
PARALEL ANALYSIS OF THE INVESTMENT ACTIVITY ON THE CROATIAN AND THE BULGARIAN STOCK EXCHANGES IN CONDITIONS OF EXTRAORDINARY EPIDEMIOLOGICAL SITUATION

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Abstract: Measures imposed in mid-March 2020 to halt the spread of Covid-19 limited and halted a number of businesses and raised serious questions and unexpected uncertainty throughout economic life. With this study we aim to assess the impact of the emergency situation on the investment activity of two selected Balkan stock exchange – The Croatian and The Bulgarian in the past year since its introduction. Subject of the study are the dynamics of stock exchange activity and market liquidity in parallel for the selected stock exchanges, which can be considered on the one hand with the price indicators and on the other with the natural measures. The input of our analysis are the main broad stock exchange indices for each of the two selected stock exchanges. For ZSE - CROBEX, whose sample includes 20 companies and for BSE – BGBX-40. As a basis for the stated analysis we set the price indicators - the stock exchange indices, after which we consistently consider the primary indicators and the analytical measures for the stock exchange activity. The main goal is to track the change in stock market activity, in parallel with the reaction of stock indices. As a starting point for changes in stock market activity, we take the previous year before the emergency situation and consider the trend in the coming quarters.

Based on the applied different categories of specialized measures and the conducted empirical analysis, we can highlight the following more significant conclusions: The price measures - popular stock indices and market capitalization show a more tangible dependence on the looming uncertainty of the impending pandemic before the introduction of social and economic constraints. And this is more pronounced for the Croatian stock exchange. The natural indicators of the stock exchange activity - the stock exchange volume and the number of transactions show a weaker dependence on the restrictive measures. We explain this first with their generally much greater variability than that of price measures. Secondly, this can be interpreted as the absence of panic withdrawal from stock market activity, which is observed in times of crisis and is more typical of small and low-liquid capital markets. In conclusion, we can summarize that the investment activity on the capital markets of Croatia and Bulgaria is affected to a lesser extent than some sectors of the real economy. The main problem remains the humanitarian impact on the health of the affected population.

Keywords: stock exchange activity, market liquidity, exchange volume, exchange transactions, stock exchange turnover, stock exchange index.

1. INTRODUCTION

The humanitarian crisis caused by the COVID-19 pandemic, which spread around the world in early 2020, has no analogue in contemporary history. Unprecedented social restrictions have directly affected economic activity, especially in the tourism, transport, culture and other sectors. It is a known fact that the investment activity concentrated on the stock exchanges is the most sensitive to changes and risks in the economic environment. Due to the relevance of this problem with the present study, our **purpose** is entirely empirical - to track and look for the impact of pandemic restrictions on stock market activity. The focus of the study is on the capital markets of Croatia and Bulgaria, representing economies with similar scale and development, which contributes to direct comparability.

Object of current study are the capital market in Croatia and Bulgaria and in particular the stock markets, which are not just the classic investment instruments, but especially those - carriers of real profitability and risk, and with good market liquidity. In addition, stock markets account for about 90 percent of capital market activity. In particular, the scope of the study covers the following official market segments: for The Bulgarian Stock Exchange – Sofia (BSE), the stock market includes the three market segments officially named - Premium, Standard and Special Investment Purpose Companies. About The Zagreb Stock Exchange (ZSE) analogically this is the market of equity instruments.

