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VOLATILITIES AND EQUITY MARKET RETURNS IN SELECTED CENTRAL AND SOUTHEAST EUROPEAN COUNTRIES

This paper investigates co-movements of equity returns, volatility persistence and spillovers in selected Central and Southeast European countries, the countries of former Yugoslavia: Croatia, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia and Slovenia during the period of 2011-2017. The Multivariate Auto Regressive Moving Average (MARMA) and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models are utilized to daily returns of the stock indices. The results of the analysis provide the evidence of significant co-movements of returns and volatility spillovers among selected markets. The findings indicate that in Slovenian, Macedonian and Serbian markets volatility reacts intensely to market movements, whereby volatilities persist very long in Bosnia and Herzegovina, and in Montenegro. From the viewpoint of volatility transmission the findings also indicate enough elements for closer and intense collaboration between selected markets.

Key words: co-movements of returns, stock indices, volatility persistence, volatility spillovers, GARCH

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1. Introduction

This paper studies the linkages among equity returns, volatility persistence and volatility spillovers. The research is based on representative stock market indices in the countries of former Yugoslavia, i.e. Croatia, Bosnia and Herzegovina, Macedonia, Montenegro, Serbia and Slovenia. Those countries shared the history and experienced similar political, economic, social and market transformations after the breakup of Yugoslavia in the early 1990s.

After leaving the centralized economy, as a consequence of privatization, Ljubljana Stock Exchange (Slovenia) and Zagreb Stock Exchange (Croatia) were established again at the end of 1990 and 1991, respectively. However, it should be noted that there was a long history of stock trading in the selected markets until the 2nd World War. The first Stock Exchange in Serbia was established in 1895 and it was closed in 1941, Croatian Stock Exchange was opened for trading in 1919 and closed in 1945, while Slovenian was set up in 1923 to be closed in 1945 (Barbić, 2010, p. 129).

One of the reasons for the selection of countries of former Yugoslavia was to study market co-movements between small neighbouring markets, to find out are there elements for closer and intense collaboration between them, and to contribute to the literature on co-movements of equity returns and volatilities in underdeveloped stock markets. Okičić (2014) pointed out that there is relatively little empirical research on the volatility of stock returns in underdeveloped stock markets, with even fewer studies on markets in the transitional economies of the CEE region.

The rest of the paper is organized as follows. After the introductory part and reviewing the literature on volatilities and equity market returns in Central and Southeast European markets, part 3 presents the data and methodology. Results of the analysis are presented in part 4, and concluding remarks in part 5.

2. Literature review

Majority of the empirical research on co-movements of returns and volatility transmission are related to major European markets, USA, China (Rezayat & Yavas 2006, Harrison & Moore 2009, Xiao & Dhesi 2010, Büttner & Hayo 2011, Égert & Kočenda 2011, Syllignakis & Kouretas 2011, Slimane at al. 2013, Dedi & Yavas, 2016). The rest of the section presents some recent research on co-movements of returns and volatilities and market integration related to Central and Southeast European countries.

Okičić (2014) investigates the behaviour of stock returns in the case of stock markets from Central and Eastern Europe (CEE), focusing on the relationship between returns and conditional volatility. As a representative of the CEE region, she used the following stock traded indices from the CEE region: SASX-10 and BIRS (Bosnia and Herzegovina), SOFIX (Bulgaria), CROBEX (Croatia), PX (Czech Republic), BUX (Hungary), MBI10 (FYR Macedonia), MONEX20 (Montenegro), WIG20 (Poland), BET (Romania), BELEX15 (Serbia), SAX (Slovakia) and SBITOP (Slovenia). Presented results provide confirmatory evidence that ARIMA and GARCH processes provide parsimonious approximations of mean and volatility dynamics in the case of the selected stock markets. Gradojević & Dobardžić (2013) conducted a frequency domain analysis of a causal relationship between the return on the major Serbian stock exchange index – BELEX 15, and the returns on the CROBEX, SBITOP, CETOP (Hungary) and DAX (Germany) indices. They find evidence of a somewhat dominant effect of the CROBEX and CETOP stock indices on the BELEX 15 stock index across a range of frequencies. Their results also indicate that the BELEX 15 index and the SBITOP index interact in a bi-directional causal fashion.

