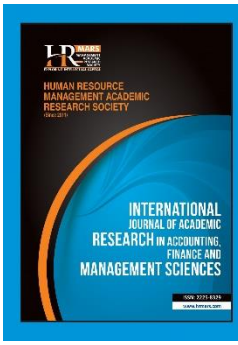

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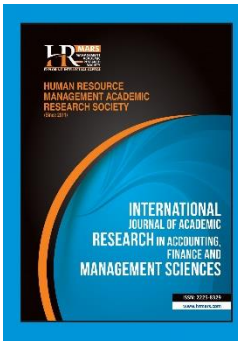
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Day-of-the-Week Effect in Post-Communist East European Stock Markets

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Abstract
This study examines the day-of-the-week effect in 18 Post-Communist East European stock markets: Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Former Yugoslav Republic of Macedonia, Hungary, Kazakhstan, Latvia, Lithuania, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia and Ukraine, over the period January 2005 to March 2014. The results indicate the presence of day-of-the-week effect in Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia even after we incorporate in the analysis the market risk, proxied by the return on the Dow Jones Global Total Stock Market Index.
Keywords: Day-of-the-week Effect, Post-Communist East European Countries, Informational Efficiency, Market Risk

Introduction

Investigating the presence of calendar effects (also, known as calendar anomalies) in financial markets is a debated subject since the presence of some patterns in the evolution of the returns of financial assets can be used for developing profitable trading strategies which could generate abnormal returns. The efficient market hypothesis (EMH), introduced by Fama (1970), states that on an efficient market the prices of assets reflect all the available information. Consequently, calendar effects challenge the EMH because abnormal returns could be made simply by knowing the patterns on returns. Further, the persistence of some calendar anomalies over time is, also, a threat for the EMH, because once the calendar anomalies were discovered for a market, they should quickly disappear since they represent new and available information which prices are supposed to reflect on an efficient market (Doyle and Chen, 2009).

There are various forms of calendar effects that are investigated in the literature. Daily seasonality in the returns of financial assets is one of the most tested anomalies. However, there are three variations of the day seasonality (Doyle and Chen, 2009). Firstly, the well-known Monday effect states that Monday's returns are, in general, negative and lower than those on Tuesday through Friday (French, 1980). Secondly, the weekend effect suggests that there is a significant difference between returns on Monday and returns on Friday. Finally, according to the day-of-the-week (DOW) effect the returns on some day of the week are substantially different than the returns on other days of the week (Brooks and Persand, 2001).

Our paper focuses on investigating the presence of DOW effect for some stock markets from the Post-Communist East European countries: Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Former Yugoslav Republic of Macedonia, Hungary, Kazakhstan, Latvia, Lithuania, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia and Ukraine. Because the DOW effect is the most general test of seasonality in daily returns, it prevents researchers to focus on specific day anomalies like the Monday effect or the weekend effect and, thus, ignoring some important results (Doyle and Chen, 2009).

There are many studies that investigated the presence of DOW effect for the stock markets located in the Post-Communist East European countries. However, to the best of our knowledge, none of them investigated if the market risk could explain the presence of DOW effect on these stock markets. Our main results show that the DOW effect is present in only six stock markets, those from Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia, of the eighteen analyzed. Furthermore, we observe that the market risk, proxied by the return on the Dow Jones Global Total Stock Market Index, is not capable to explain the identified DOW effects.

Literature Review

The DOW effect was the subject of many studies related to the evolution of prices on financial markets starting as early as the 1980's. Initially, the papers considered the markets from US and Western Europe (now known as developed markets). Keim and Stambaugh (1984) studied the US market through the S&P Composite Index for a period of 55 years. They observed a negative Monday return which persists on the whole period. The results remained the same even if the analysis was made on 5 subsequent subperiods. More recently, Berument and Kiymaz (2001) considered the same market, but in the period 1973-1997. Seasonality in mean and in variance was discovered for the analyzed period.

Kiymaz and Berument (2003) have studied other developed markets (Canada, Germania, Japan, UK, US) for the 1988-2002 period. They searched for return seasonality in both mean and variance. Both were observed on the US market.