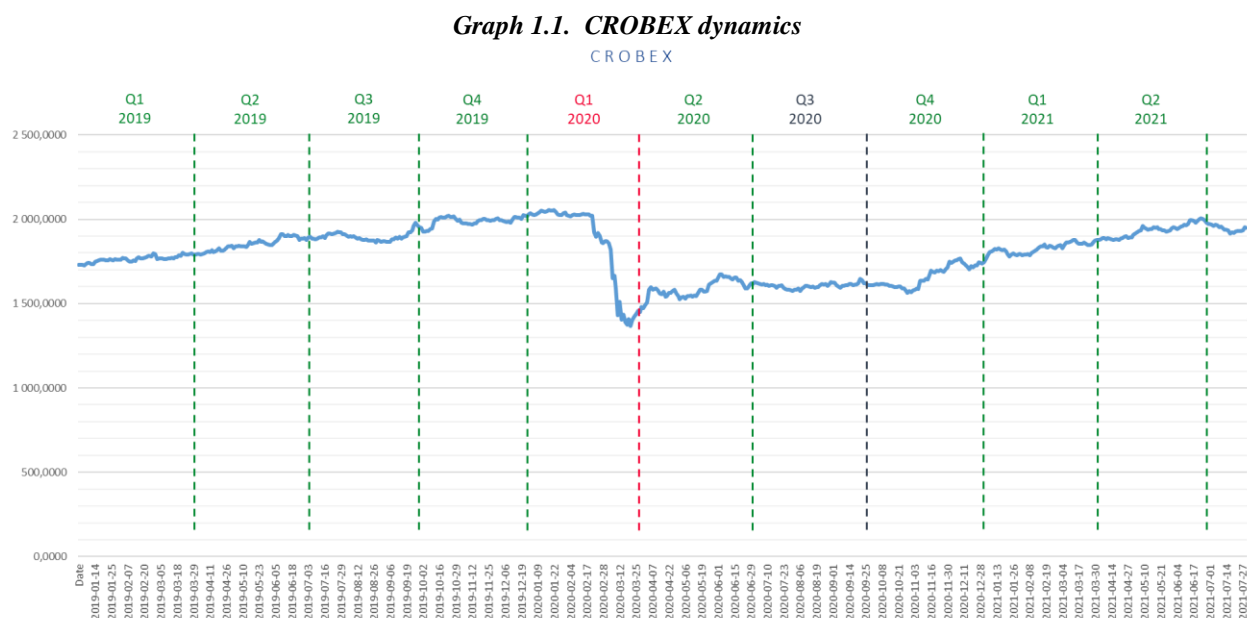
Subject of the study are the dynamics of stock exchange activity and market liquidity in parallel for the selected stock exchanges, which can be considered on the one hand with the price indicators and on the other with the natural measures. The input of our analysis are the main broad stock exchange indices for each of the two selected stock exchanges. For ZSE - CROBEX, whose sample includes 20 companies and for BSE – BGBX-40.

In an additional interpretation of the dynamics of the financial market could be considered possible structural changes in investment activity, expressed in changes in the proportions between different market segments (by individual investment instruments). Such an interpretation does not include the aims and objectives of the present study due to its limited format.

For the **methodological basis** of the research we have selected the most significant primary indicators and analytical ratios of stock exchange activity and market liquidity. Given the objectives and time scope of the present study, here we use **daily data aggregated on a quarterly basis**, which allows tracking the dynamics of stock market indicators and also comparable to a macro indicator such as GDP. The MC/GDP ratio is usually presented with GDP on an annual basis. Given the fact that the MC is a static variable (reported at a given time, date) while GDP is a dynamic variable (one that is reported for a given period), the reporting period of the dynamic - GDP should be comply with normal practice. In order to compare the values of the coefficient calculated here with the usual ones, we apply the current quarterly values of GDP as year-round in calculating MC/GDP ratio.

As the most significant of the natural primary indicators of stock exchange activity we consider the number of transactions and the stock exchange volume. Stock market turnover is the most popular measure of stock market activity, but we do not include its separate analysis here due to our understanding of its ambiguous information value. In several publications we point out the arguments for this assessment.²⁴ However, here we pay special attention to two of the secondary - analytical indicators, the component of which is the stock exchange turnover – Value Traded Ratio (VTR) and Turnover Ratio (ToR).

2. ANALYSIS OF THE DYNAMICS OF THE MAIN BROAD-BASED INDICES OF THE ZAGREB STOCK EXCHANGE AND THE BULGARIAN STOCK EXCHANGE



Author's visualization, based on data from the Zagreb Stock Exchange²⁵

From Graph-1 it can be seen that CROBEX has two smooth but steady bullish trends divided by a sharp decline in the first quarter of 2020. It is also evident that from the total ten quarters for the studied period the main index of ZSE has one quarter with decline and one, which we can practically define as neutral, and all other eight quarters are with growth.

