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The Day-of-the-Week Effect: Evidence from Selected Balkan Markets

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Abstract

The main aim of this paper is to investigate the existence of the "day of the week" financial effect in select Balkans stock markets indices. Many findings of market anomalies have corroborated the presence of the "day of the week" effect in developed markets; however, so far scarce research has been presented on this subject for the Balkan capital markets. Hence, an additional objective of this paper is to examine the impact of this market anomaly on the market efficiency hypothesis. The methodology used in this paper employs a regression including dummy variables which will help determine the existence of the effect. The authors use daily mean returns of selected stock indices found to be lower at the beginning of the week but not necessarily on Monday. The results are interpreted and expounded taking into consideration the history and market development. The paper provides academia and investors as well as policy makers new perspective of the market anomalies linked to the financial behavior of the capital markets in select Balkan countries.

Keywords: stock market anomalies; day of the week effect; efficient market hypothesis; financial markets of Balkans.

JEL classification: C32; G02; G10.

1. INTRODUCTION

For more than forty years the efficient market theory and the random walk hypothesis have been the backbone of modern finance. Since the introduction of Eugene Fama's theory in 1965 and its subsequent review (Fama, 1970) doubts and critiques were directed towards these theories among both academics and investors. One of the most prominent anomalies in finance that calls into question the efficient market theory as well as the random walk hypothesis is the seasonal anomaly, or sometimes referred to as the calendar effect. This anomaly is manifested through a characteristic pattern of the stock price and stock indices on different day of the week or different month in the year. The characteristic pattern of stock or stock indices price movements indicates inconsistency of the efficient market theory and random walk hypothesis, and enables the vigilant investor to exploit this

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systemic mistake. The strongest seasonal anomaly is Monday effect or the day-of-the-week effect, also known as the weekend effect. The day-of-the-week effect is an irregularity in the stock market and usually emerges as consistently lower or higher day-return over a prolonged period, relative to the other days of the week.

Investors and investment professionals who invest in financial markets, consider a range of factors in their decision making process before making their final choice on how and where to allocate their funds. The factors that influence the decision are risk exposure and the potential reward, as opposed to exposure. The volatility of the daily returns influences both of these factors. If investors were aware and knowledgeable of the characteristic pattern movements in the return in volatility they could partially or entirely predict the volatility and optimize the investment decision i.e. develop a profitable trading strategy. In the baseline this trading strategy could consist of a simple pattern to buy stocks on days with characteristic low return movement pattern of and sell stocks on days with characteristic high return movement pattern. In the long term when using this strategy however, this effect should disappear as more investors are drawn to this strategy, thus eliminating this effect through sheer information efficiency.

The day-of-the-week effect is well known and documented in finance literature. The distinguishing traits of this anomaly are negative daily returns or lowest daily returns on Mondays. At the same time, numerous studies documented Friday as the best day for a selling option because it consistently demonstrated the highest stock returns of all weekdays. Incidentally, Sullivan *et al.* (1998) shed new light on this topic, by observing that the effect could easily be the result of data mining connected to data snooping. Their findings correspond to the US market data. The latest articles that investigated this calendar effect discovered the "Tuesday effect", that is, a negative stock market return on Tuesdays. It is interesting to note that in both developed and emerging markets this persistent anomaly has been well documented by many authors through various research papers and manuscripts.

Therefore, the aim of this article is to investigate the day-of-the-week effect of selected indices of Balkan markets. For this study, the following six countries and their respective indices have been chosen for the analysis: Slovenia – SBITOP, Croatia – CROBEX, Bosnia and Herzegovina – SASX-10, Greece – ATGI, Bulgaria – BSE-SOFIX and Romania – BET-XT. The period under examination includes the most recent five years, from 2012 to 2016.

The paper is structured as follows: Section 2 provides an overview of the existing literature on the topic. Section 3 treats the issue of research data and use of methodology. Section 4 reports the empirical findings, while Section 5 concludes.

