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Dragan Tevdovski

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Department of Economics and Business
Aarhus University
Fuglesangs Allé 4
DK-8210 Aarhus V
Denmark

Email: oekonomi@au.dk
Tel: +45 8716 5515

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Dragan Tevdovski[*]

CREATES, Aarhus University

Faculty of Economics – Skopje, University Ss. Cyril and Methodius[†]

Abstract

The aim of this paper is to analyze the financial integration of the South Eastern Europe (SEE) stock markets. We use a multinomial logistic regression to analyze how persistence, asset class and volatility effects are related with negative coexceedances in SEE markets. We find evidence in favor of the continuation hypothesis in SEE stock markets. However, the factors associated with the coexceedances differ between the EU member countries from SEE and EU accession countries from SEE stock markets. The EU member countries are more dependent from the signals from major EU economies, while the accession countries are mainly influenced by the signals from the region.

Keywords: financial market integration, co-movement, stock markets, emerging markets, South Eastern Europe.

JEL classification: C25, F36, G15.

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[†] Correspondence: Faculty of Economics – Skopje, University Ss. Cyril and Methodius, 1000 Skopje, Republic of Macedonia; phone: +389 70 375 066; email address: dragan@eccf.ukim.edu.mk.

1. Introduction

The stock market co-movements receive a lot of attention in international finance since it has important practical implications for asset allocation and investment management. There is voluminous empirical literature that examines stock market co-movements among developed countries (for example, Engle and Susmel (1993), Bekaert and Harvey (1995), Longin and Solnik (1995), Forbes and Rigobon (2002) and Johnson and Soenen (2003). Also, there is increasing body of literature concerning Central and Eastern Europe (CEE) stock market co-movements (for example, Kasch-Haroutounian and Price (2001), Voronkova (2004), Cappieollo, et al. (2006), Babetskii et al. (2007), Egert and Kocenda (2007), Cerny and Koblas (2008), Gilmore et al. (2008) and Kocenda and Egert (2011).[1] However, the stock markets co-movements in South Eastern Europe (SEE) have been analyzed rather rarely.

Kenourgios and Samitas (2011) examine long-run relationships among five Balkan emerging stock markets (Turkey, Romania, Bulgaria, Croatia, Serbia), the United States and three developed European markets (UK, Germany, Greece), during the period 2000‑2009. Using conventional and regime-switching cointegration tests and Monte Carlo simulation, the results provide an evidence in favor of a long-run cointegrating relationship between the Balkan emerging markets within the region and globally. Gradojevic and Dobardzic (2012) employ frequency domain approach to analyze the causal relationship between the returns on main indexes of Croatia, Slovenia, Hungary and Germany on the return of the major Serbian stock exchange index. The results find evidence of a somewhat dominant effect of the Croatian and Slovenian stock exchange indexes on Serbian stock index across a range of frequencies. Horvath and Petrovski (2013) examine the international stock market comovements between Western Europe vis-àvis Central (the Czech Republic, Hungary and Poland) and South Eastern Europe (Croatia, Macedonia and Serbia) using multivariate GARCH models in 2006–2011. The results indicate that the degree of comovements is much higher for Central Europe.

[1] Most studies on CEE rely on the stock markets from Central Europe (Czech Republic, Hungary and Poland).

In this paper, we use a method proposed by Bae et al. (2003) to investigate the co-movements in the extreme returns between SEE stock markets. A multinomial logistic model is applied, which is based on a measure of joint occurrences of extreme stock market returns. Extreme returns in stock market of only one country, or exceedances, are large positive and large negative returns only in that country's stock market. Coexceedances are the joint occurrences of extreme returns in different countries stock markets. This method is used in Christiansen and Ranaldo (2009) and Dajcman (2013). The former applies on the new European Union (EU) member states stock markets, while the later applies on the selected markets from Eurozone. Markwat et al. (2009) make modification in the framework based on the ordered logit regressions in order to model the occurrence of local, regional and global crashes as function of their past occurences and financial variables.

We divide the SEE countries in two groups: EU accession countries and EU member countries and use the multinomial logit model to explain the coexceedances that occur in each group. Specifically, we allow transitory effects from major EU economies stock markets to EU member countries from SEE, and in addition, transitory effects from EU member countries from SEE to accession countries from SEE region. Following Christiansen and Ranaldo (2009) we test the persistence effects, asset class effects and volatility effects on the likelihood of the coexceedances in each SEE groups. Persistence effects refer to the likelihood of observing autocorrelation in the coexceedances, i.e. whether the extreme stock returns are followed by subsequent movements in the same direction or in the opposite direction. The asset class effects test the explanation power of the three asset class groups, namely interest rates, currency returns and stock returns, for extreme stock returns. Finally, the volatility effects refer to the link between extreme stock returns and volatility in interest rates, currency returns and stock returns.

We focus on the negative coexceedances and find strong persistence effects in the both SEE groups (EU member states and EU accession countries). The extreme negative stock returns are characterized by subsequent movement in same direction. The negative coexceedances in EU member countries from SEE stock markets are influenced by the coexceedances in major EU economies stock markets, while in the case of EU accession countries from SEE stock markets this influence is not existent. The negative

coexceedances of accession countries from SEE are influenced by negative coexceedances from EU member countries from SEE stock markets, which imply that in the accession group stock markets bad signals come from the region, not from the major EU economies. In respect to asset class effects and volatility effects, the results suggest that former have more influence on extreme negative coexceedances in the SEE stock markets than the later. Especially, the developments in the major EU stock markets are important factors in determination of the extreme returns coexceedances in SEE markets.

The results of this study may help policy makers to understand the nature of cross-region shock transmission. Similarly, it may be useful to investment managers for international portfolio diversification.

The structure of the remaining part of the paper is as follows: In Section 2 we present the data and in Section 3 we explain the methodological framework. Section 4 contains the empirical results, and Section 5 concludes.

2. Data description

South and East Europe (SEE) is a geographical and political region located primarily on the Balkan peninsula. However, there is no clear and universally accepted definition that delineates the SEE region. In this paper, we use the most broad geographical argument for SEE, which is based on the boundaries of the Balkan peninsula. We include in the analysis six countries that are fully located in the Balkan peninsula (Bosnia and Herzegovina, Macedonia, Montenegro, Serbia, Bulgaria and Greece) and four countries that are located mostly outside of the peninsula (Croatia, Slovenia, Romania and Turkey).[2]

[2] The market capitalization of listed companies in all ten observed SEE countries is equal to 415 billion US dollars in 2012 and it is higher that the market capitalization of listed companies in Central and Eastern European countries that joined EU in 2004 (Czech Republic, Slovak Republic, Hungary, Poland, Estonia, Lithuania, Latvia, Malta and Cyprus), which is equal to 253 billion US dollars, according to World Bank Global Development Indicators. In addition, the Turkey contributes the most in the SEE countries with 320 billion US dollars. But, this fact does not lower the importance of the rest of the SEE countries. For example, the three EU accession countries from SEE: Macedonia, Montenegro and Serbia, with 11.8 billion US dollars in 2012, have higher market capitalization of listed companies in comparison with Estonia, Latvia and Lithuania (7.4 billion US dollars in 2012).

We apply the daily data from DataStream stock index for various countries. Only in the cases of Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia, we use the relevant index from the local stock market (SASX10, CROBEX, MBI10, MONEX20 and BELEXline), because the DataStream stock index is not available.

We use daily log returns calculated from the price indexes for the stock markets measured in the national currency.[3] Christiansen and Ranaldo (2009) argue that usage of the national currencies returns are equivalent to currency hedged returns, while usage of common currency returns would bias the results and confound the genuine stock performance with that of the exchange rates. Also, because most markets are operating in the same time zone, the problem of non-overlapping trading hours does not arise. The data covers the period from October 4, 2004 to November 13, 2013.[4] It gives a total of 2378 observations and covers both bull and bear phases, high and low volatility and different market conditions.

We consider three groups of countries, where each is consists of five countries. The first two groups are SEE groups. The criterion for division is the EU membership. The first is the group of EU accession countries from SEE: Bosnia and Herzegovina, Macedonia, Montenegro, Serbia and Turkey. Albania and Kosovo are not included due data availability.[5] We denote this group with ACC.[6] The second is the group of EU member countries from SEE: Greece, Slovenia, Romania, Bulgaria and Croatia. We denote this group with MBR.[7] Greece and Slovenia were EU members during total sample period, while the rest of the countries were only members partly of the sample period.[8] However, in the models we use dummy variables to capture effect of January 1, 2007, when majority of the countries in this group are EU members. The group of major EU economies, according to nominal GDP in 2012, consists of the following countries: Germany, United Kingdom, France, Italy and Spain. We denote this group with

[3] For the most of the SEE countries total return indexes are not available.
[4] October 4, 2004 is the earliest date with daily stock market data for the all the countries under investigation.
[5] In the case of Albania there is not existence of stock market index, while in the case of Kosovo there is no existence of stock market.
[6] ACC is abbreviation for Accession countries in EU.
[7] MBR is abbreviation for Member countries in EU.
[8] The dates of their EU membership are: January 1, 1981 (Greece), May 1, 2004 (Slovenia), January 1, 2007 (Bulgaria and Romania) and July 1, 2013 (Croatia).

MEU.[9] In addition, we provide results also for the joined group of all ten countries from SEE. We denote this group with SEE. Tables A1 and A2 in the appendix present descriptive statistics and correlation matrix for the daily log returns of all 15 considered countries.

2.1. Coexceedance variables

We focus on occurrences of extreme returns. We treat extreme negative and extreme positive returns separately. We arbitrarily define an negative (positive) extreme return, or negative (positive) exceedance, as one that lies below (above) the 10% (90%) percentile of the return distribution. In this respect, we do not used 5% and 95% percentiles as in the Bae et al. (2003) pioneer paper due to smaller number of countries in each group in our paper.

