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THE MONTH-OF-THE-YEAR EFFECT IN POST-COMMUNIST EAST EUROPEAN STOCK MARKETS

ELENA VALENTINA TILICĂ

Abstract. This paper studies the month-of-the-year (MOY) effect between 2004 and 2014, also considering the impact of the 2008 crisis. MOYis present in most East European countries, but the patterns changebetween countries and, also, as a result of the crisis.Thus, markets should be analyzed separately and periodically, especially after important events, as their behavior changes. It appears that some markets try to correct the observed pattern in the same year, by creatingan inverse one. This creates another opportunity for informed investors to create profitable strategies, a sign that the level of efficiency on the markets is low.

1. Introduction

The predictability of returns has been an important subject of research in financial literature over time because of its implications, both on the level of informational efficiency of the capital market and on the usefulness of active trading strategies. If certain patterns are observed on a market, potential investors could benefit by buying stocks in the periods when the prices decrease and sell when they increase. Thus, they would gain from these transactions. While this is a positive aspect for informed investors, the ones which do not have the knowledge of this phenomenon will obtain lower returns.

Based on the previous reasoning, a capital market where returns have a predictable evolution have a low level of informational efficiency because some groups of investors could obtain systematically higher returns than the other groups. The observed patterns are considered anomalies as the prices of financial assets should be impossible to anticipate.

This paper studies the presence of monthly anomalies (also known as the month-of-the-year effect) on the stock markets of 18 East European, post-communist countries: Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, Former Yugoslav Republic (FYR) of Macedonia, Montenegro, Poland, Romania, Russian Federation, Serbia, Slovakia, Slovenia and Ukraine. This group of countries was chosen because they have a relatively similar economic history and the development level of the capital markets is somewhat comparable. The stock markets have a fairly short history, being opened recently, after 1990, as a result to the shift towards a market economy. In some countries, stock markets were opened earlier, before World War II, but they were closed in the communist era and reopened after.

The results show that, for the whole analyzed period: 2004-2013, the month-of-the-year effect (MOY) is present in most countries, while others do not have patterns (Bulgaria, Estonia). However, this period contains the year 2008, when the prices on these markets suffered a drastic

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Elena Valentina Tilică is PhD Student in the Department of Financeat the Bucharest University of Economic Studies, 5-7 Mihai lMoxa Street, Room 3109, Bucharest, Romania. Email: elena.tilica@yahoo.com.

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decline. In order to see if this phenomenon had an impact on the evolution of these markets, the analysis period was divided in two sub-samples: before and after the month with the most abrupt decline of the prices. The results show an important change of patterns observed in the evolution of these markets to the extent that,in some countries, the MOY effect was not present in the first sample, but was found in the second.

The results can be useful for both practitioners and the academic community. The former might use them to construct their investment strategies. The latter could be interested if they study informational efficiency, especially at a comparative level, as the results provide a picture for several countries from Eastern Europe.

The rest of the paper is structured as follows. Section 2 provides some information about the previous literature on this subject. Section 3 describes the methodology used, while section 4 specifies the database. Section 5 shows the results obtained and section 6 concludes.

2. Literature review

Calendar anomalies are the subject of many papers that study market efficiency because they convey a predictable evolution of the prices, which creates doubt about the level of informational efficiency. In theory, the prices should have astochastic evolution if they reflect all the available information at a certain time. As the information that will appear on the market next should be unpredictable, the evolution of the prices should have the same characteristic. As Thaler(1987: 198) stated "An empirical result is anomalous if it is difficult to "rationalize", or if implausible assumptions are necessary to explain it within the paradigm" (Thaler, 1987, pp 198). As it is difficult to believe that, in an efficient market, the new information that appears concerning an asset generates a similar evolution as the one from the previous period (thus, creating a predictable evolution of the price), the existence of patterns in returns is a sign of an anomalous result.

The tests used to analyze the level of efficiency do not refer only to the existence of seasonal anomalies. They can also refer to the random-walk hypothesis, as in Todea and Lazăr (2012) or Dragotă and Tilică (2014) or the efficiency of trading rules, as in Dragotă and Mitrică (2004) or Todea et al. (2012), among others. Other articles take into consideration the presence of anomalies on the market, other than the seasonal ones (see Keim 1983, Oprea2013, or Oprea and Brad 2014), A detailed presentation of these tests is provided in Lim and Brooks (2011).

This paper studies the seasonal anomalies, and more specifically the month-of-the-year (MOY) effect. Although this is not the only calendar anomaly, it is one of the most studied, along with the day-of-the-week effect (see, among others, Dubois and Louvet 1996, Chang et al 1998, Alt et al. 2011) orthe turn-of-the year effect (see Szakmary and Kiefer 2004 or Sander and Veiderpass, 2013).

The MOY effect has been and continues to be analyzed in developed markets, especially in the US. Lakonishok and Smidt (1988) studied the January effect on the US market for a period of ninety years. They found some evidence of monthly patterns, but not in January. Lucey and Zhao (2008) compare the January effect in opposition to the Halloween effect, when the returns for the months November-April represent the better part of the yearly return. They study the US markets in the period of 1926-2002, but their results are not conclusive.

Boudreaux (1995) studies seven international markets for the presence of the monthly effect, but only in four of them the phenomenon is found (Germany, Norway, Singapore and Denmark). Floros and Salvador (2014) examine calendar anomalies in spot and future indexes. They find that seasonal patterns differ in cash and future stocks due to the difference in the basis risk.

Marrett and Worthington (2011) examine the Australian market. Their results show significantly higher returns in April, July and December. Agrawal and Tandon (1994) consider eighteen developed countries and several anomalies, including the MOY effect for a period of 24 years. Most countries develop large returns in January and low ones in December.

