

The Impact of the Macroeconomic Factors on the Bucharest Stock Exchange During the Latest Crisis

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Abstract

The purpose of the paper is to observe and analyze how the dynamics of macroeconomic factors impact the evolution of the Bucharest Stock Exchange (BVB) during the latest crisis (Covid-19 pandemic and the Ukrainian war), through the lens of various market stock indices (BET, BetPlus, BET-FI and BET-NG). After the monthly values of both the macroeconomic factors (inflation rate, unemployment rate, RON-EURO exchange rates, industrial production index, average salary, money supply, interest rate and oil price) and Bucharest Stock Exchange indices were collected, during the period January 2020- June 2023, the descriptive statistics was used to describe all the observed data (mean value, standard deviation, minimum/ maximum value). Finally, the multiple regression was used to see exactly how the Romanian stock market indices are influenced by any changes of macroeconomic factors.

Keywords: Bucharest Stock Exchange, macroeconomic factors, stock market indices, Ukrainian war, Covid-19 pandemic

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1. Introduction and literature review

The expansion and development of a country's economy are significantly influenced by the financial sector. The financial sector includes the stock market, which offers investors the support and tools they need. A healthy and effective stock market gives businesses the chance to trade securities and offers worthwhile investment possibilities. By purchasing stocks, investors earn returns via dividends and capital gains. Returns to investors are significantly impacted by the stock market's performance.

Changes in macroeconomic conditions may cause the stock market to display volatile behavior. Excessive volatility can make the market riskier and make it more difficult for the financial market to operate effectively. Finding out how the stock market behaves can help investors take on less risk and have a favorable effect on the financial sector.

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Numerous variables, including macroeconomic indicators that show the general state and performance of a nation's economy, have an impact on the pricing of these stocks. These macroeconomic variables greatly influence stock market prices and are extremely important in determining investor sentiment and decision-making.

Macroeconomic factors cover a broad spectrum of economic characteristics that shed light on the overall economic environment.

The direction of stock exchange prices is significantly influenced by macroeconomic considerations. These elements work together to shed light on the entire economic climate, affecting investor views and choices. Investors, analysts, and policymakers must all comprehend how these macroeconomic factors affect the dynamics of the stock market.

Fama (1981) found that stock returns are positively correlated with the money supply, gross domestic product, capital spending, industrial production index and interest, but indirectly correlated with inflation rate after looking into the relationship between US economic activity and stock prices.

Chen, Roll, and Ross (1986) conducted a study in which they looked into how macroeconomic factors affected stock prices. They tested the multifactor hypothesis in the United States using seven macroeconomic variables.

When Martinez and Rubio examined the return of the Spanish stock market in 1989, they discovered no clear association between macroeconomic conditions and stock prices.

Mukherjee and Naka, for instance, examined the influence of 18 key macroeconomic indicators on the British stock market in 1995. They came to the conclusion that the stock prices contributed to the existing co-integrating relationship.

The link between the money supply, oil prices, and the gross domestic product has also been observed by Cheung and Ng (1998) in Germany, Italy and Japan.

Gjerde and Sættem (1999) conducted research in Norway to better understand the correlation between stock market outcomes and macroeconomic conditions. Their main concern was how much of the important research on the correlations between stock returns and macroeconomic variables from important markets could be applied to Norway.

For a group of Asian nations, Granger et al. (2000) found no indication of co-integration between stock returns and exchange rates.

According to Park and Ratti (2000), in the US, inflation and anticipated stock returns are statistically significant and change in the opposite directions in response to contractionary monetary policy shocks.

Dividend yield, interest rate, industrial production, term and default spread, inflation and exchange rate, gross national/ domestic product, money supply and prior stock returns are just a few of the economic variables that Oberuc (2004) listed as being heavily considered by researchers and typically linked to stock price movement.

Erdem et al. (2005) discovered contradictory results for the Istanbul Exchange. They found that whereas interest rates and inflation do affect stock returns, but the industrial output did not.

For emerging nations (BRIC), Gay (2008) examined the relationship between the stock market indices and the exchange rate and oil price. He observed no meaningful correlation between the values of the stock market indices in any of the emerging countries and the corresponding exchange rate, oil price, or both.