Following Christiansen & Ranaldo (2009) we construct a variable that counts the number of extreme negative returns for EU accession countries from SEE on a given day (ACC). The variable can take on integer values between 0 and 5. We collect observations of 2 and above into one group, so the variable is truncated to take on values between 0 and 2. We denote this variable the negative coexceedance variable for the EU accession countries group: XN_t^{ACC}. So, we distinguish between following situations for a given day: no extreme return, only one country with an extreme return, and several countries with an extreme return. A similar negative coexceedance variables are constructed for the group of EU member countries from SEE (MBR), for the group of major EU economies (MEU) and for the group of all SEE countries (SEE). We use the following notation for the negative coexceedance variables:

- XN_t^{ACC}: negative coexceedance for EU accession countries from SEE on day t;
- XN_t^{MBR}: negative coexceedance for EU member countries from SEE on day t;
- XN_t^{MEU}: negative coexceedance for major EU economies on day t;
- XN_t^{SEE}: negative coexceedance for major EU economies on day t.

[9] MEU is abbreviation for Major EU countries.

Table 1: Summary statistics of negative coexceedance variables

	Number of Coexceedances		
	0	1	2+
Negative Coexceedances in ACC	1558 (65.5%)	568 (23.9%)	252 (10.6%)
Negative Coexceedances in MBR	1615 (67.9%)	517 (21.7%)	246 (10.4%)
Negative Coexceedances in MEU	1969 (82.8%)	129 (5.4%)	280 (11.8%)
Negative Coexceedances in SEE	1180 (49.6%)	652 (27.4%)	546 (23.0%)

The table shows the distribution of the negative coexceedance variables.

Summary statistics for the negative coexceedance variables are given in Table 1. The 2378 days in the sample period are divided into these in which there are no exceedances in any country (e.g. 1558 such days in ACC group for negative extreme returns), only one country exceedance (e.g. 568 such days in ACC group for negative extreme returns), and multi country coexceedances (e.g. 252 such days in ACC group for negative extreme returns). The number of multi country coexceedances is higher in the group of major EU economies (MEU) in comparison with both SEE groups (ACC and MBR) with the same number of group members (five countries), which reflect the higher level of interconnection of the MEU group in comparison with the SEE groups. The joint SEE group (SEE), which is consist of all ten SEE countries, have 546 days with multi country coexceedances, 652 days with only one country exceedance and 1180 days of no exceedances.

Time series plots of the coexceedance variables are presented in appendix. They indicate that the instances of several coexceedances are spread out during the sample period and are not characteristic only to some period of time. Moreover the figures shows that for both groups of SEE countries instances of several coexceedances are more frequent during financial crisis period, while in the case of major EU economies group the frequency of the several coexceedances also increase during financial crisis period, but does not decrease in the period after the crisis as in case of SEE groups.

2.2. Explanatory variables

In the empirical analysis, we also use additional explanatory variables in order to estimate the impact of the different stock markets or the economic fundamentals on the coexceedance variable in various

multinomial logit models. In the choice of the variables we follow the existing literature, and select to a large extent the same variables as Bae et al. (2003) and Christiansen and Ranaldo (2009). The frequency of all the explanatory variables does correspondents with the daily frequency of the coexceedance variables. The variables are as follows:

- S_t^{USA}: concurrent return from the US stock market (DataStream index).
- S_t^{MEU}: concurrent return from the major EU economies stock market (log-returns from equally weighted index constructed for the Germany, United Kingdom, France, Italy and Spain).
- S_t^{INT}: concurrent return from the EU member countries from SEE stock market (log-returns from equally weighted index constructed for the Greece, Slovenia, Romania, Bulgaria and Croatia).
- σ_t^{USA}: concurrent volatility for US stock market (square root of the conditional variance stemming from estimating the AR(1)-GARCH(1,1) model for the US stock return - S_t^{USA}).
- σ_t^{MEU}: concurrent volatility for major EU economies stock market (square root of the conditional variance stemming from estimating the AR(1)-GARCH(1,1) model for the major EU economies stock return - S_t^{MEU}).
- σ_t^{MBR}: concurrent volatility for EU member countries from SEE stock market (square root of the conditional variance stemming from estimating the AR(1)-GARCH(1,1) model for the EU member countries from SEE stock return - S_t^{EUS}).
- C_t: concurrent currency log return (exchange rate of EUR per USD).
- σ_t^C: concurrent volatility for currency return (square root of the conditional variance stemming from estimating the AR(1)-GARCH(1,1) model for the currency log return - C_t).
- R_t: concurrent interest rate (first differences of 1-month EURIBOR).[10]
- σ_t^R: concurrent volatility for currency return (square root of the conditional variance stemming from estimating the AR(1)-GARCH(1,1) model for the interest rate - R_t).

[10] The first difference is used, because the hypothesis for unit root of the level of interest rate series can not be rejected.

3. Methodological framework

In the first part, we present the econometric technique of multinomial logistic regression. In the second part, we describe the models used for hypothesis testing.

3.1. Multinomial logistic regression

We use the Bae et al. (2003) method of multinomial logit model to analyze extreme commovements between stock markets. This method offers a more efficient (in econometric terms) and consistent (in economic terms) way of analyzing commovement between financial markets, because coexceedance measure is not biased in periods of high volatility, it is not restricted to model linear phenomena, and it is easy to compute across time and assets (see Baur and Schulze, 2005; and Dungey et al., 2005).

A multinomial logit model is appropriate for modeling coexceedance variables, which as discussed above are discrete choice variables that can have only three categories (0, 1, and 2). We conduct univariate analysis and model one coexceedance variable at the time. The probability of, for example, XN_t^{ACC} being in category i is given by:

$$P_i = \frac{exp(\boldsymbol{\beta}_i' \boldsymbol{x})}{\sum_{j=1}^{2} exp(\boldsymbol{\beta}_j' \boldsymbol{x})} \quad (1)$$

where $i = 1, 2$; $\boldsymbol{x}$ is the vector of the explanatory variables (including constant) and $\boldsymbol{\beta}_i$ is the vector of coefficients for category i. The probability of being in category i is given as a function of explanatory variables $P_i = function(\boldsymbol{\beta}_i' \boldsymbol{x})$ where $i = 1, 2$. There is one coefficient for each covariate for each of the categories (for example, β_{1j} for category 1 for x_j). The baseline category is 0 ($i = 0$).

Considering only three categories (0, 1 and 2), we reduce the number of parameters in the model and make the results easier to understand. The explanation of the coefficients is straightforward: when β_{1j} is significant, then variable *j* has a positive effect upon the probability of the occurrence of an exceedance; when β_{2j} is significant, then variable *j* has a significant effect upon the probability of the occurrence of a coexceedance. The significance of a given explanatory variable i.e. whether both coefficients for both

categories are insignificant simultaneously ($\beta_{1j} = \beta_{2j} = 0$ for explanatory variable x_i) is checked with χ^2-test. The joint significance of all the explanatory variable is determined by use of χ^2-test, where we compare the estimated model with the base line model that only has the constant term as explanatory variable). In addition, we calculate a Cox and Snell's pseudoR^2 for various models.

3.2. Hypotheses and models

Persistence effects

The first hypothesis is about the persistence of the extreme returns in the SEE stock markets. We explore whether negative and positive coexceedances in stock prices are followed by subsequent movements in the same direction (continuation) or in the opposite direction (reversal). The empirical literature has identified both patterns in the developed markets. De Bondt and Thaler (1985) influenced by experimental psychology documentation of the overreaction of the people to unexpected and dramatic news, found reversal pattern in long-term stock return, i.e. stocks with low long-term past returns tend to have higher future returns as the result of the correction of the initial overreaction. Jegadeesh (1990) and Lehmann (1990) provide evidence on reversal pattern in short term stock returns. In contrast, Jegadeesh and Titman (1993) and Fama and French (1996) have found continuation pattern of short term stocks returns, i.e. stocks with higher returns tend to have higher future returns.

We use two model forms in order to test the persistence effects in SEE stock markets. The first form of the model test whether the coexceedances in MBR (EU member countries from SEE group) stock markets are autoregressive and whether they are related to the coexceedances of the same type in MEU stock markets. So, for the negative coexceedance variable for the MBR group (XN_t^{MBR}), the explanatory variables are $XN_{t-1}^{MBR}$and XN_t^{MEU}. For XN_t^{MBR} the probability of having i negative coexceedances is:

$$\text{For } XN_t^{MBR}\text{: } P_i = function(\beta_{i0} + \beta_{i1}XN_{t-1}^{MBR} + \beta_{i2}XN_t^{MEU}) \text{ where } i = 1, 2. \quad (2)$$

The same model form is used for the negative coexceedances for the SEE group (XN_t^{SEE}), where the explanatory variables are XN_{t-1}^{SEE} and XN_t^{MEU}.

The second form of the model test whether the coexceedances in ACC (EU accession countries from SEE group) stock markets are autoregressive and whether they are related to the coexceedances of the same type in MBR (EU member countries from SEE) and MEU (major EU economies group) stock markets. We believe that transitory effect of the INT to ACC stock markets is important in modeling of the coexceedanes of ACC. Some evidence of this thinking could be found in the Gradojevic and Dobardzic (2012), where they find much stronger influence of the Croatian and Slovenian stock market indexes than the German and Hungarian stock indexes on Serbian stock index. So, for the negative coexceedance variable for the ACC group (XN_t^{ACC}), the explanatory variables are XN_{t-1}^{ACC}, XN_t^{MBR} and XN_t^{MEU}. For XN_t^{ACC} the probability of having i negative coexceedances is:

$$\text{For } XN_t^{ACC}\text{: } P_i = function\left(\beta_{i0} + \beta_{i1}XN_{t-1}^{ACC} + \beta_{i2}XN_t^{MBR} + \beta_{i3}XN_t^{MEU}\right) \text{ where } i = 1, 2. \quad (3)$$

Asset class effects

The second hypothesis is about the asset class effects on the extreme returns in the SEE stock markets. We explore whether currency rate and interest rates movements, as well as American and European stock markets developments, are relevant for explaining coexccedances in SEE stock markets. Obstfeld (1986) and Morris and Shin (1998) suggested currency attacks as important source of extreme returns transmission, while funding liquidity and market liquidity is pointed out by Brunnermeier and Pedersen (2009). Moreover, Caballero and Krishnamurthy (2008) put a light to flight to quality episodes (substitution between equities and safer assets such as bonds or money) as important source of financial instability. In addition, Christiansen and Ranaldo (2009) argue that EU membership may have decreased the currency risk premium and increased the degree of stock return correlation within new member states and between them and old member states.