²⁴ Mainly in the monograph (Симеонов, 2016).

²⁵ https://zse.hr/en/indeks-366/365?isin=HRZB00ICBEX6&tab=index_history

Graph 2. BGBX-40 dynamics



Author's visualization, based on data from the Bulgarian Stock Exchange – Sofia AD,

BGBX-40 also realized a sharp collapse in the first quarter of 2020, at the end of which begins a slight but steady rise, but unlike the CROBEX the previous four quarters of 2019 here are with a slight decrease.

Table 1. CROBEX dynamics, statistical indicators

CROBEX	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021
Min	1.727	1.789	1.864	1.926	1.365	1.472	1.574	1.562	1.744	1.876
Max	1.801	1.913	1.979	2.025	2.055	1.673	1.646	1.766	1.878	2.005
Average	1.765	1.848	1.895	1.989	1.855	1.588	1.607	1.661	1.826	1.933
Av.Change ₂₆	-	4,73	2,57	4,95	-6,74	-14,40	1,17	3,39	9,94	5,83
Variation %	1,03	1,95	1,25	1,26	13,54	3,03	0,90	3,84	1,68	2,04

Calculations by the author, based on primary data from market statistics for ZSE, Croatia²⁷

Table-1 and Table-2 complements the graphics 1 and 2 with more specific and analytical data. It is evident that CROBEX reports 2 quarters with a decrease in the mean values, and with SOFIX they are three. For Q2 of 2020 CROBEX loses nearly 15% of its average value, and SOFIX loses 10,1%.

As a measure of risk, we also consider the Coefficient of Variation here. Both indices reported the highest K_{var} in Q1 of 2020, reaching 13,5% for CROBEX and 9,3% for SOFIX.

²⁶ Change in the average compared to the previous quarter in percentage.

²⁷ <https://zse.hr/en/quarterly/62?fbclid=IwAR1GWIRmbgvYtByvYOVDwwwIEm8BCrHa9sisyWT0Bk0xuunUzwre1vCnkPw>

Table 2. BGBX-40 dynamics, statistical indicators

BGBX-40	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021
Min	111	113	112	108	86	90	95	96	101	114
Max	118	116	116	113	115	99	98	101	113	124
Average	115	115	114	110	106	96	96	98	109	119
Av.Change ²⁸	-	0,32	-0,70	-3,74	-3,25	-10,11	0,52	2,18	11,56	8,79
Variation	1,46	0,68	0,85	1,09	9,31	2,34	0,71	1,44	2,93	2,34

Calculations by the author, based on primary data from market statistics for The BSE-Sofia

To characterize the declines and the recovery in the dynamics of the stock exchange indices, we apply five ratios, which we introduced and applied in a previous study for the main Eastern-Asian stock exchanges (Симеонов, Анализ на активността на основните източноазиатски фондови борси (в периода 2007 – 2019 г.), 2020).

- 1) **Crisis Loss** – the value lost for the period at the lowest index level, represented as a percentage of the peak previously reached for the period, $(I_{Top} - I_{Bottom}) / I_{Top}$;
- 2) **Recovery Level** after the bottom for the period - the highest value of the index after the bottom as a percentage of the previous peak $I_{Post-Bottom Top} / I_{Pre-crisis Top}$;
- 3) **Best Revival Level** – the highest value of the index after the bottom as a percentage of the value of index bottom, $I_{Post-Bottom Top} / I_{Crisis Bottom}$;
- 4) **Relative Exchange Value Ratio** – expresses the degree of change or recovery of the current value of the index as a percentage of the index value in a previous date (at the beginning of the study period),
 $I_{Last} / I_{Previous}$
- 5) **Relative Post-crisis Exchange Value Ratio** – shows the degree of recovery through post-crisis growth to the current level, relative to the crisis loss of value $(I_{LAST} - I_{CRISIS MIN}) / (I_{BEFORE CRISIS MAX} - I_{CRISIS MIN})$.