Some studies take into account both developed and developing markets to insure a better method to compare their situations. Apolinario *et al* (2006) analyze 13 European countries, the only emerging one being the Czech Republic. The analysis was based both on symmetric and asymmetric models. They showed that no DOW effect was spotted on the Czech market.

However, usually authors tend to consider only one category of countries (developed or emerging) whether they analyze the countries from the same region (Eastern Europe, Africa etc.) or from multiple ones. Alagidede (2008) took into consideration the seven largest stock markets in Africa. Initially, in three of the analyzed countries (Nigeria, South Africa and Zimbabwe) the DOW effect was discovered, either in mean (all three) or in variance (Nigeria). When the market risk was taken into consideration, for the analysis of these three countries, the author observed that the effect becomes less pronounced in South Africa, but not in the other two.

Brooks and Persand (2001) analyzed the stock markets from 5 Asian countries in the period 31 December 1989-19 January 1996. They discovered the DOW effect in Thailand, Malaysia and Taiwan. When taking into account the influence of the market risk, the effect was less pronounced in the first two, while in Taiwan it disappeared completely.

Ajayi *et al.* (2004) is one of the first studies that investigated the presence of DOW effect for a number of stock markets from the Central and Eastern European countries (Croatia,

Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia and Slovenia). The analyzed period was between the inceptions of each stock market's major index and September 2002. Their results showed that Croatia, Czech Republic, Hungary, Latvia, Poland, Romania and Slovakia had no significant DOW effects. Furthermore, Estonia, Lithuania and Russia showed a negative Monday effect. Also, Lithuania registered a negative Tuesday effect and Slovenia a positive Thursday and Friday effect. In accordance with Ajayi *et al* (2004); Tudor (2006) observed that the DOW effect was not present in the Romanian stock market for the period 2000-2005.

Basher and Sadorsky (2006) analyzed 21 emerging markets, including Poland. They tested for the DOW effect considering both conditional and unconditional models which incorporate the market risk. For Poland, the DOW effect was not observed, when they used unconditional models. Moreover, the authors observed a Thursday effect, when using a conditional market risk model.

Yalcin and Yucel (2006) studied 20 emerging countries, including Czech Republic, Estonia, Hungary, Lithuania, Poland, Russia, and Slovenia. They analyzed the presence of the DOW effect both in mean and in variance. Their results showed high returns on Friday with high volatilities on Monday and low returns on Tuesday with low volatilities on Friday.

Guidi *et al* (2011) analyzed the presence of DOW effect on some emerging stock markets (Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia and Slovenia) for the period 1999-2009 considered as a whole and also, divided in two subperiods: before and after the EU accession. For the entire period, the Polish stock market showed the presence of a positive Monday, Thursday and Friday effects. Also, Slovenia registered a negative Monday effect and a positive Thursday and Friday effects for the period 1999-2009. A negative Thursday effect was identified in the case of Czech Republic. The remaining stock markets did not show any sign of the DOW effect. In the pre-accession period, a positive Thursday and Friday effects were observed on the Polish market. Further, Czech Republic and Hungary had a positive Thursday effect and Slovenia showed a negative Tuesday effect and a positive Thursday effect. For the other stock markets, Guidi *et al* (2011) did not find evidence for the presence of DOW effect in the pre-accession period. In the post-accession period the results are very different. Only the Slovenian stock market had a negative Monday effect. The other countries did not show signs of the presence of DOW effect.

The investigation of the DOW effect is challenged for a number of emerging stock markets, during the period of the global financial crisis and in the pre-crisis period. Diaconasu *et al.* (2012) tested the presence of DOW effect in the Romanian stock market for the period 2000-2011 and for the pre and post-crisis period. They reported that during the pre-crisis period and also for the entire period the DOW effect was present on the Romanian stock market. A positive Thursday and Friday effects were identified for the Romanian composite index and a positive Thursday effect was found for the index that reflects the price movements of the ten most liquid stocks listed on the Romanian stock market for the whole period. In the pre-crisis period the results were similar. However, during the global financial crisis period the DOW effect was not identified for any index. Furthermore, Hourvouliades and Kourkoumelis (2009) reported different results compared to those of (Diaconasu *et al.,* 2012). They observed that during the pre-crisis period and also in the post-crisis period the DOW effect was not present in the Romanian stock market.

