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Cryptocurrency in war: a double-edged sword?

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ABSTRACT

This study examines the short-term impact of the Russia-Ukraine war on the high frequency digital asset markets. We apply an event study approach, focusing on the initial months of the war and analyse hourly returns of cryptocurrencies, DeFi tokens, and metaverse tokens. We find that negative war-related events have both an immediate and sustained impact on cryptocurrencies and DeFi tokens, likely due to a series of negative events leading to positive returns. In contrast to stocks and commodities like gold, cryptocurrencies and DeFi tokens exhibit positive and significant cumulative returns following negative war-related events. This suggests that these assets could serve as diversifiers or hedges against such events, similar to the 'political property' observed for oil. Importantly, these findings provide preliminary insights into the ongoing Russia-Ukraine conflict and help to understand the impact of military conflict on cryptocurrency markets more broadly.

KEYWORDS

Cryptocurrency; bitcoin; event study; war; Ukraine

JEL CLASSIFICATION

G00; G14; G15; H56

I. Introduction

Over the past decade, cryptocurrencies have been exposed to significant global events ranging from financial crises to, most recently, the coronavirus (COVID-19) pandemic. Before 2022, cryptocurrencies had never witnessed a military conflict and simultaneously played a significant role. This all changed with the Russian invasion of Ukraine in February 2022.

Historically, large scale military conflicts such as World Wars have had significant and direct impacts on financial markets, with evidence of a 'negativity effect', where negative (positive) events lead to a significant negative (positive) effect on stock market returns (Hudson and Urquhart 2015). Indeed, recent studies confirm that the Moscow stock exchange (Köseo˘glu et al. 2023) and developed stock markets were negatively impacted following the Russian invasion, due to geopolitical factors (Yousaf, Patel, and Yarovaya 2022). However, some global currencies like the US Dollar may act as a safe haven (Mohamad 2024).

A key question is how has the conflict affected cryptocurrency markets? While they allow for digital money to be used across borders and the bypassing of financial institutions, they may also allow for the evasion of economic sanctions. Although cryptocurrencies may be resilient to major events such as COVID-19 (Caferra and Vidal-Tomàs 2021), less is known about their robustness to geopolitical conflict. Initial conclusions suggest a coherence with factors such as geopolitical risk, market structure, commodities, and war attention (Bedowska-Sójka, Demir, and Zaremba 2022; Khalfaoui and Goodell 2023; Liu and Tsyvinski 2021; Liu, Tsyvinski, and Wu 2022; Mohamed 2022). Some studies suggest a resistance to volatility shocks (Kumar, Patel, and Gubareva 2023), due to high within-market connectedness (Chen and Yu 2024) with alternative digital asset classes showing a degree of hedging ability.

However, there are a number of shortcomings in the existing literature: i) most cryptocurrency studies use daily (or lower) frequency data (Bariviera and Merediz-Solà 2021) with few studies analysing hourly data (Briola et al. 2023; Vidal-Tomàs, Briola, and Aste 2023); ii) many studies consider only Monday to Friday as trading days, however, as cryptocurrencies are traded 24/7 they react

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immediately to significant events; iii) digital assets include more than just traditional cryptocurrencies with other classes receiving less attention in the literature.

In light of these facts, we contribute by extending the literature to address the high frequency (hourly) impact of military conflicts and complementing existing studies such as Diaconas, Mehdian, and Stoica (2023) by looking beyond just the initial Russian invasion, through an event study approach. Furthermore, we contribute generally to the emerging literature on the impact of military conflicts on the wider digital asset market, by considering digital assets beyond traditional cryptocurrencies associated with decentralized finance (DeFi) and the metaverse, covering assets designed for a greater variety of purposes.