Table 3. Ratios of Loss and Recovery

Ratios in %	CROBEX	BGBX-40
<i>Crisis Loss</i>	33,59	30,84
<i>Recovery Level</i>	97,55	105,22
<i>Best Revival Level</i>	147	145
<i>Relative Exchange Value Index</i>	115	108
<i>Relative Post-crisis Exchange Value Index</i>	89,16	118,13

Concept and calculations by the author.

The five ratios presented above and calculated (in Table-3) more specifically and clearly show the dimensions of losses and recovery levels for CROBEX and SOFIX during the study period. We can note that CROBEX has failed to regain its peak from before the bottom, despite the positive trend over the last three quarters. In contrast, in the last quarter SOFIX managed to fully recover his loss from the beginning of 2020 and exceed his previous peak by 8% and ends with + 18% compared to its level from the beginning of the study period.

²⁸ Change in the average compared to the previous quarter in percentage.

3. PARALLEL ANALYSIS OF THE CROATIAN AND THE BULGARIAN STOCK EXCHANGES SCALE

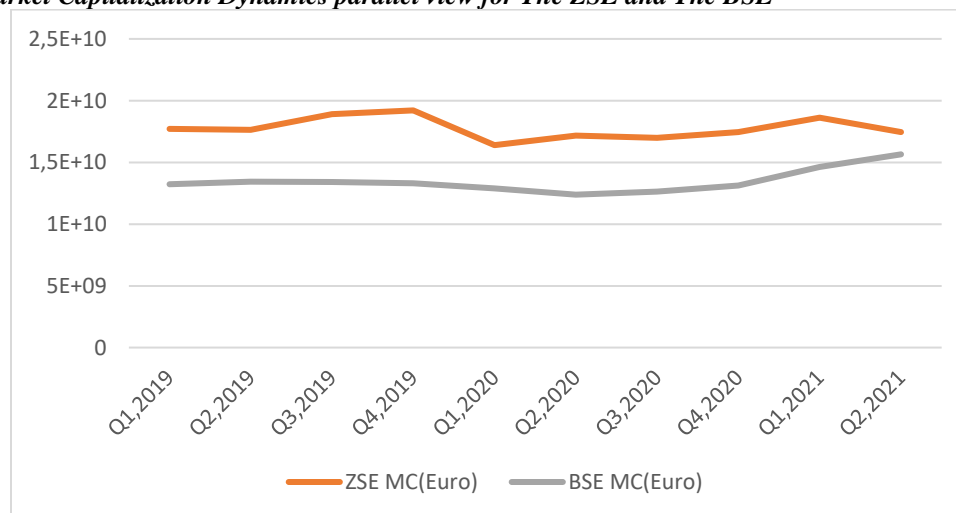
3.1. Dynamics of Primary indicators of stock exchanges scale

Table 4. Market Capitalization (quarterly in Euro)²⁹

	Q1, 2019	Q2, 2019	Q3, 2019	Q4, 2019
Zagreb Stock Exchange, Croatia	17.705.630.465	17.643.124.666	18.914.621.991	19.210.293.812
Bulgarian Stock Exchange - Sofia	13.233.591.527	13.439.035.915	13.404.624.382	13.315.253.925
	Q1, 2020	Q2, 2020	Q3, 2020	Q4, 2020
Zagreb Stock Exchange, Croatia	16.395.137.331	17.169.522.189	16.991.886.667	17.466.438.108
Bulgarian Stock Exchange - Sofia	12.888.752.346	12.384.769.475	12.643.782.487	13.128.058.136
	Q1, 2021	Q2, 2021		
Zagreb Stock Exchange, Croatia	18.623.184.279	17.465.206.279		
Bulgarian Stock Exchange - Sofia	14.629.412.195	15.649.530.964		

Summaries and organization of data by the author, based on primary data from Market Statistics for The ZSE, Croatia³⁰ and The BSE-Sofia³¹

Graph 3. Market Capitalization Dynamics parallel view for The ZSE and The BSE



Visualization and organization of data by the author, based on primary data from Market Statistics for ZSE, Croatia and BSE-Sofia

An absolute price measure of the scale of the capital market, and in particular the shares market, is the primary indicator of "market capitalization". The Zagreb and Bulgarian stock exchanges have similar scales, with the ZSE exceeding that of the BSE by about 1/4. From the data in Table-1 and the Graph-3 it is evident that the market

²⁹ For the purposes of comparability, the original data from Croatian Kuna and Bulgarian Lev are converted into Euro.