As in the case of persistence effects, we use two model forms in order to test the asset class effects in SEE stock markets. The first form of the model test whether the coexceedances in MBR (EU member countries from SEE group) stock markets or SEE (all countries from SEE) stock markets are related to different assets type returns. The explanatory variables are: currency return (C_t), interest rate (R_t), major EU stock market return (S_t^{MEU}) and US stock market return (S_t^{USA}). So, for the negative coexceedance variable (XN_t^{MBR}) the probability of having i negative coexceedances is:

$$\text{For } XN_t^{MBR}\text{: } P_i = function(\beta_{i0} + \beta_{i1}C_t + \beta_{i2}R_t + \beta_{i3}S_t^{MEU} + \beta_{i4}S_t^{USA}) \text{ where } i = 1, 2. \quad (4)$$

The same model form is used for the negative coexceedances for the SEE group (XN_t^{SEE}).

The second form of the model designed for ACC (EU accession countries from SEE) stock markets have additional variable MBR (EU member countries for SEE) stock market return (S_t^{MBR}), in order to be captured regional transitory effect. So, for the negative coexceedance variable (XN_t^{ACC}) the probability of having i negative coexceedances is:

$$\text{For } XN_t^{ACC}\text{: } P_i = function(\beta_{i0} + \beta_{i1}C_t + \beta_{i2}R_t + \beta_{i3}S_t^{MEU} + \beta_{i4}S_t^{USA} + \beta_{i5}S_t^{MBR}) \text{ where } i = 1, 2. \quad (5)$$

Volatility effects

The third hypothesis is about the volatility effects on the extreme returns in the SEE stock markets. We explore whether coexceedanes are more likely to occur in highly volatile environment overriding all asset classes. Leveraged international allocations may also increase extreme events propagation. Schinasi and Smith (2001) show that even in an efficient and frictionless setting, spillover effects can emerge on the basis of optimal portfolio decisions taken by leveraged investors as a simple rebalancing response.

We use two different model forms in order to test the asset class effects in SEE stock markets. The first form of the model test whether the negative coexceedances in EU member countries from SEE group stock markets (MBR) are related to volatility of different assets type returns. The explanatory variables are: volatility of currency return (σ_t^C), volatility of interest rate (σ_t^R), volatility of major EU stock market

return (σ_t^{MEU}) and volatility of US stock market return (σ_t^{USA}). So, for the negative coexceedance variable (XN_t^{MBR}) the probability of having i negative coexceedances is:

$$\text{For } XN_t^{MBR}\text{: } P_i = function(\beta_{i0} + \beta_{i1}\sigma_t^C + \beta_{i2}\sigma_t^R + \beta_{i3}\sigma_t^{MEU} + \beta_{i4}\sigma_t^{USA}) \text{ where } i = 1, 2. \quad (6)$$

The model form is identical in the case of negative and coexceedances for the SEE group (XN_t^{SEE}).

The second form of the model designed for ACC (EU accession countries from SEE) stock markets have additional variable EU member countries for volatility of SEE stock market return (σ_t^{MBR}), in order to capture the regional transitory effect. So, for the negative coexceedance variable (XN_t^{ACC}) the probability of having i negative coexceedances is:

$$\text{For } XN_t^{ACC}\text{: } P_i = function(\beta_{i0} + \beta_{i1}\sigma_t^C + \beta_{i2}\sigma_t^R + \beta_{i3}\sigma_t^{MEU} + \beta_{i4}\sigma_t^{USA} + \beta_{i5}\sigma_t^{MBR}) \text{ where } i = 1, 2. \quad (7)$$

4. Empirical results

We focus on the negative coexceedances. Table 2 reports the estimation results of the multinomial logit model for the three different negative coexceedance variables. The left-most part of the table concerns the situation where the negative coexceedance variable for the EU members from SEE (XN_t^{MBR}) is the explained variable, in the second part the negative coexceedances for EU accession countries from SEE (XN_t^{ACC}) is the explained variables, and in the third part the negative coexceedance variable for the all SEE countries (XN_t^{SEE}) is the explained variable. The first two columns show the parameter estimates and their standard deviations in parenthesis. In the third column, */**/*** indicate the significance of the individual parameter (β_{ij}) at a 10%/5%/1% level of significance. In the fourth column, it is marked by &/&&/&&& when the explanatory variable x_j is overall significant at the 10%/5%/1% level of significance ($\beta_{1j} = \beta_{2j} = 0$). We include an intercept dummy, as well as interaction dummies for the explanatory variables in the model, where the dummy variable takes value 1 after January 1, 2007 and zero before. The estimates are not tabulated, but the joint significance level (10%/5%/1%) of the dummy variables is indicated by #/##/### in the fifth column in the every of the fourth parts of the table.

The table 2 reports the persistence effect results. The estimated significant and positive lagged explanatory variable in all three cases is evidence in favor of the continuation hypothesis (subsequent movements in the same direction) in the SEE markets rather than reversal hypothesis (subsequent movements in the opposite direction). It implies that the number of extreme negative returns today is positively related to the number of extreme negative returns yesterday in both SEE groups (ACC and INT), as well as in the joint group (SEE).

Table 2: Persistence effects (negative coexceedances)

	EU members from SEE (XN_t^{MBR})					**Accession countries from SEE (XN_t^{ACC})**					**All countries from SEE (XN_t^{SEE})**			
Const. (1)	-1.78	(0.13)	***	&&&	###	-1.28	(0.13)	***	&&&	##	-0.93	(0.12)	***	&&&
Const.(2)	-3.85	(0.32)	***			-3.57	(0.32)	***			-1.94	(0.18)	***	
XN_{t-1}^{ACC} (1)						0.28	(0.17)	*	&&&					
XN_{t-1}^{ACC} (2)						0.95	(0.30)	***						
XN_{t-1}^{MBR} (1)	0.75	(0.20)	***	&&&	#									
XN_{t-1}^{MBR} (2)	1.22	(0.34)	***											
XN_{t-1}^{SEE} (1)											0.36	(0.13)	***	&&&
XN_{t-1}^{SEE} (2)											0.61	(0.16)	***	
XN_t^{MBR} (1)						0.74	(0.19)	***	&&&					
XN_t^{MBR} (2)						1.23	(0.32)	***						
XN_t^{MEU} (1)	0.80	(0.27)	***	&&&		0.44	(0.25)	*			0.10	(0.33)		&&&
XN_t^{MEU} (2)	1.36	(0.35)	***			-0.26	(0.58)				1.02	(0.27)	***	
Pseudo R squared	14.6%					16.7%								15.9%
Chi-square	374.2***					435.1***								412.9***

The table reports estimates from multinomial logit model for the three different coexceedance variables: the negative coexceedance variable for the EU members from SEE (first part of the table), the negative coexceedance variable for the EU accession countries from SEE (second part of the table) and the negative coexceedance variable for all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Regarding extreme negative returns in major EU economies' markets (MEU) as explanatory variable, we found them significant and positive in the MBR group. It means that the more extreme negative returns we have on major EU countries stock markets (MEU), the more likely is to have many extreme negative returns on the EU member states from SEE stock markets (MBR). The same is in joint SEE group (SEE), while the sizes of the coefficients are smaller in comparison with the MBR group. However, the extreme negative returns in major EU economies' stock markets (MEU) are not significant in the case of negative coexceedances for accession countries from SEE (XN_t^{ACC}). In this case, the additional explanatory variable – negative coexceedances for EU member states from SEE (XN_t^{MBR}) is significant and positive. It implies that the extreme negative influence of major EU countries' stock markets on the extreme negative returns of the accession countries is not directly, but through the EU member states

from SEE stock markets. It means that in accession group stock markets (ACC) bad signals come from the region (MBR), not from major EU economies (MEU).

Table 3: Asset class effects (negative coexceedances)

	EU members from SEE (XN_t^{MBR})					Accession countries from SEE (XN_t^{ACC})					All countries from SEE (XN_t^{SEE})				
Const. (1)	-1.48	(0.12)	***	&&&	###	-0.91	(0.11)	***	&&&	###	-0.79	(0.10)	***	&&&	###
Const. (2)	-3.28	(0.26)	***			-2.62	(0.22)	***			-1.47	(0.13)	***		
$C_t(1)$	0.24	(0.21)				-0.12	(0.19)				-0.07	(0.19)			
$C_t(2)$	0.01	(0.44)				0.40	(0.40)				0.23	(0.24)			
$R_t(1)$	-0.02	(0.14)				0.20	(0.11)	*	&	#	0.22	(0.11)	*		
$R_t(2)$	0.20	(0.22)				-0.37	(0.29)				-0.26	(1.73)			
$S_t^{USA}(1)$	0.21	(0.20)				0.19	(0.18)				0.23	(0.18)		&	
$S_t^{USA}(2)$	0.27	(0.41)				0.05	(0.37)				0.47	(0.23)	**		
$S_t^{MEU}(1)$	-0.53	(0.19)	***	&&&		-0.45	(0.18)	**	&&		-0.21	(0.18)		&&&	
$S_t^{MEU}(2)$	-0.97	(0.33)	***			-0.20	(0.35)				-1.11	(0.22)	***		
$S_t^{MBR}(1)$						-0.96	(0.19)	***	&&&	###					
$S_t^{MBR}(2)$						-1.50	(0.34)	***							
Pseudo R squared	14.2%					11.7%					10.3%				
Chi-square	365.6***					295.5***					259.3***				

The table reports estimates from multinomial logit model for the three different coexceedance variables: the negative coexceedance variable for the EU members from SEE (first part of the table), the negative coexceedance variable for the EU accession countries from SEE (second part of the table) and the negative coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

The results for the asset class effects are given in the table 3. For the EU member countries from SEE (MBR), the likelihood of observing negative coexceedances is only related to major EU economies stock market return (S_t^{MEU}). In particular, it is negatively related to stock returns in major EU economies market. The likelihood of observing negative coexceedances in EU accession countries from SEE (XN_t^{ACC}) appears more highly connected with EU member states from SEE stock returns (S_t^{INT}) than with major EU economies' stock return (S_t^{MEU}). These links have negative effects upon the likelihood. Also, there is positive link with interest rates (R_t), but to lesser extent. The likelihood of observing negative coexceedances in joint SEE group is related to major EU economies stock market return (S_t^{MEU}) and also there is weak link with US stock market return (S_t^{USA}). In all three cases, the currency return (C_t) is not of importance.