2. LITERATURE REVIEW

There is extensive literature on the day-of-the-week effect being detected both in developed and emerging markets across the world. An abundance of studies and empirical evidence on the presence of the day-of-the-week effect in the US equity markets can be found in finance literature. One of the first persons who noticed the effect was Kelly (1930). In his famous volume, "Why you win or lose: The psychology of speculation", Monday was identified as the day when the stock returns in the US markets were negative.

From a scientific point of view, however, a starting point of the day-of-the-week effect was an article written by French (1980) in which he showed that the average return of the S&P 500 index was negative on Monday. Afterwards, Gibbons and Hess (1981) investigated his assertion and confirmed that Monday daily returns were unusually negative

for 30 individual stocks of the Dow Jones Industrial Index. Afterwards, Keim and Stambaugh (1984) further investigated the effect and expanded the period under examination from 1908 up to 1928. Moreover, this effect was explored in other markets as well. Rogalski (1984) was the first author who applied OLS regression model and confirmed the existence of consistently negative daily returns on Monday, a finding which was not statistically significant. Chang *et al.* (1993) confirmed the effect but this time it showed statistical significance.

Jaffe and Westerfield (1985) analyzed the effect in the stock markets in the UK, Canada, Australia and Japan, discovering that Monday returns are significantly negative, as opposed to Friday returns, which are significantly positive. They also revealed the presence of the „Tuesday effect" present in the Japanese and Australian markets. Solnik and Bousquet (1990) examined the Paris stock exchange and found evidence of a day-of-the-week effect, also noting the appearance of the „Tuesday effect", i.e. negative mean return on Tuesday. Chang *et al.* (1993) conducted a comprehensive study of 23 markets which included the following: European indices (13 markets), North America indices (2 market), Pacific basin indices (5 markets), Other indices (2 markets). The findings were that in US market, Belgium, Germany, Denmark the effect was insignificant, but at other European countries was present and statistically significant.

Agrawal and Tandon (1994) investigated five seasonal effects in 18 counties. They discovered a daily seasonal effect in nearly all of the countries under investigation, and a day-of-the-week effect only in half of the examined countries. The study of Barone (1990) confirmed negative daily return on Mondays, but it was especially high and noticeable on Tuesdays. Dubois and Louvet (1996) carried out extensive research on this topic, covering 11 indices from 9 countries during the 1969-1992 period. Their findings were phrased as follows: "negative returns on Monday, which are compensated by abnormal positive returns on Wednesday, with the exception of Japan and Australia. These markets exhibit a significant negative effect on Tuesday over the whole sample period …". Moreover, the same authors came to the conclusion that the effect started disappearing during the latest period in the United Sates, as opposed to the European, Hong-Kong and Toronto markets where it is still strong.

Later studies have demonstrated that the calendar effect is not as reliable as previous analyses have indicated. Sullivan *et al.* (1998, p. 249) in their study used a new bootstrap which helped them conclude that when data is evaluated in context of full universe from which such rules were drawn, the calendar effects are not significant. Schwert (2003) noticed that the day-of-the-week effect had lost its predictive power after the manuscripts on the topic were published. In addition, in his paper he stated and agreed with Rubinstein (2001)'s stance that Monday effect is not large enough to support a profitable trading strategy as it is questionable how often the acknowledgment of this anomaly was used by investors in their investment strategy.