Heininen and Puttonen (2008) is another paper that investigated the DOW effect for some stock markets from Central and Eastern Europe (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovenia and Slovakia) in four

periods: 1997-2008, 1997-2000, 2001-2004 and 2005-2008. Heininen and Puttonen (2008) noticed that the Slovenian stock market had a negative Tuesday effect and a positive Wednesday, Thursday and Friday effects for the period 1997-2008. Also, Lithuania registered a positive Thursday effect and Russia positive Friday effect for the total period. For the period 1997-2000, the results for Slovenia are unchanged in comparison with the period 1997-2008. In addition, Hungary showed a negative Thursday effect for the period 1997-2000 although for the full period no DOW effect was identified for Hungary. In the 2001-2004 period only Russia showed the presence of DOW effect (positive Tuesday and Thursday effects and a negative Wednesday effect). For the last analyzed period (2005-2008) in Slovenia was identified a positive Thursday and Friday effects. A negative Monday effect was present in the Estonian stock market, a positive Wednesday effect was identified on Bulgarian stock market and a positive Friday effect was noticed for Lithuania for the period 2005-2008.Because the observed DOW effects were not persistent from period to period for most stock markets, Heininen and Puttonen (2008) concluded that a systematic daily pattern in stock returns is not specific in the stock markets from Central and Eastern European countries.

Georgantopoulos *et al* (2011) analyzed the presence of DOW effect for 5 stock markets (Bulgaria, Croatia, Greece, Romania and Turkey) for the period 2000-2008. On the one hand, they observed that the DOW effect was not present in Bulgaria, Croatia and Romania. On the other hand, they noted that a negative Monday effect and a positive Friday effect were present in Greece and Turkey.

Methodology of Research

To examine whether any day-of-the-week effects are present in our sample of Post-Communist East European stock markets we use the following regression:

$$R_{it} = \sum_{j=1}^{5} \alpha_{ji} D_{jt} + u_{it} \qquad (1)$$

Where R_{it} is the return on stock index i in day t, D_{1t} through D_{5t} are dummy variables such that $D_{1t} = 1$ if day t is a Monday and zero otherwise and so forth. α_{1i} to α_{5i} represent the average returns from Monday through Friday on stock index i and u_{it} is an error term which is assumed to be independent and identically distributed with a zero mean and constant variance.

If at least one of the estimated coefficients, α_{ji}, will prove to be statistically significant then, the hypothesis of seasonality in returns is supported.[1]Therefore, such a result suggests the potential presence of arbitrage opportunities and a low level of market efficiency since the market participants can develop trading strategies to exploit this seasonal pattern.

Nevertheless, it is important to note that risk factors were not taken into account in equation (1). Brooks and Persand (2001) suggested that the market risk can be systematically higher or lower on certain days compared to the average, and this could be the reason for the higher or lower average returns in equation 1. Following Brooks and Persand (2001), we incorporate the market risk as follows:

[1]The average returns are considered an appropriate proxy for expected returns. This happens because, it is believed that the information surprises tend to cancel out over a period and, therefore, the average returns are unbiased estimates of expected returns (Elton, 1999). Fama (1998) states that the daily expected returns are close to zero. Consequently, if the daily average returns are statistically different from zero and between them, then the seasonality in returns is identified.

$$R_{it} = \sum_{j=1}^{5} \alpha_{ji} D_{jt} + \beta_i R_{DJGt} + v_{it} \quad (2)$$

Where the terminology is as in equation 1, β_I is the sensitivity of return on stock index *i* to a change in the return on world stock index, R_{DJGt} is the return on world stock index in day *t*, which is used as a proxy for the market risk and v_{it} is an error term which is assumed to be independent and identically distributed with a zero mean and constant variance.