Regarding volatility effects, we find existence of multicolinearity among the volatilities of US stock market return (σ_t^{USA}), major EU market stock market return (σ_t^{MEU}) and EU member countries from SEE stock market return (σ_t^{MBR}). Table A3 in the appendix, which presents the correlation matrix of all included explanatory variables in the models, shows that the correlations among the volatilities of the

three above mentioned stock markets are higher than 0.8. Therefore, we include in the models only one of these variables at a time.

Table 4: Volatility effects with only σ_t^{USA} from stock markets volatilities (negative coexceedances)

	EU members from SEE (XN_t^{MBR})				Accession countries from SEE (XN_t^{ACC})				All countries from SEE (XN_t^{SEE})			
Const. (1)	-2.26	(1.37)	*	&&	-1.35	(1.12)			-0.72	(1.06)		
Const. (2)	-6.95	(2.78)	**		-1.40	(2.82)			-1.92	(1.40)		
$\sigma_t^C(1)$	-0.21	(2.47)			-3.17	(2.11)			-1.88	(2.13)		
$\sigma_t^C(2)$	1.20	(5.27)			-2.54	(4.65)			-3.65	(2.87)		
$\sigma_t^R(1)$	-0.18	(0.29)			0.25	(0.20)			0.53	(0.41)		
$\sigma_t^R(2)$	0.55	(0.36)			-1.00	(0.87)			-0.69	(0.71)		
$\sigma_t^{USA}(1)$	1.69	(0.99)	*	&	2.32	(0.87)	***	&&	1.28	(0.91)		&&&
$\sigma_t^{USA}(2)$	3.01	(1.83)	*		2.49	(1.83)			3.57	(1.10)	***	
Pseudo R squared	8.3%				9.0%				9.3%			
Chi-square	206.4***				223.0***				231.8***			

The table reports estimates from multinomial logit model for the three different coexceedance variables: the negative coexceedance variable for the EU members from SEE (first part of the table), the negative coexceedance variable for the EU accession countries from SEE (second part of the table) and the negative coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table 5: Volatility effects with only σ_t^{MEU}effects from stock markets volatilities (negative coexceedances)

	EU members from SEE (XN_t^{MBR})			Accession countries from SEE (XN_t^{ACC})			All countries from SEE (XN_t^{SEE})		
Const. (1)	-2.07	(1.35)		-1.09	(1.11)		-0.41	(1.05)	
Const. (2)	-6.84	(2.89)	**	-1.37	(2.68)		-1.54	(1.40)	
$\sigma_t^C(1)$	1.46	(2.28)		-1.22	(1.94)		-0.41	(1.98)	
$\sigma_t^C(2)$	2.82	(5.11)		-0.89	(4.24)		-0.64	(2.64)	
$\sigma_t^R(1)$	-0.10	(0.28)		0.28	(0.21)		0.72	(0.42)	*
$\sigma_t^R(2)$	0.40	(0.41)		-0.57	(0.76)		-0.62	(0.74)	
$\sigma_t^{MEU}(1)$	-0.04	(0.56)		0.41	(0.44)		-0.33	(0.49)	
$\sigma_t^{MEU}(2)$	1.95	(0.76)		-1.25	(1.38)		0.79	(0.58)	
Pseudo R squared	8.2%			6.2%			6.8%		
Chi-square	202.7***			151.3***			167.2***		

The table reports estimates from multinomial logit model for the three different coexceedance variables: the negative coexceedance variable for the EU members from SEE (first part of the table), the negative coexceedance variable for the EU accession countries from SEE (second part of the table) and the negative coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table 4 presents the results for volatility effects with only included volatility of US stock market return (σ_t^{USA}) from stock markets volatilities. The likelihood of observing negative coexceedances in all three cases (MBR, ACC and SEE) is only related with volatility of US stock market return (σ_t^{USA}), whereas the exchange rate volatility (σ_t^C) and interest rate volatility (σ_t^R) are insignificant. The increase of US stock market return volatility (σ_t^{USA}) leads to an increase in the likelihood of negative coexceedances in SEE markets.

Table 5 presents the results for volatility effects with only included volatility of major EU stock market return (σ_t^{MEU}) from stock markets volatilities. The volatility of the major EU stock market return (σ_t^{MEU}) seems not to be relevant for explaining negative coexccedence variables in all three cases. The effects of the other volatility variables are the same as in the table 4.

Table 6: Volatility effects for Accession countries from SEE with only σ_t^{INT} effects from stock markets volatilities (negative coexceedances)

	Accession countries from SEE (XN_t^{ACC})			
Const. (1)	-1.42	(1.12)		
Const. (2)	-1.03	(2.92)		
$\sigma_t^C(1)$	-2.72	(1.99)		
$\sigma_t^C(2)$	-3.75	(4.47)		
$\sigma_t^R(1)$	0.30	(0.20)		&
$\sigma_t^R(2)$	-1.05	(0.89)		
$\sigma_t^{MBR}(1)$	2.17	(0.61)	***	&&&
$\sigma_t^{MBR}(2)$	3.28	(1.16)	***	
Pseudo R squared	8.5%			
Chi-square	209.8***			

The table reports estimates from multinomial logit model for the negative coexceedance variable for the EU accession countries from SEE. Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table 6 presents the results for volatility effects only for EU accession countries from SEE (ACC), whereas as explanatory variable from stock markets is included only the volatility of EU member countries' stock market return (σ_t^{MBR}). The volatility of the EU member countries' stock market return (σ_t^{INT}) is significant and positive. It means that the increase in volatility in EU member countries' stock market return (σ_t^{INT}) leads to increase of the likelihood of observing negative coexceedances in EU accession countries' stock markets (XN_t^{ACC}). The effects of the other volatility variables are the same as in the tables 4 and 5.

At the end, we estimate an encompassing model with all the explanatory variables analyzed above. The model is presented in Table 7. We include only the volatility of US stock market return from the volatilities of stock markets in the model. Christiansen & Ranaldo (2009) argue that this encompassing model can be seen as robustness check in two main respects: omitted variable bias and endogeneity. The omitted variable bias could arise because we conduct separate analysis for three hypothesis (persistence effects, asset class effects and volatility effects) and it is possible that in each model we omitted one or

more independent variables that are correlated with the included independent variables. The endogeneity issue could arise from the approach to regard exogenous variables as the causes of the coexceedance variable (endogenous variable). It is possible that we omit some potential factors that originate from SEE region. The encompassing model is a comprehensive model that considers all variables at once with goal to remedy these two issues. In addition, we are aware that this approach could encounter problem of multicolinearity. However, the correlation matrix among all explanatory variables suggests that it is not the case (Table A3 in the appendix).

The encompassing model is more parsimonious than the nested models of persistence, asset class and volatility effects. This model for the negative coexceedances in EU member countries from SEE (MBR) has the same significant variables as the nested persistence effects model (the own lagged values and the negative coexceedances in major EU stock markets), while it points out major EU economies' stock market return (S_t^{MEU}) and volatilities of US stock market return (σ_t^{USA}) as insignificant. The model for negative coexceedance variable for EU accession countries from SEE (XN_t^{ACC}) indicates as influential its own lagged value (XN_{t-1}^{ACC}), major EU stock market return (S_t^{MEU}) and EU member countries from SEE stock markets (S_t^{MBR}), while it points coexceedances in major EU group (XN_t^{MEU}) and EU member countries from SEE group (XN_t^{MBR}), as well as volatilities of US stock market return (σ_t^{USA}), as insignificant. The model for all countries from SEE has its own lagged values (XN_{t-1}^{SEE}) and the two stock markets returns, S_t^{MEU} and S_t^{USA} as significant, while it points the volatility of US stock market (σ_t^{USA}) as insignificant. In overall, the encompassing models confirm the importance of the persistence effects and suggest that asset class effects have more influence on extreme negative coexceedances on the SEE stock markets than the vollatility effects.

The insignificance of intercept dummy variables in all four models implies that the likelihood of coexccedances in EU member states or accession countries is not changed after January 2007, which is not supportive for closer connection between SEE and EU stock markets through the integration process.

However, we must highlight the recent financial crisis as a very important factor, which has opposite influence than integration process of the likelihood of coexceedances in SEE stock markets.

Table 7: Encompassing model (negative coexceedances)

	EU members from SEE (XN_t^{MBR})					Accession countries from SEE (XN_t^{ACC})					All countries from SEE (XN_t^{SEE})				
Const.(1)	-1.84	(1.42)		&&		-1.24	(1.18)				-1.15	(1.09)			
Const. (2)	-6.75	(2.90)	**			-1.11	(2.93)				-1.73	(1.49)			
XN_{t-1}^{ACC} (1)						0.21	(0.18)		&&						
XN_{t-1}^{ACC} (2)						0.84	(0.31)	***							
XN_{t-1}^{MBR} (1)	0.76	(0.20)	***	&&&	##										
XN_{t-1}^{MBR} (2)	1.30	(0.35)	***												
XN_{t-1}^{SEE} (1)											0.38	(0.14)	***	&&&	
XN_{t-1}^{SEE} (2)											0.58	(0.17)	***		
XN_t^{MBR} (1)						0.28	(0.23)								
XN_t^{MBR} (2)						0.65	(0.44)								
XN_t^{MEU} (1)	0.61	(0.35)	*	&&		-0.15	(0.33)				-0.13	(0.38)			
XN_t^{MEU} (2)	1.41	(0.58)	**			-0.58	(0.75)				0.32	(0.38)			
C_t(1)	0.23	(0.22)				-0.14	(0.20)				-0.08	(0.19)			
C_t(2)	0.04	(0.46)				0.25	(0.40)				0.20	(0.25)			
R_t(1)	-0.04	(0.15)				0.16	(0.12)				0.17	(0.11)			
R_t(2)	0.12	(0.27)				-0.36	(0.33)				-0.26	(0.19)			
S_t^{USA}(1)	0.24	(0.20)				0.21	(0.18)				0.31	(0.18)	*	&	
S_t^{USA}(2)	0.40	(0.40)				0.22	(0.38)				0.49	(0.24)	**		
S_t^{MEU}(1)	-0.25	(0.24)				-0.47	(0.22)	**	&		-0.24	(0.21)		&&	
S_t^{MEU}(2)	0.01	(0.46)				-0.39	(0.45)				-0.83	(0.29)	***		
S_t^{MBR}(1)						-0.77	(0.23)	***	&&	###					
S_t^{MBR}(2)						-0.99	(0.44)	**							
σ_t^C(1)	-0.51	(2.58)				-2.52	(2.24)				-0.93	(2.19)			
σ_t^C(2)	2.23	(5.51)				-4.34	(4.92)				-3.41	(3.05)			
σ_t^R(1)	-0.21	(0.30)				0.17	(0.22)				0.42	(0.46)			
σ_t^R(2)	0.45	(0.39)				-1.74	(0.80)				-0.79	(0.75)			
σ_t^{USA}(1)	1.03	(1.06)				1.75	(0.94)	*			0.86	(0.94)			
σ_t^{USA}(2)	1.09	(2.18)				2.10	(2.05)				2.56	(1.22)	**		
Pseudo R squared	20.2%					21.1%					21.4%				
Chi-square	537.6***					564.2***					573.1***				

