Month-of-the-year effects on Romanian capital market before and after the adhesion to European Union

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MONTH-OF-THE-YEAR EFFECTS ON ROMANIAN CAPITAL MARKET BEFORE AND AFTER THE ADHESION TO EUROPEAN UNION

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Abstract: *Monthly seasonality in the stock prices returns is among the best known calendar anomalies that affect the capital markets. The knowledge about such calendar patterns could be exploited in building successful investment strategies. However, it was revealed that not all the calendar anomalies were persistent in time. Sometimes, the passage from relative quiet to more turbulent periods caused significant changes in a financial market seasonality. In this paper we investigate the presence of Month-of-the-year effects on the Bucharest Stock Exchange during two periods of time. The first period, from 2000 to 2006, corresponds to the last stages of Romania's transition to a capitalist system and could be considered as relative quiet for the capital market. The second period, from 2007 to 2012, was marked by sharp changes. The consequences of adhesion to the European Union and the global crisis induced turbulences on the Romanian financial markets. In our analysis we employ daily values of one from the main indexes of the Bucharest Stock Exchange. We use a GARCH model to reveal the monthly seasonality not only on indexes returns but also on the capital market volatility. The results indicate significant changes in the Month-of-the-year effects from the quiet to the turbulent period.*

Keywords: Calendar Anomalies, Romanian Capital Market, GARCH

JEL Classification: G02, G10, G14, G19

1. Introduction

The knowledge about seasonality of the financial markets could be used in building investment strategies that exploit such patterns of the financial assets prices evolutions. Some forms of this seasonality, known as the calendar anomalies, were used as arguments against the Efficient Markets Hypothesis which presumed that past evolutions of the financial assets prices were useless in predicting their future evolutions [1, 18, 20, 21, 22, 23, 26, 31]. However, it was proved that not all the calendar anomalies were persistent in time [16, 30]. Sometimes, the passage from a relative quiet period of time to a turbulent one induced different investors' behaviours affecting the financial markets seasonality [27].

The Month-of-the-year effects, consisting in significant differences between the month stock prices returns are among the best known calendar anomalies. Initially, the empirical researches revealed that usually in January the returns were much higher than in December [5, 7, 12, 13, 25, 27, 28, 31].

This fact was explained by several hypotheses such as: Tax Loss Selling Hypothesis, Window Dressing Hypothesis or Differential Information Hypothesis [6, 10, 28].

Later, other forms of monthly seasonality of stock markets were revealed [14, 17, 29, 32, 33, 34]. The development of GARCH models stimulated the investigation on monthly seasonality of capital markets not only on the stock returns but also on volatility [8, 11, 19, 24]

In this paper we investigate the presence of Month-of-the-year effects on the Romanian capital market from 2000 to 2012. The Bucharest Stock Exchange (BSE) evolution in this period of time passed two stages. The first one, from 2000 to 2006, corresponds to the finalization of transition to a capitalist system and it could be considered as relative quiet for the capital market. The second one, from 2007 to 2012, was marked by sharp changes induced by the adhesion to European Union and the global crisis which raised the turbulence on Romanian financial markets. In our analysis we employ daily values of BET-C, one from the main indexes of Romanian capital markets, which expresses the evolution of all the big companies listed on BSE, excepting the investment funds. In our attempt to reveal the monthly seasonality of stock returns and volatility we use a GARCH model.

The remainder of this paper is organized as it follows. The second part describes the methodology employed to reveal the Month-of-the-year effects, the third part presents the results and the fourth part concludes.

2. Data and Methodology

In our investigation about the monthly seasonality we employ daily closing values of the BET C index, provided by BSE from January 2000 to December 2012. In order to capture the changes that followed Romania's adhesion to European Union we split our sample of data in two sub-samples:

- the first sub-sample, from January 2000 to December 2006;
- second sub-sample, from January 2007 to December 2012.

We calculate continuous return of BET C as:

$$retBETC_t = [\ln(P_t) - \ln(P_{t-1})] * 100 \quad (1)$$

where P_t and P_{t-1} are the closing values of BET C index on the days t and t-1, respectively.

We analyze the stationarity of the BET C returns by employing the Augmented Dickey – Fuller (ADF) unit root tests with intercept as deterministic term [15]. Based on the graphical representation we chose intercept as deterministic term in ADF regressions (Figure 1). The Akaike Information Criteria provide us the numbers of lags [2, 3, 4]. We investigate the presence of the autocorrelation and the heteroscedasticity on BET C index by performing ARMA (p, q) models in which the values of p and q are determined by Box-Jenkins methodology [9]. We use Ljung-Box test Q and the Engle (1982) Lagrange Multiplier (LM) test for ARCH effects on the residuals of ARMA regressions [19].