Less developed markets are not as studied as the developed ones, but several studies have been made on this theme. For example, Ariss et al. (2011) analyze calendar anomalies in the

Gulf Cooperation Council (GCC)area and find a positive December effect. Singh (2014) tests for the day-of-the-week (DOW) and the MOY effect in the BRIC countries (Brazil, Russian Federation, India and China). He does not find evidence of the latter effect in neither country.

Georgantopoulos et al. (2011) investigates the presence of five anomalies, including the MOY effect in the markets from Romania, Bulgaria, Croatia, Turkey and Greece. While the January effect is not present in mean in neither of the countries, it is present in variance in Greece, Croatia and Turkey. Diaconasu et al. (2012) studies the DOW and the MOY effect for the market in Romania, considering two indices. Their results show significant returns in April and July in both indices.

As it can be seen, most papers study the anomaly on more than one market with the intention of providing a more accurate picture of the pattern by comparing the countries. In this way, the differences between them are easier to observe, as the results are obtained using the same analysis period and the same estimation method.

3. Methodology

This paper investigates if the MOY effect can be observed in the analyzed capital markets by trying to identify patterns in the monthly returns of the indices. The classical approach was used, as presented in Ariss et al. (2011).

The first step was to obtain the monthly returns from the daily values of the market indices based on equation (1): $R_t = \frac{P_t}{P_{t-1}} - 1$ (1),where P_t is the closing price from the last trading day of month t and P_{t-1} is the closing price from the last trading day of month $t-1$.

In order to test the MOY effect, the model specified in equation (2) is used for each country: $R_t = \sum_{i=1}^{12} \alpha_i D_{it} + e_t$ (2), where D_i is a series of 12 dummy variables that take the value 1 for a return from month i and 0 otherwise, α_i are the parameters to be estimated and ε_t is an error term. By using 12 dummy variables, the estimated parameters, α_i, represent the mean return obtained in month i. An alternative method would be to use in the equation a constant and eleven dummy variables.

The results were tested for serial correlation using the Ljung-Box statistic (Box and Pierce, 1970) with 12 lags (as the returns are monthly) and for heteroskedasticity with both ARCH LM test (Engle, 1982) and White's test (White, 1980). Then, the residuals were corrected using the Newey-West correction (Newey and West, 1987), if both serial correlation and heteroskedasticity was observed, or the White correction (in case that only the heteroskedasticity was present). Then, for each of the obtained parameters the following hypothesis is tested (Georgantopoulos et al, 2011): $H0 : a_i = 0$, with the alternative $H1 : \alpha_i$ different statistically from 0. If the alternative hypothesis is accepted for either parameter, than the month-of-the-year effect is present on that market, in the respective month.

This methodology was first employed on the whole period of analysis considered, in order to observe the MOY effect. As the financial crisis that started in 2008 is included in the sample, the methodology was employed on two separate sub-samples to determine if the behavior on the market changes. For that, the month with the lowest return was determined and the database was divided in two sub-samples, the first containing the returns from the period prior to that month and the second the returns registered after that month. The analysis was performed only if the sub-samples contained at least 30 observations, in order to maintain the significance of the results.

Further, the results obtained for each sample were compared to determine if the results change from one period to the next. If that is the case, it is a sign that the high decline from that month has an impact on the behavior of the market, changing the trading pattern.

Finally, in certain markets more than one coefficient proved to be statistically significant. In this case, each pair of two significant coefficients was tested to see if they have the same absolute value, but with different signs, using the Wald test. In other words, the tested hypothesis was $H0 : a_i + a_j = 0$ with the alternative $H1 : a_i + a_j \neq 0$. If the null hypothesis is accepted, the

market has the tendency to reverse the first pattern, returning to the original state. Each pair of significant coefficient is tested, even if the null hypothesis was accepted for a previous pair. The reason is to see in which of the pairs it is more likely to observe the reverse of the pattern. The rest of the significant coefficients (for which the null hypothesis is not accepted) signal the presence of a different pattern in the market.

4. Database

The data used in this article consists in the prices of the market indices from 18 countries for the period May 2004-March 2014 obtained from the Thomson Reuters Database. The monthly returns were obtained based on the closing price from the last trading day of the month compared with the closing price from the last trading day from the previous month, as shown in equation (1).

For Bosnia, Montenegro and Slovenia, the Thomson Database did not provide information about the daily quotes of the indices for the whole period and the analysis period was shortened. In other cases (FYR Macedonia, Serbia and Ukraine), the market index was formed after the beginning of the desired period. Thus, for these countries, the beginning of the analysis period represents the month in which the index appeared. Also, in the Russian Federation, two different stock markets are organized. Thus, the paper analyses two indices, representing the two stock markets.The reason behind this decision is to observe if the behavior of the investors is generalized at the country level or the two stock markets determine different patterns. Table 1 presents some information regarding the considered countries and the analysis period[1].