³⁰ <https://zse.hr/en/quarterly/62?fbclid=IwAR1GWIRmbgvYtByvYOVDwwwIEm8BCrHa9sisyWTobk0xuunUzwre1vCnkPw>

³¹ <https://www.bse-sofia.bg/bg/statistics?fbclid=IwAR0QZiYRfm6gBP9x1EV3uPnbM-Aw0e0ihJN7h0kkD8UsUPFgadLhSdXmcg>

capitalization of ZSE has reached the highest value for the fourth quarter of 2019, and for the BSE the largest is in the second quarter of 2021. The lowest values of the market capitalization are respectively for the ZSE in the first quarter of 2020, and for the BSE in the second quarter of 2020. Without claiming that pandemic restrictions are the only factor, since we are not directly examining the factor impact here, it can be seen that the biggest declines coincide with the peak of the spread of the health and humanitarian problem.

Completely expected dynamics of Mark.cap. for each of the stock exchanges develops in parallel with that of its stock exchange index. This is quite logical since the two indicators are price kind, as they reflect the average share course of the index sample and in the market segment.

3.2. Coefficients, of stock exchanges scale

Table 5. Ratio MC/GDP (in %)

		Q1, 2019	Q2, 2019	Q3, 2019	Q4, 2019
Zagreb Stock Exchange, Croatia	<i>Quarterly absolute values</i> ³²	153,87	133,97	128,52	148,80
	Annual at current values ³³	38,47	33,49	32,13	37,20
Bulgarian Stock Exchange - Sofia	<i>Quarterly absolute values</i>	65,87	55,43	83,04	79,89
	Annual at current values	16,47	13,86	20,76	19,97
		Q1, 2020	Q2, 2020	Q3, 2020	Q4, 2020
Zagreb Stock Exchange, Croatia	<i>Quarterly absolute values</i>	138,56	153,26	128,99	144,48
	Annual at current values	34,64	38,31	32,25	36,12
Bulgarian Stock Exchange - Sofia	<i>Quarterly absolute values</i>	51,86	52,74	78,27	77,62
	Annual at current values	12,97	13,19	19,57	19,41
		Q1, 2021	Q2, 2021		
Zagreb Stock Exchange, Croatia	<i>Quarterly absolute values</i>	156,16	No data yet for GDP included		
	Annual at current values	39,04			
Bulgarian Stock Exchange - Sofia	<i>Quarterly absolute values</i>	106,03			
	Annual at current values	26,51			

Calculations and visualization by the author, based on primary data from Market Statistics for ZSE, Croatia³⁴, BSE-Sofia, Croatian Bureau of Statistics and Bulgarian National Statistical Institute

In general, the values of the MC/GDP ratio for The Croatian Stock Exchange are many times higher than for The BSE and the main reason for this is about twice the higher Bulgarian GDP, which reduces the relative weight of stock market activity. Both stock indices reach their highest MC/GDP ratio in Q2, 2020.

³² Given the objectives and time scope of the present study, here we use data aggregated on a quarterly basis, which allows tracking the dynamics of stock market indicators comparable to a macro indicator such as GDP.

³³ The MC/GDP ratio is usually presented with GDP on an annual basis. In order to compare the values of the coefficient calculated here with the usual ones, we apply the current quarterly values of GDP as year-round.

