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The Extended Holiday Effects on Bucharest Stock Exchange during Coronavirus Pandemic

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In the recent times, the Coronavirus Pandemic substantially influenced the financial markets. Such influence includes the transformations experienced by some calendar anomalies. This paper investigates the Extended Holiday Effects presence on the returns of three indexes from the Bucharest Stock Exchange for the period February 3, 2020 – May 7, 2021. The results indicate that, comparing to a pre-pandemic period, significant changes occurred for both pre and post-Holiday Effects.

Keywords: The Extended Holiday Effect, Persistence in time of the calendar anomalies, Romanian capital market, Coronavirus Pandemic

JEL Codes: G10, G14, G40

1. Introduction

The Holiday Effect, one of the most known calendar anomalies from the financial markets, consists in abnormal returns occurring around public holidays. Its classical form has two components:

- ✧ - the pre-holiday effect which refers to one trading day before the public holiday;
- ✧ - the post-holiday effect which refers to one trading day after the public holiday (Fields, 1934; Thaler, 1987; Lakonishok & Smidt, 1988; Ariel, 1990; Agrawal & Tandon, 1994).

There were proposed several explanations for the presence of holiday effects on the financial markets: the "holiday spirit" which induces an optimistic mood among the investors, a specific heightening occurring around public holidays associated to religious events or the uncertainty about the events that could happen in the days when there were no transactions occurred in the financial markets (Brockman & Michayluk, 1998; Vergin & McGinnis, 1999; Meneu & Pardo, 2004; Marrett & Worthington, 2009; Canepa & Ibnrubbian, 2014; Yuan & Gupta, 2014; Lahav et al., 2016; Satt, 2016). There were revealed some differences between emerging and developed markets (Dumitriu et al., 2012; Seif et al., 2017). Along with the classical form, it was observed an extended one characterized by an enlarged time interval which could contain more than one trading day before and after public holidays (Wu, 2013; Casalin, 2018; Dumitriu & Stefanescu, 2020).

As in the case of many other calendar anomalies, the holiday effects are not necessary persistent in time. Various events and processes could provoke significant changes. Recently, the Coronavirus Pandemic induced substantial turbulences on the financial markets (Topcu &

Gulal, 2020; Zhang et al., 2020; Vasileiou, 2021). In these circumstances, calendar anomalies could experience several transformations.

On the Romanian capital market there were identified the classical and the extended forms of the Holiday Effects. Between 2007 and 2011 abnormal returns of Bucharest Stock Exchange (BSE) indexes were detected for one trading day before and one trading day after public holidays (Dumitriu et al., 2011). The extended form was found for the period January 2007 - December 2012, but it seemed to experience a significant decline for the period January 2013 - May 2018 (Stefanescu & Dumitriu, 2018). Since the beginning of 2020, the Romanian national economy was affected by the Coronavirus Pandemic. In February, the Romanian Government started to apply measures designed to prevent the disease from spreading. In the next months, as the number of COVID infections detected cases increased or decreased these measures were tightened or relaxed. The national economy has fallen into a recession and several shocks occurred on BSE.

This paper explores the Coronavirus Pandemic impact on the Extended pre and post-Holiday Effects in the Romanian capital market. We study the presence of this calendar anomaly for two periods:

- a pre-pandemic period that started in June 4, 2018 and ended in January 31, 2020;
- the period February 3, 2020 – May 7, 2021 when BSE experienced significant turbulences generated by the Coronavirus Pandemic.

We try to detect the Extended Holiday Effect presence on the daily logarithmic returns of three main indexes of BSE, using conditional mean equations with dummy variables in the classical GARCH (1,1) framework provided by Engle (1982) and Bollerslev (1986). The rest of this paper is organized as it follows: the second part describes data and methodology used to detect the Extended Holiday Effects on the returns of the three indexes, the third part presents the empirical results and the fourth part concludes.