Table 1. Descriptive statistics

Country	Market index		Analysis period		Statistical information				Month	Month
			Begin	End	Min	Max	Average	Median	min return	max return
Bosnia	BIFX	Bs	Mar.06	Mar.14	-24.91%	83.49%	0.49%	-0.62%	Sep.08	May.09
Bulgaria	SOFIX	Bg	May.04	Mar.14	-37.89%	28.83%	0.63%	0.59%	Oct.08	Apr.09
Croatia	CROBEX	Cr	May.04	Mar.14	-26.72%	34.55%	0.66%	0.22%	Oct.08	May.09
Czech Rep	PX	Cz	May.04	Mar.14	-27.13%	18.66%	0.40%	0.89%	Oct.08	Jul.09
Estonia	OMXTGI	Es	May.04	Mar.14	-30.14%	44.82%	1.08%	0.67%	Oct.08	Jan.10
Hungary	BUX	Hu	May.04	Mar.14	-28.42%	18.20%	0.64%	1.25%	Oct.08	Feb.05
Kazakhstan	KASE	Kz	May.04	Mar.14	-36.68%	54.75%	2.16%	1.08%	Jan.09	Mar.06
Latvia	OMXRGI	La	May.04	Mar.14	-23.34%	20.87%	0.37%	0.52%	Sep.08	Aug.09
Lithuania	OMXVGI	Li	May.04	Mar.14	-29.60%	43.44%	0.93%	0.86%	Oct.08	Aug.09
Macedonia	MBI10	Ma	Jan.05	Mar.14	-32.52%	46.21%	1.13%	-1.23%	Oct.08	Mar.05
Montenegro	MONEX20	Mo	Feb.11	Mar.14	-19.51%	8.94%	-0.83%	-0.77%	Nov.11	Dec.11
Poland	WIG20	Po	May.04	Mar.14	-23.42%	18.96%	0.50%	1.00%	Oct.08	Apr.09
Romania	BET-C	Ro	May.04	Mar.14	-32.95%	27.64%	0.87%	1.27%	Oct.08	Jan.05
Russia	IRTS	Rs1	May.04	Mar.14	-28.77%	22.06%	1.09%	2.01%	Oct.08	May.09
Russia	MICEX	Rs2	May.04	Mar.14	-36.18%	30.58%	1.08%	1.99%	Oct.08	May.09
Serbia	Belex15	Sr	Nov.05	Mar.14	-34.26%	34.29%	-0.05%	-0.35%	Oct.08	May.09
Slovakia	SAX	Sk	May.04	Mar.14	-18.54%	33.75%	0.33%	0.27%	Oct.08	Feb.05
Slovenia	SBITOP	Sl	May.06	Mar.14	-16.81%	17.01%	-0.28%	-0.30%	Sep.08	Sep.12
Ukraine	UAX	Ukr	Feb.08	Mar.14	-29.72%	56.06%	-0.24%	0.05%	Sep.08	Apr.09

The reported returns are calculated monthly, based on the closing price from the last trading day of the month compared with the closing price from the last trading day from the previous month.

[1]Descriptive statistics for each of the subsamples used in the analysis are presented in the Appendix, in Table 1A.

5. Results

Most of the results obtained through the OLS regression displayed both serial correlation and heteroskedasticity[2], so they were corrected with the Newey-West method. The samples from Czech Republic, Poland, Romania and Russia (IRTS index) before the abrupt decline of the prices and in the sample from Slovakia after the sharp decline were corrected using the White method.

The results obtained for all 19 indices, for the whole period, are presented in Table 2. Only in three countries(Bosnia, Bulgaria and Estonia) the presence of the MOY effect was not detected. These indices have not registered significant parameters even at a 10% significance level, which means that the efficient market hypothesis (EMH) cannot be rejected. However, the results obtained for these countries if the database is split in two (before the high decline of prices in 2008 and after) show a pattern in the trading from one or both periods. Thus, the previous conclusion about EMH is questionable. It is more likely that trading on these markets has a pattern, but it changes significantly and rapidly enough that, in a long-term analysis, the effects compensate each other.

For most countries, the results show at least one significant parameter, proof of a pattern in the trading on that market. The January effect[3], a particular form of the MOY effect most present in literature, is present only in five countries, namely Croatia, Lithuania, FYR Macedonia, Montenegro and Slovakia. While the first four signal an intuitive January effect, with positive coefficients, the latter provides a particular case by manifesting a negative monthly return. Also, only in Lithuania this effect proves to be the only predictable pattern. The other countries also determine other significant coefficients.

This conclusion is not isolated to the five countries. In most cases the predictable pattern of the returns is not restricted to only one month as the results show two or more significant coefficients for most indices. However, in some countries (Kazakhstan, Lithuania, Poland, Romania and Russia - MICEX), only one coefficient is significant. An interesting observation is the fact that all these coefficients are positive. So, an informed investor on these markets could take advantage of this situation by simply buying at the beginning of the month and selling at the end.

When analyzing the two indices from Russia, the results prove to be similar, but not the same. A general pattern, attributed to the whole country, can be found in the positive February coefficients for both indices. However, the IRTS index also shows a specific pattern through the positive December coefficient.

The results show that for eleven indices the pattern of returns involves more than one month. At least one of these for each country has a positive sign, thus the possibility of creating a successful trading strategy is easier. However, Slovenia creates a more challenging case because both its significant coefficients are negative. Thus, if short selling is not allowed, the possibility to profit from this pattern is reduced.

[2]The results for the Ljung-Box test, ARCH LM test, and White test are available from the author on request.

[3]The January effect is considered to be present if a significant coefficient is observed in this month. Some papers define this effect somewhat differently, by adding an additional condition: the coefficient for January is higher that the ones of the rest of the months. This condition was not considered in this paper.

