ANALYZING THE RESILIENCE OF THE CENTRAL AND EASTERN EUROPEAN STOCK MARKETS DURING THE COVID-19 PANDEMIC

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Abstract

In the recent period there has been much speculation regarding the adaptation of the economy to the COVID-19 pandemic, and to the fact that markets are gradually becoming resilient to news about the pandemic. This theory may be applicable for the North American and Western European markets, but when it comes to more volatile and less liquid markets like the ones analyzed in this article, Romania, Poland and Bulgaria, the effects can be divergent. Our proposal is a method for assessing the influence of the COVID-19 pandemic on the stock markets of the Central and Eastern European countries. For each of the country taken into consideration, the main stock exchange index has been selected, BET, WIG20, SOFIX, and the influence of the daily COVID-19 registered cases has been examined. The sampled period is situated between the 3rd of September and the 29th of October of the current year, 2021. The volatility fluctuations, correlation and the impact of the chosen markets have been investigated through statistical and econometric methods, using panel data for Vector Error Correction model.

Keywords: *COVID-19, resilience, regional development, Vector Error Correction, panel data*

JEL Classification: C1, G1

Introduction

One of the most important questions in finance has always been quantifying the impact of unpredictable factors on the returns registered by the stock exchange market. For most researchers an important factor is the news, because most news stories have been shown to have an impact on the stock exchange market due to the way investors react. Favorable news generate interest in the market and lead to the increase in the price of shares and unfavorable news lead investors to sell their stock, leading to a decrease in overall shares prices.

From the beginning of 2020 the world has been confronting with the COVID-19 pandemic, this is not an unique case in history, but it represents a genuine opportunity to analyze and compare the level of resilience of different regions. Starting from this mindset, we decided to approach the Central and Eastern European region, in order to understand if the pandemic has brought about changes in the way the stock markets respond to shocks caused by the influence of news regarding the pandemic. In the model used we decided that the data registered in the last period is the most significant, due to the possibility that the stock markets developed a resistence to the stress factors due to their prolonged presence (more than a year). A reason for choosing Romania, Bulgaria and Poland was the fact that the response to the pandemic was similar in all three countries regarding the way the financial markets and they represent countries that have been recently integrated in the European Union. It is well known that the news of the pandemic we are going through affected the regional development, which generated fluctuations on stock exchange markets due to the existing interconnections between the economies.

Even if we are unable to approximate the long-term impact of the COVID-19 pandemic, we are aware of the fact that it has influenced the returns registered by the major indices of the stock exchange markets in the world. Besides, the pandemic situation has had a significant effect on the emerging countries which seem to be unable to become resilient to news regarding the new registered daily cases although it has been almost two years since the coronavirus outbreak has started.

Taking into account the regional situation regarding the evolution of the pandemic, we believe that the stock markets should develop resilience towards news related to COVID-19

cases. Hence, the present article aims to investigate the relation between the registered daily cases and the stock market returns for the mentioned countries between 3rd of September 2021 and the 29th of October 2021.

Literature review

In order to understand the purpose of this research paper, it is essential to highlight the following bibliographical references that were useful in developing the methodology of this article. One of the most important is the paper written by Jonathan Batten (2011) that accentuates the idea that the emerging economies have been resilient to the consequences of a global crisis. Turalay Kenç (2016) also analyzed financial crisis and the way of transmission external shocks. Nidal (2004) showed that during economic periods of crisis or events, the volatility of the stock exchange markets increases dramatically, generating changes in other markets, thus causing financial instability.

The methodology used by the author Elie I. Bouri (2014) is different from ours, although stock markets from less developed countries are being examined in terms of volatility. ARCH, GARCH and multivariate models are estimated. Both Elie I. Bouri (2014) and Hechem Ajmi (2021) tested vector autoregression.

An article similar to the present one was written by Turalay Kenç (2016). Financial markets were also investigated and the way of transmission external shocks were taken into consideration.

Essers (2013) took into account the global financial crisis triggered by the fall of Lehman Brothers in 2008. The paper contains both data before the year of the crisis and the year after its occurrence, so so the sample used is significantly larger than ours. Phakawa Jeasakul (2014) considered the asian market and Sercan Demiralay (2017) discussed the correlations through time between markets.

The present research is closely related to studies on COVID-19 pandemic, including the paper of (Ngwakwe, 2020). Also, authors like Prorokowski (2012), Wasim Ahmad (2014), Sercan Demiralay (2017) examined stock exchange markets by taking into account varrying methods and data samples.