Using quarterly time series data, Acikalin et al. (2008) investigated the connection between macroeconomic factors and stock market returns on the Istanbul Stock Exchange. The ISE index and macroeconomic factors were determined to have a stable, long-term association by the authors.

Gunsel and Cukur (2007) investigated how macroeconomic factors affected the stock prices on the London Stock Exchange between 1980 and 1993. Variables including interest rates, the dollar exchange rate, the money supply, the risk period, dividend yield, and others were compared to stock returns. The results of the analysis showed that macroeconomic variables significantly and favorably affected the rise of stock indices.

Ngoc (2009) investigated the influence of interest rates on the prices of Vietnamese stock returns.

The association between the Kazakhstan Stock Exchange and macroeconomic indicators such the industrial production index, inflation and exchange rate, volume of trade, volatility of the oil price, and long/ short term interest rates was examined by Oskembayev et al. (2011) in their study.

In the cases of Malaysia, the US, and China, Geetha et al. (2011) investigated the relationships between the gross domestic product, exchange rate, (un)expected inflation rate and stock market.

According to Khan (2021) and Salma (2021), inflation rate and exchange rate changes have an important impact on the financial markets and can cause an economic downturn.

A second comparative research on emerging markets, but this time from Central and Eastern Europe focuses on Romania and Hungary (Nicolescu, 2020). The study came to the conclusion that throughout the study period, macroeconomic variables had a greater impact on Romania's capital markets than on Hungary's, and that stock exchange growth was affected by macroeconomic factors.

Another substantial association for Romania was found between the gross domestic product and the Bucharest Stock Exchange benchmark index, according to a different study by Sabau-Popa et al. (2014).

Except for Slovenia's stock indexes, all other European countries included in the study conducted by Lupu and Calin (2014) revealed very little association between macroeconomic indicators and stock indices.

2. Research methodology

The paper is analyzing the impact of eight macroeconomic variables (inflation rate, unemployment rate, RON-EURO exchange rates, industrial production index, average salary, money supply, interest rate and oil price) on the Bucharest Stock Exchange market indices during the latest crisis (Covid-19 pandemic and Ukrainian war).

Therefore, the research was conducted as following:

1. Data collection: the monthly values of both the macroeconomic factors and the stock market indices were taken into consideration between January 2020 and June 2023. These data were collected from the websites: www.bvb.ro (Bucharest Stock Exchange), www.bnr.ro (National Bank of Romania) and www.innse.ro (National Institute of Statistics). Afterwards, the SPSS application was used to enter the observed data.
2. Using the main indicators of descriptive statistics to describe the stock market data (mean value, standard deviation, minimum/ maximum value).
3. Using multiple regression to see exactly how stock market indices are influenced by changes in macroeconomic factors. The estimated equation summarizes the link between these two categories of variables:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon$$

where:

Y = dependent variable (the stock market indices);

$X_{1...n}$ = independent variables (the macroeconomic factors);

β_0 = is the value of Y when all of the independent variables (X_1 through X_n) are equal to zero

$\beta_{1...n}$ = regression coefficients;

ε = standard error.

3. Results and discussion

➤ *Descriptive statistics*

• **Bucharest Stock Exchange indices**

During 2020-2023, the BET index had a mean return of 0.0067 and a standard deviation of 0.0528. BetPlus, on the other hand, had returns ranging from -0.1634 to 0.0965 and an average return of 0.0067, similar to BET. BetPlus return values deviate from the average of 0.0067 by 0.0522. Over the three years considered, BET-FI had returns between

-0.1345 and 0.0964. The average return of this index was 0.0018, with a standard deviation of 0.0472.

The average return on BET-NG was 0.0065. The minimum recorded during this period was -0.1430, and the maximum was 0.1084. At the same time, the return of BET-NG deviates from the average of 0.0065 by 0.0602. If taking into consideration the standard deviation from the perspective of volatility, it can be seen that the BET-NG index carries the highest risk, followed by the BET, BetPlus and BET-FI. As for the highest return obtained, still the BET-NG index ranks first, followed by the other three market indices. The values for BET and BetPlus are very closed as the companies from the reference index (BET) are the ones that will influence the most the entire market.

