week of a month tend to be significantly positive, while the returns during the other weeks of a month are statistically indistinguishable from zero (Wang *et al*., 1997; Kohers and Patel, 1999).

The month of the year (MOY) effect includes three anomalies: The turn of the year effect (TOY) called the January effect, the Holidays effect, the October effect and the May to October effect. Haugen and Jorion (1996) report that January effect is observed during the first month of the year (January) and represents the most well-known example of abnormal behaviors on stock markets around the world. Accordingly, we should always remember that the month of January represents the best month to buy shares because returns in January tend to be higher than returns in other months as concluded by Ariel (1990), Schwert (2003) and Starks *et al.* (2006). The May to October effect also called the Halloween indicator means the fact that stock returns tend to be significantly lower in summer and fall months (May to October) than in the months of winter and spring (Bouman and Jacobsen, 2002; Jacobsen and Marquering, 2008). However, the October effect also known as the Mark Twain effect refers to the fact that stock returns in October are lower than in other months (Cadsby, 1989) but for the S&P 500 this effect disappears after 1993 (Szakmary and Kiefer, 2004).

Frieder and Subrahmanyam (2004) find another interesting result concerning the holiday effect by showing that returns are higher before religious holidays and lower following the holidays. Heston and Sadka (2008) highlighted through a new model in the cross-section of expected stock returns that stocks with relatively high (low) returns seem to have high (low) returns every year in the same calendar month and prior to the current month only monthly returns 12, 24, 36 out of 240 months can

predict returns today. Since, holiday anomaly is very widespread in several countries, Hong and Yu (2009) attempt to analyze for many countries the seasonality in trading activity and asset prices related to vacation periods, typically the summer months and they concluded that trading activity is lower in summer than the rest of the year. The researchers note it the gone fishing effect which is stronger for furthest countries from the equator where vacations occur during summer.

Other works test the existence of a combination of some calendar anomalies. For instance, Brusa and Liu (2004) stipulate that there are consistent positive Monday returns concentrated in the first and third weeks of the month, and are associated with the increase of trading activities of institutional investors. Khaksari and Bubnys (2005) have investigated three anomalies in two stock index futures. They show the presence of day of the week and day of the month effects in the rate performance of the future indexes rather than in their underlying spot indexes and in contrast, the January effect is more announced for spot indexes rather than for stock index futures. Bouges *et al*. (2009) evaluate the presence of calendar anomalies in the S&P 500 and American Depository Receipts (ADRs) index returns and do find only evidence to support the TOM anomaly.

3. METHODOLOGY

To reach the findings, we test four seasonal effects (WOY, MOY, WOM and DOW) on the Tunisian stock market following a general autoregressive conditional heteroskedasticity GARCH model of Levy and Yagil (2012).

To investigate whether the week of the year (WOY) irregularity exists or not, we need to divide the year into 53 weeks, as follows: The primary week starts on January 8 and ends on January 14, the second week begins on January 8 and ends on January 14, etc. It is worth noting that the 53rd week is the only week that has fewer than 7 days. It is important to use the last trading day in cases where there is no trading on the seventh day, especially at weekends.

To investigate whether there is an association between several weeks and different stock returns, we calculate the regression equation below:

$$r_t = \sum_{t=1}^{53} b_t W_t + \varepsilon_t \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, r_t denotes the results of TUNINDEX index among week $t-1$ and week t, W_t represents a dummy variable equal to 1 during week t of the year (t = 1,. . . ,53) and 0 otherwise, and ε_t is the error term. We note that Eq. (1) is composed of 53 variables, so Week 53 includes fewer than 7 days. The error term reflects a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) process (Bollerslev, 1986). Therefore, we calculate the following GARCH (1, 1) equation:

$$\sigma_t^2 = \alpha_0 + \gamma_1 \sigma_{t-1}^2 + \alpha_t \varepsilon_{t-1}^2 \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, σ_t^2 and σ_{t-1}^2 present the variance of the stock TUNINDEX returns for Week t and $t-1$ respectively, and α_0, α_1, α_2 are the GARCH model coefficients. The following is the null hypothesis that we test:

$$H_0: b_1 = b_2 = \cdots = b_{52} = b_{53} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The results reject the null hypothesis which claims that at least one of the 53 weekly rates of TUNINDEX return is unequal to the others.