If the coefficients, α_{ji}, are statistically insignificant where they were previously significant in equation 1, we can state that the seasonality is explained by the risk-return relationship. If, on the other hand, they are still significant, then other risk factors should be considered (Alagidede, 2008).

However, equation 2 forces the risk-return relationship to be constant over all days of the week. Following Brooks and Persand (2001), we allow the β_I coefficient to vary across the days of the week by using interactive dummies (dummy variables multiplied by the return on world stock index) as follows:

$$R_{it} = \sum_{j=1}^{5} \alpha_{ji} D_{jt} + \sum_{j=1}^{5} \beta_{ji} D_{jt} R_{DJGt} + w_{it} \quad (3)$$

Where the terminology is as in equation 2, β_{jI} represents the sensitivity coefficients of stock index *i* for each day of the week and w_{it} is an error term which is assumed to be independent and identically distributed with a zero mean and constant variance.

Database

For our analysis we used the daily closing levels of 19 stock indices for the period January 2005-March 2014. We collected 18 country indices and 1 world stock index, namely Dow Jones Global Total Stock Market Index (DJG). The stock indices had days in which they were not calculated. These blank days are due to holidays and perhaps to other events. Therefore, the previous day's level was attributed to the day in which the stock index was not calculated. This procedure was implemented only for the national stock indices because the DJG index did not show missing values.

The data for country indices were obtained from the Thomson Reuters Database and for DJG from www.djindexs.com.The country stock indices are used to compute the returns of national stock markets and DJG index is used to measure the return of world stock market. DJG includes more than 12000 securities from 77 countries, providing near-exhaustive coverage of both developed and developing markets. The return of DJG index is used as a proxy of market risk.

For each index, a series of daily continuously compounded returns are computed as follows:

$$R_{it} = \ln\left(\frac{P_{it}}{P_{it-1}}\right) \quad (4)$$

Where R_{it} is the return on stock index *i* in day *t*, P_{it} is the closing level of stock index *i* in day *t* and P_{it-1} is the closing level of stock index *i* in day *t-1*.

For Bosnia, Montenegro, Slovenia and Slovakia the Thomson Database did not provide information about the daily closing levels of stock indices for the whole period and, as a consequence, the analysis period was shortened. Further, for Former Yugoslav Republic of Macedonia (hereafter, FYR Macedonia), Serbia and Ukraine the stock indices were launched after the beginning of the desired period. As such, for these countries, the beginning of the analysis period represents the day in which the index appeared. Table 1 reports the descriptive statistics of the 19 indices and presents information regarding the analysis periods.