Table 1. Descriptive statistics for the Bucharest Stock Exchange (2020-2023)

	N	Minimum	Maximum	Mean	Std. Deviation
BET	42	-0.1640	0.0968	0.0067	0.0528
BET-FI	42	-0.1345	0.0964	0.0018	0.0472
BET-NG	42	-0.1430	0.1084	0.0065	0.0602
BET-PLUS	42	-0.1634	0.0965	0.0067	0.0522

Source: Authors' processing based on research data

➤ *Multiple regression model*

➤ **Macroeconomic factors and BetPlus index**

The BetPlus index and macroeconomic factors are moderately correlated with one another in the 2020–2023 timeframe, according to the value of the correlation coefficient R. According to the coefficient of variation, the variation in the observed macroeconomic factors is responsible for 23.6% of the variation in the BetPlus index.

Table 2. Regression statistics (macroeconomic factors and BetPlus index)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.485 ^a	0.236	0.050	0.0508562

Source: Authors' processing based on research data

Table 3 shows the fact that most of the macroeconomic factors have a negative effect on the BetPlus index. The factors that influence directly the index, on the other hand, are the industrial production index (0.053), money supply (1.236) and oil price (0.380), whose increase by one unit would lead also to an increase in the stock index.

The RON-EURO exchange rate has the most significant negative impact on the BetPlus index. A one-unit increase in this independent variable results in a 6.338-unit decrease in BetPlus. Smaller decreases are brought also by macroeconomic factors like the unemployment rate (0.084 units), the average salary (0.119 units), the inflation rate (0.050 units) and the interest rate (0.075).

The correlations between the independent factors and the dependent variable cannot be declared statistically significant due to the high p-value, except for the RON-EURO exchange rate, where the correlation coefficient is close to the threshold of 0.05 and the oil price, that has an important significance, as the p-value is of 0.027.

Table 3. Regression outputs between macroeconomic factors and BetPlus index (2020-2023)

	Unstandardized coeff.		Standardized coeff	p-value
	B	Std. error	Beta	
(Constant)	0.003	0.014		0.812
Inflation rate	-0.050	0.070	-0.129	0.481

	Unstandardized coeff.		Standardized coeff	p-value
	B	Std. error	Beta	
Unemployment rate	-0.084	0.262	-0.055	0.752
Industrial production index	0.053	0.406	0.024	0.896
RON-EURO exchange rate	-6.338	3.160	-0.338	0.053
Average salary	-0.119	0.267	-0.072	0.660
Money supply	1.236	1.003	0.217	0.226
Interest rate	-0.075	0.091	-0.150	0.415
Oil price	0.380	0.164	0.404	0.027

Source: Authors' processing based on research data

• Macroeconomic factors and BET index

A moderate level of prediction is indicated by the multiple correlation coefficient of 0.488, and the independent variables (macroeconomic factors) account for 23.8% of the variability of the dependent variable, the BET index, similar to the BetPlus's obtained values.

Table 4. Regression statistics (macroeconomic factors and BET index)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.488 ^a	0.238	0.054	0.0513333

Source: Authors' processing based on research data

During the three years' period, the RON-EURO exchange rate had a greater impact on the BET index (Table 5). Therefore, for every unit increase in this rate, the BET index will decrease by 6.443 units.

The BET index's value is negatively impacted, less than in the case of the exchange rate, by the inflation rate because it decreases by 0.050 points for every unit increase in this macroeconomic factor, by the unemployment rate with a decrease of 0.080 units and by the interest rate, which determines a 0.076-unit decrease. Another change, this time a little bit higher (a 0.125-unit decrease in the index's value) is observed in terms of average salary.

On the other hand, the money supply has the greatest positive impact on the index, change in this variable causes BET to increase by 1.257 units. Also the industrial production and the oil price have a direct influence over the reference index, just than lower compared to the money supply.

