

Effect of Ukraine-Russia Conflict on the Cryptocurrency Market: an Event Study Perspective

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Abstract. Russia massively invaded Ukraine on February 24, 2022, unavoidably having an effect on the world economy and finance. This paper uses the event study to research the short-term response of the February 2022 top 5 variable-price cryptocurrencies (BTC, ETH, BNB, XRP, SOL) to the Russia-Ukrainian war under the constant mean model. The cryptocurrency volatility was dramatic during the event window, and cryptocurrencies did not show the characteristics of safe haven. Overall, the result of the effect of the Russia-Ukraine war on the cryptocurrency market was negative, with the least negative impact on SOL and the most negative impact on BNB, XRP. Finally, Using the different event window analysis, it shows the cryptocurrency market return volatility rebounded, but it does not sufficiently indicate there is a positive trend in the cryptocurrency market after the event. The analysis of this paper can provide some help for cryptocurrency investors in the event of unforeseen circumstances. And in the data selection, this paper doesn't consider stablecoins.

Keywords: Russia-Ukraine conflict; Cryptocurrency; Event study.

1. Introduction

The conflict involving Russia and Ukraine significantly intensified on February 24, 2022, the time that Russia invaded Ukraine. The invasion could result in the most serious refugee crisis Europe has seen following World War II and was the biggest military confrontation in the continent since that conflict. Meanwhile, negatively the Russian invasion in the Ukraine is a huge external shock to the financial markets. In financial terms, it is a "black swan" event, that is, a rare and highly unlikely event that will have an important impact in the short and long run. There is some prior research on how conflict affects financial markets. Like lower-grade corporate spreads widened, equity prices dropped, the dollar weakened, and oil prices soared as war risk grew [1]. And Middle Eastern political unrest had the biggest effect on financial market volatility around the commencement of the Iraq war, primarily on developed markets, according to a sample of stocks and commodities [2]. And the recent the author use a representative sample of commodities to assess how the European and worldwide equities markets responded. Response to the conflict is contrasted with the present Covid-19 outbreak and the 2008 global financial crisis [3].

Cryptocurrencies have been on people's minds since Satoshi Nakamoto published his paper on Bitcoin in 2008. As the earliest cryptocurrency to employ blockchain technology, Bitcoin has dominated the marketplace since its creation in 2009. More than 1,000 alternative coins and cryptocurrency tokens have been created since the invention of Bitcoin, with 919 or more of them currently transacting on unregulated or unregistered exchanges. Startups in the bitcoin and blockchain industries have access to a new source of funding. Through what are called initial cryptographic token offerings or initial token sales, the disruption caused by Bitcoin could be felt outside of payments [4]. Cryptocurrencies have no centralised regulating or issuing body, but instead, record the transaction and issue fresh units through a decentralised system. In recent years, more and more cryptocurrencies have emerged, contributing to the rise of decentralized finance. Although cryptocurrencies have a short history, they are rapidly changing the world. It is a digital trade system and is not dependent on banks to check transactions. Through peer-to-peer technology, any person, anywhere, can transfer and receive money. There are cryptocurrency payments only in the form of digital records describing specified transactions in an online database, in contrast to the real physical currency that is transported and exchanged in the real world. A general ledger keeps a record of all transactions carried out with