Table 2. Results for Month-of-the-year effect on the whole period

	1	2	3	4	5	6	7	8	9	10	11	12
Bs	0.005	-0.007	-0.008	0.014	0.099	-0.032	-0.004	-0.018	0.013	0.016	-0.033	0.016
	(0.049)	(0.039)	(0.031)	(0.020)	(0.106)	(0.023)	(0.018)	(0.026)	(0.050)	(0.024)	(0.033)	(0.017)
Bg	0.027	0.031	-0.019	0.016	0.019	-0.015	0.026	0.040	0.008	-0.031	-0.039	0.014
	(0.041)	(0.033)	(0.015)	(0.036)	(0.018)	(0.015)	(0.020)	(0.030)	(0.033)	(0.045)	(0.029)	(0.011)
Cr	0.055*	-0.011	0.015	0.013	0.022	-0.020	0.016**	0.005	0.017	-0.024	-0.038	0.030
	(0.033)	(0.022)	(0.025)	(0.017)	(0.039)	(0.020)	(0.008)	(0.016)	(0.026)	(0.028)	(0.030)	(0.023)
Cz	-0.002	0.000	0.013	0.029	-0.026*	-0.009	0.027	0.016	-0.013	-0.008	-0.002	0.024*
	(0.025)	(0.022)	(0.020)	(0.022)	(0.016)	(0.019)	(0.021)	(0.018)	(0.025)	(0.031)	(0.016)	(0.012)
Es	0.074	-0.005	0.029	0.002	-0.018	-0.001	0.008	0.044	0.004	-0.023	-0.005	0.019
	(0.049)	(0.029)	(0.020)	(0.014)	(0.020)	(0.013)	(0.015)	(0.037)	(0.026)	(0.036)	(0.027)	(0.016)
Hu	0.022	0.001	-0.002	0.041**	-0.007	0.014	0.039**	-0.008	0.004	-0.018	-0.014	0.009
	(0.021)	(0.025)	(0.021)	(0.020)	(0.029)	(0.020)	(0.018)	(0.023)	(0.023)	(0.035)	(0.017)	(0.012)
Kz	0.019	0.069	0.062	0.052	-0.012	-0.018	0.023	-0.011	-0.012	-0.004	0.037	0.056*
	(0.047)	(0.047)	(0.059)	(0.042)	(0.048)	(0.016)	(0.024)	(0.035)	(0.035)	(0.037)	(0.028)	(0.028)
La	0.025	-0.021	-0.016	0.027*	-0.023*	0.031***	0.033***	0.024	-0.006	-0.016	-0.010	-0.001
	(0.025)	(0.018)	(0.019)	(0.016)	(0.013)	(0.011)	(0.011)	(0.025)	(0.028)	(0.012)	(0.026)	(0.020)
Li	0.046***	-0.017	0.012	0.011	-0.001	0.009	0.018	0.051	0.025	-0.026	-0.031	0.016
	(0.027)	(0.022)	(0.015)	(0.021)	(0.014)	(0.011)	(0.011)	(0.044)	(0.039)	(0.035)	(0.032)	(0.013)
Ma	0.051**	0.049	0.046	-0.009	0.036	-0.021	0.028	0.069	-0.001	-0.043	-0.084***	0.004
	(0.023)	(0.046)	(0.053)	(0.035)	(0.048)	(0.021)	(0.028)	(0.042)	(0.041)	(0.041)	(0.029)	(0.027)
Mo	0.018**	-0.002	-0.036**	-0.008	-0.046***	0.003	-0.047***	-0.009	0.033	-0.011	-0.058	0.071***
	(0.008)	(0.033)	(0.017)	(0.005)	(0.006)	(0.019)	(0.007)	(0.021)	(0.032)	(0.034)	(0.068)	(0.018)
Po	-0.016	-0.010	0.024	0.028	-0.015	-0.004	0.041**	-0.013	0.008	0.000	0.005	0.014
	(0.023)	(0.022)	(0.018)	(0.026)	(0.017)	(0.022)	(0.021)	(0.016)	(0.021)	(0.030)	(0.016)	(0.016)
Ro	0.042	0.014	0.008	0.024	-0.023	-0.006	0.043***	-0.005	-0.007	0.004	-0.003	0.015
	(0.052)	(0.023)	(0.037)	(0.032)	(0.025)	(0.022)	(0.016)	(0.018)	(0.028)	(0.041)	(0.019)	(0.017)
	1	2	3	4	5	6	7	8	9	10	11	12
Rs1	0.017	0.033*	0.007	0.026	-0.012	-0.004	0.019	0.006	0.013	0.000	-0.004	0.031*
	(0.027)	(0.019)	(0.022)	(0.028)	(0.036)	(0.021)	(0.023)	(0.023)	(0.037)	(0.035)	(0.026)	(0.016)
Rs2	0.003	0.037*	0.024	0.036	-0.027	0.001	0.019	-0.007	0.018	0.004	-0.003	0.028
	(0.037)	(0.021)	(0.032)	(0.028)	(0.048)	(0.018)	(0.024)	(0.029)	(0.047)	(0.045)	(0.024)	(0.021)
Sr	0.035	0.011	-0.001	0.019	0.019	-0.042***	0.002	0.019	-0.021	-0.048	-0.041	0.036**
	(0.027)	(0.033)	(0.044)	(0.031)	(0.056)	(0.012)	(0.031)	(0.039)	(0.046)	(0.045)	(0.030)	(0.014)
Sk	-0.016*	0.026	0.021**	-0.010	-0.013	-0.008	0.014	0.018*	0.010	-0.022	0.004	0.015
	(0.010)	(0.037)	(0.010)	(0.010)	(0.021)	(0.009)	(0.017)	(0.011)	(0.016)	(0.024)	(0.022)	(0.011)
Sl	0.024	-0.028***	-0.008	0.019	-0.003	0.010	0.007	-0.008	-0.004	-0.001	-0.036**	-0.001
	(0.025)	(0.010)	(0.023)	(0.022)	(0.026)	(0.021)	(0.018)	(0.017)	(0.034)	(0.027)	(0.018)	(0.022)
Ukr	0.026	0.025	-0.006	0.070	-0.015	-0.068***	0.025	-0.080	-0.049	-0.066	0.069**	0.036
	(0.036)	(0.063)	(0.059)	(0.101)	(0.102)	(0.025)	(0.043)	(0.048)	(0.066)	(0.051)	(0.027)	(0.034)

The table presents the estimation results for the month-of-the-year effect for 18 countries in the period 2004-2014. Standard error are reported in parentheses.***, **, * represents significance at 1%, 5% and 10% level, respectively.

