Marija Trpkova-Nestorovska[1]
Predrag Trpeski[2]
Filip Peovski[3]

STUDIJE DOGAĐAJA NA UTICAJ PANDEMIJE COVID-19 NA MAKEDONSKOJ BERZI

Apstrakt: Opšti uticaj pandemije COVID-19 ostavio je trag na cena akcija kroz značajne oscilacije u svom početku. Da bismo utvrdili opšte efekte i značaj određenih vesti, koristimo analizu studije događaja zasnovanu na modelu povrata prilagođenom riziku ili tržišnom modelu CAPM sa jednim faktorom u slučaju Severne Makedonije. Za ovo istraživanje koriste se dnevni prinosi akcije četri makedonske kompanije u intervalu između januara 2019 i maja 2020 godine. Za svaki datum događaja određujemo [-10, 10] interval predviđanja/prilagođavanja. Rezultati pokazuju da događaji kao što je primena nacionalnog „zaključavanja“ i najave policijskog časa utiču na prinose akcije negativno i značajno. U suprotnosti sa očekivanjima, prvi registrovani slučaj COVID-19 i prestanak policijskog časa, procenjeno je da su beznačajni u kretanjima na tržištu.
Ključne reči: Studija događaja, COVID-19, berza, abnormalni prinosi

EVENTS' STUDY ON THE IMPACT OF THE COVID-19 PANDEMIC ON THE MACEDONIAN STOCK MARKET

Abstract: The general impact of the COVID-19 pandemic certainly left a mark on stock prices through significant fluctuations in its beginning. To determine the general effects and significance of specific news, we use event study analysis based on the risk-adjusted return model or the single-factor CAPM market model in the case of North Macedonia. For this research, daily stock returns of four Macedonian companies are used in the interval between January 2019 and May 2020. For each event date, we determine [-10, 10] anticipation/adjustment windows. General results show that events such as implementing national "lockdown" and curfew announcements impact stock returns negatively and significantly. On contrary to the expectations, the first registered COVID-19 case and curfew ceasing events are estimated to be insignificant in market movements.
Keywords: Event study, COVID-19, stock market, abnormal returns

1. INTRODUCTION

Every single world economy faces enormous health and economic crisis unseen in our time. A quick and effective combination of fiscal and monetary expansionism was necessary to preserve partial economic stability. Declining output and price levels are a common situation these days. Soaring unemployment in the second and third quarter of 2020 is in line with the expectations and plans of large transnational corporations – rationalizing expenditures and productivity, even though this process is now immensely accelerated. Integrating both demand and supply-side policies is probably the golden mix of policy reaction to this crisis, with a different experience throughout the countries affected.

Our main objectives are the developing countries and their stock markets, precisely the case of North Macedonia. In this paper, we try to grasp the general tendencies of the Macedonian stock market in the era of the COVID-19 crisis, as well as its overall performances based on event study analysis. Being one of the key components in modern-day financial development, stock markets as an integrated part of capital markets are observed as highly volatile and sensitive to exogenous systematic shocks (Mishkin and Eakins 2014). Even though it is widely understood that developing economies have weak and shallow capital markets given that they are mainly bank-based financial systems (Arestis, Demetriades and Luintel 2001), it is still of great interest in analyzing potential threats and opportunities. One of the essential elements in our analyzed timeline is the fact that there is a persistent precautionary saving by the households. It can be observed as a behavioral fact in the Balkans, where a large amount of disposable income that is not used in common expenditures is saved rather than invested in high yielding instruments. It might be due to the low level of

[1] Ekonomski fakultet Skopje ✉ marija.trpkova-nestorovska@eccf.ukim.edu.mk
[2] Ekonomski fakultet Skopje ✉ predrag.trpeski@eccf.ukim.edu.mk
[3] Ekonomski fakultet Skopje ✉ peovski@eccf.ukim.edu.mk

financial literacy in developing economies (Klapper, Lusardi and van Oudheusden 2015), especially the Western Balkans in Europe, that people tend to be risk-averse towards this type of investments.

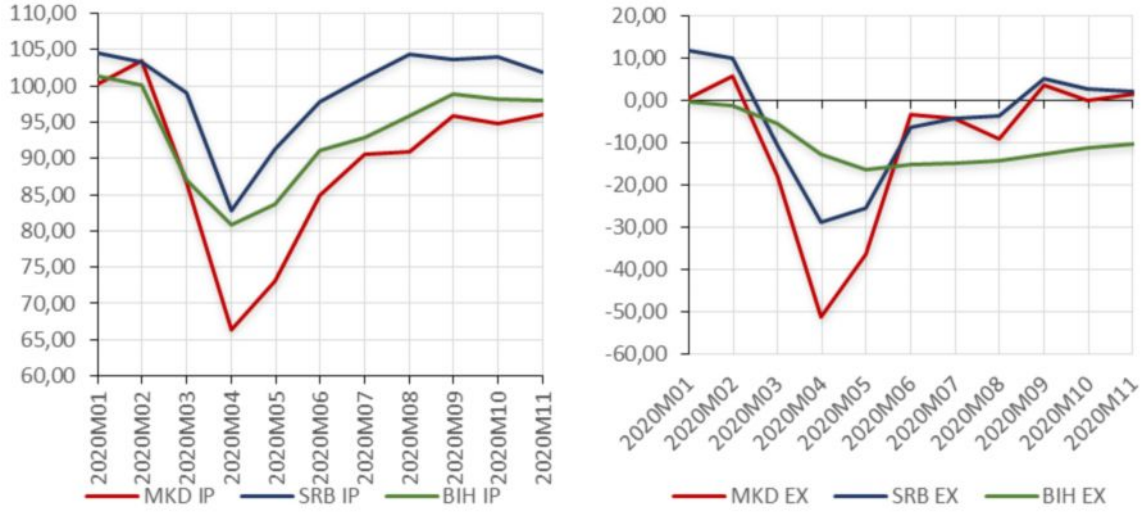
In Section 2 we focus on some key macroeconomic indicators, making a comparative analysis of the severity of the crisis. Section 3 on the other hand gives an overview of the key literature regarding the chosen topic of this paper. Sections 4 and 5 elaborate the used methodology, data sources, and the results of our stock market research. Finally, in our last section, we summarize some of the key conclusions and propose questions that might spark ambition for any future research.