A wide range of studies have analyzed the calendar effects in emerging markets. For the purpose of this paper only a number of studies will be reviewed. Mangala and Lohia (2013) investigated the monthly effect for a 15 year period (1997-2012) for indices of nine emerging countries: Argentina, Brazil, China, India, Indonesia, Malaysia, Mexico, Russia and Taiwan. They discovered positive stock index returns for December and January while negative for August and September. Omar *et al.* (2013) analyzed the day-of-the-week effect in Saudi Arabia market and detected a pattern of lower volatility on Saturdays and Sundays, with the highest volatility occurring on Wednesdays. Al-Jafari (2012) examined Muscat

market in Omar *et al.* (2013). Namini *et al.* (2013) examined the interaction between the month and the day-of-the-week effect in Tehran stock exchange. The effect was also found in the Kuwait stock exchange (Gharaibeh Obeid and Swailem Al Azmi, 2015). Liu and Kamath (2011) studied the Santiago stock exchange and discovered persistent presence of the day-of-the-week effect in the Chilean market. Al-Khazali (2008) investigated the effect in the markets of the United Arab Emirates and found out that day-of-the-week effect in the UAE equity markets is not present.

As far as Central and Eastern European stock markets are concerned, one of the earliest empirical analyses conducted by Ajayi *et al.* (2004) could provide "no consistent evidence to support the presence of any significant daily patterns in the stock market returns". A decade later, another wide-ranging study of eighteen post-Communist Eastern European countries conducted by Oprea and Tilica (2014) again detected the day-of-the-week effect in some countries, but not in others, even after incorporating market risk into the analysis. Similarly, when examining Poland, Hungary, and the Czech Republic through subperiod analysis, Stavarek and Heryan (2012) find that "the analysed stock markets seem to be mostly immune" to the day of the week effect.

Stoica and Diaconasu (2011) however, isolate a number of instances of the day-of-the-week and month-of-the-year effect across nine CEE countries while suggesting that findings greatly differ when regression is applied to sub-periods or when EU accession dates are taken into consideration. In similar vein, a later, more detailed analysis of calendar anomalies solely for the Romanian equity market (Diaconasu *et al.*, 2012) demonstrates the existence of a Thursday effect, but no month-of-the-year effect, unless subsample analysis including various criteria was again employed. Tonchev and Kim (2004) looked for five different calendar effects in Slovenia, Slovakia, and the Czech Republic but only found weak evidence of their existence. Moreover, the utilization of different models can greatly influence the obtained findings, as the study conducted by Guidi *et al.* (2011) suggests. These authors tested the weak form of the Efficient Market Hypothesis and found different patterns of daily anomalies depending on the used methodology. A recent study by Okicic (2014) also finds EMH weak-form inefficiency in 12 CEE countries, but mainly cautioned against the leverage effect, which in the case of negative shocks, exacerbates volatility of stock returns. Finally, empirical tests conducted by Dodd and Gakhovich (2011) confirm the presence of the holiday effect in 14 CEE countries and corroborate the claim that such market inefficiences could be exploited.

Although there is extensive written literature on the day-of-the-week effect in emerging countries, only a limited number of manuscripts treat this effect in select Balkan markets. To the best of the authors' knowledge, the papers that investigate this effect on the Balkans focus on Greece (Georgantopoulos *et al.*, 2011; Georgantopoulos and Tsamis, 2014), the former Yugoslav Republic of Macedonia (Tevdovski *et al.*, 2012), and Romania (Panait *et al.*, 2013). The Istanbul Stock Exchange has also been subject to analysis by Cinko and Avci (2009) who observed a significant negative Monday, while positive Thursday and Friday returns. An earlier study by Alexakis and Xanthakis (1995) discovered a Monday effect in the Athens Stock Exchange, followed by research conducted by Floros (2008) who demonstrated the absence of the January effect, but could nevertheless isolate an effect during the first fortnight of the month. The calendar effect was explored in further detail in the Greek stock market by Kenourgios *et al.* (2005) who assert to have observed the day-of-the-week effect which over time „loses its strength and significance … which might be due to the Greek entry to the Euro-Zone and the market upgrade to the developed". As with studies in other geographical

regions, mixed or weak evidence often renders results inconclusive. Interestingly, Siriopoulos and Giannopoulos (2006) identified the so-called Halloween effect in Greece, but conceded that it disappears after adjustments for the impact of outliers.