³⁴ <https://zse.hr/en/quarterly/62?fbclid=IwAR1GWIRmbgvYtByvYOVDwwwIEm8BCrHa9sisyWT0Bk0xuunUzwre1vCnkPw>

4. PARALLEL ANALYSIS OF INVESTMENT ACTIVITY ON THE CROATIAN AND THE BULGARIAN STOCK EXCHANGES

4.1. Dynamics of Primary indicators of stock exchange activity by quarters

We consider the transactions number as natural indicator with dominant meaning for the stock exchange activity.³⁵

Table 6. Transactions number (quarterly)

	Q1, 2019	Q2, 2019	Q3, 2019	Q4, 2019
Zagreb Stock Exchange, Croatia	23.738	25.410	33.094	25.691
Bulgarian Stock Exchange - Sofia	12.473	8.458	8.793	9.444
	Q1, 2020	Q2, 2020	Q3, 2020	Q4, 2020
Zagreb Stock Exchange, Croatia	46.539	31.697	22.882	20.355
Bulgarian Stock Exchange - Sofia	19.776	17.007	9.457	11.527
	Q1, 2021	Q2, 2021		
Zagreb Stock Exchange, Croatia	23.856	23.232		
Bulgarian Stock Exchange - Sofia	16.348	16.518		

Data organization and visualization by the author, based on primary data from Market Statistics for ZSE³⁶ and BSE-Sofia³⁷.

Table 7. Trading Volume (quarterly)

	Q1, 2019	Q2, 2019	Q3, 2019	Q4, 2019
Zagreb Stock Exchange, Croatia	13.300.553	17.451.434	13.627.203	9.108.541
Bulgarian Stock Exchange - Sofia	25.132.625	10.007.662	17.817.312	18.298.810
	Q1, 2020	Q2, 2020	Q3, 2020	Q4, 2020
Zagreb Stock Exchange, Croatia	20.666.729	17.129.547	12.048.083	9.126.590
Bulgarian Stock Exchange - Sofia	28.146.837	23.580.598	29.136.866	24.498.936
	Q1, 2021	Q2, 2021		
Zagreb Stock Exchange, Croatia	9.182.457	9.819.822		
Bulgarian Stock Exchange - Sofia	16.711.237	43.834.929		

Data organization and visualization by the author, based on primary data from Market Statistics for ZSE³⁸ and BSE-Sofia³⁹.

In Table-6 it is noteworthy that the number of transactions on the Croatian Stock Exchange is on average about twice as high as on the BSE. From the point of view of trade volumes (Table-7), however, the ratio is the opposite. With the exception of one of the quarters for the whole period, the volumes of the BSE exceed sometimes several times those of the ZSE. The average transaction volume for the period on the BSE is 1885 compared to 478 on the ZSE.

4.2. Coefficients of stock exchange activity

Table 8. Value Traded Ratio (in %)

	Q1, 2019	Q2, 2019	Q3, 2019	Q4, 2019
Zagreb Stock Exchange, Croatia	0,537	0,575	0,797	0,746
Bulgarian Stock Exchange - Sofia	0,335	0,142	0,207	0,152

³⁵ Detailed systematics of the measures of stock exchange activity and their information significance are presented in monography since 2016 (Simeonov, 2016).

³⁶ <https://zse.hr/en/quarterly/62?fbclid=IwAR1GWIRmbgvYtByvYOVDwwwIEm8BCrHa9sisyWToBk0xuunUzwre1vCnkPw>

³⁷ <https://www.bse-sofia.bg/en/statistics?fbclid=IwAR0QZlYRfm6gBP9x1EV3uPnbM-Aw0e0ihJN7h0kkD8UsUPFgadLhSdXmcg>

³⁸ <https://zse.hr/en/quarterly/62?fbclid=IwAR1GWIRmbgvYtByvYOVDwwwIEm8BCrHa9sisyWToBk0xuunUzwre1vCnkPw>

³⁹ <https://www.bse-sofia.bg/en/statistics?fbclid=IwAR0QZlYRfm6gBP9x1EV3uPnbM-Aw0e0ihJN7h0kkD8UsUPFgadLhSdXmcg>