Furthermore, the p-values for the macroeconomic factors considered are mostly higher than the 0.05 cutoff, indicating no meaningful significance. The p-value for the industrial production is even close to one. As in the case of the BetPlus index, two macroeconomic factors (RON-EURO exchange rate and oil price) have values close to or even lower than 0.05, which means that they are the only ones that have a statistical significance.

Table 5. Regression outputs between macroeconomic factors and BET index (2020-2023)

	Unstandardized coeff.		Standardized coeff	p-value
	B	Std. error	Beta	
(Constant)	0.003	0.014		0.805
Inflation rate	-0.050	0.071	-0.127	0.487
Unemployment rate	-0.080	0.265	-0.052	0.765
Industrial production index	0.042	0.410	0.019	0.919
RON-EURO exchange rate	-6.443	3.189	-0.340	0.052
Average salary	-0.125	0.270	-0.075	0.646
Money supply	1.257	1.012	0.218	0.223
Interest rate	-0.076	0.092	-0.150	0.414
Oil price	0.388	0.166	0.408	0.025

Source: Authors' processing based on research data

- **Macroeconomic factors and BET-FI index**

The variation of the macroeconomic factors accounts for 21.9% of the variation in the BET-FI index, lowest compared to the previous analyzed indices (BET and BetPlus).

Table 6. Regression statistics (macroeconomic factors and BET-FI index)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.468 ^a	0.219	0.030	0.0465008

Source: Authors' processing based on research data

The independent variable that has the lowest direct influence on the BET-FI index is the oil price. A one-unit increase in the oil price during this period has the effect of increasing the BET-FI index by only 0.092 units. Apart from the oil price, also

the industrial production index (0.333) and the money supply (0.570) have a direct effect on the BET-FI index, the last being also the one with the greatest positive influence.

All the other macroeconomic factors impact the BET-FI index in an indirect manner. The RON-EURO exchange rate has the highest negative impact (6.852) over the index. As for the unemployment rate, a one-unit increase in it would determine the index to fall by 0.368 units. The inflation rate has the same negative influence on the BET-FI index, but with a lower impact (0.069). The same impact can also be seen in the case of the average salary (0.55) and the interest rate (0.094).

With a p-value of 0.024, lower than the 0.05 threshold, that shows whether a link is statistically significant, is the relation between BET-FI and the RON-EURO exchange rate. All the other values are higher than the 0.05 cutoff. Therefore, there is no meaningful relationship between BET-FI and the rest of the macroeconomic factors (Table 7).

Table 7. Regression outputs between macroeconomic factors and BET-FI index (2020-2023)

	Unstandardized coeff.		Standardized coeff	p-value
	B	Std. error	Beta	
(Constant)	0.004	0.012		0.740
Inflation rate	-0.069	0.064	-0.197	0.292
Unemployment rate	-0.368	0.240	-0.267	0.134
Industrial production index	0.333	0.371	0.169	0.376
RON-EURO exchange rate	-6.852	2.889	-0.404	0.024
Average salary	-0.055	0.245	-0.037	0.822
Money supply	0.570	0.917	0.111	0.538
Interest rate	-0.094	0.083	-0.207	0.267
Oil price	0.092	0.150	0.108	0.545

Source: Authors' processing based on research data

- **Macroeconomic factors and BET-NG index**

For this index the correlation is the weakest of all, with a coefficient of 0.428. The low coefficient of variation value indicates that only 18.3% of the variation in BET-NG during this time period was caused by the macroeconomic factors, the lowest

when compared to the other indices, explaining why the adjusted R^2 value is negative.

Table 8. Regression statistics (macroeconomic factors and market capitalization)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.428 ^a	0.183	-0.015	0.0606706

Source: Authors' processing based on research data

In this period marked by special events at the global and European level (2020-2023), it can be seen that the influence of the industrial production on BET-NG has decreased considerably (Table 9). A one-unit increase in this independent variable now has a negative effect on BET-NG, namely, decreasing it by 0.223 units, whereas for the other indices the influence was positive. The RON-EURO exchange rate, the most considerable of the period, also has a negative influence. Therefore, the increase of one unit in the RON-EURO exchange rate would cause a decrease in BET-NG by 4.167 units. Other macroeconomic factors whose unit increase would lead to a decrease in BET-NG are the average salary (0.236) and the interest rate (0.037).