The table reports estimates from multinomial logit model for the three different coexceedance variables: the negative coexceedance variable for the EU members from SEE (first part of the table), the negative coexceedance variable for the EU accession countries from SEE (second part of the table) and the negative coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

The empirical results are in the same line with those found in Christiansen and Ranaldo (2009). They analysed the stock markets in the new EU member countries, including 3 SEE countries, for the period 2000-2007. They found strong persistence effects, and that there are significant global linkages of the new EU countries stock markets with stock markets in old EU countries in terms of returns, volatility, and coexceedances. However, they also found that the relevance of many of the factors changed after the EU enlargement in May 2004, which fact is not found in the present study as expected with the new EU enlargement in January 2007.

4.1. Comment for positive coexceedances

The estimation results of the multinomial logit model for the positive coexceedance variables are presented in the tables in the appendix. The positive coexceedance variables are defined analoguely to negative coexceedance variables, where we arbitrarily use positive extreme return, or positive exceedance, as one that lies above the 90% percentile of the return distribution. Also, the model forms for these variables are constructed in the same fashion as those of the negative ones.

The continuation hypothesis (subsequent movements in the same direction) is confirmed also in the positive coexceedances. The number of extreme positive returns today is positively related to the number of extreme positive returns yesterday in both SEE groups (ACC and MBR), as well as in the joint group (SEE). Regarding extreme positive returns in major EU economies' markets (MEU) as explanatory variable, as expected we found them significant and positive in all groups. However, the positive coexceedance of EU accession group (ACC) is not influenced by positive coexceedance of EU member states group (MBR), as in the case of negative coexceedances, but only from positive coexceedances from major EU economies group (MEU). It means that in EU accession group stock markets (ACC) bad signals come from the region, while good signals come from the major EU economies (MEU).

The results of the asset class effects show that the likelihood of observing positive coexceedances in EU member countries from SEE (MBR) is only related to currency returns and major EU economies stock market return. Surprisingly, in the case of positive coexceedances of EU accession countries group (ACC) there is no link with major EU economies' stock market return, but only with US stock market return.

The results of the volatility effects point out that the likelihood of observing positive coexceedances of EU accession countries from SEE (ACC) is related with volatility of interest rate, volatility of US stock market return and volatility of EU member states from SEE (MBR) stock market. The positive coexcedances of EU member states from SEE (MBR) stock market seems not related with the observed volatilities.

5. Conclusion

We apply the coexceedance methodology of Bae et al. (2003) to investigate the co-movements in the negative extreme returns between SEE stock markets. We divide the SEE stock markets in two groups based on the countries EU membership in order to allow for transmission mechanism from major EU economies' stock markets to EU member countries from SEE, and in addition, transitory effect from EU member countries from SEE to accession countries from SEE region. Also, we provide results for the joint group which include all SEE countries. The negative coexceedance variable for the EU accession countries from SEE (ACC) counts the number of extreme returns (below 10% percentile) across the EU accession countries on a given day. The negative coexceedance variables for the following groups are constructed in the same analogous way: EU member countries from SEE (MBR), major EU economies (MEU) and all SEE countries (SEE). Using the multivariate logit model, we test the persistence, asset class and volatility effects on the likelihood of the coexceedances in SEE groups.

We find strong persistence effects in coexceedances, which is evidence in favor of the continuation hypothesis rather than reversal hypothesis in SEE stock markets. However, the factors associated with the coexceedance variables differ between the EU member countries from SEE stock markets (MBR) and EU accession countries' stock markets from SEE (ACC). The negative coexceedances in EU member countries from SEE (MBR) stock markets are dependent from the extreme movements in the major EU economies' stock markets (MEU), while the EU accession countries from SEE stock markets (ACC) are mainly influenced by the EU member countries from SEE (MBR) stock markets developments.

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Appendix

Table A1: Descriptive statistics

	BIH	MKD	MON	SRB	TUR
Mean (%)	-0.065	0.021	0.062	0.002	0.046
Median (%)	0.000	0.000	0.000	0.000	0.038
Max. (%)	7.566	8.090	11.286	9.871	11.712
Min. (%)	-41.365	-10.283	-9.708	-6.969	-10.505
10% percentile	-1.252	-1.215	-1.456	-0.949	-1.900
90% percentile	1.142	1.345	1.732	0.944	1.982
Std. Dev. (%)	1.435	1.423	1.717	0.968	1.701
Skewness	-9.847	-0.127	0.690	0.263	-0.281
Kurtosis	292.834	11.311	10.266	15.523	6.704

	HRV	BGR	ROM	SVN	GRC
Mean (%)	0.010	0.013	0.017	-0.023	-0.038
Median (%)	0.000	0.000	0.000	0.000	0.000
Max. (%)	14.779	10.399	11.825	8.170	12.459
Min. (%)	-10.764	-11.278	-13.955	-8.333	-9.970
10% percentile	-1.174	-1.460	-1.886	-1.046	-2.134
90% percentile	1.249	1.512	1.945	1.032	1.872
Std. Dev. (%)	1.325	1.507	1.866	1.049	1.806
Skewness	0.049	-0.318	-0.600	-0.531	0.000
Kurtosis	18.001	10.349	10.186	12.412	6.562

	DEU	GBR	FRA	ITA	ESP
Mean (%)	0.023	0.017	0.012	-0.010	0.007
Median (%)	0.089	0.027	0.038	0.031	0.054
Max. (%)	16.046	8.861	9.920	10.482	11.749
Min. (%)	-7.801	-8.714	-8.429	-8.636	-8.492
10% percentile	-1.341	-1.249	-1.409	-1.557	-1.577
90% percentile	1.209	1.222	1.379	1.417	1.497
St. Dev. (%)	1.246	1.219	1.302	1.414	1.403
Skewness	0.553	-0.209	-0.020	-0.105	0.090
Kurtosis	20.053	10.577	9.678	8.650	9.007

	US stock market (USA)	Major EU economies stock market (MEU)	EU member countries from SEE stock market (EUS)
Mean (%)	0.021	0.010	-0.004
Median (%)	0.055	0.053	0.041
Max. (%)	10.902	9.497	7.654
Min. (%)	-9.409	-7.489	-8.559
10% percentile	-1.247	-1,326	-1,040
90% percentile	1.212	1.270	0.963
St. Dev. (%)	1.301	1.231	1.000
Skewness	-0.363	-0.142	-0.742
Kurtosis	13.551	9.161	13.627

The tables report the descriptive statistics for the daily log returns (in %) of the considered stock markets for the sample period October 4, 2004 to November 13, 2013 (2378 observations). The first table includes the EU accession countries from SEE: Bosnia and Herzegovina (BIH), Macedonia (MKD), Montenegro (MON), Serbia (SRB) and Turkey (TUR). The second table includes EU member countries from SEE: Greece (GRC), Slovenia (SLV), Bulgaria (BGR), Romania (ROM) and Croatia (HRV). The third table includes the major EU economies: Germany (DEU), United Kingdom (UK), France (FRA), Italy (ITA) and Spain (ESP). When available we use the DataStream stock index. In the cases of Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia, we use the relevant index from the local stock market (SASX10, CROBEX, MBI10, MONEX20 and BELEXline). In addition, the fourth tablepresent the descriptive statistics of daily log returns of US stock market (DataStream stock index), major EU economies stock market (log-returns from equally weighted index constructed from 5 major EU countries stock market indexes) and EU member countries from SEE stock market (log-returns from equally weighted index constructed from 5 EU member countries from SEE stock market indexes).The following statistics are reported: mean, median, minimum, maximum, 10% and 90%percentiles, standard deviation, skewness and kurtosis.

The properties of the indices vary dramatically across the countries. Montenegro has the highest average daily return (0.062%), but Romania has the highest daily return standard deviation (1.866%), significantly higher than that of the United States and Major EU stock markets. The largest positive extreme return in SEE (14.779%) obtains for Croatia (while it is lower than of Germany), whereas Bosnia and Herzegovina experienced the largest negative extreme returns (-41.365%). Skewness is positive in the case of Montenegro, Serbia, Croatia, Germany and Spain and all the indices have excess kurtosis.