3. DATA AND METHODOLOGY

For the purpose of this paper, six select Balkan stock markets were examined: SASX-10 in Bosnia and Herzegovina, BSE-SOFIX in Bulgaria, CROBEX in Croatia, ATGI in Greece, SBITOP in Slovenia, and BET-XT in Romania. The data used for analysis is comprised of daily closing prices in all observed markets. All of the markets under examination are open from Monday to Friday, however, some of them have previously demonstrated liquidity issues. Guided by this fact, the authors have chosen indices that disentangle this hindrance. Sarajevo Stock Exchange 10 is the core index of the Bosnian market. It is comprised of the ten highest ranked company stocks by market capitalization and frequency of trading. SOFIX is the main index on Bulgarian Stock Exchange and it's based on market capitalization and minimum liquidity criteria. The main index of the Zagreb Stock Exchange is CROBEX, which consists of 25 shares. The selection criteria for listing are that stocks exhibit more that 80% trading days. The Athens Stock Exchange General Index (ATG i.e. ASE) is the oldest of all observed indices as it dates from 1980. It is a capitalization-weighted index of Greek stocks listed on the Athens Stock Exchange. This index has not experienced any problems with liquidity. SBITOP is a blue chip index and consists of the most liquid shares in the Ljubljana Stock Exchange. The Bucharest Exchange Trading Index (BET) is capitalization-weighted index and is comprised of the 10 most liquid stock listed.

The data covers the period of the most recent five years, from January 1, 2012 to December 31, 2016. The main reason for not using longer data period is to avoid a possible influence of the Global financial crisis on the markets. The data of daily closing prices were obtained from the web site investing.com. The daily closing price were used to calculate daily returns i.e. change by following formulas:

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

The daily returns (R_t) were computed as the natural logarithmic first difference of the daily closing price P_t over daily closing price with one lag P_{t-1}.

The augmented Dickey–Fuller (ADF) statistic was applied for determination and acceptance of the hypothesis that all observed data series are stationary (The results are not specified in this paper but they are available on request). The intercept and linear trend coefficients for all data are different from zero. Therefore, all datasets are stationary. The methodology for this analysis was first introduced by French (1980) and then additionally developed and applied by Rogalski (1984), Jaffe and Westerfield (1985), Agrawal and Tandon (1994) and others. The main characteristic of these analyses is dummy variable technique. Dummy variable are often used in OLS analysis to distinguish different outcomes of the observed data. It is artificial variable with the value of 0 or 1. In order to analyze the presence of day-of-the-week effect the following regression model with dummy variables was applied:

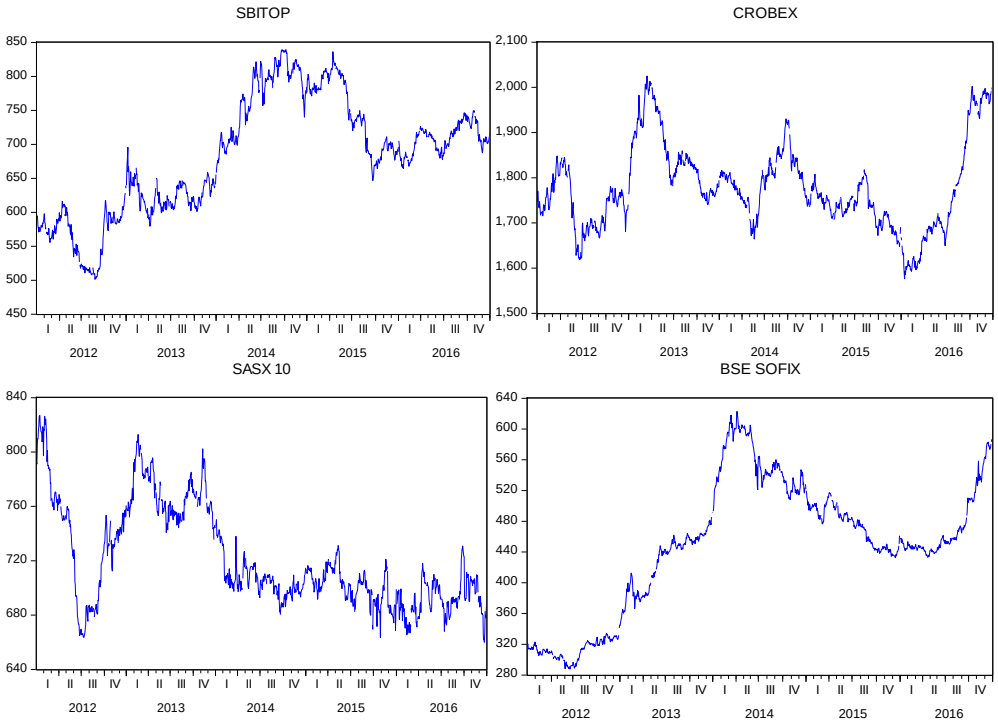
$$R_t = \beta_1 + \beta_2 Tu_t + \beta_3 We_t + \beta_4 Th_t + \beta_4 Fr_t + \varepsilon_t \quad (2)$$