The unemployment rate, the inflation rate and the oil price are the independent variables that bring a positive influence on the BET-NG index. A one-unit increase in the oil price would add 0.383 units to the BET-NG index, while a one-unit increase in the inflation rate and unemployment rate would increase the BET-NG by 0.072 units, respectively 0.149 units. The money supply is the factor that has the highest direct influence on the index, causing a 1.334 units increase of BET-NG.

Except for the oil price, that has a p-value of 0.59, all the other p-values registered by the other macroeconomic variables are much above the 0.05 threshold. This fact makes the links between macroeconomic factors and the BET-NG index not statistically significant.

Table 9. Regression outputs between macroeconomic factors and BET-NG (2020-2023)

	Unstandardized coeff.		Standardized coeff	p-value
	B	Std. error	Beta	
(Constant)	-0.001	0.016		0.963
Inflation rate	0.072	0.084	0.162	0.393
Unemployment rate	0.149	0.313	0.084	0.638
Industrial production index	-0.223	0.484	-0.088	0.649
RON-EURO exchange rate	-4.167	3.769	-0.193	0.277

	Unstandardized coeff.		Standardized coeff	p-value
	B	Std. error	Beta	
Average salary	-0.236	0.319	-0.125	0.464
Money supply	1.334	1.196	0.203	0.273
Interest rate	-0.037	0.109	-0.063	0.737
Oil price	0.383	0.196	0.353	0.059

Source: Authors' processing based on research data

Conclusions

From the analysis of the descriptive data, the following conclusions can be drawn: the BET-NG stock index recorded the largest fluctuations in the observed period. It indicates higher volatility compared to other stock indices, hence more heightened risk. The standard deviation of the BET-NG index is 0.0617. The BET-FI index is the least volatile index in the period marked by the Covid-19 pandemic and Ukrainian war influences (0.0479).

Analyzing the results obtained with the help of the multiple regression, the lowest link observed was between the macroeconomic factors and the BET-NG index (18.3%). For the BET and BetPlus index, the links were similar (23.8% and 23.6%), as the companies from the BET index portfolio are the ones that influence both the market itself the most and the BetPlus index. The macroeconomic factors have the highest impact on the BET index, which is also the reference index from the Romanian capital market.

As for the BET-FI index the fluctuation of the macroeconomic factors is responsible for 21.9% of the variation of the financial index.

Regarding the macroeconomic variables, the RON-EURO exchange rate is the independent variable that has the greatest negative impact on the stock market indices during the 2020-2023 time frame and is the variable that influences indirectly all the market indices. Other two factors that influence indirectly all the observed indices are the average salary and the interest rate.

As for the other factors, the money supply and the oil price influence directly all the analyzed market indices. The money supply is the macroeconomic factor that has the highest positive influence over all the indices.

The last three remaining factors (inflation rate, unemployment rate and industrial production index) influence in the same manner only three out of the four market

indices, namely BetPlus, BET and BET-FI. The inflation and the unemployment rate have an indirect influence, while the industrial production index has a direct impact.

The trend changes, in case of these three factors, when it comes to the BET-NG index. For this index, the impact of the inflation, unemployment rate and industrial production index is totally opposite compared to the other market indices, namely: direct correlation both with the inflation and the unemployment rate and indirect correlation with the industrial production.

Regarding the p-values, most of the values are above the 0.05 threshold, fact that makes the links between the macroeconomic factors and the stock market indices not statistically significant. There are only two single exceptions in this case, which happen in case of the RON-EURO exchange rate and the oil price, where the p-values are very close or even lower to the threshold.

In conclusion, the macroeconomic factors do not influence or have too little influence on the stock indices. Only in the case of the RON-EURO exchange rate and the oil price, the situation remains constant, the impact of these factors being significant, just that they influence the market indices in an opposite way. All of the indices have an indirect and strong correlation with the exchange rate. In contrast, the oil price has a direct and moderate relationship with BET, BetPlus, and BET-NG, but a direct and weak link with the financial index (BET-FI).

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