It is possible that the severe decline of the stock markets produced by the generalized financial crisis from 2008 has an impact in the method of trading of investors. On one hand, it is possible that the 2008 decrease of prices lead investors to a more prudent strategy, based on a more careful valuation of shares. In this case, the patterns on the markets might disappear. On the other hand, the fear of investors that the prices might keep on dropping and the desire to limit their losses might drive them to make rash and impulsive decisions. In either case, the pattern presented on the market should change, as the behavior of investors changes. To test

if this is the case, the sample was divided in two: before and after the month with the most abrupt decrease of prices. The results obtained are presented in Table 3[4]. For lack of sufficient information, Montenegro and Ukraine were removed from the analysis.

Table 3. Significant coefficients for the before and after the sharp decline periods

Month	Before the abrupt decline												After the abrupt decline											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Bs						-						+									+		-	
Bg			-		+			+																
Cr							+			+			+		+			-						
Cz								+				+					-							
Es												+	+						+					
Hu			-				+																-	
Kz												+	+					-				+		
La					-		+		+									+	+			-		
Li					-							+	+						+					
Ma							+	+			-		+		-	-			-				-	
Po																						+		
Ro		+	-				+			+									+					
Rs1		+											+						+			+		
Rs2		+										+							+			+		
Sr			+				+					+	-					-				+		
Sk		-					+						+	-										
Sl																							-	

The table presents the results for the month-of-the-year effect for 17 indices in the period before and after the abrupt decline in 2008. The abrupt decline was considered the month with the highest decline of prices. "+" means that a positive and statistically significant coefficient was estimated, while "-" depicts a negative one.

It is easily observed that the evolution of all countries changes between the two periods.While in the first sample the January effect is not present in any of the countries analyzed, for the second one, in eight of the 17 indices it is observed. At the same time, the MOY effect in December is highly visible in the first sample, while in the second, it disappears altogether.

The predominant sign of the significant coefficients does not change, most of them are positive both in the first sample and in the second. However, it appears that the semester when the MOY is present changes in most cases. For example, Croatia had positive coefficients in July and October in the first sample. However, in the second, the results are positive for January, March and negative in June. Thus, the first sample has the MOY effect in the second semester, while the other has in the first.

Maybe the most important changes, however, can be observed in Poland, Slovenia and Bulgaria, respectively. The first two countries did not have a MOY effect in the first sample. It appears that the abrupt decline in 2008 has lead to a decrease of their level of efficiency because the results for the second sample show the presence of the MOY effect. Bulgaria's situation is in reverse: while the MOY effect was present initially, it does not appear after the decline from 2008. So, in this case, it appears that the evolution of the market becomes less predictable, improving its efficiency.

While the reason behind the changing patterns is hard to determine, it is clear that the abrupt decline of prices in 2008 has lead to modifications in the behavior of the markets. In some countries, the number of months with a predictable evolution has decreased, a possible sign that investors became more prudent with their investors and trading patterns became uninteresting. For others, the structure of the pattern changed, either by changing signs or by changing the month when the MOY is present. For most, the number of months affected

[4]A more detailed presentation of the results is offered in the Appendix, in Table 2A and Table 3A.

by the MOY effect has increased, which is a sign that the opportunities investors have to gain abnormal returns have increased.

For some indices, more than one coefficient proved to be significant. For these, an additional analysis is performed. Each significant coefficient is paired with the other significant coefficients from that country. Each pair is tested to observe if the coefficients are equal in absolute value, but with different signs. If that is true, it means that on two different months the returns are predictable and more than that, the prices have a similar evolution in value, but inversed in trend (ascending in one month and descending in another). This might be seen as a sign that the market tends to reestablish the equilibrium by creating an inverse pattern. However, for informed investors the creation of the opposite patterns is favorable because they could benefit from both of them by buying and selling the stocks at the opportune moment. The results are depicted in Table 4[5].

Table 4. Results for the Wald test for all three samples:
total period, period before the decline, period after the decline

	before		after		total			before		after		total	
	Coef.	p-value	Coef.	p-value	Coef.	p-value		Coef.	p-value	Coef.	p-value	Coef.	p-value
Bs	c6,c12	46.84%	c9,c11	50.56%			Bg	c3,c5	53.50%				
Cr			c1,c6	94.81%				c3,c8	44.18%				
			c3,c6	31.22%			Cz					c5,c12	91.59%
Hu	c3,c7	53.95%					Kz			c1,c6	97.84%		
La	c5,c7	67.12%	c6,c10	55.38%	c4,c5	80.96%				c6,c10	37.61%		
	c5,c9	74.63%	c7,c10	60.01%	c5,c6	68.61%	Li	c5,c12	46.52%				
					c5,c7	57.26%	Mo					c1,c3	30.55%
Ma	c7,c11	65.83%	c1,c3	49.79%	c1,c11	42.99%						c1,c5	1.01%
	c8,c11	65.83%	c1,c4	33.89%								c1,c7	1.12%
			c1,c7	54.67%								c3,c12	17.24%
			c1,c11	81.44%								c5,c12	19.10%
Ro	c2,c3	29.82%										c7,c12	21.34%
Sr					c6,c12	5.09%	Sk					c1,c3	74.52%
Sl	c2,c7	67.39%	c1,c2	90.48%								c1,c8	91.70%
	c2,c10	85.92%	c1,c11	46.71%			Ukr					c6,c11	97.41%

The table shows the probability that each pair of two coefficients follow the hypothesis: $c_i+c_j=0$, where ci and cj are the ones mentioned in the column "Coef.". c_i represents the coefficient of dummy i, with i from 1 to 12.