Where R_t is return on day *t*, calculated with the formula (1). The intercept β_1 is the mean return for Monday. The coefficients β_2, β_3, β_4, β_5 measure the differences between the average return on Monday and other days in the week. The coefficients of β_1 variable represents Monday and is coded with number 1 for that day; for the rest it's coded with number 0. The dummy variable Tu_t takes value 1 for Tuesdays in the data series and 0 for all other days in the week. Consequently, dummy variable We_t represents Wednesdays, Th_t Tuesdays and Fr_t Fridays, respectively, and the coding was connected to the day of the week that it represents. Normally distributed error term was noted with ε_t and assumed to be identically and independently distributed.

Georgantopoulos *et al.* have stated that "If there are no differences among index returns across days of the week, the parameters of β_1 to β_5 are zero. Therefore, the null hypothesis of the relevant Wald test is the following: H_0 : i = 0 for i = 2,…,5. If the null hypothesis is rejected, then stock returns should exhibit some form of the day of the week seasonality" (2011, p. 70).

4. EMPIRICAL RESULTS ON BALKAN MARKETS DAY-OF-THE-WEEK EFFECT

To avoid the non-stationarity, the time series of the daily returns were log-transformed. The following figures (see Figure no. 1) show the closing price movements of market indices for the observed period.