Stoica et al. (2015) examine the efficiency of the transmission of information across the stock markets of Bulgaria, the Czech Republic, Hungary, Poland, Romania, and Slovakia, as well as the relative importance and influence of advanced equity markets of Germany and France on the abovementioned markets using GARCH models. Horvath & Petrovski (2012) analyzed the international stock market co-movements between Western Europe vis-à-vis Central (the Czech Republic, Hungary and Poland) and South Eastern Europe (Croatia, Macedonia and Serbia) using multivariate GARCH models in 2006 - 2011. Comparing these two groups, they find that the degree of comovements is much higher for Central Europe.

Caporale & Spagnolo (2011) applied a trivariate VAR-GARCH(1,1)-in-mean model to examine linkages between the stock markets of three Central and Eastern European countries (CEECs), specifically the Czech Republic, Hungary, and Poland, and both the UK and Russia. They find a significant co-movement (interdependence) of these CEEC markets with Russian and the UK markets. Kunovac (2011) compares the Croatian equity market in turbulent and calm market conditions and asymmetry on the Croatian equity markets as well as on several European equity markets. His results suggest that correlations between stock prices are more than twice as high during bear's than in bull's market. According to his analysis, this is also true both for the stocks included in the CROBEX and for the relationship among various European equity indices. Dajčman & Festić (2012) examined the co-movement and spillover dynamics between the Slovenian and some European (the UK, German, French, Austrian, Hungarian and the Czech)

stock market returns using the DCC-GARCH model from April 1997 to May 2010. They found a significant return spillovers between the stock markets and increased comovement between Slovenian and European stock markets.

3. Data and Methodology

This paper utilizes stock market indices. The data period is from April 28th, 2011 to April 28th, 2017, a sample of 1555 days on the following stock market indices[1]: 1. *CROBEX* (Zagreb Stock Exchange, Croatia); 2. *SBITOP* (Ljubljana Stock Exchange, Slovenia); 3. *BIRS* (Banja Luka Stock Exchange, Bosnia & Herzegovina (B&H)); 4. *SASX30* (Sarajevo Stock Exchange, Bosnia & Herzegovina (B&H); 5. *BELEX15* (Belgrade Stock Exchange, Serbia); 6. *MONEX* (Montenegro Stock Exchange, Montenegro) and 7. *MBI10* (Macedonian Stock Exchange, Macedonia).

Multivariate Auto Regressive Moving Average (MARMA) is used to study co-movements of daily returns. MARMA model combines some characteristics of the univariate autoregressive moving average models with, at the same time, some characteristics of regression analysis (Makridakis et al. 1998).

Among the models that can be used to measure the dynamic relationship of the volatility of a process are *autoregressive conditional heteroskedastic* (ARCH) or *exponential smoothing* and *generalized autoregressive conditional heteroskedastic* (GARCH) models. ARCH models were introduced by Engle (1982) and generalized as GARCH by Bollerslev (1986). GARCH models, have become widespread tools for dealing with time series heteroskedasticity and are more widely used to model the conditional volatility of financial series. Practically, GARCH models are fitted when errors of AR or ARMA or in general a regression model have variances which are not independent or the variance of the current error term is related to the value of the previous periods' error terms as well as past variances. The coefficients of the past periods' squared error terms are an indicative of the strength of the shocks in the short term while the coefficient of the past variances (GARCH effect) measures the contribution of these shocks to long run persistence (Grosvenor & Greenidge, 2010).

GARCH processes have commonly heavier tails than the normal distribution. This property makes the GARCH process attractive because the distribution of asset returns frequently displays heavier tails than the normal distribution. In most empirical applications with finite sampled data, the simple ARCH (1) or GARCH

[1] Data source is *Bloomberg*.

(1, 1) is found to provide a fair description of the data (Yavas & Dedi, 2016, p. 588). In this study GARCH (1, 1) is used to analyze the persistence of conditional volatility of the returns and augmented GARCH (1, 1) is used to detect transmission of volatility between stock markets.