We will proceed in the same manner using the same tests and equations for the other three anomalies while changing the way to divide the year. That is to say that for the month of the year anomaly

(MOY), we will divide the year into 12 months instead of 53 weeks and the equation of our regression will be as follows:

$$r_t = \sum_{t=1}^{12} b_t W_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

We test the following null hypothesis:

$$H_0: b_1 = b_2 = \cdots = b_{11} = b_{12} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

The null hypothesis above was rejected. It estimates that at least one of the 12 monthly rates of TUNINDEX return is not equal to the others.

For the week of the month anomaly (WOM), the year will be divided into four weeks for each month and the regression will be done following this equation:

$$r_t = \sum_{t=1}^{4} b_t W_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The null hypothesis we test is:

$$H_0: b_1 = b_2 = b_3 = b_4 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The findings reject the null hypothesis that assumes that at least one of the four weekly rates of TUNINDEX return is not equal to the others.

Finally, the day of the week anomaly (DOW), we will divide the year into five days for each week and the regression equation will be presented as follows:

$$r_t = \sum_{t=1}^{5} b_t W_t + \varepsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

The null hypothesis we test is:

$$H_0: b_1 = b_2 = b_3 = b_4 = b_5 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

The above null hypothesis was rejected. It implies that at least one of the five daily rates of TUNINDEX return is unequal to the others.

4. DATA AND RESULTS

4.1. Data

We use weekly, monthly and daily closing prices of the Tunisian Stock Market Index (TUNINDEX) during the period from 01 January 2003 to 31 December 2015. The data collected was gathered from the Tunisian stock exchange website (BVMT). The Weekly stock return of the TUNINDEX index is calculated by the log-difference of the stock index as:

$$r_t = ln\left(\frac{P_t}{P_{t-1}}\right) = ln(P_t) - ln(P_{t-1}) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

Where, r_t is the returns of TUNINDEX on week t, P_t is the closing price of TUNINDEX on week t and P_{t-1} is the closing price of TUNINDEX on week $t-1$.

4.1. Detection of the week of the year (WOY) effect on the Tunisian stock market

4.1.1. Descriptive statistics

Table 1 presents the descriptive statistics for the TUNINDEX returns by the WOY. We notice a substantial disparity, the weekly mean rate of return for the total sample that ranges between (-0.0070) for Week 40 and (0.0103) for Week 5.

Table 1: Descriptive Statistics for the TUNINDEX returns by week of the year (WOY) for the full period (January 2003 to 31 December 2015)

Weeks	Mean	Std. Dev	Min	Max	P-value	Positive	Negative
1	0.01**	0.02	-0.01	0.06	0.04	0.69	0.31
2	0.00	0.05	-0.14	0.10	0.90	0.59	0.41
3	0.00	0.01	-0.03	0.03	0.66	0.50	0.50
4	0.00	0.01	-0.03	0.04	0.50	0.59	0.41
5	0.01	0.04	-0.03	0.11	0.29	0.69	0.31
6	0.00	0.01	-0.03	0.05	0.45	0.50	0.50
7	0.00	0.02	-0.04	0.06	0.85	0.38	0.62
8	0.00	0.05	-0.11	0.09	0.84	0.38	0.62
9	0.00	0.01	-0.04	0.02	0.32	0.38	0.62
10	0.01	0.04	-0.02	0.09	0.28	0.69	0.31
11	0.00	0.01	-0.03	0.03	0.52	0.62	0.38
12	0.00	0.01	-0.02	0.02	0.87	0.59	0.41
13	0.01*	0.01	-0.02	0.04	0.08	0.62	0.38
14	0.01	0.03	-0.04	0.07	0.33	0.59	0.41
15	0.00	0.02	-0.06	0.04	0.98	0.50	0.50
16	0.01	0.02	-0.03	0.05	0.28	0.59	0.41
17	0.00	0.01	-0.02	0.02	0.12	0.69	0.31
18	0.00*	0.01	-0.01	0.02	0.10	0.69	0.31
19	0.00	0.01	-0.02	0.03	0.95	0.41	0.59
20	0.00	0.01	-0.03	0.01	0.71	0.50	0.50
21	0.00	0.01	-0.01	0.02	0.71	0.59	0.41
22	0.00	0.01	-0.01	0.02	0.17	0.77	0.23
23	0.00	0.01	-0.03	0.01	0.32	0.59	0.41
24	0.00	0.01	-0.03	0.02	0.60	0.41	0.59
25	0.00	0.01	-0.02	0.02	0.51	0.50	0.50
26	0.00	0.01	-0.02	0.02	0.88	0.38	0.62
27	0.00	0.01	-0.02	0.02	0.78	0.50	0.50
28	0.00	0.01	-0.02	0.02	0.35	0.38	0.62
29	0.00	0.01	-0.03	0.02	0.20	0.62	0.38
30	0.00	0.01	-0.01	0.02	0.11	0.69	0.31
31	0.01**	0.01	0.00	0.02	0.02	0.69	0.31
32	0.00	0.01	-0.02	0.03	0.23	0.77	0.23
33	0.00*	0.01	-0.01	0.02	0.06	0.62	0.38
34	0.00**	0.01	-0.01	0.02	0.04	0.77	0.23
35	0.01*	0.01	-0.01	0.03	0.08	0.62	0.38
36	0.00	0.01	-0.02	0.03	0.64	0.50	0.50
37	0.01*	0.01	-0.01	0.03	0.08	0.69	0.31
38	0.00	0.02	-0.04	0.05	0.71	0.41	0.59
39	0.01**	0.01	-0.01	0.03	0.03	0.77	0.23
40	-0.01	0.02	-0.08	0.02	0.32	0.41	0.59
41	0.00	0.01	-0.02	0.02	0.72	0.38	0.62
42	0.00	0.01	-0.01	0.01	0.20	0.62	0.38
43	0.00	0.01	-0.03	0.02	0.28	0.38	0.62
44	0.00	0.01	-0.02	0.03	0.82	0.50	0.50