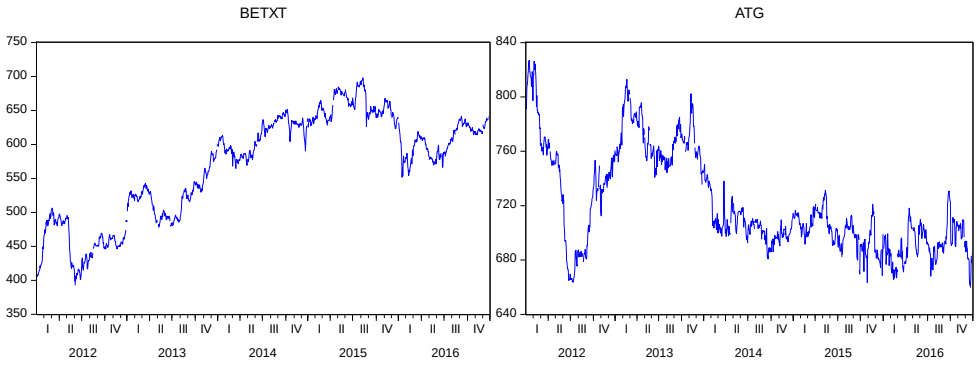


Figure no. 1 – Graphical plots of daily closing price indices

Table no. 1 reports the descriptive statistics for the sample of the six selected indices of Balkan markets. All observed market indices have positive mean characteristic of bull market except ATG and SBITOP. These two markets have negative mean characteristic of bear market in the observed period. The highest minimum of daily returns has BETXT -6,432 while lowest have CROBEX -2,961. The highest maximum of daily returns has BSE SOFIX 5,638 and lowest have BETXT 3,120. Except ATG and SASX 10 all other indices have positive mean while standard deviation of selected markets indices is between 0,928 for SBITOP and 0,545 CROBEX. All indices have long tail in the negative direction as is also suggested by the negative results for skewness. Kurtosis is highly positive for all indices and indicates that datasets have heavier tails than a normal distribution. The Jarque-Bera results test for all observed indices indicated rejection for the unconditional normal distribution of daily returns at 1%.

Table no. 1 – Summary statistics of daily returns in % of selected Balkan market indices

Index	Observation	Mean	Max	Min	SD	Skewness	Kurtosis	Jarque-Bera
ATG	1246	-0.011	4.375	-4.224	0.742	-0.212	8.292	1463.343 (0.000000)*
BETXT	1256	0.036	3.120	-6.432	0.833	-0.805	9.639	2442.702 (0.000000)*
BSE SOFIX	1236	0.050	5.638	-4.737	0.818	-0.080	8.762	1710.952 (0.000000)*
CROBEX	1245	0.011	3.389	-2.961	0.545	-0.004	5.703	379.0904 (0.000000)*
SASX 10	1246	-0.011	4.375	-4.224	0.742	-0.212	8.292	1463.343 (0.000000)*
SBITOP	1244	0.015	3.420	-5.314	0.928	-0.336	5.630	381.7908 (0.000000*

**Probability value*

Table no. 2 shows results of equation (2) for day-of-the-week effect in selected Balkan markets. Using the Wald test, the null hypothesis was rejected/accepted for dummy variables.

Table no. 2 – The day-of-the-week effect of selected Balkan market indices

Index/country	β_1	β_2	β_3	β_4	β_5	Wald test
ATG	-0,0467	0,0081	0,0306	0,0563	0,0837	0,4825
Greece	(0,3266)	(0,9033)	(0,6455)	(0,3983)	(0,2134)	(0,7895)
BETXT	-0,0905	0,1531	0,2120	0,1514	0,1138	2,2555
Romaina	(0,0890)	(0,0401)	(0,0046)**	(0,0421)	(0,1281)	(0,0468)
BSE SOFIX	0,0276	0,0451	0,0443	-0,0083	0,0282	1,0852
Bulgaria	(0,5997)	(0,5449)	(0,5480)	(0,9101)	(0,7013)	(0,3667)
CROBEX	-0,1281	0,2104	0,1890	0,0960	0,1982	5,5903
Croatia	(0,0002)****	(0,0000)****	(0,0001)****	(0,0473)	(0,0000)****	(0,0000)****
SASX 10 Bosnia	-0,0467	0,0837	0,0563	0,0081	0,0306	0,4825
and Herzegovina	(0,3266)	(0,2134)	(0,3983)	(0,9033)	(0,6455)	(0,7895)
SBITOP	-0,1214	0,2185	0,1965	0,1525	0,1419	1,6020
Slovenia	(0,0400)	(0,009)*****	(0,0418)	(0,0661)	(0,0886)	(0,1566)

Note: P-values are in brackets, while; *, **, *** represent statistical significance at 1%, 5% 10% level.

The null hypothesis is rejected just for market index of Croatia – CROBEX. All others null hypothesis of the day-of-the-week effect are equal to zero and are not rejected, as may be seen in results presented in Table no. 2. The findings for daily returns intercepts β_1 for Monday are negative for all countries except for Bulgaria, although it should be emphasized that they are not significant. Only the CROBEX index shows statistically significant results. Therefore, it can be observed that the Wald test F-statistic is significant at 1% level while the coefficient dummy variable for Monday – β_1 is negative and all other coefficients β_2- β_5, i.e. Tuesday-Friday are positive and statistically significant. Based on all of the above, the authors conclude that mean daily returns on Monday are lower than for the rest of weekdays.