cryptocurrencies. Some investors see cryptocurrencies as safe-haven asset that can provide value preservation during sharp market corrections as part of an investment portfolio. A deep observation is provided by including 30 worldwide indices and 973 different types of cryptocurrencies from a dynamic point of view. The empirical findings primarily demonstrate that cryptocurrency generally serves as risk averse asset rather than a hedge for the majority of indices from around the world, in groupings with higher market capitalization and liquidity, as well as in established markets, the safe haven property is more prominent [5]. For the study of how cryptocurrencies work with respect to COVID-19, the number of reported incidents and fatalities and the price of Bitcoin initially have a negative correlation, but later on, the correlation turns out to be positive. Though the interactions are weaker, the outcomes for Ethereum and Ripple are comparable. This demonstrates how cryptocurrencies can lessen the risk that COVID-19 poses [6]. The event study method has been used many times in previous studies. Applying the event study approach, both Bitcoin and Altcoin anomalous returns are negative around dates for Covid-19, as well as Altcoins are deeper negatively impacted by the pandemic of COVID-19 than Bitcoin [7]. Using event analysis, it was concluded in general, the Russian invasion was met with the fastest market reactions in commodities and the stock market. This Russian invasion resulted in varied adverse cumulative anomalous results for indices of the world's stock markets. The markets of NATO members showed better returns, which is according to the anticipated military economic stimulation of military readiness [8]. The effect of the Russia-Ukrainian war on the G20 and other particular markets for stocks is researched in the event analysis context, the overall stock market research shows that the Russia-Ukraine war will have a major and unfavourable influence during the event's day and the days after [9]. As an important financial market, it is necessary to research the effects of the crisis between Russia and Ukraine within the cryptocurrency industry. On the cryptocurrency marketplaces, the price variations are significantly greater between nations than within them, and they are substantially less between cryptocurrencies [10]. So this paper only selects the cryptocurrency USD to research how the Russian and Ukrainian war has affected on the cryptocurrency market. Compare to the global abrupt crisis COVID-19 pandemic, cryptocurrencies also offer investment opportunities with "safe heaven" characteristics in the Russia-Ukrainian conflict. This essay investigates the immediate results of Russia's launches aggression on the cryptocurrency market through the perspective of an event study method.

The analysis in this article is divided into three parts. First, analysis with respect to the aggregate abnormal returns (AARs) and the aggregate cumulative abnormal return (CAARs) show the strong fluctuation and negative impact on the cryptocurrency market during the event window. Second, the everyday cumulative abnormal returns (CARs) analysis illustrates that XRP, BNB has a negative reaction in both before and after event days, whereas SOL is negatively impacted in pre-event days just. Lastly, the cumulative abnormal returns (CARs) of different windows analysis indicate that BNB has been most impacted by the beginning of the Russian particular operations force mission in Ukraine. Additionally, in the post-event window, it shows the cryptocurrency market rebounding after the event. But there is no sufficient support for a rising trend in the cryptocurrency market after the event. The remaining research is organized as follows: The study's data and methodology are explained in part 2, and the study's results and conclusion are presented in parts 3 and 4. This paper selects the Feb 2022 top five variable-price cryptocurrencies by market capital for study, without considering stablecoin.

2. Methodology

2.1 Event Study Methodology

This paper considers the top 5 variable-price cryptocurrencies by market capitalization in February 2022 which are Bitcoin (BTC), Ethereum (ETH), Binance coin (BNB), Ripple (XRP), and Solana (SOL). The data are all sourced from investing.com and cover the period from 22 Oct 2021 to 1 Mar 2022.

Using the event study perspective, firstly, the event, event date, event window and estimated window need to be defined. The day the Russia-Ukraine war broke out on full scale is 24 February 2022. So, The event day $t=0$ is 24 February 2022. Since 120 days are enough to formulate a benchmark for normal returns, the window for estimation covers 120 days between $t-125$ and $t-6$ [11]. And the event window is between $t-5$ and $t+5$ which includes 11 days. As shown in the figure 1.

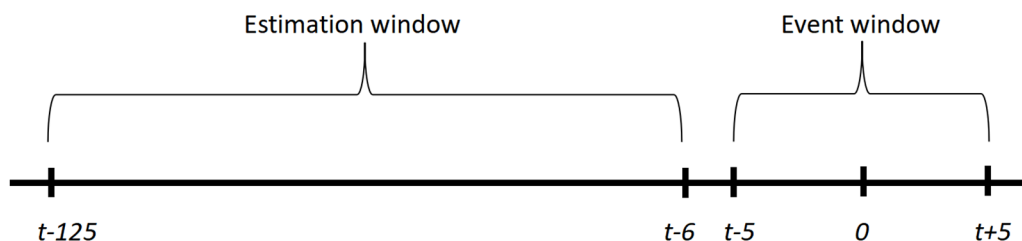


Fig. 1 Event timeline

2.1.1 Constant Mean Model

Since the cryptocurrency market does not have an official market benchmark index that includes most cryptocurrencies, this paper uses the event study under the constant mean model.

The Constant mean model assigns large weights to the historical information of a given security. The choice of the constant mean model is justified and it often gives results like those of the complicated models [12]. The model assumes that a cryptocurrency's average return is constant.

$$ER_{it} = R^{-}I + e_{it} \quad (1)$$

where $R^{-}I$ denotes the average log return between the estimation window 22 Oct 2021 to 1 Mar 2022, and e_{it} is the error term.