	Q1, 2020	Q2, 2020	Q3, 2020	Q4, 2020
Zagreb Stock Exchange, Croatia	1,432	0,619	0,392	0,663
Bulgarian Stock Exchange - Sofia	0,231	0,237	0,226	0,247
	Q1, 2021	Q2, 2021		
Zagreb Stock Exchange, Croatia	0,523	No data yet for GDP included		
Bulgarian Stock Exchange - Sofia	0,241			

Calculations and visualization by the author, based on primary data from Market Statistics of the ZSE⁴⁰ and the BSE, NSI⁴¹

In general, the values of the **Value Traded Ratio** (VTR) for The Croatian Stock Exchange are about 2 – 3 times higher than for The BSE and the main reason for this is the same as about the MC/GDP ratio - about twice the lower GDP of Croatia, but here also contribution have the higher turnovers on The ZSE (Table-8). The highest value of the VTR indicator on the Croatian stock exchange is noted for the first quarter of 2020, and for the BSE - for the first quarter of the same year. The lowest values of the VTR indicator are respectively the third quarter of 2020 for the Croatian Stock Exchange, and on the BSE the second quarter of 2019. Both the maxima and minima of this measure for both stock exchanges do not show a direct relationship with the periods of pandemic restrictions. This is not surprising, given the relative staticity of this measure in relation to stock market volumes and turnover ratio.

5. PARALLEL ANALYSIS OF MARKET LIQUIDITY OF CROATIA AND BULGARIAN STOCK EXCHANGES

The issue of market liquidity on the Bulgarian capital market is one of the most topical issues for the BSE and authors often discuss this issue (Georgiev, L. and Naydenova, Kr. 2020).

We highlight the **Turnover Ratio (ToR)** as an important measure of stock market activity and in particular for market liquidity. Some researchers apply the Amihud's Illiquidity ratio (Amihud, 2002), later adopted from Amiwist to present the aggregated market liquidity (Alexandros Gabrielsen, 2011), but we share some reservations about its objectivity.

The activity of the Zagreb Stock Exchange reaches the highest values of ToR in Q1, 2020 and Bulgarian Stock Exchange in Q2, 2021. The lowest values of ToR are respectively Q3, 2020 for The ZSE and Q2, 2019 for The BSE (Table-9).

Table 9. Turnover Ratio (in %)

	Q1, 2019	Q2, 2019	Q3, 2019	Q4, 2019
Zagreb Stock Exchange, Croatia	0,349	0,429	0,620	0,501
Bulgarian Stock Exchange - Sofia	0,302	0,151	0,243	0,184
	Q1, 2020	Q2, 2020	Q3, 2020	Q4, 2020
Zagreb Stock Exchange, Croatia	1,034	0,404	0,304	0,459
Bulgarian Stock Exchange - Sofia	0,229	0,263	0,283	0,303
	Q1, 2021	Q2, 2021		
Zagreb Stock Exchange, Croatia	0,335	0,459		
Bulgarian Stock Exchange - Sofia	0,216	0,392		

Calculations and visualization by the author, based on primary data from Market Statistics of the ZSE and the BSE

6. CONCLUSIONS

Based on the applied different categories of measures and the conducted empirical analysis, we can highlight the following more significant conclusions:

- The price measures - popular stock indices and market capitalization show a more tangible dependence on the looming uncertainty of the impending pandemic before the introduction of social and economic constraints. And this is more pronounced for the Croatian stock exchange.

⁴⁰ <https://zse.hr/en/turnover/44>

⁴¹ https://infostat.nsi.bg/infostat/pages/reports/result.jsf?x_2=1117

- The natural indicators of the stock exchange activity - the stock exchange volume and the number of transactions show a weaker dependence on the restrictive measures.
- We explain this first with their generally much greater variability than that of price measures. Secondly, this can be interpreted as the absence of panic withdrawal from stock market activity, which is observed in times of crisis and is more typical of small and low-liquid capital markets.
- In conclusion, we can summarize that the investment activity on the capital markets of Croatia and Bulgaria is affected to a lesser extent than some sectors of the real economy. The main problem remains the humanitarian impact on the health of the affected population.

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