From the results for SBITOP evidence is detected for the Tuesday effect, even though the Monday effect is not statistically significant. The BETXT index have coefficient β_1 negative, implying a daily return lower on Monday but statistically not significant. The coefficient for dummy variable β_4 is significant at the 5% level, however, and means that daily returns on Thursday are higher than on Monday.

All of the other findings for the rest of the observed Balkan markets indices suggest that there is no presence of the day-of-the-week effect. The presented results are slightly different in regards with previous studies, for example Ajayi *et al.* (2004) in a study that covers a period from the mid 1990s through the 2000s have found positive significant returns for Friday for the Slovenian stock market index, and the same results were obtained by Guidi *et al.* (2011) for the 1999-2009 period, with additional finding of significant negative returns for Monday and Thursday. The same observation of the Monday effect on the Croatian market that was obtained in this study was previously found by Stoica and Diaconasu (2011) on 2000-2010 time series. In addition, they found negative returns for Monday on Slovenian market as documented in their research. In the study conducted by Patev *et al.* (2003) negative Monday returns for Romanian market and positive returns for Slovenia were documented as well. In their comprehensive work, Oprea and Tilica (2014) discovered negative Monday returns for the Bulgarian and the Slovenian stock markets, while negative Friday returns for the Croatian and Bosnia and Herzegovina indices. Tonchev and Kim (2004) found significantly positive Monday returns and negative Friday returns in their study that covered the 1999-2003 period. However, the results obtained in this study should be observed and explained under the light of the selected time period. Moreover, it should be noted that the data series under this examination also differ from the other compared studies.

5. CONCLUSION

The above empirical study was conducted in order to test the presence the day-of-the-week effect in six Balkan markets from 2012 to 2016, that is, the most recent five year period for which daily closing prices of listed shares of stock were available. The model employed in this study used log-transformed data with dummy variables serving as proxies for the different days of the week. In contrast with the research conducted by Oprea and Tilica (2014), the observed findings identify a clear and statistically significant existence of the day-of-the-week effect on the Croatian stock market index, but not on the other five indices under examination. The discrepancy in the obtained results, which in the cases of Greece and Bulgaria also clash with previous findings (Floros, 2008; Dodd and Gakhovich, 2011) can be attributed to the different periods under observation as well as their length. Moreover, with the increased prominence of the day-of-the-week effect among both academics and investment professionals, and the intensive use of data-processing machines, it can be surmised that the markets are becoming informationally more efficient and are correcting such price anomalies through arbitrage (Kenourgios *et al.*, 2005) and greater integration in the EU single market (Stoica and Diaconasu, 2011; Guidi *et al.*, 2011). The results may have been substantially different, however, if the time series had been longer or spanned over a different time period.

Nevertheless, based on everything that was stated before, this paper serves to further corroborate the claim that humans are inherently irrational. In that irrationality, unique systematic patterns can be observed by the trained eye. This may in fact raise the question of resilience of the effects in markets, especially under the light of impulses of new acknowledgement that influence the evolving and constantly-changing behaviour of the participants through new, endogenously formed patterns. To quote Schwert (2003, p. 941):

> *"All of these findings raise the possibility that anomalies are more apparent than real. But even if the anomalies existed in the sample period in which they were first identified, the activities of practitioners who implement strategies to take advantage of anomalous behaviour can cause the anomalies to disappear (as research findings cause the markets to become more efficient)."*

In order to better present the argument in favour of the existence of the day-of-the-week effect, in addition to identifying a pattern in among the stock price returns, the next logical step of this empirical analysis would include an investigation of volatility patterns of the stock price indices as well, which is beyond the scope of this paper, but clearly points in which direction any future analyses of this kind should progress.

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