2. THE COVID-19 ECONOMIC IMPACT

The Macedonian economy has faced a turbulent decade. Stemming its weak economic performances in the financial crisis in 2009 and the frequent political instability in the 2012-2016 period, it showed to be quite vulnerable to sudden endogenous and exogenous shocks. While finally gaining momentum in the 2016-2019 period, the pandemic proposed a new challenge for policy creators. In this section, we will review some of the key economic indicators to target specific problems that will prove to be of great importance in our main research of the stock market. To perform our comparative analysis, we make use of the available data from the Statistical Offices of the Republic of North Macedonia, Serbia, and Bosnia and Herzegovina as well as national Ministries of Finance and Central banks. As we like to estimate the effects of the pandemic, we specifically analyze 11 months (2020M01 – 2020M11).

Since GDP data is published quarterly or yearly, to maintain the monthly analysis consistently, we focus on the industrial production index in each of the Balkan countries as an output proxy. For almost the entire year, industrial production declines showing the impact of the pandemic. Serbian data show a quicker rebound in production which can be attributed to potentially weaker restrictive measures of the economy. On contrary, the Macedonian industrial production is heavily impacted, showing a monthly decline of 33.5% in April based on the same month in 2019. Similarly, both Serbian and Bosnian industrial production reach their lowest points in April which highly correlates to the imposed restrictive measures in the first and the second quarter of the year.

Graph 1 and 2: Industrial production index annual growth (same period in the previous year=100), monthly data, 2020M01–2020M11; Exports index annual growth (same period in the previous year=100), monthly data, 2020M01–2020M11

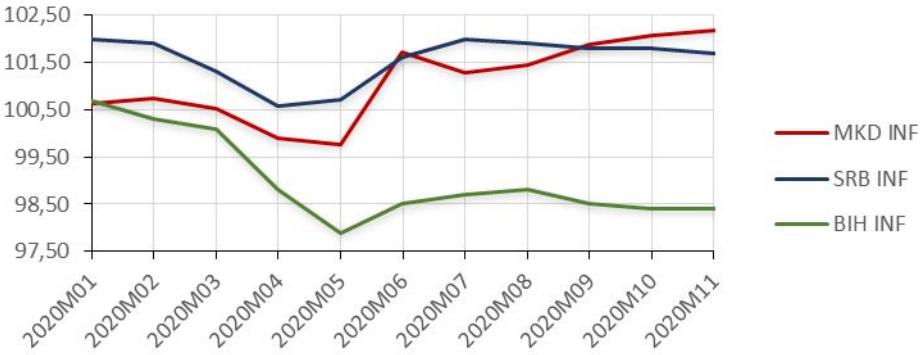


Source: Statistical Office of the Republic of North Macedonia, Statistical Office of Serbia, Statistical Office of Bosnia and Herzegovina; authors' depiction

As the analyzed countries are small and open economies, export plays a significant role in generating economic growth. Bosnia and Herzegovina's exports show a little to no signal of regaining the pre-crisis levels possibly signaling a significant enlargement of the current account deficit. On the other hand, Macedonian and Serbian exports show positive signs in the last quarter of 2020. Reaching their lowest growth in April and May coincides with the transport and trade ban in the entire European Union. Because a large proportion of total trade is with the EU, it can be perceived as expected.

Inflation, however, showed moderate growth in Serbia and North Macedonia with a short deflation episode in April and May for North Macedonia. The impact of the extensive fiscal measures guaranteed positive inflation, but its true inflationary effects are yet to be estimated and expected in the following period. Deflation tendencies are a real problem for the B&H economy as data has shown. If not targeted quickly it furthermore depresses the aggregate demand, potentially being a significant problem for generating economic growth under the circumstances of a deflationary trap (Carlin and Soskice 2015).