Table 1

Descriptive Statistics

Country	Market index	Start date	End date	Mean	Maximum	Minimum	Standard deviation	Skewness	Kurtosis	Jarque-Bera	P-value
Bosnia	BIRS	13-Jan-2009	31-Mar-2014	-0.0281%	3.8419%	-4.7764%	0.6428%	-0.1280	10.0223	2798.0800	0.0000
Bulgaria	SOFIX	04-Jan-2005	31-Mar-2014	-0.0016%	7.2924%	-11.3600%	1.2980%	-0.9661	12.9397	10295.8700	0.0000
Croatia	CROBEX	04-Jan-2005	31-Mar-2014	0.0045%	14.7790%	-10.7636%	1.3003%	0.0535	19.0446	25851.3600	0.0000
Czech Republic	PX	04-Jan-2005	31-Mar-2014	-0.0018%	12.3641%	-16.1855%	1.5545%	-0.5615	17.4800	21181.0800	0.0000
Estonia	OMXTGI	04-Jan-2005	31-Mar-2014	0.0236%	12.0945%	-7.0459%	1.1930%	0.2253	12.7847	9634.4000	0.0000
Hungary	BUX	04-Jan-2005	31-Mar-2014	0.0072%	13.1777%	-12.6489%	1.6957%	-0.0716	9.5064	4253.0420	0.0000
Kazakhstan	KASE	06-Jan-2005	31-Mar-2014	0.0655%	15.7430%	-14.8236%	2.4424%	0.3315	10.2493	5316.8730	0.0000
Latvia	OMXRGI	04-Jan-2005	31-Mar-2014	0.0007%	10.1798%	-7.8586%	1.3047%	0.1635	9.9569	4870.6970	0.0000
Lithuania	OMXVGI	05-Jan-2005	31-Mar-2014	0.0163%	11.0015%	-11.9378%	1.1837%	-0.3546	21.0205	32646.2600	0.0000
FYR Macedonia	MBI10	05-Jan-2005	31-Mar-2014	0.0224%	8.0896%	-10.2831%	1.4179%	-0.1268	11.3421	6991.5340	0.0000
Montenegro	MONEX20	11-Jan-2011	31-Mar-2014	-0.0407%	6.9329%	-6.5767%	1.0185%	0.1627	11.0492	2271.3140	0.0000
Poland	WIG20	04-Jan-2005	31-Mar-2014	0.0093%	8.1548%	-8.4428%	1.5563%	-0.3051	6.1138	1010.9840	0.0000
Romania	BET-C	04-Jan-2005	31-Mar-2014	0.0031%	10.8906%	-12.1184%	1.5977%	-0.7697	11.6456	7743.6420	0.0000
Russia	IRTS	12-Jan-2005	31-Mar-2014	0.0292%	20.2039%	-21.1994%	2.1901%	-0.5045	15.8504	16642.8800	0.0000
Serbia	Belex15	05-Oct-2005	31-Mar-2014	-0.0258%	12.1576%	-10.8614%	1.4209%	0.1525	16.0569	15735.5800	0.0000
Slovakia	SAX	05-Apr-2005	31-Mar-2014	-0.0306%	11.8803%	-14.8101%	1.1082%	-1.5768	31.7397	81675.6500	0.0000
Slovenia	SBITOP	05-Apr-2006	31-Mar-2014	-0.0176%	8.3584%	-8.4311%	1.2179%	-0.4416	9.9814	4299.9570	0.0000
Ukraine	UAX	09-Jan-2008	31-Mar-2014	-0.0625%	16.7260%	-13.2103%	2.4056%	-0.1360	10.2563	3567.9130	0.0000
World	DJG	04-Jan-2005	31-Mar-2014	0.0171%	8.4458%	-7.2936%	1.1042%	-0.4951	11.0307	6574.5990	0.0000

Results

Table 2 reports the results of equation 1 which was estimated for each country from our sample. As we mentioned earlier the estimated coefficients represent the daily average returns. The main results are as follows. On the one hand, Czech Republic, Estonia, Hungary, Kazakhstan, Lithuania, FYR Macedonia, Montenegro, Poland, Romania, Russia, Slovakia and Ukraine have no significant day-of-the-week effects. These results suggest that, from this perspective, these stock markets have a high level of market efficiency.

On the other hand, Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia show some day-of-the-week effects. Bosnia, Croatia and Latvia have significant negative Friday average

returns. Bulgaria, Serbia and Slovenia register significant negative Monday average returns. Moreover, Slovenia has, also, a significant positive Thursday average return. These results suggest that these stock markets have a low level of market efficiency, providing the opportunity for investors to develop profitable trading strategies.