4. Findings

The results from descriptive statistics (Table 1) show that during the period under study, mean returns of the stock indices from all of the markets included in the sample are negative. The only exception is SBITOP (Slovenian stock market index) with zero mean return in the selected period. Figure 1 shows a visual representation of returns of the stock indices and demonstrates volatility clustering.

Table 1:

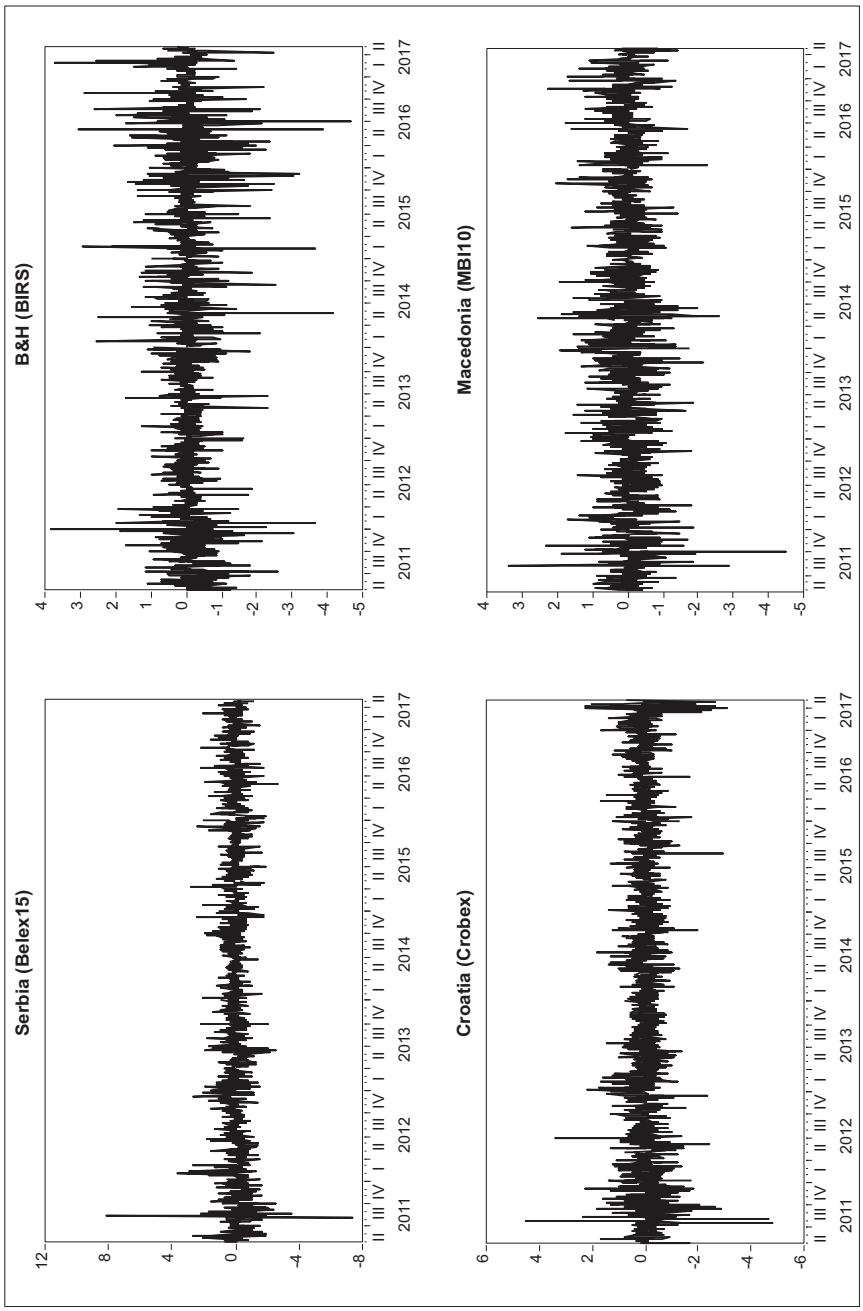
DESCRIPTIVE STATISTICS (APRIL 28, 2011 – APRIL 28, 2017)