2. Data and Methodology

2.1. Description of Data

Daily closing values of three indexes from BSE (BET, BET-FI and BET-XT), covering the two periods mentioned before, are employed in this investigation about the Extended Holiday Effect presence on the Romanian capital market (Figure 1).

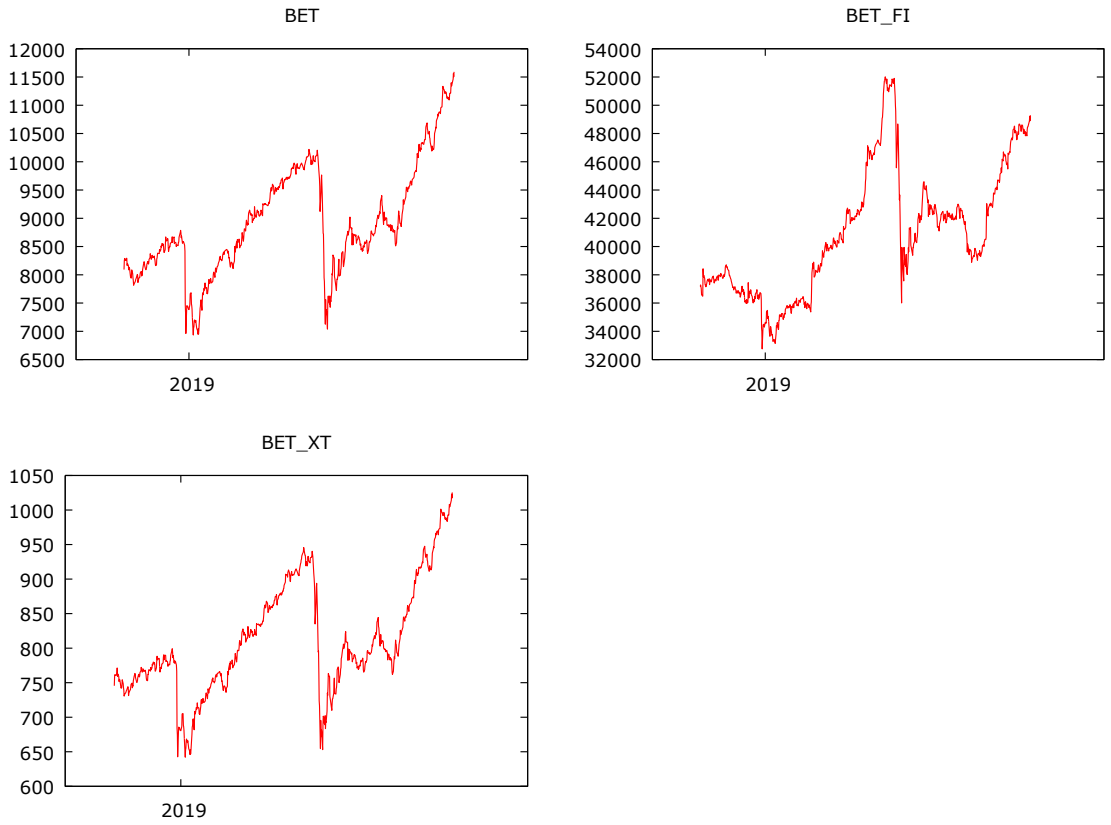

Figure 1. Evolution of daily values of the three BSE indexes from June 4, 2018 to May 7, 2021
Source of the daily values: https://bvb.ro

We compute, for each of the three indexes, the logarithmic returns ($r_{i,t}$) as:

$$r_{j,t} = [\ln(P_{j,t}) - \ln(P_{j,t-1})] \times 100 \quad (1)$$

in which $P_{j,t}$ and $P_{j,t-1}$ are the notations for the closing prices of index j on the days t and t-1, respectively.