The Constant Mean Model is employed to establish the expected returns (1) and use log returns as an equation (2). The average log return during the estimating window is used to determine the expected return ER_{it} .

$$R_{it} = \text{LN}[P_{it} / P_{it-1}] \quad (2)$$

P_{it} and P_{it-1} are the cryptocurrency's price on day t and day before day t respectively.

2.1.2 AR and CAR

Assessing impact of an event requires the calculation of abnormal return. The Abnormal returns (AR) is the gap compared to the real return on the cryptocurrency during the occasion window and the predicted return for the same period, while the predicted return in the event that the event does not materialise is known as the expected return.

$$AR_{it} = R_{it} - E(R_{it}|X_t) \quad (3)$$

AR_{it} denotes the abnormal return of cryptocurrency i in day t , R_{it} denotes the real return of cryptocurrency i in time t , and $E(R_{it})$ is the expected return of cryptocurrency i in time t . X_t is the limited component of the normal return model.

The cumulative abnormal return (CAR) is calculated for cryptocurrency i cover the event window between t_1 and t_2 .

$$CAR(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (4)$$

Where (t_1, t_2) is the time period of event window.

2.1.3 AAR and CAAR

The aggregate of abnormal return (AAR) is computed by the average of total each cryptocurrency's abnormal returns for each day which can be used to calculate the common response of the cryptocurrencies to the event. The equation below to calculate AAR.

$$AAR_{it} = 1/N \sum_{i=1}^n AR_{it} \quad (5)$$

Where N denotes the number of cryptocurrencies.

The cumulative aggregate abnormal return (CAAR) for the event window is then determined using AAR like CAR determined by AR.