In some cases, the tested hypothesis cannot be rejected. For example, in Croatia and Kazakhstan, the coefficients for January and June are equal in absolute value, but have different signs, thus the market tries to regain the equilibrium lost in January, by creating an inverse pattern in June. However, in both these countries, other coefficients have proved to be significant (March in Croatia and October in Kazakhstan).

In other countries, the only two coefficients that proved to be significant are equal in absolute value, but with different signs. In the Czech Republic, the market tries to balance the negative return from May with a positive one in December. However, the relatively high number of month between the two patterns creates a better possibility for informed investors to take advantage of the situation. In Ukraine, the evolution of the market is similar, the negative coefficients from June being balanced with a positive one in November.

6. Conclusions

This paper analyses the presence of the month-of-the-year effect in 18 countries from Eastern Europe. This anomaly is studied most often in the form of the January effect because it is

[5]Table 4 shows only the results obtained by testing pairs of coefficients with different signs. The results of the Wald test employed on pairs of coefficients with the same sign are available from the author on request.

believed that the end of the fiscal year (which is in most countries in December) may lead to predictable transactions from investors in order to reduce their taxes.

The results obtained show that, as a general rule, the January effect is not present on these markets. However, the MOY effect appears in other months, either through a positive or negative coefficient. In some case, the effect is not present on a long-term analysis, suggesting a less predictable market, like in Bulgaria or Estonia. However, the analysis performed for a shorter period of time shows the presence of the MOY effect, but with a changing structure. Thus, the effect counter each other on the long run.

The major decline of prices from 2008 appears to have changed the behavior of the market in all countries, based on the examined patterns. Moreover, the market tries in some cases to restore the equilibrium these patterns disrupt by creating opposite patterns. However, informed investors can still benefit from the predictable evolution by trading at the opportune moments.

As further directions of research, it might be interesting to observe why in some countries the level of market efficiency appears to have declined after the abrupt decrease of the market (the MOY effect has become apparent), while in others the same event has caused the disappearance of the MOY effect.

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Appendix

Table 1A. Descriptive statistics

Country	Index	The period after the abrupt decline of prices					The period before the abrupt decline of prices				
		Min	Max	Avg	Med	St.dev.	Min	Max	Avg	Med	St.dev.
Bosnia	BIFX	-20.45%	83.49%	0.43%	-0.55%	11.67%	-20.99%	31.26%	1.48%	-0.59%	12.09%
Bulgaria	SOFIX	-26.19%	28.83%	0.64%	-0.20%	8.27%	-22.91%	26.96%	1.35%	1.92%	8.60%
Croatia	CROBEX	-26.67%	34.55%	-0.05%	-0.47%	7.68%	-14.42%	22.84%	2.05%	2.07%	7.50%
Czech Rep	PX	-17.22%	18.66%	0.41%	0.07%	6.33%	-18.50%	10.86%	0.91%	1.72%	5.83%
Estonia	OMXTGI	-17.66%	44.82%	1.73%	1.12%	9.05%	-14.76%	16.42%	0.86%	0.59%	7.05%
Hungary	BUX	-14.60%	16.26%	0.63%	0.61%	6.78%	-12.78%	18.20%	1.21%	2.18%	6.32%
Kazakhstan	KASE	-19.24%	31.65%	1.25%	0.67%	9.29%	-31.86%	54.75%	3.86%	2.25%	13.56%
Latvia	OMXRGI	-15.72%	20.87%	0.32%	0.07%	6.52%	-14.01%	10.67%	0.90%	0.94%	5.07%
Lithuania	OMXVGI	-16.98%	43.44%	1.37%	0.97%	8.07%	-24.40%	19.23%	0.98%	0.32%	7.40%
Macedonia	MBI10	-21.59%	39.80%	-0.52%	-1.53%	8.51%	-18.45%	46.21%	4.25%	0.68%	14.09%
Poland	WIG20	-13.95%	18.96%	0.65%	0.21%	6.20%	-14.58%	11.46%	0.77%	1.64%	6.17%
Romania	BET-C	-23.59%	25.69%	0.91%	0.80%	7.94%	-22.47%	27.64%	1.47%	1.50%	9.25%
Russia	IRTS	-16.48%	22.06%	1.20%	1.41%	6.92%	-23.82%	15.87%	1.53%	2.59%	8.68%
	MICEX	-22.05%	30.58%	1.18%	0.96%	9.81%	-26.38%	16.91%	1.66%	3.34%	9.08%
Serbia	Belex15	-21.65%	34.29%	0.14%	-0.35%	8.89%	-26.62%	30.74%	0.57%	-0.05%	11.17%
Slovakia	SAX	-12.41%	10.50%	-0.74%	-0.49%	4.12%	-9.36%	33.75%	2.00%	0.67%	6.57%
Slovenia	SBITOP	-16.79%	17.01%	-0.82%	-0.77%	5.57%	-14.34%	14.83%	1.60%	2.23%	6.77%

The reported returns are calculated monthly, based on the closing price from the last trading day of the month compared with the closing price from the last trading day from the previous month.The abrupt decline was considered the month with the highest decline of prices.