The Vector Error Correction model that we implemented is based on the Vector Autoregressive model methodology developed by Sims (1980). Even though, at first, the approach was deemed complicated, in the following years it caught on, being one of the most used methods in economical analysis. The error correction factors were added by several influencial papers such as Engle (1987) which added a new level of prediction correction and impulse response analysis to the VAR's capabilities.

Methodology, data analysis and results

The objective of this research is achieved due to the steps taken and detailed in this section.

Yahoo Finance, European Central Bank and Wikipedia were the sources of information considered to be the most relevant for this paper.

In order to accomplish the purpose of the paper, three stock market indices were needed, one for our country, BET, one for Bulgaria, SOFIX, and one for Poland, WIG20.

The collected data were transformed to daily returns with the following formula:

$$D_{R_i} = 100 \times \ln\left(\frac{P_{i_t}}{P_{i_{t-1}}}\right) \quad (1)$$

where: D_{R_i} represents the daily returns of "i" stock market index; $\ln$ represents natural logarithm; P_{i_t} represents the closing price of "i" stock market index at time "t"; $P_{i_{t-1}}$ represents the closing price of "i" stock market index at time "$t-1$".

In modelling financial data, it is particularly important to know the behavior and distribution of the used data series. Therefore, Table 1 captures the descriptive statistics of the returns registered by the BET, WIG20 and SOFIX indices.

Tabel 1 Descriptive statistics

	BET	*WIG20*	*SOFIX*
Currency	RON	PLN	BGN
No. obs.	41	41	41
Average	0.0007	0.0001	0.0007
Minimum	-0.0150	-0.0263	-0.0148
Maximum	0.0111	0.0243	0.0107
Standard deviation	0.0051	0.0098	0.0057
Skewness	-0.5362	0.3175	-0.4961
Kurtosis	0.9843	0.9166	0.3535

Source: The result of own processing of the authors in EViews 12-Student Version

The results observed in the first table are obtained from the returns calculated for each index that was collected in its national currency. The reason behind such a choice is that we were not interested in the exchange rate fluctuations, but only in analyzing those three sets of data from our research in terms of the share price.

Skewness is negative for BET and SOFIX and this indicates that the yield distribution is negatively asymmetric, with an elongated curve to the left. The recording of a negative value of the asymmetry coefficient is a common feature of returns, indicating a negative correlation between changes in the stock market and those in volatility. The WIG20 is showing a positive asymmetry to the right.

The kurtosis of analyzed series shows positive values not far from the value of the normal distribution whose kurtosis is 3, as follows: 0.99, 0.92, 0.35. The values point out the idea that the distributions of all indices are platykurtic.

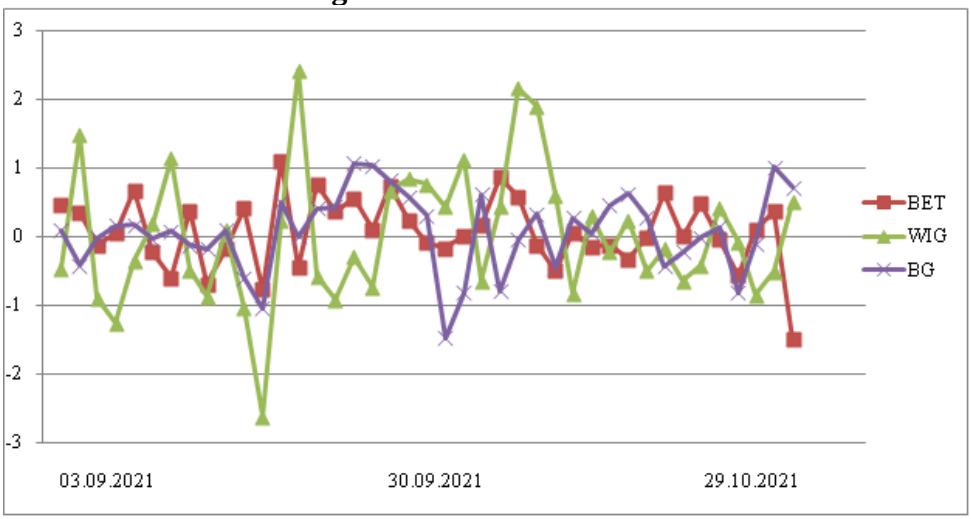
Standard deviations are close for the BET and SOFIX indices, but this doesn't mean that the WIG20 index far exceeds them. In other words, we could say that the Polish index is the most volatile from the ones in the sampled data.