Table A2: Correlation matrix of the daily log returns of all stock markets and indexes

	BIH	MKD	MON	SRB	TUR	HRV	BGR	ROM	SVN	GRC	DEU	GBR	FRA	ITA	ESP	EUS	MEU	USA
BIH	1.00	0.10	0.11	0.17	-0.01	0.06	0.08	0.05	0.07	0.02	0.01	0.00	0.02	0.01	0.01	0.08	0.01	-0.01
MKD	0.10	1.00	0.10	0.24	0.10	0.20	0.10	0.18	0.20	0.12	0.08	0.11	0.14	0.14	0.11	0.23	0.12	0.06
MON	0.11	0.10	1.00	0.23	0.04	0.14	0.09	0.12	0.13	0.05	0.05	0.07	0.06	0.07	0.06	0.16	0.07	0.02
SRB	0.17	0.24	0.23	1.00	0.09	0.23	0.21	0.23	0.28	0.16	0.12	0.15	0.15	0.16	0.13	0.33	0.15	0.07
TUR	-0.01	0.10	0.04	0.09	1.00	0.35	0.14	0.36	0.22	0.42	0.50	0.57	0.56	0.51	0.50	0.47	0.56	0.34
HRV	0.06	0.20	0.14	0.23	0.35	1.00	0.21	0.44	0.36	0.33	0.41	0.45	0.45	0.44	0.41	0.69	0.46	0.33
BGR	0.08	0.10	0.09	0.21	0.14	0.21	1.00	0.23	0.23	0.13	0.11	0.15	0.14	0.14	0.13	0.54	0.14	0.05
ROM	0.05	0.18	0.12	0.23	0.36	0.44	0.23	1.00	0.40	0.35	0.35	0.42	0.41	0.40	0.37	0.77	0.42	0.23
SVN	0.07	0.20	0.13	0.28	0.22	0.36	0.23	0.40	1.00	0.23	0.22	0.27	0.29	0.27	0.25	0.61	0.28	0.15
GRC	0.02	0.12	0.05	0.16	0.42	0.33	0.13	0.35	0.23	1.00	0.42	0.47	0.50	0.50	0.48	0.67	0.51	0.28
DEU	0.01	0.08	0.05	0.12	0.50	0.41	0.11	0.35	0.22	0.42	1.00	0.79	0.84	0.78	0.74	0.47	0.89	0.70
GBR	0.00	0.11	0.07	0.15	0.57	0.45	0.15	0.42	0.27	0.47	0.79	1.00	0.92	0.85	0.80	0.55	0.93	0.59
FRA	0.02	0.14	0.06	0.15	0.56	0.45	0.14	0.41	0.29	0.50	0.84	0.92	1.00	0.92	0.88	0.55	0.98	0.61
ITA	0.01	0.14	0.07	0.16	0.51	0.44	0.14	0.40	0.27	0.50	0.78	0.85	0.92	1.00	0.88	0.54	0.95	0.57
ESP	0.01	0.11	0.06	0.13	0.50	0.41	0.13	0.37	0.25	0.48	0.74	0.80	0.88	0.88	1.00	0.51	0.93	0.55
EUS	0.08	0.23	0.16	0.33	0.47	0.69	0.54	0.77	0.61	0.67	0.47	0.55	0.55	0.54	0.51	1.00	0.56	0.32
MEU	0.01	0.12	0.07	0.15	0.56	0.46	0.14	0.42	0.28	0.51	0.89	0.93	0.98	0.95	0.93	0.56	1.00	0.64
USA	-0.01	0.06	0.02	0.07	0.34	0.33	0.05	0.23	0.15	0.28	0.70	0.59	0.61	0.57	0.55	0.32	0.64	1.00

The table reports the correlation matrix of the daily log returns of the all considered stock markets and three indexes (USA stock market, Major EU stock market and EU member countries from SEE stock market). Correlations within groups are higher than correlation across groups. However, the group of EU accession countries has the lowest correlations both within the group and across the groups (exception is Turkey with correlations similar to those of EU member countries from SEE group). The group of EU member countries from SEE have higher correlations with major EU economies group than with EU accession countries group. The highest correlations are within the major EU economies group.

Table A3: Correlation matrix of the all independent variables

	XN_t^{ACC}	XP_t^{ACC}	XN_t^{INT}	XP_t^{INT}	XN_t^{MEU}	XP_t^{MEU}	C_t	R_t	S_t^{USA}	S_t^{MEU}	S_t^{INT}	σ_t^C	σ_t^R	σ_t^{USA}	σ_t^{MEU}	σ_t^{INT}
XN_t^{ACC}	1.00															
XP_t^{ACC}	-0.06	1.00														
XN_t^{EUS}	0.33	-0.06	1.00													
XP_t^{EUS}	-0.02	0.17	-0.17	1.00												
XN_t^{MEU}	0.25	-0.08	0.37	-0.13	1.00											
XP_t^{MEU}	0.00	0.12	-0.09	0.26	-0.19	1.00										
C_t	0.07	-0.10	0.15	-0.15	0.24	-0.19	1.00									
R_t	-0.03	-0.03	-0.07	-0.08	-0.05	-0.05	-0.01	1.00								
S_t^{USA}	-0.11	0.08	-0.18	0.17	-0.44	0.40	-0.20	-0.02	1.00							
S_t^{MEU}	-0.21	0.15	-0.33	0.28	-0.68	0.62	-0.35	0.01	0.64	1.00						
S_t^{EUS}	-0.30	0.19	-0.65	0.57	-0.40	0.26	-0.26	-0.01	0.32	0.56	1.00					
σ_t^C	0.17	0.01	0.20	0.15	0.18	0.18	0.03	-0.28	-0.02	-0.03	-0.08	1.00				
σ_t^R	0.06	0.06	0.03	0.02	0.04	0.03	0.02	-0.10	-0.02	-0.02	-0.01	0.03	1.00			
σ_t^{USA}	0.30	0.07	0.29	0.17	0.23	0.23	0.02	-0.27	-0.02	-0.03	-0.14	0.69	0.22	1.00		
σ_t^{MEU}	0.24	0.01	0.29	0.13	0.25	0.27	0.03	-0.23	-0.02	-0.02	-0.15	0.62	0.15	0.90	1.00	
σ_t^{EUS}	0.29	0.14	0.30	0.19	0.20	0.22	0.03	-0.22	-0.03	-0.02	-0.12	0.48	0.14	0.82	0.82	1.00

The table reports the correlation matrix of the all independent variables in the encompassing models.

Table A4: Summary statistics of positive coexceedance variables

	Number of Coexceedances		
	0	1	2+
Positive Coexceedances in ACC	1498 (63.0%)	641 (26.9%)	239 (10.1%)
Positive Coexceedances in MBR	1535 (64.6%)	595 (25.0%)	248 (10.4%)
Positive Coexceedances in MEU	1946 (82.0%)	126 (5.3%)	303 (12.7%)
Positive Coexceedances in SEE	1032 (43.4%)	746 (31.4%)	600 (25.2%)

The table shows the distribution of the positive coexceedance variables.

Table A5: Persistence effects (positive coexceedances)

	EU members from SEE (XP_t^{MBR})					**Accession countries from SEE (XP_t^{ACC})**					**All countries from SEE (XP_t^{SEE})**				
Const. (1)	-1.25	(0.12)	***	&&&		-0.81	(0.13)	***	&&&	###	-0.35	(0.14)	**	&&&	##
Const.(2)	-2.89	(0.24)	***			-2.55	(0.25)	***			-1.11	(0.17)	***		
XP_{t-1}^{ACC} (1)						0.67	(0.14)	***	&&&	##					
XP_{t-1}^{ACC} (2)						1.19	(0.21)	***							
XP_{t-1}^{MBR} (1)	0.52	(0.15)	***	&&&	##										
XP_{t-1}^{MBR} (2)	1.00	(0.23)	***												
XP_{t-1}^{SEE} (1)											0.45	(0.13)	***	&&&	
XP_{t-1}^{SEE} (2)											0.72	(0.15)	***		
XP_t^{MBR} (1)						-0.02	(0.15)								
XP_t^{MBR} (2)						0.27	(0.22)								
XP_t^{MEU} (1)	-0.07	(0.29)		&&		0.47	(0.24)	**	&		0.44	(0.31)		&	
XP_t^{MEU} (2)	0.79	(0.28)	***			-0.19	(0.49)				0.64	(0.32)	**		
Pseudo R squared	7.90%					14.1%					10.8%				
Chi-square	195.6***					362.2***					271.9***				

The table reports estimation estimates from multinomial logit model for the three different coexceedance variables: the positive coexceedance variable for the EU members from SEE (first part of the table), the positive coexceedance variable for the EU accession countries from SEE (second part of the table) and the positive coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table A6: Asset class effects (positive coexceedances)

	EU members from SEE (XP_t^{MBR})					**Accession countries from SEE (XP_t^{ACC})**					**All countries from SEE (XP_t^{SEE})**				
Const. (1)	-1.02	(0.10)	***	&&&		-0.45	(0.10)	***	&&&	###	0.02	(0.10)		&&&	###
Const. (2)	-2.44	(0.20)	***			-1.73	(0.16)	***			-0.45	(0.11)	***		
$C_t(1)$	0.09	(0.19)		&	#	-0.01	(0.17)				0.08	(0.18)			
$C_t(2)$	-0.66	(0.31)	**			-0.11	(0.27)				-0.18	(0.21)			
$R_t(1)$	-0.10	(0.13)				0.10	(0.11)				0.18	(1.32)			
$R_t(2)$	-0.37	(0.23)				0.06	(0.17)				-0.27	(1.31)			
$S_t^{USA}(1)$	-0.21	(0.18)				0.10	(0.17)				-0.07	(0.17)			
$S_t^{USA}(2)$	0.26	(0.30)				-0.48	(0.26)	*	&		-0.20	(0.20)			
$S_t^{MEU}(1)$	-0.07	(0.18)		&	#	0.12	(0.16)				0.09	(0.17)			
$S_t^{MEU}(2)$	0.72	(0.32)	**			0.30	(0.27)				0.35	(0.20)	*		
$S_t^{MBR}(1)$						-0.10	(0.16)			#					
$S_t^{MBR}(2)$						0.07	(0.25)								
Pseudo R squared	10.5%					6.4%					8.8%				
Chi-square	262.6***					157.9***					220.1***				

The table reports estimation estimates from multinomial logit model for the three different coexceedance variables: the positive coexceedance variable for the EU members from SEE (first part of the table), the positive coexceedance variable for the EU accession countries from SEE (second part of the table) and the positive coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table A7: Volatility effects with only σ_t^{USA} effects from stock markets volatilities (positive coexceedances)