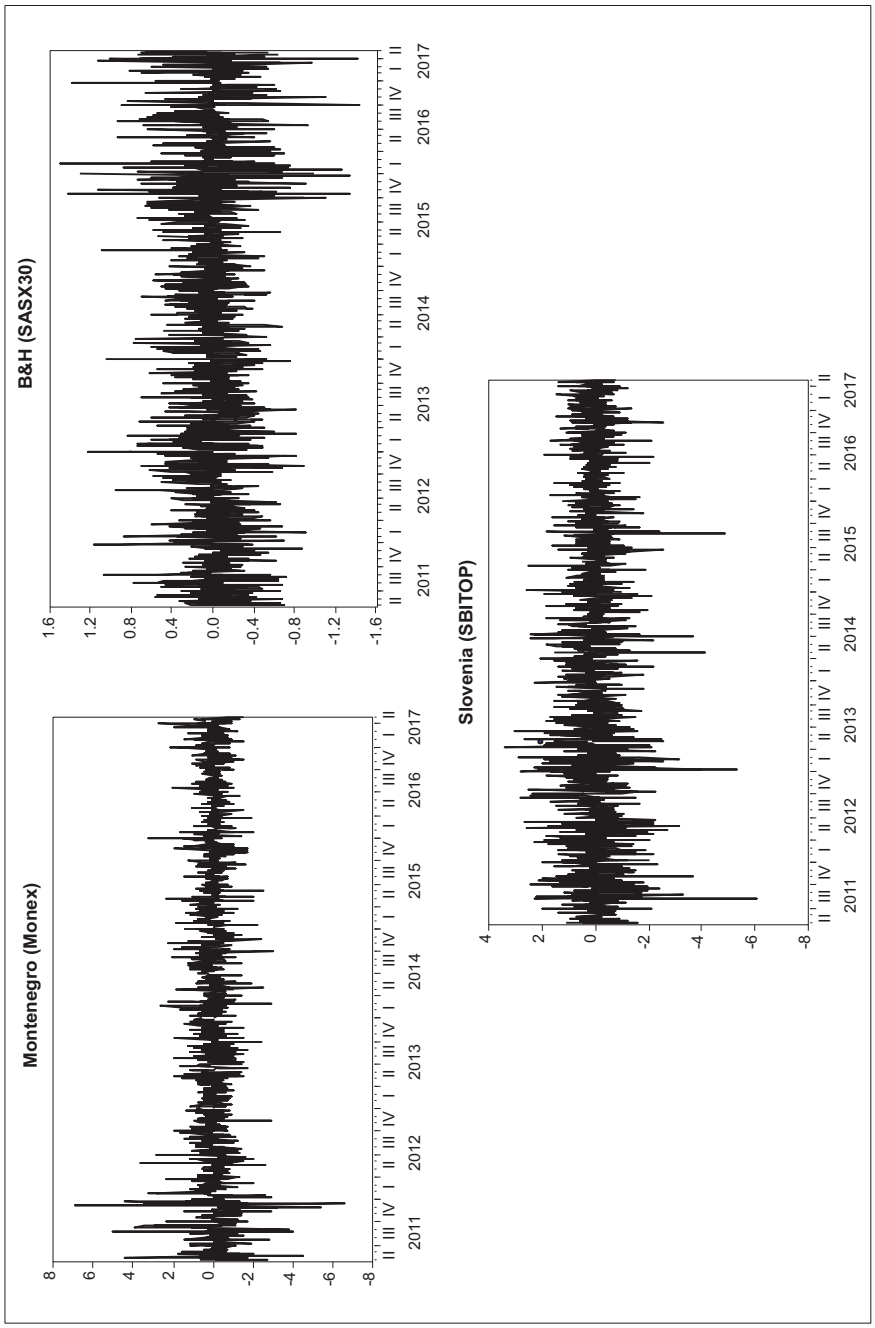
	BELEX 15 Serbia	**BIRS B&H**	**CROBEX Croatia**	**MBI10 Macedonia**	**MONEX Montenegro**	**SBITOP Slovenia**	**SASX 30 B&H**
Mean	-0.002	-0.045	-0.010	-0.0101	-0.007	0.0002	-0.007
Median	0.000	0.000	0.0000	0.000	0.000	0.000	0.000
Maximum	8.229	3.842	4.525	3.395	6.933	3.420	1.487
Minimum	-7.408	-4.662	-4.776	-4.475	-6.577	-6.059	-1.440
Std. Dev.	0.799	0.664	0.649	0.621	0.866	0.921	0.326
Skewness	-0.129	-0.665	-0.552	-0.141	0.103	-0.496	0.134
Kurtosis	18.733	11.572	10.398	6.781	12.241	6.527	5.447
Jarque-Bera	16031.05	4872.38	3622.26	930.70	5531.98	869.32	392.23
Probability	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observations	1554	1554	1554	1554	1554	1554	1554