45	0.00	0.01	-0.01	0.03	0.13	0.69	0.31
46	0.00	0.01	-0.02	0.01	0.35	0.41	0.59
47	0.00	0.01	-0.02	0.01	0.23	0.38	0.62
48	0.00	0.01	-0.01	0.02	0.34	0.50	0.50
49	0.00	0.01	-0.02	0.03	0.38	0.38	0.62
50	0.00	0.01	-0.02	0.03	0.39	0.59	0.41
51	0.00	0.01	-0.01	0.01	0.57	0.41	0.59
52	0.00	0.01	-0.01	0.01	0.17	0.62	0.38
53	0.00**	0.00	0.00	0.01	0.02	0.92	0.08

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively

The mean Weekly returns during the investigated period are statistically relevant for 11 of the 53 weeks in the sample. The former is higher than the latter. The results show that during the last week of the year, more than 90% of weekly return is significantly positive. This can probably be explained by the presence of two anomalies: (TOY) effect (January effect) and the Holidays Effect. Then, by comparing the results of our study with those of Levy and Yagil (2012), We note that there are certain similarities, but there are also contradictions. Indeed, by referring to this article which analyzed the effect of seasonal anomalies in 20 countries, we find that the WOY impact exists. The results of this article show that for the 20 countries surveyed, all the average weekly returns are positive during the 44th week of the year spanning from 29th October to 4th November. On the other hand, our study showed that this result is not confirmed in the Tunisian context. We find that for the 44th week, the average weekly returns are not significant. This week is not presenting the anomaly. We also note that during this week only 50% of the average weekly returns of the securities are positive. Thus, the terms of the article can't be confirmed. Moreover, the results set out in the tables above allow us to conclude that this seasonal anomaly exists in the Tunisian market and is observed during the 1st, 13th, 18th, 31st, 33rd, 34th, 35th, 37th, 39th and 53rd weeks.

4.1.2. The results of regression analysis

In this study, we calculate Eq. (1) under the assumption (3) to examine the weekly effect.

The major outcomes of the study are summarized in Table 2.

Table 2: Results of week of the year (WOY) in TUNINDEX returns with GARCH (1,1) model for the full period (January 2003 to 31 December 2015)

Weeks	GARCH Coefficient	Std. Dev	t-statistic	P-value
1	-0.0025	0.0022	-1.0344	0.2836
2	0.0040	0.0029	1.4341	0.1497
3	-0.0015	0.0030	-0.5307	0.5893
4	-0.0026	0.0023	-1.1815	0.2605
5	0.0031	0.0041	0.8561	0.3901
6	-0.0010	0.0022	-0.4629	0.6431
7	-0.0017	0.0024	-0.8628	0.4015
8	-0.0032	0.0037	-0.8438	0.4187
9	-0.0023	0.0029	-0.6991	0.4930
10	0.0010	0.0027	0.3893	0.7140
11	0.0040	0.0029	1.4156	0.1575
12	0.0024	0.0030	0.7503	0.4492
13	0.0022	0.0018	1.235	0.2266
14	0.0012	0.0031	0.3854	0.7113
15	-0.0059**	0.0025	-2.3749	0.0158
16	0.0046	0.0036	1.3153	0.1966
17	0.0049	0.0037	1.3542	0.1877
18	0.0037	0.0031	1.2101	0.2322