Table 2A. Results for MOY effect for the period before the abrupt decline												
	1	2	3	4	5	6	7	8	9	10	11	12
Bs	0.089	0.077	-0.018	-0.006	-0.005	-0.082**	0.019	-0.002	0.093	0.027	0.021	0.056***
	(0.204)	(0.106)	(0.108)	(0.023)	(0.049)	(0.036)	(0.042)	(0.049)	(0.142)	(0.106)	(0.136)	(0.001)
Bg	0.020	0.068	-0.056**	-0.036	0.039*	-0.011	0.030	0.035**	0.015	0.049	-0.012	0.011
	(0.077)	(0.067)	(0.026)	(0.026)	(0.022)	(0.029)	(0.040)	(0.008)	(0.066)	(0.045)	(0.029)	(0.015)
Cr	0.076	0.015	0.010	0.020	0.012	0.002	0.034***	0.014	0.024	0.021*	0.003	0.019
	(0.081)	(0.029)	(0.065)	(0.026)	(0.023)	(0.032)	(0.008)	(0.027)	(0.047)	(0.011)	(0.039)	(0.035)
Cz	-0.008	0.034	0.000	0.011	-0.014	-0.001	0.005	0.023*	-0.004	0.026	0.019	0.026***
	(0.055)	(0.024)	(0.017)	(0.020)	(0.028)	(0.031)	(0.015)	(0.013)	(0.048)	(0.025)	(0.036)	(0.008)
Es	0.010	0.017	0.038	-0.016	-0.020	0.018	-0.017	0.022	-0.001	0.000	0.015	0.048*
	(0.064)	(0.062)	(0.037)	(0.015)	(0.015)	(0.017)	(0.026)	(0.024)	(0.041)	(0.035)	(0.049)	(0.026)
Hu	-0.003	0.050	-0.038*	0.035	-0.005	0.025	0.055***	-0.011	0.004	-0.017	0.017	0.031
	(0.040)	(0.046)	(0.020)	(0.027)	(0.032)	(0.036)	(0.020)	(0.023)	(0.030)	(0.034)	(0.028)	(0.021)
Kz	0.069	0.115	0.163	0.066	-0.005	0.021	0.017	-0.005	-0.050	-0.043	0.066	0.100**
	(0.047)	(0.102)	(0.130)	(0.050)	(0.052)	(0.013)	(0.046)	(0.048)	(0.061)	(0.071)	(0.047)	(0.048)
La	0.007	-0.032	-0.002	0.022	-0.034*	0.020	0.025*	0.008	0.043**	0.004	0.020	0.031
	(0.027)	(0.031)	(0.029)	(0.015)	(0.020)	(0.016)	(0.013)	(0.014)	(0.021)	(0.014)	(0.054)	(0.025)
Li	0.006	0.002	0.015	0.013	-0.028***	0.013	0.006	0.019	0.025	-0.003	0.006	0.047*
	(0.048)	(0.040)	(0.033)	(0.047)	(0.010)	(0.024)	(0.018)	(0.015)	(0.073)	(0.029)	(0.053)	(0.024)
Ma	0.042	0.131	0.163	0.011	-0.008	-0.025	0.110***	0.151*	-0.001	-0.049	-0.115***	0.035
	(0.042)	(0.095)	(0.114)	(0.084)	(0.029)	(0.050)	(0.028)	(0.075)	(0.075)	(0.032)	(0.036)	(0.055)
Po	-0.017	0.011	0.017	0.011	-0.023	0.008	0.041	-0.021	0.014	0.017	0.010	0.028
	(0.048)	(0.036)	(0.026)	(0.038)	(0.027)	(0.031)	(0.026)	(0.022)	(0.032)	(0.032)	(0.034)	(0.020)
Ro	0.087	0.035*	-0.075**	0.011	0.012	0.003	0.049*	-0.024	-0.017	0.074*	0.003	0.032
	(0.109)	(0.018)	(0.034)	(0.027)	(0.027)	(0.046)	(0.027)	(0.018)	(0.054)	(0.040)	(0.040)	(0.026)
Rs1	0.003	0.071**	-0.017	0.040	-0.018	0.014	-0.007	0.026	0.001	0.022	0.024	0.038
	(0.067)	(0.028)	(0.017)	(0.035)	(0.051)	(0.029)	(0.044)	(0.041)	(0.070)	(0.026)	(0.049)	(0.027)
Rs2	0.000	0.080***	-0.010	0.048	-0.023	0.015	-0.006	0.013	-0.002	0.023	0.039	0.044*
	(0.069)	(0.025)	(0.022)	(0.036)	(0.051)	(0.023)	(0.046)	(0.053)	(0.074)	(0.032)	(0.039)	(0.025)
Sr	0.033	0.048	0.049	0.022	-0.012	-0.025	0.008	-0.008	-0.062	-0.036	-0.019	0.057**
	(0.075)	(0.042)	(0.142)	(0.067)	(0.067)	(0.015)	(0.092)	(0.049)	(0.108)	(0.062)	(0.048)	(0.022)
Sk	0.004	0.074	0.023*	-0.013	-0.001	-0.002	0.033*	0.019	0.029	0.032	0.018	0.028
	(0.003)	(0.087)	(0.012)	(0.018)	(0.033)	(0.013)	(0.017)	(0.016)	(0.031)	(0.027)	(0.052)	(0.020)
Sl	0.026	-0.036**	-0.044	0.049	0.029	0.027	0.049*	0.014	0.008	0.026	-0.018	0.035***
	(0.115)	(0.012)	(0.093)	(0.064)	(0.022)	(0.058)	(0.028)	(0.043)	(0.026)	(0.051)	(0.024)	(0.002)

The reported returns are calculated monthly, based on the closing price from the last trading day of the month compared with the closing price from the last trading day from the previous month.The abrupt decline was considered the month with the highest decline of prices.