3. Results

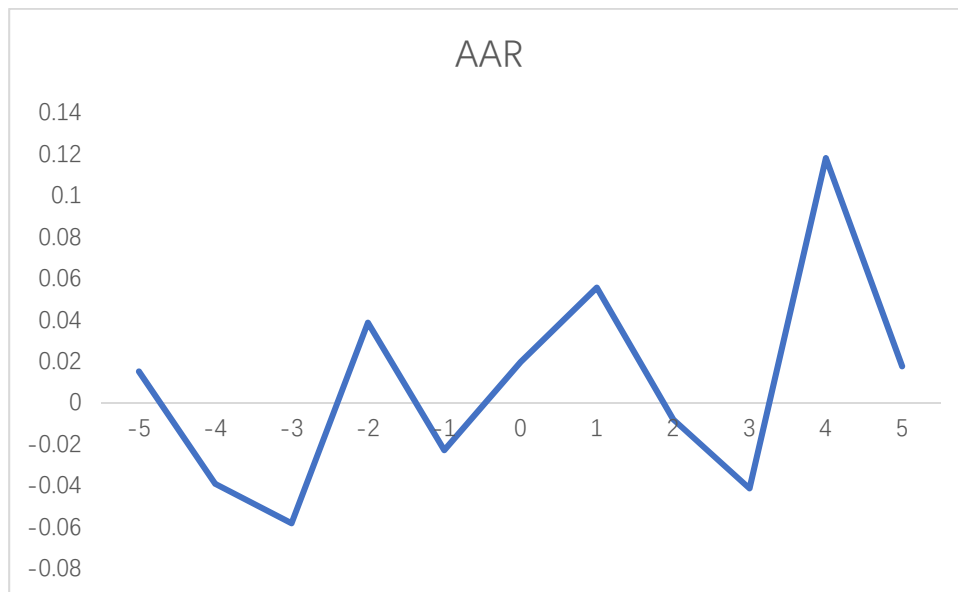


Fig. 2 AAR over event window

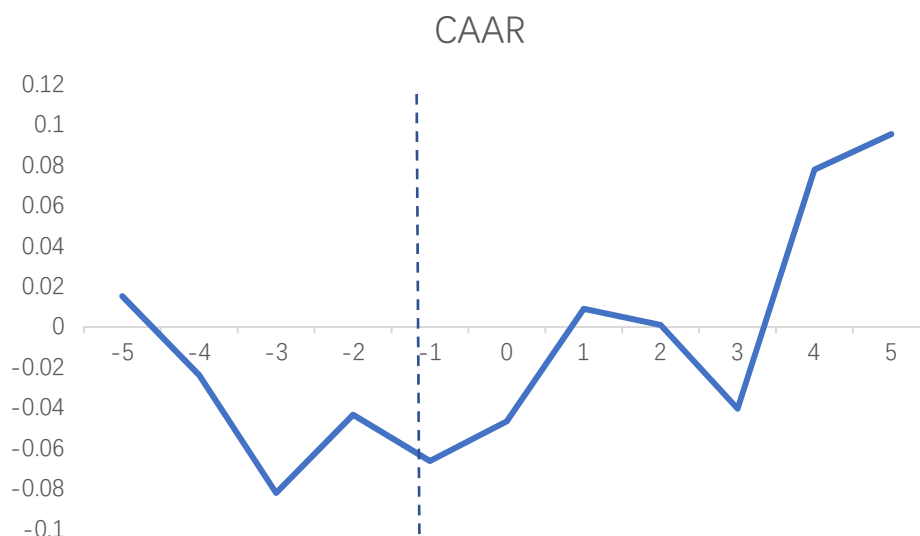


Fig. 3 CAAR over event window

Table 1. Aggregate cryptocurrencies' AAR and CAAR

	AAR	t value	CAAR	t value
t-5	0.0151	1.6303	0.0151	1.6303
t-4	-0.0391	-3.9929	-0.0240	-1.7771
t-3	-0.0582	-3.7940	-0.0822	-8.2860
t-2	0.0386	8.7987	-0.0436	-4.2169
t-1	-0.0229	-8.4507	-0.0664	-5.2690
t	0.0197	1.4986	-0.0468	-1.9035
t+1	0.0556	4.1105	0.0088	0.4317
t+2	-0.0080	-1.3178	0.0008	0.0448
t+3	-0.0414	-9.7448	-0.0405	-2.4624
t+4	0.1182	8.4548	0.0776	2.6391
t+5	0.0176	2.3765	0.0952	3.5395

Figure 2 depicts the average abnormal return (AAR) of the top five cryptocurrencies during the time of the event window of 11 days. As is obvious, the AARs of the cryptocurrencies fluctuate greatly during the 5 days before and post the event, and do not show the hedging effect of being a cryptocurrency as “digital gold”. Figure 3 shows CAAR of these 5 cryptocurrencies during the time of the 11-day event window. As is evident from Figure 3, the average cumulative abnormal returns mostly are zero or negative at pre or after the event day, and at t-4,t-3, t-2, t-1, t=0,t+3, the CAARs are significantly negative, and only at t+1, it is slightly positive, but then falls back at t=2 which is approximately equal to zero. However, at t+4 and t+5, the average cumulative abnormal returns are both greater than zero, since this paper is a short-term event study, the data are not collected for a long term after the event, and the positive CAAR at t=4 and t=5 do not clearly reflect an upward trend after the 4th and 5th day of the incident. It only shows that the cryptocurrency market is very volatile. According to Figures 2 and 3, we can see that on the day of the event which is t=0, AAR is positive but the CAAR is negative under the constant mean model, meanwhile the CAARs are basically negative around the day of the event, which shows that the Russia-Ukrainian war has an adverse effect on the cryptocurrency exchange. Table1 shows the specific data of AAR and CAAR throughout the occasion window of 11 days, it shows that AAR at t-4,t-3,t-1,t+1,t+3, CAAR at t-3,t-2,t-1,t,t+3 are significant negative, it indicates that the conflict has a profoundly adverse effect on the cryptocurrency market in these days. And AAR at t-2,t+1,t+4,t+5, CAAR at t+4,t+5 are significantly positive, it shows that there has been some rebound in AAR after the invasion. On the occasion day, the AAR is 0.0197, which is not significant in t value, while the CAAR is -0.0468, which is significant, it shows CAAR impact the day of the occasion is very negative. Generally, the result can be concluded that the event occurrence has a negative impact on the cryptocurrency market, while there are some signs of recovery after the event occurrence, there is not enough data to support it. At the same time, these 5 cryptocurrencies' returns were volatile around the time of the event.