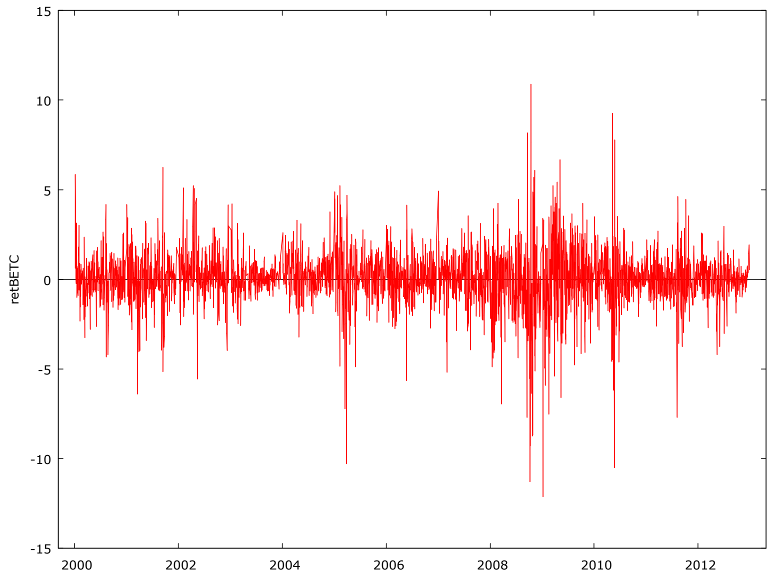

Figure 1: Returns of BET C from January 2000 to December 2012

The Month-of-the year effects are to be revealed by dummy variables (D_i) that correspond to the first eleven months of a year. Such a variable D_i takes the value one for the month i and zero otherwise. In order to avoid dummy trap we exclude the variable that correspond to December.

The GARCH model we employ in the analysis of Month-of-the year effects is described by two equations.

The first equation expresses the conditional mean of the BET C returns:

$$retBETC_t = \mu_0 + \sum_{i=1}^{11} \mu_i * D_{i,t} + \sum_{k=1}^{n} (\xi_k * r_{t-k}) + \varepsilon_t \qquad (2)$$

where:

- μ_0 is a constant term reflecting a December effect on BET C returns;
- μ_i (i=1, 2,…11) are coefficients which reflect the Month-of-the-year effects on BET C returns for the first eleven months;
- ξ_k (k=1,..n) are coefficients associated to the lagged returns of BET C;
- n is the number of lagged returns, calculated by the Akaike (1969) Final Prediction Error Criterion [2];
- ε_t is the error term.

The second equation expresses the conditional variance of BET C returns:

$$\sigma_t^2 = \nu_0 + \sum_{i=1}^{11} \nu_i * D_{i,t} + \sum_{k=1}^{q} \alpha_k * \varepsilon_{t-k}^2 + \sum_{l=1}^{p} (\beta_l * \sigma_{t-l}^2) \qquad (3)$$

where:

- σ_t^2 is the conditional variance of the returns of BET C index;
- ν_0 is a constant term reflecting a December effect on BET C volatility;
- ν_i (i=1, 2,…11) are coefficients which reflect the Month-of-the-year effects on BET C volatility for the first eleven months;
- α_k (k=1, 2, …q) are coefficients associated to the squared values of the lagged values of error term from the conditional mean equation;
- q is the number of lagged values of the error term, calculated by the Akaike Information Criteria [3,4];
- β_l (j=1, 2, …p) are coefficients associated to the lagged values of the conditional variance;
- p is the number of lagged values of conditional variance, calculated also by the Akaike Information Criteria.

After performing the two regressions we investigate the presence of the ARCH effects on their residuals by employing Lagrange Multiplier (LM) tests.

3. Empirical Results

The Table 1 reports the results of the

ADF, Ljung-Box Q and ARCH LM tests. We find that, for both sub-samples, BET C returns are stationary. These results also indicate that we can't reject the null hypothesis of autocorrelation and the heteroscedasticity of the residuals from ARMA models.