Table 1. Descriptive statistics of the returns for the three BSE indexes

Variable	Mean	Standard Deviation	Coefficient of variation	Min	Max	Jarque-Bera test
First sub-sample: June 4, 2018 - January 31, 2020						
BET	0.0519	1.070	20.617	-11.9	6.82	30853.50***
BET-FI	0.0790	0.890	11.265	-5.85	5.18	2124.09***
BET-XT	0.0530	0.997	18.814	-11.3	6.46	36723.20***
Second sub-sample: February 3, 2020 – May 7, 2021						
BET	0.0457	1.43	31.356	-10.1	5.97	2256.78***
BET-FI	-0.0123	1.43	116.52	-9.56	10.4	4478.86***
BET-XT	0.0324	1.37	42.128	-9.07	6.06	2164.47***

*Note: *** means significant at 0.01 level.*

From the first to the second period the average returns values decreased, while the volatility increased (Table 1). For both sub-samples, the Jarque-Bera test failed to confirm the returns normality.

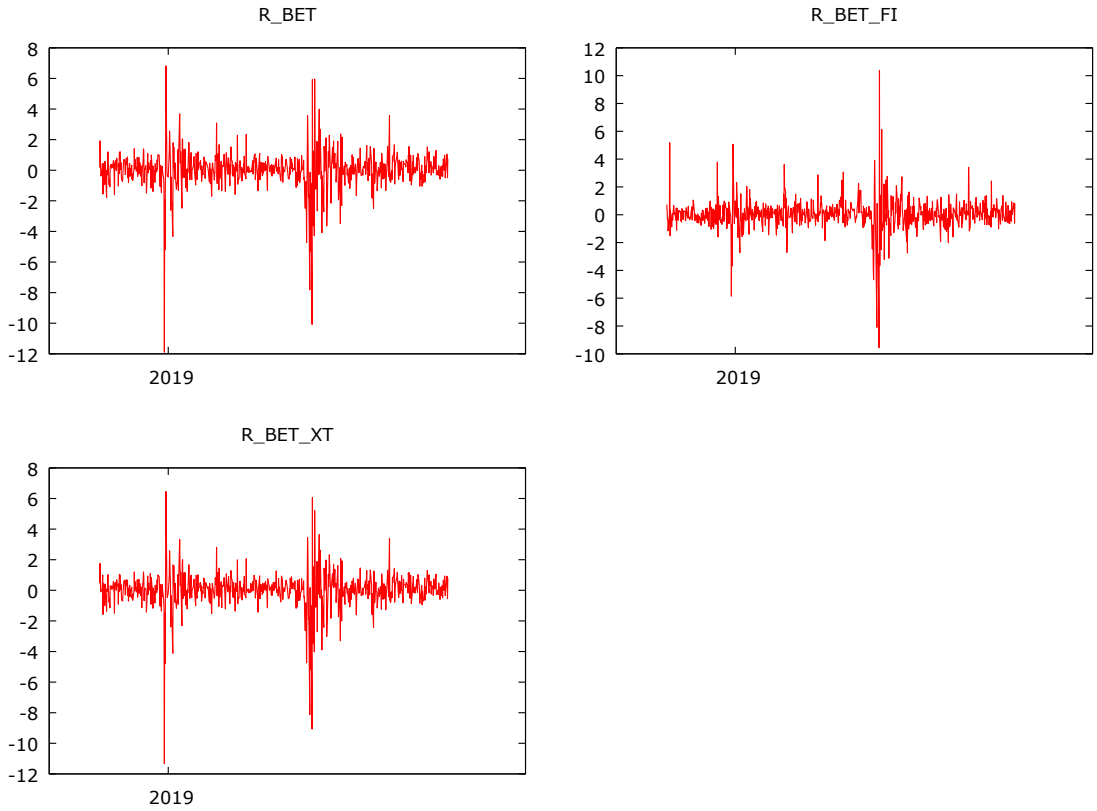

Figure 2. Evolution of daily returns of the three BSE indexes from June 4, 2018 to May 7, 2021

Source of the daily values: https://bvb.ro

We perform the Augmented Dickey – Fuller (ADF) unit root tests on returns of the three indexes. The optimum number of lags was established using Akaike (1974) Information Criterion. The graphical representations of returns suggest the use of two variants of these tests: with and without constant (Figure 2). For both sub-samples, the results of ADF tests indicate that returns were stationary (Table 2).