Table 2 provides CARs of the top five cryptocurrencies by market capitalization in February 2022 for each day during the event window. As we can see, the Russia-Ukrainian conflict has a more negative impact on XRP, BNB than other cryptocurrencies, because the CAR of XRP, BNB is always negative from t-4 to t+3. On the day of the event, the CARs are BTC(-0.0203), ETH(-0.0494), BNB(-0.0920),XRP(-0.1036),SOL(0.0314).Among them, only the CAR of SOL is positive. We can see it is always positive after the event, and the CAR is between 0 and 0.1 until t+1, which shows that Russia's invasion has the least negative impact on SOL. And for BTC, ETH, only t+3 is negative after the event, so the negative impact of the Russia-Ukraine conflict on BTC, ETH is also relatively small.

Table3 reports the cumulative abnormal returns of these five cryptocurrencies using different event windows, which are (-5,5), (-4,4), (-3,3), (-3,-1), (0,3). Obviously, the window (-5,5), the CARS are all positive, and in the(-4,4),they are all negative, which shows that there are very high volatility around the event day. In the (-3,3) window, the CAR is BTC(0.7481%),ETH(2.3103%),BNB(-4.4166%),XRP(-5.1481%),SOL(-0.8133). Compared to other cryptocurrencies, we can conclude that BNB, XRP react more negatively to the Russia-Ukraine conflict while BTC, SOL react very little to the conflict. In the (-3, -1) window, the CARs of all five cryptocurrencies are negative, which shows

that the cryptocurrency market was very depressed in the three days before the event, and in the (0, 3) window, only BNB has a negative CAR, which indicates that the volatility of the cryptocurrency market has rebounded in the short term after the event, but since there is no data collected for a longer period of time, it does not indicate that there is a positive trend in the market for cryptocurrencies after the event. In general, the market for cryptocurrencies is still showing negative effects.

Table 2. Top 5 Cryptocurrencies CAR during the event window.

	BTC	t statistic	ETH	t statistic	BNB	t statistic	XRP	t statistic	SOL	t statistic
t-5	0.0059	0.1848	-0.0025	-0.0611	0.0026	0.0639	0.0487	1.0884	0.0206	0.3802
t-4	-0.0346	-0.7628	-0.0533	-0.9094	-0.0457	-0.7851	-0.0062	-0.0973	0.0196	0.2551
t-3	-0.0664	-1.1948	-0.0687	-0.9580	-0.1090	-1.5283	-0.1037	-1.3380	-0.0632	-0.6724
t-2	-0.0301	-0.4682	-0.0399	-0.4822	-0.0592	-0.7183	-0.0735	-0.8209	-0.0152	-0.1403
t-1	-0.0535	-0.7453	-0.0595	-0.6422	-0.0808	-0.8774	-0.1063	-1.0620	-0.0322	-0.2651
t	-0.0203	-0.2585	-0.0494	-0.4865	-0.0920	-0.9125	-0.1036	-0.9449	0.0314	0.2357
t+1	0.0058	0.0683	0.0176	0.1609	-0.0532	-0.4881	-0.0008	-0.0064	0.0746	0.5193
t+2	0.0071	0.0780	0.0240	0.2052	-0.0560	-0.4810	-0.0228	-0.1802	0.0519	0.3378
t+3	-0.0264	-0.2740	-0.0323	-0.2595	-0.0912	-0.7382	-0.0595	-0.4431	0.0066	0.0408
t+4	0.1135	1.1177	0.0816	0.6227	0.0048	0.0366	0.0229	0.1619	0.1653	0.9630
t+5	0.1453	1.3644	0.1028	0.7482	0.0384	0.2814	0.0289	0.1948	0.1608	0.8927

Table 3. Top 5 CAR of cryptocurrencies over different windows

Cryptocurrency	[-5,5]	[-4,-4]	[-3,3]	[-3,-1]	[0,3]
BTC	14.4092% (0.2012)	-4.0679% (0.2122)	0.7481% (0.9324)	-1.9203% (0.7352)	2.6684% (0.6853)
ETH	10.6070% (0.4664)	-5.0448% (0.2321)	2.3103% (0.8397)	-0.5323% (0.9423)	2.8427% (0.7388)
BNB	4.0483% (0.7813)	-4.8161% (0.2550)	-4.4166% (0.6997)	-3.4501% (0.6399)	-0.9665% (0.9100)
XRP	3.1824% (0.8413)	-5.4601% (0.2364)	-5.1481% (0.6799)	-9.9313% (0.2178)	4.7832% (0.6077)
SOL	16.8309% (0.3799)	-0.0366% (0.9947)	-0.8133% (0.9568)	-4.9711% (0.6074)	4.1578% (0.7109)

p-values in parentheses

4. Conclusion

This paper's objective is to analyse the conflict involving Russia and Ukraine effect on the cryptocurrency market using the top five variable-price cryptocurrencies by market capitalization in February 2022. The data are not considering stablecoins.