Table 3A. Results for MOY effect for the period after the abrupt decline												
	1	2	3	4	5	6	7	8	9	10	11	12
Bs	-0.024	-0.035	-0.003	0.025	0.162	-0.003	-0.018	-0.028	0.034*	0.013	-0.050***	0.003
	(0.021)	(0.036)	(0.013)	(0.030)	(0.167)	(0.024)	(0.018)	(0.034)	(0.018)	(0.012)	(0.017)	(0.020)
Bg	0.032	0.007	0.006	0.057	0.000	-0.019	0.022	0.045	0.001	-0.026	-0.057	0.016
	(0.053)	(0.034)	(0.010)	(0.058)	(0.029)	(0.016)	(0.015)	(0.062)	(0.023)	(0.018)	(0.045)	(0.018)
Cr	0.041*	-0.028	0.019*	0.007	0.033	-0.043*	-0.001	-0.003	0.009	-0.011	-0.066	0.037
	(0.023)	(0.032)	(0.010)	(0.024)	(0.079)	(0.022)	(0.008)	(0.021)	(0.030)	(0.009)	(0.042)	(0.032)
Cz	0.003	-0.023	0.022	0.043	-0.039**	-0.017	0.049	0.010	-0.021	0.017	-0.015	0.023
	(0.024)	(0.032)	(0.033)	(0.036)	(0.016)	(0.025)	(0.039)	(0.035)	(0.022)	(0.013)	(0.013)	(0.021)
Es	0.117*	-0.020	0.023	0.017	-0.016	-0.019	0.032***	0.065	0.010	0.014	-0.018	0.000
	(0.068)	(0.030)	(0.025)	(0.022)	(0.039)	(0.016)	(0.010)	(0.074)	(0.038)	(0.024)	(0.033)	(0.019)
Hu	0.039	-0.032	0.021	0.047	-0.009	0.003	0.023	-0.005	0.003	0.034	-0.034*	-0.006
	(0.024)	(0.021)	(0.031)	(0.031)	(0.052)	(0.022)	(0.031)	(0.042)	(0.037)	(0.021)	(0.019)	(0.012)
Kz	0.056***	0.038	-0.006	0.042	-0.019	-0.057***	0.030	-0.017	0.025	0.035*	0.009	0.012
	(0.012)	(0.042)	(0.032)	(0.069)	(0.087)	(0.014)	(0.025)	(0.056)	(0.033)	(0.020)	(0.031)	(0.019)
La	0.037	-0.013	-0.025	0.031	-0.012***	0.042**	0.041	0.040	0.000	-0.029*	-0.031	-0.022
	(0.038)	(0.025)	(0.027)	(0.027)	(0.017)	(0.015)	(0.019)	(0.049)	(0.015)	(0.016)	(0.027)	(0.028)
Li	0.072**	-0.030	0.009	0.009	0.026	0.004	0.029**	0.084	0.025	0.010	-0.055	-0.004
	(0.029)	(0.027)	(0.015)	(0.014)	(0.020)	(0.005)	(0.012)	(0.088)	(0.041)	(0.029)	(0.040)	(0.009)
Ma	0.056*	-0.006	-0.033***	-0.025**	0.071	-0.017	-0.037***	0.003	-0.002	0.017	-0.069*	-0.012
	(0.030)	(0.036)	(0.009)	(0.009)	(0.084)	(0.012)	(0.004)	(0.022)	(0.051)	(0.030)	(0.041)	(0.031)
Po	-0.015	-0.023	0.028	0.041	-0.008	-0.016	0.041	-0.005	0.003	0.034*	0.001	0.004
	(0.026)	(0.028)	(0.025)	(0.038)	(0.023)	(0.033)	(0.035)	(0.026)	(0.031)	(0.018)	(0.016)	(0.024)
Ro	0.011	0.000	0.064	0.034	-0.058	-0.015	0.038*	0.015	0.004	0.014	-0.007	0.003
	(0.053)	(0.037)	(0.045)	(0.055)	(0.038)	(0.013)	(0.021)	(0.030)	(0.028)	(0.011)	(0.019)	(0.023)
Rs1	0.027*	0.008	0.022	0.015	-0.007	-0.021	0.044***	-0.015	0.026	0.040**	-0.022	0.026
	(0.016)	(0.021)	(0.036)	(0.044)	(0.058)	(0.032)	(0.013)	(0.022)	(0.037)	(0.019)	(0.030)	(0.021)
Rs2	0.005	0.008	0.047	0.027	-0.031	-0.014	0.043***	-0.027	0.038	0.061**	-0.031	0.018
	(0.045)	(0.025)	(0.052)	(0.045)	(0.088)	(0.030)	(0.015)	(0.030)	(0.065)	(0.031)	(0.026)	(0.032)
Sr	0.036	-0.008	-0.026	0.018	0.037	-0.051***	-0.002	0.035	0.004	0.005	-0.051	0.026
	(0.026)	(0.045)	(0.016)	(0.038)	(0.085)	(0.016)	(0.014)	(0.058)	(0.046)	(0.012)	(0.041)	(0.018)
Sk	-0.030**	-0.006	0.019	-0.007	-0.025	-0.014	-0.005	0.017	-0.009	-0.034**	-0.006	0.007
	(0.014)	(0.024)	(0.016)	(0.013)	(0.028)	(0.014)	(0.028)	(0.016)	(0.009)	(0.017)	(0.015)	(0.012)
Sl	0.023*	-0.026*	0.003	0.007	-0.023	-0.001	-0.018	-0.020	0.023	-0.010	-0.042*	-0.013
	(0.013)	(0.014)	(0.016)	(0.021)	(0.038)	(0.016)	(0.017)	(0.015)	(0.041)	(0.033)	(0.023)	(0.028)

The table presents the estimation results for the month-of-the-year effect for 16 countries in the period after the abrupt decline in 2008. Standard error are reported in parentheses.***, **, * represents significance at 1%, 5% and 10% level, respectively.