Table 2. Results of ADF tests

Index	Test without constant		Test with constant	
	Number of lags	Test statistic	Number of lags	Test statistic
First sub-sample: June 4, 2018 - January 31, 2020				
BET	2	-13.1496***	2	-13.1773***
BET-FI	3	-10.7488***	3	-10.9498***
BET-XT	2	-12.9508***	2	-12.9864***
Second sub-sample: February 3, 2020 – May 7, 2021				
BET	5	-6.819***	5	-6.82689***

Index	Test without constant		Test with constant	
	Number of lags	Test statistic	Number of lags	Test statistic
BET-FI	5	-6.53592***	5	-6.5262***
BET-XT	6	-6.46503***	6	-6.46502***

Note: *** means significant at 0.01 level.

2.2. Methodology

For the Extended pre-Holiday Effect we take into consideration a time interval that includes the five trading days before a public holiday:

$(PH_{-5}; PH_{-4}; PH_{-3}; PH_{-2}; PH_{-1})$

We associate, for this time interval, a category of dummy variables ($DPH_{-k,t}$) with the form:

$$DPH_{-k,t} = \begin{cases} 1, \ if\ the\ day\ t\ is\ with\ k\ \ trading\ days\ before\ a\ public\ holiday \\ 0, \ otherwise \end{cases}$$

where $1 \leq k \leq 5$.

In the case of Extended post-Holiday Effect we use a time interval composed by five trading days after a public holiday:

$(PH_{+1}; PH_{+2}; PH_{+3}; PH_{+4})$

For this time interval we define another category of dummy variables ($DPH_{+k,t}$):

$$DPH_{+k,t} = \begin{cases} 1, \ if\ the\ day\ t\ is\ with\ k\ \ trading\ days\ after\ a\ public\ holiday \\ 0, \ otherwise \end{cases}$$

where $1 \leq k \leq 4$.

These dummy variables are introduced in the conditional mean equations of GARCH (1,1) model. For the Extended pre-Holiday Effect, we use the equation:

$$r_{j,t} = \theta_0 + \sum_{k=1}^{5} \lambda_k \times DPH_{-k,t} + \varepsilon_t \qquad (2)$$

where:
- θ_0 is a constant term;
- λ_k represents a coefficient associated to the dummy variable DPH_{-k};
- ε_t is the error term of the equation.

In the case of Extended pre-Holiday Effect, the conditional mean equation has the form:

$$r_{j,t} = \theta_0 + \sum_{k=1}^{4} \rho_k \times DPH_{-k,t} + \varepsilon_t \qquad (3)$$

where:
- θ_0 and ε_t have the same significations as in the equation (2);
- ϱ_k represents a coefficient associated to the dummy variable DPH_{+k}.

It is supposed that ε_t follows a normal distribution with zero mean and a time varying variance h_t:

$$\varepsilon_t \mid I_{t-1} \sim N(0, h_t)$$

Along with the conditional mean equation the GARCH (1,1) model includes a conditional variation equation with the form:

$$h_t = \omega + \alpha_1 \times \varepsilon_{t-1}^2 + \beta_1 \times h_{t-1} \qquad (4)$$

where:
- ω is a constant term;
- α_1 and β_1 are coefficients associated to the lagged squared residuals and, respectively, to the lagged variance.

We identify the abnormal returns associated to the Extended pre and post-Holiday Effects by analyzing the significance of λ_k and ϱ_k coefficients. A significant value for one of them, positive or negative, indicates abnormal high, respectively, low returns in the trading day associated.