Table 2
Day-of -the-week effect

Country	Monday α_{1i}	Tuesday α_{2i}	Wednesday α_{3i}	Thursday α_{4i}	Friday α_{5i}
Bosnia					
Coefficient	-0.0007	-0.0004	0.0001	0.0004	-0.0008*
t-statistic	-1.7447	-1.1950	0.1943	1.1269	-2.0164
Bulgaria					
Coefficient	-0.0015*	0.0009	0.0003	0.0010	-0.0008
t-statistic	-2.3813	1.5575	0.5082	1.7945	-1.2614
Croatia					
Coefficient	0.0002	0.0006	0.0006	0.0005	-0.0017*
t-statistic	0.3429	0.9944	1.1562	0.8352	-2.4519
Czech Republic					
Coefficient	-0.0006	0.0007	0.0004	-0.0008	0.0002
t-statistic	-0.8886	1.0563	0.5345	-0.9744	0.2390
Estonia					
Coefficient	-0.0003	0.0009	-0.0001	0.0007	0.0000
t-statistic	-0.5076	1.7766	-0.1911	1.2689	-0.0422
Hungary					
Coefficient	-0.0001	-0.0005	-0.0008	0.0006	0.0011
t-statistic	-0.0939	-0.5900	-0.9925	0.7988	1.4574
Kazakhstan					
Coefficient	0.0000	0.0010	0.0010	0.0023	-0.0010
t-statistic	-0.0348	0.9305	0.9943	1.9363	-0.8663
Latvia					
Coefficient	-0.0001	0.0006	0.0001	0.0008	-0.0014*
t-statistic	-0.1611	0.9290	0.2441	1.5807	-2.1820
Lithuania					
Coefficient	-0.0004	0.0002	0.0003	0.0009	-0.0002
t-statistic	-0.7421	0.4688	0.5978	1.7618	-0.3322
FYR Macedonia					
Coefficient	-0.0002	0.0006	0.0007	0.0006	-0.0006
t-statistic	-0.3491	0.9613	0.9892	1.2299	-0.8806
Montenegro					
Coefficient	-0.0004	-0.0006	-0.0004	0.0004	-0.0010
t-statistic	-0.5308	-0.8160	-0.5673	0.4671	-1.0843
Poland					
Coefficient	0.0000	0.0000	-0.0004	0.0000	0.0009
t-statistic	0.0388	-0.0073	-0.5812	-0.0627	1.2701
Romania					
Coefficient	-0.0009	0.0001	0.0013	0.0006	-0.0009

Country	Monday	Tuesday	Wednesday	Thursday	Friday
	α_{1i}	α_{2i}	α_{3i}	α_{4i}	α_{5i}
t-statistic	-1.1409	0.0715	1.7995	0.9332	-1.2558
Russia					
Coefficient	-0.0003	-0.0004	0.0007	0.0009	0.0005
t-statistic	-0.2530	-0.3775	0.7795	0.8563	0.4401
Serbia					
Coefficient	-0.0017*	-0.0003	0.0010	0.0007	-0.0011
t-statistic	-2.3187	-0.4376	1.5809	1.1443	-1.5156
Slovakia					
Coefficient	-0.0007	-0.0003	0.0001	-0.0004	-0.0002
t-statistic	-1.5045	-0.6474	0.1178	-0.8773	-0.2916
Slovenia					
Coefficient	-0.0017*	0.0001	0.0003	0.0014*	-0.0010
t-statistic	-2.5628	0.1130	0.5432	2.4607	-1.7134
Ukraine					
Coefficient	-0.0017	-0.0011	-0.0005	0.0001	0.0001
t-statistic	-1.0835	-0.8939	-0.4147	0.0771	0.0490

Notes: We analyzed the presence of heteroscedasticity and serial correlation in error terms during the estimation of regressions. The heteroscedasticity was tested by the ARCH LM test (Engle, 1982) and the serial correlation was verified by the Breusch–Godfrey Lagrange multiplier test (Breusch, 1978; Godfrey, 1978) using 10 lags. If we detected only the heteroscedasticity, we applied the correction proposed by White (1980) and if errors were serial correlated, we applied the correction proposed by Newey and West (1987) to calculate *t*-statistic (see Brooks, 2008, p. 152). ** and * indicates significance at 1% and 5% levels, respectively.

For example, the presence of a positive Thursday effect and a negative Monday effect in the case of Slovenian stock market suggests, at first view, the existence of arbitrage opportunities, because investors can develop profitable trading strategies. Since the stock prices have the tendency to decrease on Monday and to rise on Thursday, investors could buy on Monday and sell on Thursday in order to take advantage of these effects. However, the small potential gain might not generate positive profits when we take into consideration the transaction costs. At the same time, these stock markets have in general a low level of liquidity which is an important constrain for an active portfolio management (see, Dragotă and Mitrică, 2004, for the Romanian case and Dragota and Tilica (2014), for other Post-Communist East European stock markets).