In Figure 1 we provide a graphical evidence of the returns for the same time sample.

It is obvious that the extreme values are recorded for returns of WIG20 index. Since we have decided to use data only from the beginning of September, the first month of the autumn, for the panel data sample, we considered that is important to analyze the trends for each country. We consider that the increasing number of cases influences the stock exchange markets and implicitly the volatility registered by it.

We used the data obtained by applying the formula specified before for the daily returns in order to obtain Figure 1.

Figure 1 Returns of indices



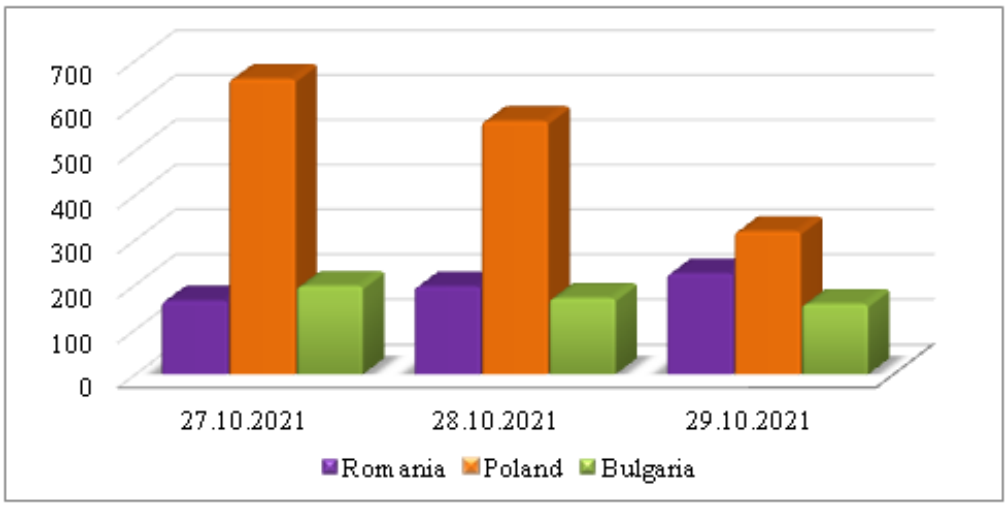
Source: The result of own processing of the authors in Excel

In the figure below we provide a picture of the daily registered number of new cases of COVID-19 between 1st of June and 29th of October 2021 for all the countries analyzed. From what we can observe, it has been an exponential increase at the end of summer, and respectively at the beginning of autumn emphasizing the idea that the virus was more contagious then.

It is important to mention that, for Figure 2, we used the platform Refinitiv Eikon for extracting the number of cumulative cases of COVID-19 registered for every country in the sample: Romania, Poland and Bulgaria.

Our selection has undergone adjustments because the sample data that we collected counted all the existing cases up to a certain point and we were interested in finding and examining the number of new cases that appeared from one day to another.

Figure 2 Covid-19 cases

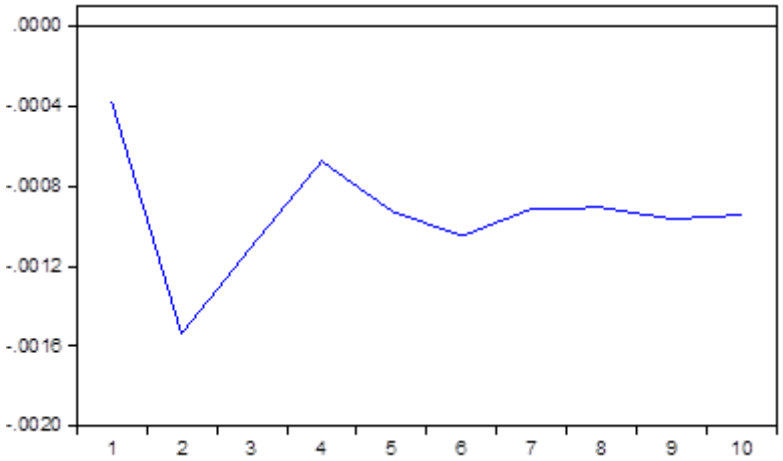


Source: The result of own processing of the authors in Excel

We decided to use the data to construct a Vector Error Correction Model (VEC) in order to analyze the impulse response function of the stock exchange index price when a shock happens in the data series of the daily COVID-19 cases. The influence was taken into account with two lags. Due to the fact that news circulates fast in the market, but most of the trading decision took a while to process. Also we took into account the low liquidity of the Central and Eastern European stock exchange markets selected, especially Romania and Bulgaria. We considered that even if the selling signal will be given in the moment the news regarding the new cases it would take a while to materialize into a price decrease.