3. Empirical Results

3.1. Results for the first sub-sample (June 4, 2018 - January 31, 2020)

For the Extended pre-Holiday Effects, GARCH (1,1) model revealed, for all three indexes, significant positive values of the λ_5 coefficients (Table 3).

Table 3. Coefficients of GARCH equations for the Extended pre-Holiday Effects occurring in the first sub-sample

Coefficient	Index		
	BET	**BET-FI**	**BET-XT**
θ_0	0.0952022*** (0.0362938)	0.0837056** (0.0366466)	0.101395*** (0.0337302)
λ_5	0.817388*** (0.158571)	0.586008*** (0.181519)	0.782516*** (0.152740)
λ_4	−0.270727 (0.206540)	−0.123914 (0.215654)	−0.185477 (0.205873)
λ_3	−0.254435 (0.192088)	−0.150095 (0.217353)	−0.267044 (0.180705)
λ_2	0.00652808 (0.219683)	0.137622 (0.221172)	0.0207290 (0.220368)
λ_1	0.102837 (0.181093)	0.144813 (0.224958)	0.0291361 (0.165933)
ω	0.185029** (0.0768539)	0.117929*** (0.0416573)	0.150177*** (0.0482126)
α_1	0.589937*** (0.126728)	0.257174*** (0.0841634)	0.588450*** (0.122459)
β_1	0.351376** (0.141942)	0.634662*** (0.0825506)	0.365165*** (0.107112)

*Notes: Standard errors are within parentheses; *** and ** * mean significant at 0.01 and 0.05 levels, respectively.*

The Table 4 reports the coefficients of GARCH equations for the Extended post-Holiday Effects. We found significant negative values of the ϱ_3 coefficient, in the case of BET-FI, and of the ϱ_4 coefficient, in the case of BET and BET-XT.

Table 4. Coefficients of GARCH equations for the Extended post-Holiday Effects occurring in the first sub-sample

Coefficient	Index		
	BET	**BET-FI**	**BET-XT**
θ_0	0.146537*** (0.0344485)	0.131898*** (0.0347934)	0.158895*** (0,0313958)
ϱ_1	−0.0841773 (0.177485)	−0.269895 (0.198428)	−0.141238 (0.159515)
ϱ_2	0.154906 (0.193091)	0.234342 (0.215744)	0.153680 (0.178667)
ϱ_3	−0.0630719 (0.200057)	−0.406816* (0.216417)	−0.116149 (0.201467)
ϱ_4	−0.400392** (0.171739)	−0.281256 (0.235023)	−0.340338** (0.150960)
ω	0.249037*** (0.0648507)	0.124406*** (0.0444687)	0.197056*** (0.0450097)
α_1	0.822548*** (0.121748)	0.378405** (0.148398)	0.789885*** (0.114439)
β_1	0.265367*** (0.0891106)	0.565784*** (0.0906308)	0.210115*** (0.0771335)

*Notes: Standard errors are within parentheses; ***, ** and * mean significant at 0.01, 0.05 and 0.1 levels, respectively.*

3.2. Results for the second sub-sample (February 3, 2020 - May 7, 2021)

In the case of Extended pre-Holiday Effects, GARCH conditional mean equation revealed significant positive values of the λ_5 coefficients for BET-FI and BET-XT (Table 5).