From another perspective, the market risk can be higher or lower in some days of the week, thus explaining the presence of a high or low anomalous average return in some days. As such, we incorporated the market risk in the subsequent analysis. However, we excluded from our analysis Czech Republic, Estonia, Hungary, Kazakhstan, Lithuania, FYR Macedonia, Montenegro, Poland, Romania, Russia, Slovakia and Ukraine since there are no day-of-the-week effects to explain. The results are reported in Table 3.

Table 3
Day-of-the-week effect and the market risk

Country	Monday α_{1i}	Tuesday α_{2i}	Wednesday α_{3i}	Thursday α_{4i}	Friday α_{5i}	R_{DJG} β_i
Bosnia						
Coefficient	-0.0008	-0.0005	0.0000	0.0004	-0.0008*	0.0430*
t-statistic	-1.8140	-1.2645	0.0985	1.0984	-2.0136	2.4985
Bulgaria						
Coefficient	-0.0017*	0.0008	0.0003	0.0010	-0.0007	0.2524**
t-statistic	-2.6732	1.4939	0.4270	1.7715	-1.1491	5.3203
Croatia						
Coefficient	-0.0001	0.0005	0.0005	0.0004	-0.0015*	0.5684**
t-statistic	-0.2012	0.9470	1.0154	0.7127	-2.6086	8.1006
Latvia						
Coefficient	-0.0002	0.0005	0.0001	0.0008	-0.0013*	0.2177**
t-statistic	-0.3691	0.8863	0.1533	1.5374	-2.1341	5.4502
Serbia						
Coefficient	-0.0018*	-0.0003	0.0010	0.0007	-0.0010	0.2309**
t-statistic	-2.5288	-0.4930	1.5255	1.1065	-1.4459	4.6260
Slovenia						
Coefficient	-0.0019**	0.0000	0.0003	0.0013*	-0.0008	0.2795**
t-statistic	-2.9097	0.0625	0.4585	2.5436	-1.5430	5.9933

Notes: We analysed the presence of heteroscedasticity and serial correlation in error terms during the estimation of regressions. The heteroscedasticity was tested by the ARCH LM test (Engle, 1982) and the serial correlation was verified by the Breusch–Godfrey Lagrange multiplier test (Breusch, 1978; Godfrey, 1978) using 10 lags. If we detected only the heteroscedasticity, we applied the correction proposed by White (1980) and if errors were serial correlated, we applied the correction proposed by Newey and West (1987) to calculate *t*-statistic (see Brooks, 2008, p. 152). R_{DJG} is the return of Dow Jones Global Total Stock Market Index (DJG) which is used as a proxy of market risk. DJG includes more than 12000 securities from 77 countries, providing near-exhaustive coverage of both developed and emerging markets. ** and * indicates significance at 1% and 5% levels, respectively.

From our analysis, it is apparent that the consideration of market risk does not explain the day-to-day variation in the stock market returns of Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia. Also, it is interesting to note that the sensitivity coefficients, β_i, are considerably lower than 1, for all stock markets, indicating that these stock markets are less risky than the world stock market.

The previous analysis imposes a constant relationship between return and risk. To relax this constrain, we used interactive dummy variables (dummy variables multiplied by the return on world stock market). The results of this investigation are presented in Table 4.

As it can be seen, the conclusions from the previous analysis are unchanged. All day-of-the week effects reported in Table 2 and Table 3 are still persistent in Table 4. Moreover, the sensitivity coefficient, β_{ij}, varies across the days of the week in the case of Bulgaria, Croatia, Latvia, Serbia and Slovenia. Interestingly, the daily sensitivity coefficient of Bosnia is not statistically significant for any day of the week. Also, for both Bulgaria and Latvia the

sensitivity coefficient from Wednesday is not significant and Serbia registers an insignificant sensitivity coefficient on Monday and Tuesday.