The daily AR, AAR CAAR and CAR over the event window and the CARs of different event windows are analyzed using the constant mean return model under the event study perspective. While cryptocurrencies are considered as safe-havens and speculative hedges and people choose to go for bitcoins to preserve their value, in the event study, the result shows when Russia invaded Ukraine the cryptocurrency volatility was dramatic during the event window and did not show the characteristics of safe-haven. In general, the result the effect of Russia launches an invasion on the cryptocurrency market was negative, with the least negative impact on Solana and the most negative impact on Binance and Ripple. After the event, the cryptocurrency market return volatility rebounded, but it does not sufficiently indicate that there is a positive trend in the cryptocurrency market after the event. The result can provide some help for cryptocurrency investors in the event of unforeseen circumstances.

References

- [1] Roberto Rigobon, Brian Sack, The effects of war risk on US financial markets, *Journal of Banking & Finance*, Volume 29, Issue 7, 2005, Pages 1769-1789, ISSN 0378-4266, <https://doi.org/10.1016/j.jbankfin.2004.06.040>.
- [2] Viviana Fernandez, The war on terror and its impact on the long-term volatility of financial markets, *International Review of Financial Analysis*, Volume 17, Issue 1, 2008, Pages 1-26, ISSN 1057-5219, <https://doi.org/10.1016/j.irfa.2006.11.003>.
- [3] Izzeldin, Marwan and Muradoglu, Yaz Gulnur and Muradoglu, Yaz Gulnur and Pappas, Vasileios and Petropoulou, Athina and Sivaprasad, Sheeja, The Impact of the Russian-Ukrainian War on Global Financial Markets (October 6, 2022). <http://dx.doi.org/10.2139/ssrn.4133387>.
- [4] David LEE Kuo Chuen, Li Guo and Yu Wang, *The Journal of Alternative Investments* Winter 2018, 20 (3) 16-40; DOI: <https://doi.org/10.3905/jai.2018.20.3.016>.
- [5] Pengfei Wang, Wei Zhang, Xiao Li, Dehua Shen, Is cryptocurrency a hedge or a safe haven for international indices? A comprehensive and dynamic perspective, *Finance Research Letters*, Volume 31, 2019, Pages 1-18, ISSN 1544-6123, <https://doi.org/10.1016/j.frl.2019.04.031>.
- [6] Demir, E., Bilgin, M.H., Karabulut, G. et al. The relationship between cryptocurrencies and COVID-19 pandemic. *Eurasian Econ Rev* 10, 349–360 (2020). <https://doi.org/10.1007/s40822-020-00154-1>.
- [7] Abraham, M., 2021. An event study analysis of Bitcoin and Altcoins under COVID-19. *African Review of Economics and Finance*, 13(2), pp.7-24.
- [8] Boubaker, S., Goodell, J.W., Pandey, D.K. and Kumari, V., 2022. Heterogeneous impacts of wars on global equity markets: Evidence from the invasion of Ukraine. *Finance Research Letters*, 48, p.102934.
- [9] Yousaf, Imran and Patel, Ritesh and Yarovaya, Larisa, The Reaction of G20+ Stock Markets to the Russia-Ukraine Conflict ‘Black-Swan’ Event: Evidence From Event Study Approach (March 29, 2022). Available at SSRN: <http://dx.doi.org/10.2139/ssrn.4069555>
- [10] Igor Makarov, Antoinette Schoar, Trading and arbitrage in cryptocurrency markets, *Journal of Financial Economics*, Volume 135, Issue 2, 2020, Pages 293-319, <https://doi.org/10.1016/j.jfineco.2019.07.001>.
- [11] MacKinlay, A.C., 1997. Event studies in economics and finance. *Journal of economic literature*, 35(1), pp.13-39.
- [12] Brown, S.J., Warner, J.B., 1985. Using daily stock returns. The case of event studies. *J. Financ. Econ.* 14, 3–31. [https://doi.org/10.1016/0304-405X\(85\)90042-X](https://doi.org/10.1016/0304-405X(85)90042-X).