Table 1 Results of ADF, Ljung-Box Q and ARCH LM tests

Sub-sample	*ADF tests*	*Ljung-Box Q Tests*	*ARCH LM*
First sub-sample	-10.9466 (0.0001***)	7.63799 (0.05412*)	171.096 (0.0001***)
Second sub-sample	-7.76177 (0.0001***)	7.36703 (0.06108*)	254.258 (0.0001***)

Notes: The p-values are within brackets ***, **, *; mean significant at 0.01, 0.05, and 0.1 levels, respectively. For the ADF tests there were used 11 lags for the first sub-sample and 14 lags for the second sub-sample.

The results of the GARCH regressions are presented in the Table 2. For the first sub-sample we find a significant January Effect on returns and a significant December Effect on volatility. For the second sub-sample we find significant monthly seasonality on returns for May, September and November. It also results a significant August Effect on volatility.

Table 2 Results of GARCH regressions

Variable	*First sub-sample*			*Second sub-sample*		
	Coefficient	*Standard Error*	*p-value*	*Coefficient*	*Standard Error*	*p-value*
GARCH conditional mean equation						
μ_0	0.10933	0.0950	0.2498	0.11549	0.0798	0.1483
μ_1	0.42171	0.1597	0.0083***	0.08839	0.1422	0.5343
μ_2	0.00454	0.1405	0.9742	0.05575	0.1341	0.6777
μ_3	-0.15389	0.1411	0.2756	0.08231	0.1227	0.5025
μ_4	-0.0007	0.1449	0.9962	-0.0987	0.1264	0.4352
μ_5	-0.0791	0.1356	0.5591	-0.3026	0.1447	0.0365**
μ_6	-0.0125	0.1168	0.9148	-0.1194	0.1413	0.3979
μ_7	0.0145	0.1179	0.9021	-0.0151	0.1418	0.9155
μ_8	-0.0693	0.1176	0.5553	-0.1057	0.1468	0.4713
μ_9	0.05996	0.1166	0.6071	-0.2189	0.1146	0.0562*
μ_{10}	0.08488	0.1141	0.4572	-0.0802	0.1095	0.4641
μ_{11}	0.03262	0.1142	0.7753	-0.2758	0.1041	0.0081***
GARCH conditional variance equation						
ν_0	0.32141	0.1183	0.0066***	0.03549	0.0237	0.1346
ν_1	0.36114	0.2286	0.1143	0.03113	0.0496	0.5311
ν_2	0.02630	0.1421	0.8531	0.02525	0.0453	0.5779
ν_3	0.13543	0.1561	0.3857	0.02039	0.0455	0.6546
ν_4	0.08318	0.1622	0.6082	0.01518	0.0393	0.6996
ν_5	0.07647	0.1555	0.6229	0.05882	0.0583	0.3131
ν_6	-0.1418	0.1177	0.2283	0.03049	0.0513	0.5525
ν_7	-0.11521	0.1194	0.3348	0.11021	0.0688	0.1093
ν_8	-0.12243	0.1177	0.2982	-0.07241	0.0246	0.0032***
ν_9	-0.13156	0.1195	0.2710	0.04943	0.0428	0.2485
ν_{10}	-0.14191	0.1175	0.2273	-0.03718	0.0251	0.1387
ν_{11}	-0.13456	0.1256	0.2841	-0.01014	0.0274	0.7111

α	0.28197	0.0463	0.0001***	0.14213	0.0384	0.0002***
β	0.56007	0.0537	0.0001***	0.84712	0.0374	0.0001***

Notes: ***, **, * mean significant at 0.01, 0.05, and 0.1 levels, respectively; ARCH LM tests for residuals of GARCH model are 7.35543 (with p-value = 0.118256) for the first sub-sample and 2.86343 (with p-value = 0.721031) for the second sub-sample.

4. Conclusions

In this paper we approached the monthly seasonality on BSE before and after Romania's adhesion to European Union. The results suggest that the changes occurred after the adhesion affected the Month-of-the-year effects for returns and volatility.

Monthly seasonality of the returns passed from a positive January effect to negative May, September and November effects. This evolution could be explained by the Dimson and Marsh (1999) Murphy's Law of calendar anomalies and, perhaps for the May and September returns, by the decline of capital market activity that usually occurs in that period of time [16].

From a volatility perspective, the monthly seasonality passed from a positive December effect to a negative August Effect. In general, August is a relative quiet month for BSE, in which changes seldom occur.

The investigation on Month-of-the-year effects on Romanian capital market could be extended by employing values of other BSE indexes.

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