19	0.0055**	0.0021	2.6355	0.0103
20	0.0022	0.0025	0.8810	0.3804
21	-0.0026	0.0026	-1.0099	0.3115
22	0.0061***	0.0022	2.5982	0.00956
23	-0.0057**	0.0020	-2.4854	0.01331
24	-0.0017	0.0029	-0.5721	0.5842
25	0.0005	0.0024	0.2351	0.8278
26	-0.0034	0.0026	-1.3220	0.1839
27	0.0037*	0.0021	1.7502	0.0801
28	0.0017	0.0024	0.7255	0.4728
29	0.0053*	0.0031	1.7090	0.0897
30	0.0083***	0.0024	3.389	0.0095
31	0.0152***	0.0021	6.9701	0.0000
32	0.0041	0.0029	1.4401	0.1538
33	0.0019	0.0030	0.6602	0.5126
34	0.0027	0.0026	1.0627	0.3004
35	0.0034	0.0036	0.9399	0.3674
36	-0.0067**	0.0031	-1.8816	0.0505
37	0.0157***	0.0031	5.1740	0.0002
38	0.0085*	0.0045	1.7531	0.0801
39	0.0176***	0.0025	6.7960	0.0000
40	-0.0075	0.0046	-1.6701	0.1213
41	0.0012	0.0036	0.3475	0.7455
42	0.0022	0.0037	0.6124	0.5506
43	-0.0027**	0.0023	-2.1382	0.0334
44	0.0004	0.0025	0.1651	0.8732
45	0.0023	0.0026	0.9154	0.3717
46	-0.0026	0.0028	-0.9376	0.3653
47	-0.0012	0.0033	-0.3714	0.7235
48	0.0035	0.0024	1.5297	0.1473
49	0.0017	0.0020	0.7702	0.4524
50	0.0019	0.0029	0.6748	0.5032
51	0.0008	0.0032	0.2642	0.8007
52	0.0019	0.0032	0.6197	0.5592
53	0.0105***	0.0018	5.7662	0.0001

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively
Wald Test: F-Statistic=25.301 with significance level=0.00000126

According to Table 2, in Tunisia, the anomaly (WOY) has a very strong effect on the securities returns during the 31st week which corresponds to the first week of August (positive and highly significant GARCH coefficient). During this period, more than 75% of the average returns of the securities appear to be positive at the 5% level. However, the results of the 43rd week of the year are close to Levy and Yagil (2012)'s article where only 35% of the average returns of the securities are positive (negative and highly significant GARCH coefficient). The Wald test relative to the null hypothesis (3) provides an F-statistic equals to 25.301 with a P-value of 0.00000126. The anomaly (WOY) seems to be due to the psychology and mood of investors during this time of year, which affects the stock market returns.

4.2. Detection of the MOY effect on the Tunisian stock excha

4.2.1. Descriptive statistics

Table 3 contains the mean menstrual profits for each of the 12 months of the year for the Tunisian stock market. They also show the levels of significance and the percentage of positivity and negativity of the monthly returns for each month of the year.

Table 3: Detailed Statistics for the TUNINDEX returns by month of the year (MOY) for the full period (January 2003 to 31 December 2015)

Months	Mean	Std. Dev	Positive	Negative	P-value
January	0.02	0.06	0.69	0.31	0.44
February	0.01	0.06	0.41	0.59	0.76
March	0.02*	0.03	0.69	0.31	0.07
April	0.03	0.05	0.62	0.38	0.12
May	0.00	0.02	0.59	0.41	0.65
June	0.00	0.03	0.41	0.59	0.88
July	0.01	0.03	0.50	0.50	0.19
August	0.02**	0.03	0.77	0.23	0.01
September	0.02**	0.03	0.62	0.38	0.05
October	-0.01	0.05	0.41	0.59	0.67
November	0.00	0.02	0.59	0.41	0.73
December	0.01	0.02	0.77	0.23	0.40

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively

We notice that the highest returns are reflected in August in contrary to October where they are the lowest. This confirms the findings made by Cadsby (1989). As the table shows, 77% of the August and December returns are positive while only 41% of the February, June and October returns are. However, 59% of the returns in those months are negative. This is consistent with the assumption of the existence of a seasonal effect stating that securities are more profitable during the periods before holidays. Furthermore, the mean return in August is highly positive and significant at 5% Level. The results seem to demonstrate that August delivers a performance which is superior as compared to the other months of the year.