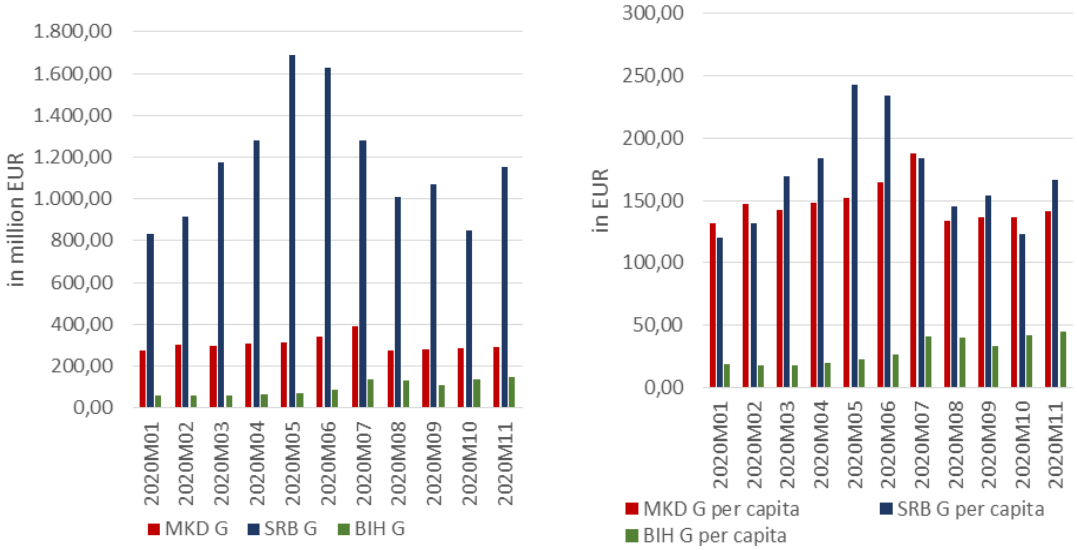
Graph 3: Inflation index annual growth (same period in the previous year=100), monthly data, 2020M01–2020M11



Source: Statistical Office of the Republic of North Macedonia, Central Bank of North Macedonia, Statistical Office of Serbia, Statistical Office of Bosnia and Herzegovina; authors' depiction

For our last indicator of interest, we gathered information from the national Ministries of Finance on the level of government expenditures during the pandemic. The fiscal policy is one of the key weapons in tackling the negative effects of the COVID-19 crisis, as a large proportion of developed and developing economies focused on introducing extensive fiscal measures. Their primary aim was reestablishing private consumption while at the same time introducing social measures aimed at the most vulnerable individuals and households. While depending on their fiscal budget governments show a great difference in expenditures, it is more adequate to portray such amounts per capita to catch the potential impact. As depicted in graph 5, both Macedonian and Serbian governments spent roughly similar budget funds per capita, averaging 147.18 € and 168.56 €, respectively. On the other hand, the B&H government spent ~30 € per citizen which is five times less. However, we must note that public information for government expenditures in Bosnia and Herzegovina is not yet available, so we used a basic method of interpolation to determine the expenditure levels in the last quarter.

Graph 4 and 5: Monthly government expenditure (in millions of EUR) and government expenditure per capita (in EUR), 2020M01-2020M11



Source: Ministry of Finance of the Republic of North Macedonia, Ministry of Finance of Serbia, Ministry of Finance and Treasury of Bosnia and Herzegovina; authors' depiction

2. LITERATURE REVIEW

In this section, we focus on some of the key literature regarding our methodological approach and market efficiency implemented in the following research. By presenting the key researches in this up-to-date and relevant field we make a starting parallel to our hypotheses and results.

None of the available stock market studies avoids the constant theoretical and practical debate over the concept of market efficiency in incorporating all of the available information. Even though its genesis is understood to be a lot older, the work of Fama (1970) stands as one of the most influential works in the field of capital market efficiency. By segregating the market efficiency into three different levels, the literature tries to postulate the theoretical approach, whereas quantitative research aims to approve or disapprove it through series of tests and models. One of the most discussed topics in emerging and developing markets is the presence of semi-strong market efficiency. It states that all contemporaneous market prices incorporate each historical and publicly available information. In line with this, the market can't be 'beaten' unless the investor possesses insider information ((Fama 1970); (Malkiel 2003)). Usually, poorly developed financial markets contain the semi-strong efficiency component unlike developed markets for example, even though the problem of inside trading can never be fully eradicated and thus a real strong market efficiency might never be completely achievable.

To test the persistence of semi-strong market efficiency, one of the main and fundamental approaches is the event study. Introduced by Ball and Brown (1968), event studies are used in testing the speed of information incorporation into market prices. They follow the abnormal returns in a specific time interval around the event date, making use of their variations and the expected return of the period. Time intervals are segregated into observation and estimation windows, with the latter containing the event date. It is understood that the market can anticipate the event and even adjust after its occurrence, but their significance should not be greater than the one of the event.

One of the key elements is deciding the length of each window. By segregating the anticipation from the estimation window, the methodology ensures that the event won't influence the "normal" market performance, which is crucial in maintaining model stability (MacKinlay 1997). Once the event is isolated from typical market movements, the calculation of abnormal returns and their volatility is much more precise and gives a wider scope of information about the event itself.

Event study analysis is incorporated through various models to determine the stock market reaction to a specific event, for instance, natural disasters, merger or acquisition announcements, stock splits, dividend news, and political events. For example, Suwanna (2012) investigates abnormal return responses on dividend announcement days. Unlike traditional researches, the author analyses a roughly 2-month trading period around the event date. The usage of a risk-adjusted model such as the CAPM shows to be highly adequate for larger samples in contrast to the market-adjusted model. The results suggest that stock prices react positively and significantly nearly 2 days after the event announcement.

The case of emerging economies, such as China, shows that sectoral reaction to the COVID-19 event is significantly divergent, being especially negative in the mining, agricultural, educational, health, and real estate sectors (He et al. 2020). They analyzed both Shanghai and Shenzhen stock markets around the Wuhan lockdown, as their main event of interest. As stated by the authors, traditional industries suffered the most. The high-tech companies even experienced positive abnormal returns according to the research results, signaling the importance of the new era business models in turbulent periods.