	EU members from SEE (XP_t^{MBR})			Accession countries from SEE (XP_t^{ACC})					All countries from SEE (XP_t^{SEE})				
Const. (1)	-1.61	(1.23)		-2.89	(1.12)	**	&&		-2.37	(1.08)	**	&	
Const. (2)	-1.23	(2.07)		-2.03	(2.20)				-2.35	(1.23)	*		
$\sigma_t^C(1)$	2.43	(2.21)		-0.79	(2.04)				1.28	(2.15)			
$\sigma_t^C(2)$	-2.24	(3.69)		3.53	(3.38)				0.38	(2.47)			
$\sigma_t^R(1)$	-0.26	(0.25)		-0.27	(0.22)		&&&	###	-0.85	(0.43)	*	&&	###
$\sigma_t^R(2)$	-0.56	(0.51)		-1.76	(0.77)	**			-1.48	(0.61)	**		
$\sigma_t^{USA}(1)$	-0.39	(0.94)		3.58	(0.86)	***	&&&	###	2.69	(0.96)	***	&&	##
$\sigma_t^{USA}(2)$	1.59	(1.47)		2.12	(1.40)				2.81	(1.07)	***		
Pseudo R squared	3.4%			4.0%					3.5%				
Chi-square	83.3***			97.4***					84.5***				

The table reports estimation estimates from multinomial logit model for the three different coexceedance variables: the positive coexceedance variable for the EU members from SEE (first part of the table), the positive coexceedance variable for the EU accession countries from SEE (second part of the table) and the positive coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table A8: Volatility effects with only σ_t^{MEU}effects from stock markets volatilities (positive coexceedances)

	EU members from SEE (XP_t^{MBR})			Accession countries from SEE (XP_t^{ACC})					All countries from SEE (XP_t^{SEE})				
Const. (1)	-1.66	(1.23)		-2.45	(1.09)	**	&		-2.02	(1.06)	*		
Const. (2)	-1.15	(2.05)		-2.02	(2.14)				-1.81	(1.21)			
$\sigma_t^C(1)$	2.03	(2.07)		3.68	(1.88)	*	&&	#	3.13	(2.01)			
$\sigma_t^C(2)$	-0.60	(3.37)		6.04	(3.18)	*			3.01	(2.89)			
$\sigma_t^R(1)$	-0.29	(0.26)		-0.20	(0.22)		&&	##	-0.86	(0.46)	*	&&	##
$\sigma_t^R(2)$	-0.46	(0.51)		-1.34	(0.73)	*			-1.17	(0.57)	**		
$\sigma_t^{MEU}(1)$	0.07	(0.49)		0.62	(0.43)				0.77	(0.47)			
$\sigma_t^{MEU}(2)$	0.02	(0.85)		-0.78	(0.96)				-0.03	(0.59)			
Pseudo R squared	3.0%			2.8%					2.6%				
Chi-square	72.0***			66.8***					62.6***				

The table reports estimation estimates from multinomial logit model for the three different coexceedance variables: the positive coexceedance variable for the EU members from SEE (first part of the table), the positive coexceedance variable for the EU accession countries from SEE (second part of the table) and the positive coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table A9: Volatility effects for Accession countries from SEE with only σ_t^{INT} effects from stock markets volatilities (positive coexceedances)

	Accession countries from SEE (XP_t^{ACC})				
Const. (1)	-2.71	(1.10)	**	&&	
Const. (2)	-1.36	(2.28)			
$\sigma_t^C(1)$	2.91	(1.91)			
$\sigma_t^C(2)$	1.65	(3.31)			
$\sigma_t^R(1)$	-0.15	(0.21)		&&&	###
$\sigma_t^R(2)$	-1.98	(0.79)	**		
$\sigma_t^{MBR}(1)$	1.64	(0.62)	***	&&&	##
$\sigma_t^{MBR}(2)$	3.40	(0.88)	***		
Pseudo R squared	5.2%				
Chi-square	125.9***				

The table reports estimation estimates from multinomial logit model for the positive coexceedance variable for the EU accession countries from SEE. Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&&

indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Table A10: Encompassing model (positive coexceedances)

	EU members from SEE (XP_t^{MBR})					Accession countries from SEE (XP_t^{ACC})					All countries from SEE (XP_t^{SEE})				
Const.(1)	-1.61	(1.26)				-1.97	(1.15)	***	&&		-2.42	(1.10)	**	&&	
Const. (2)	-1.49	(2.22)				-3.10	(2.22)				-2.67	(1.29)	**		
XP_{t-1}^{ACC} (1)							(0.15)	***	&&&						
						0.60									
XP_{t-1}^{ACC} (2)							(0.21)	***							
						1.15									
XP_{t-1}^{MBR} (1)	0.53	(0.16)	***	&&&	##										
XP_{t-1}^{MBR} (2)	0.97	(0.23)	***												
XP_{t-1}^{SEE} (1)											0.41	(0.13)	***	&&&	
XP_{t-1}^{SEE} (2)											0.70	(0.15)	***		
XP_t^{MBR} (1)						-0.06	(0.19)								
XP_t^{MBR} (2)						0.18	(0.28)								
XP_t^{MEU} (1)	0.13	(0.33)				0.21	(0.28)				0.32	(0.35)			
XP_t^{MEU} (2)	0.34	(0.40)				-0.34	(0.54)				0.44	(0.37)			
C_t(1)	0.11	(0.20)				-0.10	(0.18)				0.02	(0.19)			
C_t(2)	-0.58	(0.32)	*			-0.18	(0.29)				-0.18	(0.22)			
R_t(1)	-0.04	(0.13)				0.12	(0.12)				0.70	(1.19)			
R_t(2)	-0.39	(0.24)				0.26	(0.19)				0.46	(1.43)			
S_t^{USA}(1)	-0.26	(0.18)				-0.01	(0.17)		&&		-0.19	(0.18)			
S_t^{USA}(2)	0.13	(0.31)				-0.66	(0.28)	**			-0.38	(0.21)	*		
S_t^{MEU}(1)	-0.08	(0.19)			#	0.11	(0.19)				0.10	(0.19)			
S_t^{MEU}(2)	0.61	(0.40)				0.52	(0.32)				0.35	(0.23)			
S_t^{MBR}(1)						-0.04	(0.20)								
S_t^{MBR}(2)						0.14	(0.31)								
σ_t^C(1)	1.96	(2.29)				0.95	(2.12)				1.30	(2.20)			
σ_t^C(2)	-1.95	(3.88)				3.44	(3.60)				0.54	(2.58)			
σ_t^R(1)	-0.24	(0.26)				-0.22	(0.22)		&&	##	-0.81	(0.45)	*	&&	##
σ_t^R(2)	-0.55	(0.55)				-1.42	(0.73)	*			-1.34	(0.62)	**		
σ_t^{USA}(1)	-0.36	(0.98)				2.95	(0.91)	***	&&	##	2.21	(0.99)	**	&	
σ_t^{USA}(2)	0.78	(1.66)				1.53	(1.50)				2.15	(1.13)	*		
Pseudo R squared	13.6%					17.2%					15.4%				
Chi-square	346.9***					447.7***					397.8***				

The table reports estimation estimates from multinomial logit model for the three different coexceedance variables: the positive coexceedance variable for the EU members from SEE (first part of the table), the positive coexceedance variable for the EU accession countries from SEE (second part of the table) and the positive coexceedance variable for the all countries from SEE (third part of the table). Standard errors in parentheses. */**/*** indicate that the parameter is significantly different from zero at 10%/5%/1% level. &/&&/&&& indicate that the explanatory variable is significant at 10%/5%/1% level. #/##/### indicate that the parameter is significantly different after January 2007 at 10%/5%/1% level.

Time Series Plots

Figure 1A: Time Series Plot of the Negative CoexceedanceVariable for the EU Accession countries from SEE (ACC), 4.10.2004-13.11.2013

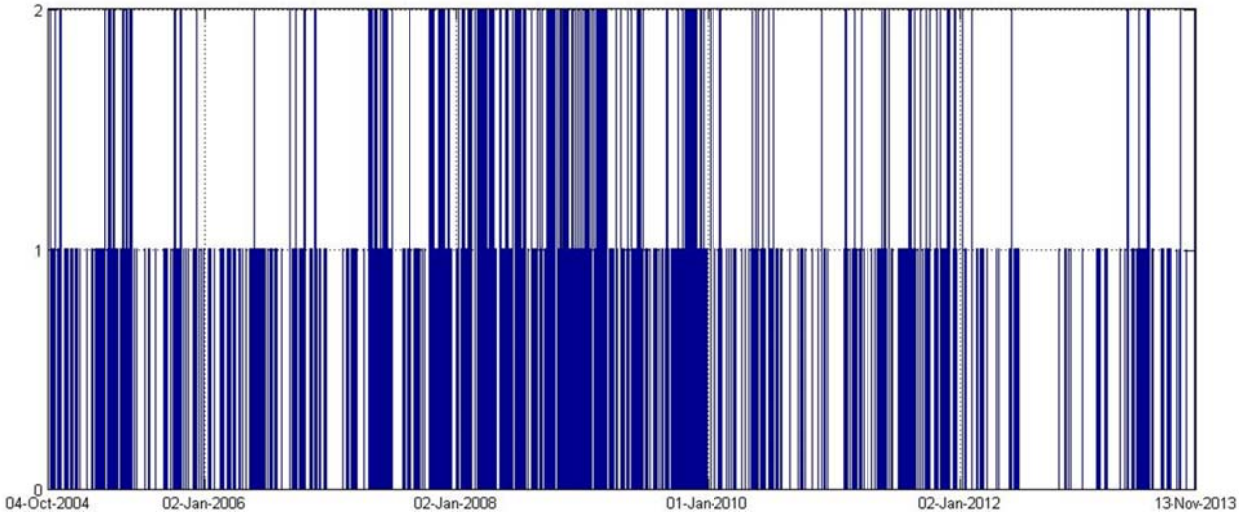


Figure 2A: Time Series Plot of the PositiveCoexceedanceVariable for the EU Accession countries from SEE (ACC), 4.10.2004-13.11.2013