4.2.2. The results of regression analysis

The findings of the monthly positive and negative coefficients of the regression (4) for the entire sample are shown in Table 4:

Table 4: Results of month of the year (MOY) in TUNINDEX returns with GARCH (1,1) model for the full period (January 2003 to 31 December 2015)

Months	GARCH Coefficient	Std. Dev	t-statistic	P-value
January	0.0206	0.0133	1.5405	0.1320
February	0.0113	0.0121	0.9783	0.3804
March	0.0213*	0.0115	1.8064	0.0771
April	0.0282**	0.0111	2.5486	0.0102
May	0.0043	0.0109	0.4067	0.7560
June	0.0003	0.0107	0.0374	0.9827
July	0.0090	0.0107	0.8511	0.4927
August	0.0227**	0.0110	2.0428	0.0397
September	0.0185	0.0110	1.6152	0.1091
October	-0.0080	0.0109	-0.6514	0.5085
November	0.0001	0.0106	0.0849	0.9173
December	0.0082	0.0117	0.6325	0.5206

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively
Wald Test: F-Statistic=6.5278 with significance level=0.01832410

The results show that only the GARCH coefficients related to August and April are positive and statistically significant at 5 % level. The Wald test of the null hypothesis (5) provides an F-statistic equals to 6.5278 with a P-value of 0.0183 which is less than 5%.Therefore, The null hypothesis is rejected and it is concluded that the monthly returns during the year are not equal, which contradicts

the efficient market hypothesis (EMH) and confirms the presence of a month of the year effect.

4.3. Detection of the week of the month (WOM) effect on the Tunisian stock market

4.3.1. Descriptive statistics

Table 5 describes the statistics for the TUNINDEX returns by the week of the month (WOM). An overview shows a disparity in the significance of weekly returns over the months.

Table 5: Descriptive Statistics for the TUNINDEX returns by week of the month (WOM) for the full period (January 2003 to 31 December 2015)

Weeks	Mean	Std. Dev	Min	Max	P-value	Positive	Negative
1	0.00***	0.02	-0.05	0.10	0.00	0.60	0.40
2	0.00	0.02	-0.14	0.10	0.58	0.53	0.47
3	0.00*	0.02	-0.07	0.11	0.10	0.56	0.44
4	0.00**	0.01	-0.06	0.06	0.03	0.60	0.40

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively

It should be noted that only the first week and last week returns of the month are positively significant at the 5% level. It is also mentioned that the first and last weeks of the month have the highest positive average returns rate which is around 60%.

4.3.2. The results of regression analysis

Table 5 shows that the income of the first week of the month is much higher than the three other weeks (TOM effect). So we examine this effect by dividing the month into 4 weeks.

Table 6: Results of week of the month (WOM) in TUNINDEX returns with GARCH (1,1) model for the period (01/2003 to 31 /12/2015)

Weeks	GARCH Coefficient	Std. Dev	t-statistic	P-value
1	0.0002*	0.0008	1.6799	0.0931
2	0.0013	0.0009	1.5334	0.1253
3	0.0013	0.0009	1.3672	0.1744
4	0.0007	0.0010	0.7148	0.4748

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively
Wald Test: F-Statistic = 4.0913 with significance level = 0.0872

The findings in Table 6 show that the revenues in the opening week of the month is positive and statistically significant (positive and significant GARCH coefficient at 10% level). Moreover, in the rest weeks, the results are positive but not statistically significant (GARCH coefficients not significant). Thus, the results presented in table 6 show that there seems to be a difference between the first week and other weeks of the month. The TOM effect is supported by the findings. Referring to the Wald test, the F-statistic relative to the null hypothesis (7) is equal to 4.0913 with a P-value of 0.08728520.The null hypothesis is therefore denied at 10% level. This value confirms the presence of the week of the month anomaly (WOM), although it is less obvious than the previous anomalies.