Source: Authors' calculations. All results are obtained by EViews econometric software.

Figure 1.

GRAPHS OF DAILY RETURNS OF SELECTED MARKET INDICES




B&H (SASX30)
Montenegro (Monex)
Slovenia (SBITOP)
2011
2012
2013
2014
2015
2016
2017

In terms of standard deviations, the highest volatility in the selected period is exhibited by Slovenia (SBITOP) followed by Montenegro (MONEX) and Serbia (BELEX 15).

Equity markets go up and down. For example, the worst year for Zagreb Stock Exchange index CROBEX was 2008 with -67% return. This is known as „negative skewness". All markets except for Montenegro and partly Bosnia and Herzegovina (SASX 30) have negative skewness. The kurtosis or degree of excess, in all markets exceeds three (3), indicating a leptokurtic distribution. Accordingly, the Jarque-Bera test statistic strongly rejects the null hypothesis of normal distribution for all returns in the sample at α=0.05. The standard Augmented Dickey-Fuller (ADF) test (Table 2) confirmed the stationarity of the data (see for details in Brooks, 2014).

Table 2:

ADF UNIT ROOT TEST (APRIL 28, 2011 – APRIL 28, 2017)

	BELEX 15 Serbia	**BIRS B&H**	**CROBEX Croatia**	**MBI10 Macedonia**	**MONEX Montenegro**	**SBITOP Slovenia**	**SASX 30 B&H**
ADF-test statistic (prob)	-34.093 (0.000)	-39.764 (0.000)	-35.954 (0.000)	-31.365 (0.000)	-38.869 (0.000)	-36.623 (0.000)	-37.117 (0.000)
Critical values:							
1% level	-3.434355	-3.434355	-3.434355	-3.434355	-3.434355	-3.434355	-3.434355
5% level	-2.863196	-2.863196	-2.863196	-2.863196	-2.863196	-2.863196	-2.863196
10% level	-2.567700	-2.567700	-2.567700	-2.567700	-2.567700	-2.567700	-2.567700

Source: Authors' calculations.

Furthermore, the results indicated that there are significant cross correlations of lag zero for most of the returns and cross correlations of lag one for some of the returns of the stock indices. Partial correlation and autocorrelation analysis indicated that all of the returns of the stock indices (except for BIRS and MONEX) demonstrated significant partial correlations of lag one. As noted earlier, MARMA model is used to investigate co-movements of daily returns. For each return equation, regressors are the other six returns of the stock indices, its own one-period lagged returns as well as one-period lagged returns of other returns. Table 3 presents the co-movements of daily returns of the stock indices.

Table 3:

CO-MOVEMENTS* OF DAILY RETURNS OF THE SELECTED STOCK INDICES (APRIL 28, 2011 – APRIL 28, 2017)

$\hat{r}_{t(BELEX15)} = 0.24r_{t(MBI10)} + 0.10r_{t(SBITOP)} + 0.14r_{t(CROBEX)} - 0.10r_{t-1(BELEX15)} + 0.06r_{t(MONEX)} + + 0.08r_{t-1(CROBEX)}$
$\hat{r}_{t(BIRS)} = 0.04r_{t(SBITOP)} + 0.11r_{t(SASX30)}$
$\hat{r}_{t(CROBEX)} = 0.12r_{t(SBITOP)} + 0.10r_{t(BELEX15)} + 0.07r_{t(MBI10)} + 0.05r_{t-1(CROBEX)}$
$\hat{r}_{t(MBI10)} = 0.15r_{t(BELEX15)} + 0.20r_{t-1(MBI10)} + 0.06r_{t(CROBEX)} + 0.06r_{t-1(CROBEX)}$
$\hat{r}_{t(MONEX)} = 0.09r_{t(BELEX15)} + 0.07r_{t(CROBEX)}$
$\hat{r}_{t(SASX30)} = 0.03r_{t-1(MONEX)} + 0.07r_{t-1(SASX30)} + 0.03r_{t(BIRS)}$
$\hat{r}_{t(SBITOP)} = 0.23r_{t(CROBEX)} + 0.15r_{t(BELEX15)} + 0.10r_{t-1(CROBEX)} + 0.07r_{t(BIRS)}$