Table 5. Coefficients of GARCH equations for the Extended pre-Holiday Effects occurring in the second sub-sample

Coefficient	Index		
	BET	**BET-FI**	**BET-XT**
θ_0	0.121996** (0.0503680)	0.0670159 (0.0497598)	0.114337** (0.0470068)
λ_5	0.431835 (0.287263)	0.730534** (0.317782)	0.554882* (0.284452)
λ_4	0.350342 (0.281166)	−0.0305631 (0.356757)	0.283002 (0.276373)
λ_3	−0.0281558 (0.264346)	0.160413 (0.339739)	−0.0263307 (0.260083)
λ_2	−0.0395475 (0.332914)	−0.198338 (0.350347)	−0.0461946 (0.327596)
λ_1	−0.154409 (0.275384)	−0.427185 (0.351132)	−0.170488 (0.259336)

Coefficient	Index		
	BET	**BET-FI**	**BET-XT**
ω	0.0471526** (0.0199635)	0.103804*** (0.0358231)	0.0437440** (0.0192601)
α_1	0.235387*** (0.0652263)	0.189315*** (0.0541294)	0.234307*** (0.0732774)
β_1	0.751460*** (0.0540100)	0.715348*** (0.0712831)	0.748315*** (0.0627903)

*Notes: Standard errors are within parentheses; ***, ** and * mean significant at 0.01, 0.05 and 0.1 levels, respectively.*

The coefficients of GARCH equations for the Extended post-Holiday Effects are presented in the Table 6. We found significant positive values of the ϱ_1 coefficient (for BET) and of the ϱ_2 coefficient (for BET and BET-XT).

Table 6. Coefficients of GARCH equations for the Extended post-Holiday Effects occurring in the second sub-sample

Coefficient	Index		
	BET	**BET-FI**	**BET-XT**
θ_0	0.112161** (0.0484818)	0.0631245 (0.0488439)	0.106589** (0.0453292)
ϱ_1	0.554034* (0.327599)	0.0004242 (0.309867)	0.510963 (0.327525)
ϱ_2	0.547122* (0.317655)	0.417625 (0.359212)	0.565531* (0.309091)
ϱ_3	−0.0577339 (0.306680)	−0.281916 (0.334375)	−0.110174 (0.304223)
ϱ_4	−0.0256060 (0.311643)	0.266793 (0.326382)	0.0231742 (0.299170)
ω	0.0490770** (0.0204612)	0.107403*** (0.0373213)	0.0477375** (0.0200110)
α_1	0.249053*** (0.0685441)	0.201589*** (0.0609257)	0.261760*** (0.0831679)
β_1	0.738507*** (0.0563391)	0.702867*** (0.0772247)	0.722406*** (0.0683555)

*Notes: Standard errors are within parentheses; ***, ** and * mean significant at 0.01, 0.05 and 0.1 levels, respectively.*

4. Conclusions

The results of this investigation indicate that during Coronavirus Pandemic some significant changes occurred in the Extended Holiday Effects on BSE. Regarding the Extended pre-Holiday Effects, we found that abnormal high returns from PH_{-5} for only two indexes (during the pre-pandemic period all three indexes displayed such patterns). In the case of Extended post-Holiday Effects the changes were more obvious. The abnormal low returns observed, during the pre-pandemic period on PH_{+3} and PH_{+4}, in the pandemic period, were replaced by abnormal high returns in PH_{+1} and PH_{+2}.

Such changes could be viewed as a part of the "natural transformations" experienced by many calendar anomalies (Dimson and Marsh, 1999; Schwert, 2003; Marquering et al., 2006; Auer and Rottmann, 2019; Plastun et al., 2019). Sometimes, the changes are initiated or amplified by the turbulences from the financial markets (Wong et al., 2006; Dumitriu et al., 2012). However, the turbulences caused by the Coronavirus Pandemic had some particularities. There were many negative shocks on stock prices but the general tendency was ascendant. Quite often, before and during the public holidays, especially in the case of religious ones, the Romanian authorities relaxed the quarantine measures. In these circumstances, the "holiday spirit" and the heightening of religious persons survived. However, the uncertainty about events that could happen during the public holidays was, perhaps, higher than in "normal" times.

In the present circumstances, it is very hard to predict the future evolution of Coronavirus Pandemic. The investigation about the impact of this disease on the Extended Holiday Effects could be continued as more information will become available.

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