4.4. Detection of the (DOW) effect on the Tunisian stock exchange

4.4.1. Descriptive statistics

Table 7 presents the levels of significance, the minimum and maximum rates as well as the percentage of positivity and negativity of average daily returns from Monday to Friday.

Table 7: Descriptive Statistics for the TUNINDEX returns by day of the week (DOW) for the full period (January 2003 to 31 December 2015)

Days	Mean	Std. Dev	Min	Max	P-value	Positive	Negative
Monday	0.00*	0.01	-0.05	0.04	0.10	0.55	0.45
Tuesday	0.00	0.01	-0.04	0.04	0.85	0.47	0.53
Wednesday	0.00**	0.01	-0.04	0.04	0.05	0.56	0.44
Thursday	0.00**	0.01	-0.04	0.03	0.01	0.59	0.41
Friday	0.00***	0.00	-0.03	0.03	0.00	0.66	0.34

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively

The table indicates that 45% and 53% of the mean return on Monday and Tuesday are significantly negative at 10% level. In contrast, 66% of the mean return on Friday is positive and highly significant at 5% level. Compared to previous studies, the present results demonstrate that the weekend effect exists even in a weaker form.

4.4.2. The results of regression analysis

Table 8: Results of day of the week (DOW) in TUNINDEX returns with GARCH (1,1) model for the full period (January 2003 to 31 December 2015)

Days	GARCH Coefficient	Std. Dev	t-statistic	P-value
Monday	0.0002**	0.0001	1.9685	0.0492
Tuesday	-0.0002	0.0001	-1.3129	0.1894
Wednesday	0.0002	0.0001	1.3980	0.1650
Thursday	0.0004***	0.0001	2.8262	0.0047
Friday	0.0006***	0.0001	4.0364	0.0001

Note: *, **, *** Significance at 1%, 5% and 10% levels respectively
Wald Test: F-Statistic = 7.0088 with significance level = 0.0134

From the table, we note that the results of the regression (8) confirm those of table 7, namely that the most significant GARCH coefficient is that of Friday, whose t-statistic amounts to 4.0364 and p-value equals to 0.0001 .Thursday also appears to be associated with abnormal returns. Based on the F-value (7.0088) with a significance level less than 5% (P-value equals to 0.0134), we can deny our null hypothesis (9) and conclude that gains of the days during the week are not same, which contradicts the efficient market hypothesis (EMH). Indeed, we can confirm that the seasonal anomaly (TOK) exists on the Tunisian stock market. The highest security returns are recorded during this particular day of the week (Friday) and this result is very interesting considering that its exploiting could generate exceptional earnings for the investors.

5. CONCLUSION

Studies that focus on the calendar anomalies observed in the financial markets continue to evolve from day to day. On the other hand, the discovery of these anomalies over the last few years did not lead to their decrease nor to their disappearance which makes researches about them more interesting. Indeed, these phenomena only accentuate the criticisms addressed to classical theories of efficiency (EMH) and capital asset pricing model (CAPM) given that according to this latter, the appearance of a phenomenon on the market does not last long because once discovered investors will consider it when making their decisions, and this arbitration will automatically lead to the disappearance of these anomalies when the market finds his initial equilibrium.

To conclude, our esxample involves the weekly, monthly and daily rates of return from the stock index (TUNINDEX) of Tunisia stock exchange. The studied period begins in January 2003 and ends in December 2015. All the results that have been achieved confirm the existence of these anomalies and above all the existence of a strong positive or negative relationship between them and the stock market returns. Specifically, the results of our tests have been proved to be significant in most cases, even if

they do not always confirm the affirmations of researchers. The best example is the 44th week concerning the week of the year effect (WOY). The researchers state that during this period the returns are always positive which is not the case on the Tunisian financial market.

The discovery of these anomalies can generate very interesting returns to all those who know how to get profit from them. It should be noted that it would be preferable for financial market participants in the Tunisian context to sell their securities on the eve of the holidays or the New Year rather than after, given that the results show that average returns of shares are almost always higher during this period. Although the results obtained through this empirical study and the resulting confirmations are of great importance in the understanding of financial anomalies in the Tunisian market, it would be even more interesting to develop specific models that would allow stakeholders to take them into account and to take advantage of them. So, how to transform the relationships between these different anomalies and the average stock returns into econometric models. This could be the subject of a future search.

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