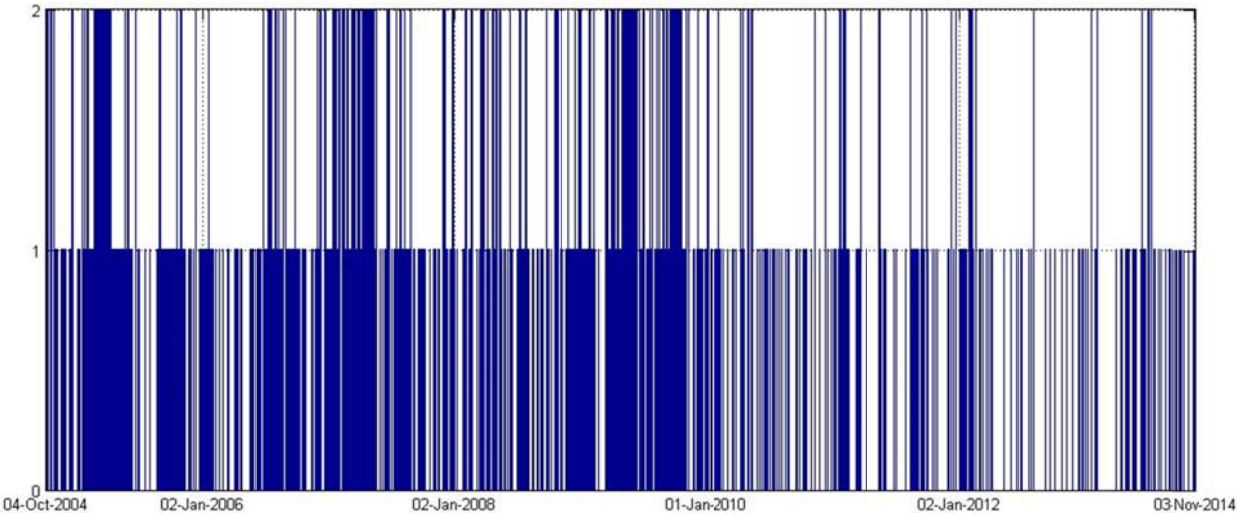


Figure 3A: Time Series Plot of the Negative CoexceedanceVariable for the EU member countries from SEE (EUS), 4.10.2004-13.11.2013

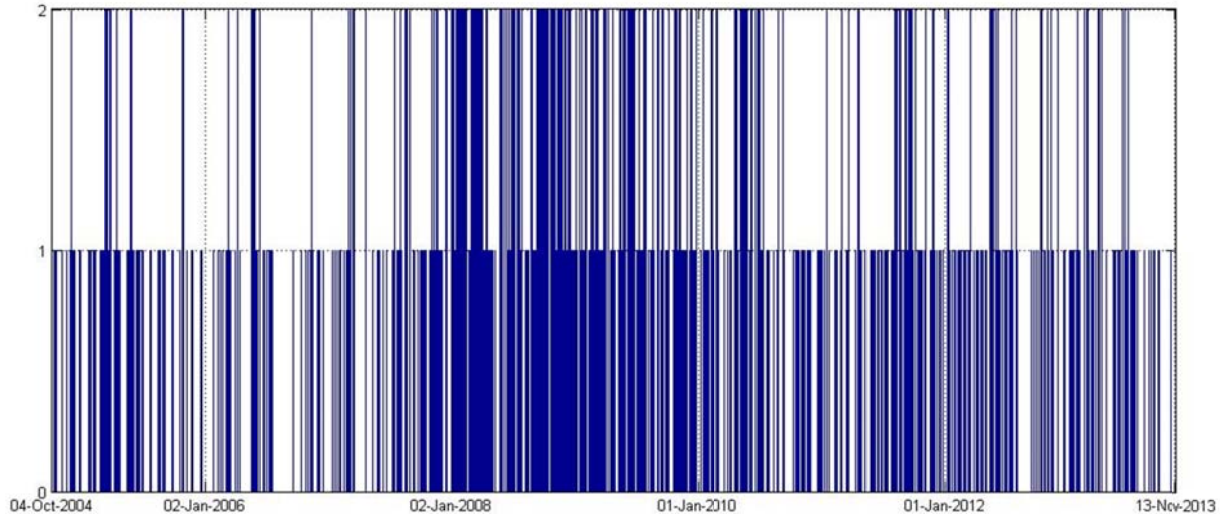


Figure 4A: Time Series Plot of the PositiveCoexceedanceVariable for the EU member countries from SEE (EUS), 4.10.2004-13.11.2013

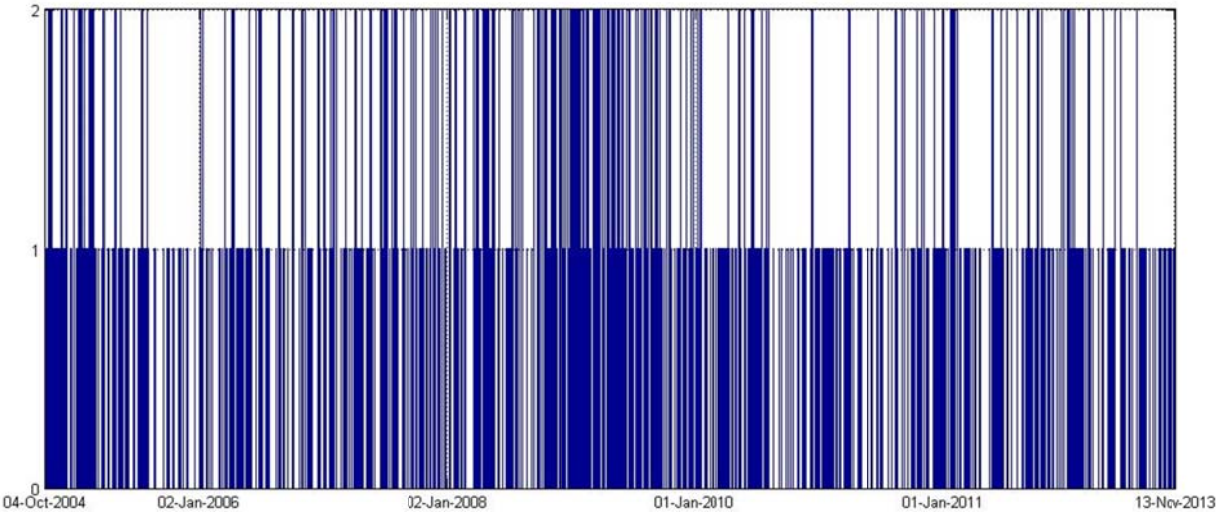


Figure 5A: Time Series Plot of the Negative CoexceedanceVariable for the major EU economies from SEE (MEU), 4.10.2004-13.11.2013

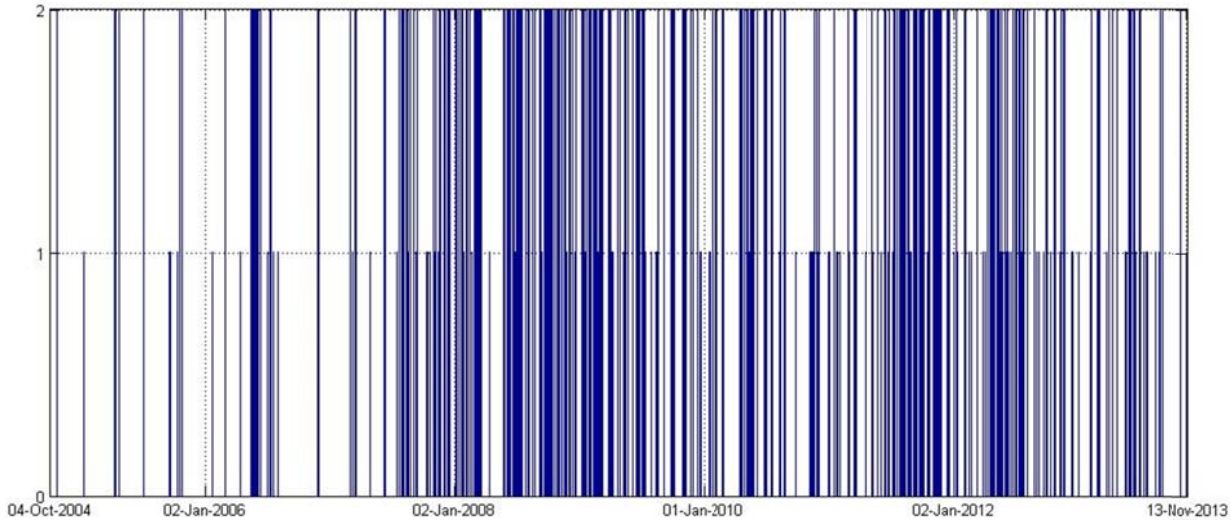
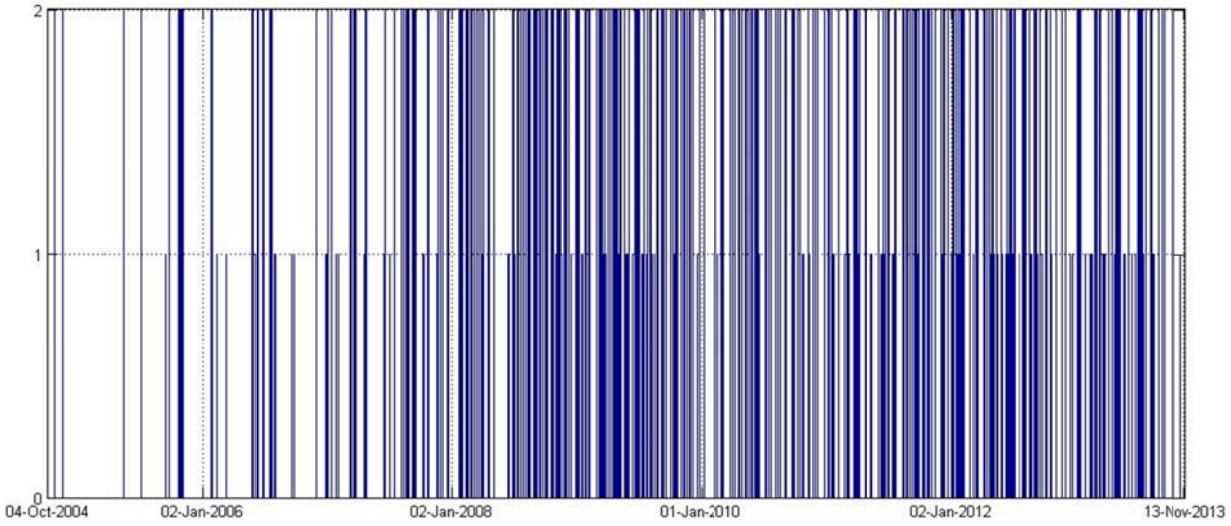


Figure 6A: Time Series Plot of the PositiveCoexceedanceVariable for the major EU economies countries from SEE (MEU), 4.10.2004-13.11.2013



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