Mazur, Dang and Vega (2020) also focus on the COVID-19 market impact, while analyzing the US stock market. March 2020 is taken as an event for the S&P1500 firms. By focusing on abnormal returns and return volatility, the authors aim to quantify the effects on different types of industries. Healthcare, natural gas, software and food sectors experience abnormally high returns in March. Entertainment, hospitality and real estate on the other hand faced the most dramatic falls, which is in line with the theoretic expectations.

Bash (2020) focuses his research on 30 different stock indices using the mean-adjusted returns model to explain the impact of the first registered case in each of the respective countries. As expected, all of them show a decline in the cumulative abnormal returns, with results varying depending on the extensiveness of the observation period and the anticipation and adjustment intervals that typically range between [-3,3], [-5,5], [-10,10], or even prolonged after-event intervals like [-5,20].

Even though a large background exists in event study researches, choosing the optimal model, event timeline or even the right explanation of the results seems to be more of an art than a straightforward pathway. The implementation of event study analysis for testing the semi-strong efficient market hypothesis can be considered quite useful in studying Balkan stock markets. According to the relevance of the present

circumstances in economic and financial analysis, we try to model the stock market's reaction to COVID-19 related events, in line with the previously stated researches but significantly different.

3. RESEARCH METHODOLOGY AND DATA SOURCES

Since the usage of event study analysis can be used to model stock market reactions in developing economies such as North Macedonia, we try to grasp the impact and the importance of the coronavirus pandemic on specific company shares. We analyze the returns of four large public companies, each of them being part of a distinctive industry. However, we must note that the decision to choose these specific companies which are undoubtedly components of the MBI10 market index is only due to the liquidity of their stocks. Other companies, unfortunately, do not register day-to-day trading and thus they can't be efficiently taken into the analysis. For our event study, we make use of publicly available daily return data from the Macedonian Stock Exchange for the 2 January 2019 – 31 December 2020 period. This specific time interval is chosen since 2019 can be perceived as a stable year without any major events and thus can be used as an estimation window for the model. In 2020, the pandemic took its toll on almost every economic and social aspect and thus is made useful for the observation window and the events of interest.

For our research, we are interested in the shares of Alkaloid AD – Skopje, Granit AD –Skopje, Komercijalna Banka AD – Skopje, and Makpetrol AD – Skopje. They are one of the most prominent representatives of the pharmaceutical, construction, banking, and oil products supply and production sectors, respectively. These sectors can be logically connected to the aftermath of the economic crisis that was generated by a health crisis, so we target their reaction specifically.

To conduct our event study, we follow the single-factor risk-adjusted model for abnormal returns or the CAPM. Since our estimation window contains more than 270 observations, we firmly believe that incorporating the risk-component of the specific share contains valuable information and thus it can be quite useful. The event study analysis is based on estimating the significance of single or multiple events on certain price movements. By calculating the concept of abnormal returns one can get important information about the price deviation and its size around the certain event of interest. To estimate the abnormal returns we can make use of the following equation:

$$\mathbf{AR}_{i,t} = \mathrm{R}_{i,t} - \left(\alpha + \beta \mathrm{R}_{M,t}\right) \quad (1)$$

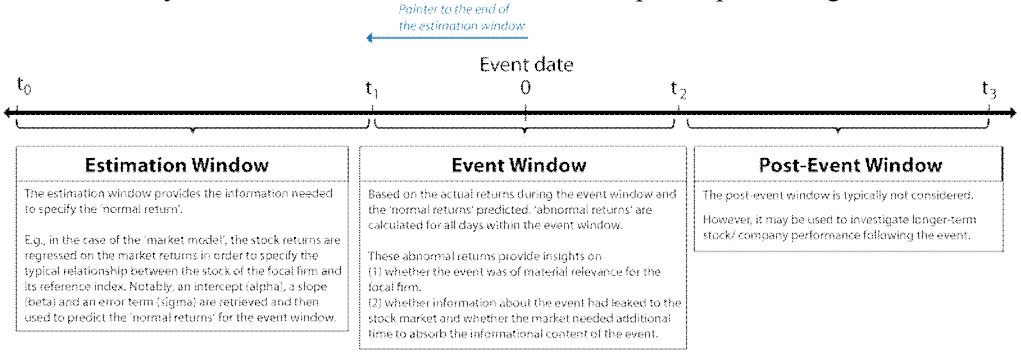
where, $AR_{i,t}$ is the abnormal return of the stock i in period t, R is the return of the stock of interest, $R_{M,t}$ is the stock market's return (proxied by a stock exchange index) in period t for every $t=0, 1, 2, \ldots, T$. The coefficients α and β are the respective estimates of a regression of the stock against the market index. Furthermore, they can be perceived as a company's recent performance and its sensitivity to general market movements or systematic risk.

Besides the abnormal rates of return, a calculation of cumulative abnormal returns is needed to further test the significance of each time interval based on the following equation:

$$\mathrm{CAR}_{i,(t_1,t_2)} = \sum_{t=t_1}^{t_2} \mathrm{AR}_{i,t} \quad (2)$$

The significance tests are conducted through the obtained values of the t-stat and the respective p-values.

For our research approach, we like to study the response to COVID-19 related events. We formulate an observation window with both anticipation and adjustment intervals of 10 trading days. With the event date included, through this method, we make use of a typical trading month. By that, the chosen observation windows are deemed to be more than adequate. For the estimation window, we take all available observations from January 2, 2019, until the date where the anticipation period begins.