After analyzing all the mentioned factors we decided that the effect of the daily case increase is seen in a more accurate way after two days from the announcement made by the public health officials. According to this, we constructed a model that takes into account the panel date from all of the three countries for the stock exchange in relation to the daily cases registered in each one. The time interval selected is between 3rd of September of 2021 and 29th of October 2021. We chose this interval due to the idea that by now, with the markets being over exposed to the stimuli that is represented by the news of the COVID-19 cases, some resilience to them has been built. In Figure 3 we can see the impulse response function generated by the VEC model.

Figure 3 Impulse response function



Source: The result of own processing of the authors in EViews 8

In Figure 3, we can see the way that news about COVID-19 pandemic influences the response of the index on average for all three countries, the effect is clearly one of decrease in the price of the index, taking into account that these indices are composed of the most important shares traded in the respective markets, we can state that the effect is one of decrease for the first two periods. The model with which we generated the results in the impulse response function is presented in the Appendix.

The results are interesting from our point of view because they prove that even though the pandemic and its effects have been felt in the economy for more than a year, the analyzed countries have not developed resilience to the impact generated by news stories even though the COVID-19 cases have been registered since the beginning of 2020.

Conclusions

In recent years the evolution of the stock exchanges in Central and Eastern Europe has been of great interest to economic researchers, both living in the area and in other countries. With the evolution of the pandemic being still considered by the medical scientific community to be uncertain, the present paper set out to analyze the connection between the main indices of three countries in the area and the daily COVID-19 cases registered.

The influence on volatility of the COVID-19 pandemic, is from what we have seen, significant. The largest volatility of the stock market index was registered by the Polish index WIG20 and we can state that this could have resulted from the political crisis in Poland that happened troughout the 2nd half of 2020 and that continued in 2021. The returns for the analyzed period were left skewed for Bulgaria and Romania, indicating a market in which the index had a less than good performance, in both cases is difficult to state that there is a clear correlation between COVID-19 and the performance of the index, due to concurring political events such as the political crisis in Romania that happened in the last part of the analyzed time period, although it is to be said that most of the stock market returns analyzed by the economic literature are left skewed.

In order to be able to evaluate the influence of the daily COVID-19 cases on the index we implemented a VEC model, with which we can state that the daily cases influence the index with two lags, meaning that the cases registered today will influence the value of the stock market index registered in the day after tommorow.

We conclude that even though the COVID-19 pandemic has been manifesting since the beginning of 2020, its effects are still influencing the evolution of the stock markets in the Central and Eastern European region in the present.

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Appendix

Vector Error Correction Estimates
Date: 11/13/21 Time: 10:42
Sample (adjusted): 9/10/2021 10/29/2021
Included observations: 108 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
CAZURI(-3)	1.000000	
INDICE(-1)	-4.203899	
	(13.5601)	
	[-0.31002]	
C	-0.217352	
Error Correction:	**D(CAZURI(-2))**	**D(INDICE)**
CointEq1	-1.594076	-0.002164
	(0.21402)	(0.00171)
	[-7.44820]	[-1.26734]
D(CAZURI(-3))	0.341711	0.000850
	(0.16158)	(0.00129)
	[2.11483]	[0.65925]
D(CAZURI(-4))	0.079701	0.000304
	(0.10322)	(0.00082)
	[0.77213]	[0.36914]
D(INDICE(-1))	-3.196043	-0.424346
	(11.5448)	(0.09210)
	[-0.27684]	[-4.60726]
D(INDICE(-2))	-9.680313	-0.450381
	(11.5628)	(0.09225)
	[-0.83719]	[-4.88231]
C	0.039919	2.55E-05
	(0.09650)	(0.00077)
	[0.41367]	[0.03306]
R-squared	0.605521	0.268697
Adj. R-squared	0.586184	0.232849

Sum sq. resids	102.4508	0.006521
S.E. equation	1.002208	0.007996
F-statistic	31.31378	7.495421
Log likelihood	-150.3970	371.3588
Akaike AIC	2.896240	-6.765904
Schwarz SC	3.045247	-6.616897
Mean dependent	0.035170	-6.99E-05
S.D. dependent	1.557951	0.009129

Determinant resid covariance (dof adj.)	6.41E-05
Determinant resid covariance	5.71E-05
Log likelihood	221.0827
Akaike information criterion	-3.834865
Schwarz criterion	-3.487181