*All coefficients are significant at the five percent level ($p<0.05$); r denote returns (EViews).

Source: Authors' calculations.

The one-period lagged returns of some returns of the stock indices are also presented in Table 3, because of the existence of significant cross correlation of lag one (t-1) among some of the returns.

First, it is important to note that BELEX 15 is affected by all other returns and its own one period lagged return, except by BIRS and SASX 15 . Second, most of the coefficients are positive indicating that the markets move together. The only exception is its own negative one-period lagged return. Next, both BELEX 15 and CROBEX appear to positively affect all other returns except returns in Bosnia and Herzegovina. SBITOP affects CROBEX, BIRS and BELEX 15 and vice versa. SASX 30 returns are correlated (positively) only with BIRS returns and with its own one-period lagged returns.

The results indicate that there are still opportunities for portfolio diversification. For example, Serbian investors and investors from Bosnia and Herzegovina can safely diversify by investing in each other's markets. The same is true for investors from Montenegro and from Bosnia and Herzegovina; they can benefit from investing in each other's market. On the other hand, Croatian and Serbian investors have limited opportunities since the Croatian market and Serbian market

are positively correlated with all other analyzed markets except with Bosnia and Herzegovina.

Volatility persistence

To analyse persistence in volatility GARCH (1,1) model is used. The Engle (1982) test (Heteroscedasticity Test: ARCH) results for sample markets confirmed the presence of ARCH in the returns of the stock indices indicating the appropriateness of the model. Results of GARCH (1, 1) are presented in table 4.

Table 4:

ESTIMATION RESULTS OF GARCH (1, 1) (APRIL 28, 2011 – APRIL 28, 2017)

	BELEX 15 Serbia	**BIRS B&H**	**CROBEX Croatia**	**MBI 10 Macedonia**	**MONEX Montenegro**	**SASX 30 B&H**	**SBITOP Slovenia**
AR(1)	0.123 (0.00)		0.065 (0.02)	0.226 (0.00)		0.067 (0.01)	0.071 (0.01)
Variance equation							
Constant (C)	0.038 (0.00)	0.013 (0.00)	0.013 (0.00)	0.042 (0.00)	0.018 (0.00)	0.002 (0.00)	0.077 (0.00)
ARCH(-1) (α)	0.121 (0.00)	0.043 (0.00)	0.067 (0.00)	0.131 (0.00)	0.064 (0.00)	0.037 (0.00)	0.135 (0.00)
GARCH(-1) (β)	0.814 (0.00)	0.929 (0.00)	0.901 (0.00)	0.753 (0.00)	0.911 (0.00)	0.946 (0.00)	0.776 (0.00)
$\alpha+\beta<1$	0.935	0.972	0.968	0.884	0.975	0.983	0.911
AIC	2.134	1.951	1.789	1.734	2.366	0.531	2.565
SIC	2.151	1.965	1.806	1.751	2.379	0.548	2.582
ARCH-LM test statistic (Obs*R-squared)	2.219	0.044	0.226	0.276	0.283	1.344	1.039
Prob. Chi-Square(1)	0.136	0.833	0.635	0.599	0.596	0.246	0.308

Source: Authors' calculations.