On behalf of our research interest, we are specifically interested in four different event dates in North Macedonia:

- 26 February 2020 – the first registered case of COVID-19 patient,
- 16 March 2020 – the first day of closed borders, shopping malls, restaurants, etc. (national lockdown),
- 23 March 2020 – implementation of curfew,
- 27 May 2020 - ceased curfew.

Alongside the four events, we set four hypotheses that we aim to confirm through the respective approach. By confirming or maybe even rejecting them, a conclusion can be drawn about the individual stock's reaction.

H□: The announcement of the first registered COVID-19 case in North Macedonia had a significantly negative impact on the stock's movements.

H□: The announcement of the national lockdown had a negative and highly significant effect on stock return movements.

H□: The announcement of curfew implementation generated negative and highly significant stock movements.

H□: The announcement of curfew ceasing had a positive and significant impact.

4. RESULTS DISCUSSION

In this segment, we overview the results from the conducted event study research. For our modeling, we segregate the observation window into three different intervals – anticipation window, event date, and adjustment window. By doing this, we can extract significant information about the strength of information incorporation into stock prices, as well as the possibility of so-called inside trading based on exclusive information about future restrictions.

To test our first hypothesis we set an estimation window of 273 trading days, event date 26 February 2020 as 0, and [-10, 10] estimation window. The data shows a pure negative stock response on the event date for all four companies. The announcement of the first COVID-19 case had a negative impact. However, we must check this statement through t-stats, and p-values. For simplification, we estimate CAR, t-stats and p-values for the event date alone, anticipation window [-10, -1], and adjustment interval [1, 10]. The regression coefficients were estimated as ALK ($\alpha = -0.0022\%$ and $\beta = 1.35$), KMB ($\alpha = 0.0179\%$ and $\beta = 1.04$), GRNT ($\alpha = -0.0175\%$ and $\beta = 1.28$), and MPT ($\alpha = 0.0304\%$ and $\beta = 1.16$). Each stock underperformed its expectations on the event date, signaling its overall negativity. Unfortunately, the t-stats and p-values show no significance in these price movements, so they can be perceived as theoretically stochastic or random. The data for the anticipation period does not register any potential insider-trading due to the positive reaction of the stocks. The positive signs in the CAR for the adjustment period indicate market overreaction on the event date, by over-performing the expectations. No sign of significance is found except for the adjustment window trading of the KMB stocks, which can be understood as a statistically significant market reaction only at the 10% level. Based on these results, we cannot confirm our first hypothesis and so we reject the statement that the announcement of the first COVID-19 case in North Macedonia had a significantly negative impact on price movements.

Table 1 and 2: Abnormal, cumulative abnormal returns, t-stats, and p-values for event 26 February 2020, anticipation and adjustment windows

	ALK	KMB	GRNT	MPT	ALK	KMB	GRNT	MPT
	RAR/CAPM				CAR			
-10	0.36%	-0.44%	-0.41%	-1.25%	0.36%	-0.44%	-0.41%	-1.25%
-9	-0.46%	-0.17%	0.20%	0.02%	-0.10%	-0.61%	-0.22%	-1.23%
-8	-0.27%	-0.27%	-0.58%	-0.30%	-0.37%	-0.89%	-0.80%	-1.54%
-7	0.59%	0.14%	0.20%	1.07%	0.22%	-0.75%	-0.60%	-0.46%
-6	0.21%	0.08%	-0.71%	0.39%	0.43%	-0.67%	-1.31%	-0.07%
-5	-0.05%	-0.49%	-0.24%	-0.27%	0.38%	-1.15%	-1.55%	-0.34%
-4	0.25%	0.21%	-0.01%	-0.11%	0.62%	-0.94%	-1.57%	-0.45%
-3	0.53%	0.33%	0.36%	0.25%	1.15%	-0.61%	-1.21%	-0.20%
-2	2.12%	1.53%	2.12%	1.38%	3.28%	0.91%	0.91%	1.18%
-1	2.62%	0.63%	1.14%	2.48%	5.89%	1.54%	2.05%	3.66%

0	***-0.86%***	***-0.38%***	***-1.18%***	***-1.05%***	5.03%	1.16%	0.88%	2.61%
1	-3.44%	-3.57%	-4.53%	-3.52%	1.59%	-2.40%	-3.66%	-0.91%
2	-3.47%	-3.54%	-3.93%	-3.50%	-1.88%	-5.95%	-7.59%	-4.42%
3	3.08%	7.61%	2.23%	2.57%	1.20%	1.66%	-5.36%	-1.85%
4	-1.94%	-0.73%	-1.51%	-0.95%	-0.73%	0.93%	-6.87%	-2.80%
5	-1.46%	2.06%	3.05%	0.18%	-2.19%	2.99%	-3.83%	-2.62%
6	1.38%	0.31%	5.13%	1.48%	-0.82%	3.30%	1.30%	-1.14%
7	8.32%	5.92%	0.34%	6.84%	7.50%	9.22%	1.64%	5.70%
8	-8.77%	-8.78%	-6.90%	-10.32%	-1.27%	0.45%	-5.26%	-4.62%
9	5.49%	3.05%	2.81%	4.64%	4.22%	3.49%	-2.45%	0.02%
10	9.33%	9.16%	10.00%	10.80%	13.55%	12.65%	7.55%	10.81%