Conclusions

This paper investigates the presence of day-of-the-week effect in 18 Post-Communist East European stock markets. Twelve of the stock markets, those of Czech Republic, Estonia, Hungary, Kazakhstan, Lithuania, FYR Macedonia, Montenegro, Poland, Romania, Russia, Slovakia and Ukraine, do not show any sign of the day-of-the-week effect. The remaining stock markets, those of Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia, register at least one day in which the average return is statistically significant.

Following Brooks and Persand (2001), we investigate if the high or low abnormal returns registered for Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia can be explained by a high or low level of market risk. We consider the relationship between return and risk to be, initially, constant through all days of the week. Then, we make the relationship to vary across the days of the week. We observe that the day-of-the-week effects reported for the stock markets from Bosnia, Bulgaria, Croatia, Latvia, Serbia and Slovenia cannot be explained by the market risk. As such, future analysis should take in consideration other risk factors that may explain the abnormal high or low returns observed for these stock markets.

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Table 4

Day-of-the-week effect and the daily market risk

Country	Monday α_{1i}	Tuesday α_{2i}	Wednesday α_{3i}	Thursday α_{4i}	Friday α_{5i}	Monday R_{DIG} β_{1i}	Tuesday R_{DIG} β_{2i}	Wednesday R_{DIG} β_{3i}	Thursday R_{DIG} β_{4i}	Friday R_{DIG} β_{5i}
Bosnia										
Coefficient	-0.0008	-0.0004	0.0000	0.0004	-0.0008*	0.0370	0.0031	0.0426	0.0911	0.0510
t-statistic	-1.7906	-1.1794	0.0996	1.0547	-2.0096	1.0033	0.0716	1.4133	1.5194	1.5356
Bulgaria										
Coefficient	-0.0016*	0.0008	0.0003	0.0009	-0.0006	0.2084**	0.1761*	0.1384	0.4440**	0.3242**
t-statistic	-2.6260	1.5121	0.4669	1.6950	-1.1113	2.8366	1.9757	1.8610	3.4189	4.1839
Croatia										
Coefficient	-0.0001	0.0005	0.0005	0.0004	-0.0014*	0.5078**	0.5047**	0.4313**	0.5758**	0.7525**
t-statistic	-0.1394	0.9661	1.0778	0.7051	-2.4999	6.3571	5.5256	5.7164	4.2947	6.9826
Latvia										
Coefficient	-0.0002	0.0005	0.0001	0.0008	-0.0013*	0.2222**	0.2405**	0.0493	0.3058**	0.2788**
t-statistic	-0.3721	0.8777	0.2225	1.4986	-2.0928	2.8891	2.9996	0.6834	4.1895	3.2871
Serbia										
Coefficient	-0.0018*	-0.0003	0.0010	0.0007	-0.0009	0.1725	0.0723	0.1891**	0.2851**	0.3842**
t-statistic	-2.5007	-0.4533	1.5353	1.0895	-1.3517	1.5010	0.7548	3.0706	2.8052	4.1528
Slovenia										
Coefficient	-0.0018**	0.0000	0.0003	0.0013*	-0.0008	0.1868**	0.2256**	0.2155*	0.3753**	0.3796**
t-statistic	-2.8673	0.0726	0.4771	2.5353	-1.4511	2.7188	2.9956	2.5004	3.4399	6.8735

Notes: We analyzed the presence of heteroscedasticity and serial correlation in error terms during the estimation of regressions. The heteroscedasticity was tested by the ARCH LM test (Engle, 1982) and the serial correlation was verified by the Breusch–Godfrey Lagrange multiplier test (Breusch, 1978; Godfrey, 1978) using 10 lags. If we detected only the heteroscedasticity, we applied the correction proposed by White (1980) and if errors were

serial correlated, we applied the correction proposed by Newey and West (1987) to calculate *t*-statistic (see Brooks, 2008, p. 152). R_{DJG} is the return of Dow Jones Global Total Stock Market Index (DJG) which is used as a proxy of market risk. DJG includes more than 12000 securities from 77 countries, providing near-exhaustive coverage of both developed and emerging markets. ** and * indicates significance at 1% and 5% levels, respectively.

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