In the selected period, as shown in table 4, Slovenia (SBITOP (0.135)), Macedonia (MBI 10 (0.131)) and Serbia (BELEX 15 (0.121)) exhibit the highest α value (ARCH coefficient), meaning that volatility reacts intensely to market movements. SASX 30 and BIRS, representing Bosnia and Herzegovina, have the lowest ARCH coefficient (0.037 and 0.043) indicating stable short term volatility. Long term (cumulative) effect of past shocks on returns is measured by the GARCH parameter ß. The results show that ß ranges from a low value of 0.753 in Macedonia (MBI 10) to 0.946 in Bosnia and Herzegovina (SASX 30). Macedonia (MBI 10) and Slovenia (SBITOP) have a relatively high α value indicating that the volatility reacts intensely to market movements. On the other hand they both have a relatively low ß value which indicates that shocks to conditional variance fade quickly. In such cases, volatility tends to be more 'spiky'.

Finally, volatility persistence measured by the sum of ARCH and GARCH (α and β), is the highest in Bosnia and Herzegovina (SASX 30 (0.983), BIRS (0.972) and Montenegro (MONEX 0.975)) indicating that the effects of the volatility shocks fade away slowly. ARCH LM test presented in table 4 confirms that there are no ARCH effects left in the standardized residuals and that the variance equation is correctly specified.

Volatility transmission

The Augmented GARCH model developed by Duan (1997) is used to detect volatility transmission between the stock markets.

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 + \theta X_t \tag{1}$$

Where X_t is the residual squared of ARMA model and θ is the term that measures the magnitude of volatility transmission across the markets.

The augmented GARCH (1,1) process has three attractive features. First, the use of the auxiliary variable, θ_t, and a transformation to define the conditional variance provides freedom to separately specify the time-series dynamic and functional form of the transformation. Second, it is an autoregressive system with both multiplicative and additive stochastic coefficients. Third, the augmented GARCH (1,1) process requires neither multiplicative nor additive shock to be a random variable that is bounded below (Duan 1997, p. 102).

For BIRS and MONEX returns, AR could not be fitted. Therefore for those returns one-period lagged squared returns are inputs for X_t. Hence, the paper reports transmission of conditional volatilities. The results are presented in table 5.

Table 5:

VOLATILITY TRANSMISSION

$\sigma^2_{t(BELEX15)} = 0.41 + 0.165e^2_{t-1(BELEX15)} + 0.579\sigma^2_{t-1(BELEX15)} - 0.028r^2_{t-1(BIRS)} - 0.017r^2_{t-1(MONEX)} - 0.028e^2_{t-1(SBITOP)} - 0.298e^2_{t-1(SASX30)} - 0.083e^2_{t-1(MBI10)}$
$\sigma^2_{t(BIRS)} = 0.01 + 0.028e^2_{t-1(BIRS)} + 0.944\sigma^2_{t-1(BIRS)} - 0.005e^2_{t-1(SBITOP)} + 0.03e^2_{t-1(SASX30)} + 0.007e^2_{t-1(MBI10)}$
$\sigma^2_{t(CROBEX)} = 0.02 + 0.078e^2_{t-1(CROBEX)} + 0.875\sigma^2_{t-1(CROBEX)} + 0.004r^2_{t-1(MONEX)} - 0.009e^2_{t-1(MBI10)}$
$\sigma^2_{t(MBI10)} = 0.03 + 0.115e^2_{t-1(MBI10)} + 0.769\sigma^2_{t-1(MBI10)} + 0.007e^2_{t-1(BELEX15)} + 0.019e^2_{t-1(CROBEX)}$
$\sigma^2_{t(MONEX)} = 0.67 + 0.028e^2_{t-1(MONEX)} + 0.593\sigma^2_{t-1(MONEX)} - 0.067r^2_{t-1(BIRS)} - 0.005e^2_{t-1(BELEX15)} - 0.368e^2_{t-1(SASX30)} - 0.031e^2_{t-1(CROBEX)}$
$\sigma^2_{t(SASX30)} = 0.001 + 0.996\sigma^2_{t-1(SASX30)} + 0.0004r^2_{t-1(BIRS)} - 0.001e^2_{t-1(MBI10)} + 0.0004e^2_{t-1(CROBEX)}$
$\sigma^2_{t(SBITOP)} = 0.07 + 0.102e^2_{t-1(SBITOP)} + 0.812\sigma^2_{t-1(SBITOP)} - 0.011r^2_{t-1(BIRS)} + 0.026e^2_{t-1(BELEX15)} - 0.087e^2_{t-1(SASX30)}$