	ALK			***KMB***			***GRNT***			***MPT***		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-0.86%	*-0.433*	*66.52%*	-0.38%	*-0.204*	*83.85%*	1.18%	*-0.615*	*53.93%*	-1.05%	*-0.506*	*61.30%*
[-10,-1]	5.89%	*0.941*	*34.77%*	1.54%	*0.262*	*79.38%*	2.05%	*0.339*	*73.47%*	3.66%	*0.559*	*57.69%*
[1,10]	8.51%	*1.359*	*17.53%*	11.49%*	*1.945*	*5.28%*	6.67%	*1.102*	*27.14%*	8.20%	*1.252*	*21.15%*
total	13.55%	*1.492*	*13.68%*	12.65%	*1.478*	*14.05%*	7.55%	*0.860*	*39.03%*	10.81%	*1.139*	*25.56%*

**significant at 10% level.*

Source: Authors' calculations

For second hypothesis testing, we set an estimation window of 286 trading days, event date 16 March 2020 as 0, and [-10, 10] estimation window. This data confirms the expectation of negative stock response on the event date for each observed stock. The regression coefficients were estimated as ALK ($\alpha = 0.014\%$ and $\beta = 1.16$), KMB ($\alpha = 0.014\%$ and $\beta = 0.90$), GRNT ($\alpha = -0.0248\%$ and $\beta = 1.12$), and MPT ($\alpha = 0.0354\%$ and $\beta = 0.99$). Unlike the first model, this one completely confirms the second hypothesis of negative and significant response to national lockdown restrictions. All cumulative abnormal returns for the event date indicate statistical significance even at the 1% level, and they seem to be roughly even for all stocks gravitating around ~ -7%. The stocks have drastically underperformed in respect to their expectations. Anticipatory abnormal returns reject the possible presence of market reaction similar to that at the given event. Even more, the market reacts positively and significantly in almost all cases. However, the presence of negative CAR for the adjustment window indicates the possibility of slow information incorporation into stock prices and thus violating the semi-strong efficient market hypothesis. Nevertheless, a significant post-event market reaction is observed only for the MPT stock with a reaction a lot greater than the event itself. Having this in mind, one can conclude that in this particular case a market under-reaction on event day news is observed. Based on our results, we can completely confirm the second hypothesis.

Table 3 and 4: Abnormal, cumulative abnormal returns, t-stats, and p-values for event 16 March 2020, anticipation and adjustment windows

	ALK	***KMB***	***GRNT***	***MPT***	***ALK***	***KMB***	***GRNT***	***MPT***
	RAR/CAPM				***CAR***			
-10	3.17%	7.68%	2.32%	2.65%	3.17%	7.68%	2.32%	2.65%
-9	-1.67%	-0.51%	-1.27%	-0.70%	1.49%	7.17%	1.05%	1.95%
-8	-1.31%	2.19%	3.20%	0.33%	0.18%	9.35%	4.25%	2.28%
-7	1.24%	0.23%	5.03%	1.37%	1.42%	9.58%	9.28%	3.64%
-6	7.21%	5.10%	-0.60%	5.84%	8.64%	14.68%	8.69%	9.48%
-5	-8.53%	-8.58%	-6.67%	-10.09%	0.11%	6.10%	2.02%	-0.61%
-4	5.21%	2.86%	2.60%	4.40%	5.32%	8.96%	4.61%	3.79%
-3	7.57%	7.84%	8.50%	9.20%	12.89%	16.80%	13.11%	12.99%
-2	-11.90%	-10.71%	-11.14%	-11.66%	0.99%	6.09%	1.98%	1.32%
-1	10.20%	13.63%	9.79%	8.56%	11.19%	19.73%	11.77%	9.89%
0	***-6.91%***	***-7.22%***	***-6.78%***	***-7.21%***	4.28%	12.51%	4.99%	2.67%
1	0.48%	-0.23%	-0.14%	2.49%	4.76%	12.28%	4.84%	5.16%
2	-1.29%	-1.94%	-1.36%	-1.88%	3.48%	10.33%	3.48%	3.28%
3	-8.49%	-3.80%	-8.25%	-8.11%	-5.01%	6.54%	-4.77%	-4.82%
4	8.04%	8.94%	8.89%	7.95%	3.03%	15.48%	4.12%	3.13%
5	-5.79%	-6.06%	-6.21%	-6.20%	-2.76%	9.42%	-2.09%	-3.07%
6	-1.53%	-2.27%	-3.10%	-6.36%	-4.29%	7.15%	-5.19%	-9.43%
7	11.14%	9.75%	10.83%	10.20%	6.86%	16.90%	5.64%	0.77%
8	11.39%	-3.06%	0.38%	-2.29%	18.24%	13.84%	6.02%	-1.52%
9	-8.46%	-12.47%	-7.13%	-13.39%	9.78%	1.38%	-1.12%	-14.90%
10	-8.43%	3.36%	-1.28%	-0.12%	1.35%	4.73%	-2.40%	-15.03%

	ALK			KMB		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-6.91%***	-3.754	0.02%	-7.22%***	-4.044	0.01%
[-10,-1]	11.19%*	1.922	5.56%	19.73%***	3.495	0.06%
[1,10]	-2.93%	-0.503	61.52%	-7.78%	-1.377	16.95%
total	1.35%	0.160	87.28%	4.73%	0.579	56.33%
	GRNT			**MPT**		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-6.78%***	-3.727	0.02%	-7.21%***	-3.649	0.03%
[-10,-1]	11.77%**	2.045	4.17%	9.89%	1.582	11.48%
[1,10]	-7.38%	-1.283	20.04%	-17.70%***	-2.832	0.49%
total	-2.40%	-0.288	77.39%	-15.03%	-1.659	9.82%

, **, * significant at 10%, 5% and 1% level, respectively.*
Source: Authors' calculations

In our third modeling we regress 291 trading days, event date 23 March 2020 as 0, and again [-10, 10] estimation window. Since the event correlates with the implementation of curfew restrictions (complete lockdown) and is understood as one step away from quarantine, it's logical to expect great market movements. Since economic activity is highly restricted to just first-shift working hours, a large skepticism around investing can be expected. The available data confirms the expectation of negative stock response on the event date, but slightly less intensive than the previous event. The regression coefficients were estimated as ALK ($\alpha = 0.0705\%$ and $\beta = 0.91$), KMB ($\alpha = 0.08\%$ and $\beta = 0.75$), GRNT ($\alpha = 0.0041\%$ and $\beta = 1.13$), and MPT ($\alpha = 0.089\%$ and $\beta = 0.80$). Once again, every event date CAR is statistically significant at the 1% level. What is different from the previous event is that right now the anticipation windows indicate reaction with the same sign as the event, meaning that possibly traders had the information of a potential curfew implementation. However, these coefficients are significant only in the case of Alkaloid and Makpetrol stocks, both at 5% level. The significant positive reaction in the adjustment window for the ALK stocks indicates market over-reaction at the event date, and thus a market correction. Each of the observed stocks experiences negative total CAR, with the especially significant and large one in the case of Makpetrol. As the data collectively indicate negative and significant event date reaction, the fourth hypothesis is confirmed.

Table 5 and 6: Abnormal, cumulative abnormal returns, t-stats, and p-values for event 23 March 2020, anticipation and adjustment windows

	ALK	KMB	GRNT	MPT	ALK	KMB	GRNT	MPT
	RAR/CAPM				CAR			
-10	-8.24%	-8.44%	-6.71%	-9.87%	-8.24%	-8.44%	-6.71%	-9.87%
-9	4.80%	2.59%	2.58%	4.07%	-3.44%	-5.86%	-4.13%	-5.81%
-8	5.11%	6.40%	8.55%	7.29%	1.67%	0.54%	4.42%	1.49%
-7	-11.54%	-10.54%	-11.18%	-11.39%	-9.87%	-9.99%	-6.76%	-9.91%
-6	7.92%	12.29%	9.84%	6.80%	-1.95%	2.30%	3.08%	-3.11%
-5	-7.65%	-7.68%	-6.79%	-7.79%	-9.60%	-5.38%	-3.70%	-10.90%
-4	-0.67%	-0.93%	-0.13%	1.59%	-10.27%	-6.31%	-3.84%	-9.32%
-3	-2.16%	-2.48%	-1.36%	-2.56%	-12.43%	-8.78%	-5.20%	-11.88%
-2	-7.76%	-3.41%	-8.31%	-7.55%	-20.18%	-12.19%	-13.51%	-19.43%
-1	6.86%	8.23%	8.90%	7.03%	-13.33%	-3.96%	-4.61%	-12.40%
0	***-5.54%***	***-5.95%***	***-6.25%***	***-6.02%***	-18.87%	-9.92%	-10.86%	-18.42%
1	-0.55%	-1.74%	-3.16%	-5.62%	-19.42%	-11.66%	-14.02%	-24.04%
2	9.73%	8.90%	10.85%	9.10%	-9.70%	-2.76%	-3.18%	-14.93%
3	9.67%	-4.08%	0.41%	-3.63%	-0.03%	-6.83%	-2.77%	-18.56%
4	-7.51%	-11.95%	-7.20%	-12.66%	-7.53%	-18.78%	-9.97%	-31.22%
5	-6.69%	4.32%	-1.37%	1.21%	-14.22%	-14.46%	-11.34%	-30.01%
6	9.28%	9.28%	8.95%	10.50%	-4.93%	-5.18%	-2.39%	-19.51%
7	-1.02%	-3.02%	-0.24%	-7.59%	-5.95%	-8.21%	-2.63%	-27.09%
8	-6.46%	-6.83%	-6.37%	-5.12%	-12.42%	-15.04%	-8.99%	-32.22%
9	5.12%	3.50%	-0.51%	4.72%	-7.29%	-11.54%	-9.51%	-27.50%
10	1.26%	-0.38%	2.31%	2.84%	-6.04%	-11.92%	-7.20%	-24.66%

	ALK			KMB		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-5.54%***	-3.303	0.11%	-5.95%***	-3.474	0.06%
[-10,-1]	-13.33%**	-2.511	1.26%	-3.96%	-0.731	46.51%
[1,10]	12.83%**	2.418	1.62%	-2.00%	-0.370	71.18%
total	-6.04%	-0.785	43.31%	-11.92%	-1.518	13.01%
	GRNT			***MPT***		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-6.25%***	-3.428	0.07%	-6.02%***	-3.188	0.16%
[-10,-1]	-4.61%	-0.799	42.49%	-12.40%**	-2.076	1.98%
[1,10]	3.67%	0.636	52.55%	-6.24%	-1.046	15.71%
total	-7.20%	-0.861	39.00%	-24.66%***	-2.850	0.29%

, **, * significant at 10%, 5% and 1% level, respectively.*
Source: Authors' calculations

For our last analysis 334 trading days are taken for the estimation window, event date 27 May 2020 as 0, and [-10, 10] estimation window. This time the event should theoretically signalize positivity in market trading since restrictions were lifted. Contrary, the data doesn't support this thesis. As can be seen from table 7 and table 8, the stocks reacted negatively in terms of reaching their expectations. Furthermore, as in the first model, almost all of the estimated coefficients are insignificant. On that note, we can conclude that the market didn't react as expected to the ceasing of curfew restrictions. One of the reasons for this might be the fact that the first wave of COVID-19 gradually lost its momentum and positivity became evident even before the formal event of removing restrictions. Following the same method as previous models, the estimated regression coefficients are ALK ($\alpha = 0.1252\%$ and $\beta = 0.31$), KMB ($\alpha = 0.0595\%$ and $\beta = 0.26$), GRNT ($\alpha = 0.0528\%$ and $\beta = 0.49$), and MPT ($\alpha = 0.097\%$ and $\beta = 0.35$). As the results don't satisfy our expectations, we reject the fourth hypothesis since neither of the stocks reacted significantly to the event.