Source: Authors' calculations

Serbian market is the only market experiencing volatility spillovers from all other markets, except from Croatian market. However, since the coefficients of market volatility spillover terms are negative in the equation for Serbia (BELEX15), it indicates that volatilities in all markets (Bosnia and Herzegovina, Montenegro, Slovenia, and Macedonia) have inverse influence on volatility in the Serbian market. Serbian market volatilities spill over to the Macedonian, Montenegrin and Slovenian markets. Croatian market volatility spills over to the Macedonian and Montenegrin markets and to a part of Bosnia & Herzegovina market. Macedonian market volatilities spill over to Serbian, Croatian and Bosnia & Herzegovina markets. However, it is important to note that, in most cases, the coefficients of market volatility spillover terms are very small. It indicates that even though there is an evidence of volatility transmission from one market to another the impact is weak.

5. Concluding remarks

This paper studied co-movements of equity returns, volatility persistence and transmission of volatilities among six countries of former Yugoslavia, using daily returns of the stock indices (CROBEX, SBITOP, BIRS, SASX30, BELEX15, MONEX and MBI10) from April 28th, 2011 to April 28th, 2017. Multivariate Auto Regressive Moving Average (MARMA) and the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) methodologies are utilized.

The results of this analysis indicate that co-movements between daily returns of the stock indices representing the countries under study are significant. It is interesting to note that Serbian market (BELEX 15) is affected by all other returns except by Bosnia and Herzegovina (BIRS and SASX 15). Furthermore, both Serbian and Croatian market returns appear to be positively affecting all other returns except returns in Bosnia and Herzegovina. However, there are still opportunities for portfolio diversification in the region. For example, the investors from Montenegro and from Bosnia and Herzegovina can safely invest in each other's market.

Other findings indicate that in Slovenian, Macedonian and Serbian markets volatility reacts intensely to market movements. Furthermore, volatilities persist very long in Bosnia and Herzegovina, and in Montenegro.

The analysis of volatility transmission showed that Serbian market is the only market experiencing volatility spillovers from all other markets, except from Croatian market. However, volatilities in all markets have inverse influence on volatility in the Serbian market.

Macedonia and Montenegro both experience volatility spillovers from Serbia and Croatia. The opposite is also true.

Volatility transmission or spillover and the time-varying nature of volatility are important for investors and portfolio managers who need those data on a daily basis to achieve better portfolio diversification. Even though the results of the analysis showed market interdependence, significant possibilities for international diversification within the region still exist. From the viewpoint of volatility transmission the findings also indicate enough elements for closer and better collaboration between selected markets. Intense collaboration should ease a comparison of the risk-return measurement of the stocks from different markets and enable application of the sophisticated portfolio management methods on such a small markets. Further research should also include other regional markets with extended research methodology.

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VOLATILNOST I PRINOSI DIONIČKIH INDEKSA NA ODABRANIM TRŽIŠTIMA SREDNJE I JUGOISTOČNE EUROPE

Sažetak

Rad istražuje kretanje prinosa, postojanost volatilnosti i njeno prelijevanje u zemljama srednje i jugoistočne Europe, zemljama bivše Jugoslavije: Hrvatskoj, Bosni i Hercegovini, Makedoniji, Crnoj Gori, Srbiji i Sloveniji u periodu od 2011. do 2017. MARMA i GARCH modeli su primijenjeni na dnevne prinose dioničkih indeksa. Rezultati analize pokazali su da postoji značajno zajedničko kretanje prinosa i prelijevanje volatilnosti između odabranih tržišta. Nalazi ukazuju da na slovenskom, makedonskom i tržištu Srbije volatilnost intenzivnije reagira na tržišna kretanja te da je na tržištima Bosne i Hercegovine i Crne Gore volatilnost najdulje prisutna. Sa stajališta prijenosa volatilnosti, rezultati ukazuju da postoji dovoljno elemenata za intenzivniju suradnju između odabranih tržišta.

Ključne riječi: kretanje prinosa, dionički indeksi, postojanost volatilnosti, prelijevanje volatilnosti, GARCH