Table 5 and 6: Abnormal, cumulative abnormal returns, t-stats, and p-values for event 27 May 2020, anticipation and adjustment windows

	ALK	***KMB***	***GRNT***	***MPT***	***ALK***	***KMB***	***GRNT***	***MPT***
	RAR/CAPM				***CAR***			
-10	-0.95%	-0.64%	-1.42%	1.43%	-0.95%	-0.64%	-1.42%	1.43%
-9	-0.81%	-0.08%	0.03%	0.64%	-1.77%	-0.72%	-1.39%	2.08%
-8	0.08%	-0.85%	0.30%	0.83%	-1.69%	-1.57%	-1.08%	2.91%
-7	-2.42%	-0.75%	0.30%	1.16%	-4.10%	-2.31%	-0.78%	4.07%
-6	-1.22%	-0.05%	0.11%	-1.14%	-5.33%	-2.36%	-0.67%	2.93%
-5	0.39%	-0.21%	-0.12%	-0.20%	-4.94%	-2.57%	-0.79%	2.73%
-4	1.90%	-0.47%	-0.50%	-0.07%	-3.04%	-3.04%	-1.30%	2.66%
-3	0.85%	-0.45%	-0.61%	-1.57%	-2.19%	-3.49%	-1.91%	1.09%
-2	0.14%	0.03%	1.60%	-0.17%	-2.05%	-3.46%	-0.31%	0.92%
-1	-0.80%	-1.31%	-2.87%	-0.85%	-2.85%	-4.77%	-3.18%	0.08%
0	***-0.26%***	***-1.22%***	***-0.45%***	***-0.44%***	-3.11%	-5.99%	-3.62%	-0.37%
1	-1.26%	0.88%	1.24%	1.50%	-4.37%	-5.11%	-2.39%	1.14%
2	-0.30%	-0.17%	-1.35%	0.05%	-4.67%	-5.29%	-3.74%	1.18%
3	-0.79%	0.44%	-0.08%	-0.03%	-5.46%	-4.84%	-3.82%	1.16%
4	-1.68%	-0.83%	0.31%	-0.58%	-7.14%	-5.68%	-3.51%	0.58%
5	-0.50%	-0.10%	0.08%	0.00%	-7.64%	-5.78%	-3.43%	0.58%
6	0.21%	-0.10%	-0.60%	-0.16%	-7.43%	-5.88%	-4.03%	0.41%
7	-0.37%	0.06%	0.32%	0.17%	-7.80%	-5.81%	-3.70%	0.58%
8	-0.91%	-0.02%	-0.07%	-1.26%	-8.71%	-5.83%	-3.77%	-0.68%
9	-1.84%	-0.48%	-0.02%	-0.44%	-10.55%	-6.31%	-3.79%	-1.12%
10	-0.82%	-2.05%	-0.14%	-0.57%	-11.37%	-8.36%	-3.94%	-1.69%

	ALK			KMB		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-0.26%	-0.174	86.20%	-1.22%	-0.762	44.65%
[-10,-1]	-2.85%	-0.599	54.99%	-4.77%	-0.940	34.80%
[1,10]	-8.26%*	-1.737	8.33%	-2.37%	-0.466	64.13%
total	-11.37%*	-1.650	9.996%	-8.36%	-1.137	25.65%
	GRNT			**MPT**		
	CAR	*t-stat*	*p-value*	*CAR*	*t-stat*	*p-value*
event	-0.45%	-0.273	78.51%	-0.44%	-0.246	80.61%
[-10,-1]	-3.18%	-0.616	53.80%	0.08%	0.014	98.92%
[1,10]	-0.31%	-0.061	95.18%	-1.32%	-0.233	81.61%
total	-3.94%	-0.527	59.87%	-1.69%	-0.205	83.78%

** Significant at 10% level.*

Source: Authors' calculations

5. CONCLUSION

Based on our research methodology, we found out that restrictive measures impact the chosen stocks the most. For instance, a largely negative and significant impact is registered on the announcement dates of national "lockdown" and curfew restrictions which is in line with the theoretical expectations due to the inevitable decline in economic activity. However, the same cannot be stated for the first and last hypothesis. The first registered COVID-19 case and the announcement of curfew ceasing generated negative abnormal returns on the observed stocks but essentially this impact is insignificant.

The usage of event study analysis for stock markets such as the example of North Macedonia is ideal according to the level of development. The violation of the efficient market hypothesis can be registered only in highly distortive events. The largest cumulative abnormal returns are observed in the case of Makpetrol.

For other future researches, the event study analysis can help establish and determine the connection between COVID-19 events that are slightly more positive. However, since the pandemic is far from over yet we yet need to face the real market movements and potential corrections.

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