II. Data and methodology

Our data comprises the hourly prices of three traditional cryptocurrencies: Bitcoin (BTC); Ethereum (ETH); Litecoin (LTC), two DeFi tokens: Chainlink (LINK); Uniswap (UNI), and one metaverse token Decentraland (MANA), expressed in US Dollars (USD), for the 1655 hour period of 00:00 22 February 2022 to 23:00 1 May 2022, inclusive.[1]

Cryptocurrency data were obtained from CoinMarketCap and the hourly log returns were used in the main analysis.[2] A sample of 216 war-related events was collected from the official BBC News website's real-time war coverage over the above sample period. News events were assigned labels of positive or negative sentiment from the perspective of Ukraine and the rest of the world, as detailed in online Appendix A2.

We investigate the impact of war-related events through a simple event study using abnormal returns. Using the mean adjusted returns model by Brown and Warner (1985), the hourly excess (abnormal) returns of each cryptocurrency at time t are computed as

$$AR_t = R_t - \bar{R}, \tag{1}$$

where AR_t denotes the abnormal return at time t, R_t is the observed hourly log return at time t, and $\bar{R}$ is the mean hourly log return over a fixed estimation window. A modified 230 day (5520 hour) estimation window as proposed by Diaconas, Mehdian, and Stoica (2023) is used, which covers 14 March 2021 to 29 October 2021, inclusive, to reduce the probability of being influenced by events relating to (or preceding) the war itself. The difference in the starting date compared with Diaconas, Mehdian, and Stoica (2023) arises since we analyse only digital tokens, thus all calendar days are trading days.

By setting $t = 0$ to be the event time, the cumulative abnormal returns (CARs) are computed as

$$CAR_t = \sum_{t=T_1}^{T_2} AR_t, \tag{2}$$

where $t = T_1 = 0$ denotes the time of the event, and T_2 can take values of 0, 1, 6, 12, 24, or 48 hours after the event. Cumulative average abnormal returns (CAARs) are computed as the average of the CARs for each event for a fixed T_2. The significance of positive and negative events on abnormal returns was tested using the generalized sign test by Cowan (1992).

III. Results and discussion

Our results diverge from Diaconas, Mehdian, and Stoica (2023) and the 'negativity effect' for stock markets (Tables 1–4, and Figure 1). In general, CAARs following negative events are significantly positive for all assets, increasing with the event window, possibly due to negative event clustering. Results for short windows up to 12 hours also support this result (Figure 2),[3] though differences may be attributed to asset intraconnectivity. The findings additionally agree with the 'political property' of oil suggested by Diaconas, Mehdian, and Stoica (2023), resistance to volatility shocks from the war

[1] See online Appendix A1 for a detailed data discussion.
[2] Alexander and Dakos (2020) suggest that non-traded price data provided by 'coin-ranking' services, including CoinMarketCap, may lead to inconsistencies when examining portfolio optimization, and hedging and trading applications. However, Vidal-Tomàs (2022) concludes that these services account for most trading activity and are characterized by the same underlying processes as mainstream exchanges. Therefore, we believe that price data from CoinMarketCap is appropriate for the current study.
[3] See online Appendix B1.

Table 1. Event study results for Bitcoin, Ethereum, and Litecoin following positive events.

Positive Events	BTC/USD				ETH/USD				LTC/USD			
Event Window	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.
[0, 0]	25:23	0.00099	2.178**	0.03	24:24	0.00089	−2.156**	0.03	25:23	0.00114	0.563	0.57
[0, 1]	25:23	0.00171	2.178**	0.03	25:23	0.00230	0.940	0.35	22:26	−0.00212	−8.725***	0.00
[0, 6]	25:23	−0.00061	2.178**	0.03	22:26	−0.00018	−8.346***	0.00	21:27	−0.00105	−11.821***	0.00
[0, 12]	24:24	0.00110	−0.916	0.36	24:24	0.00043	−2.156**	0.03	23:25	0.00066	−5.629***	0.00
[0, 24]	22:26	0.00281	−7.104***	0.00	20:28	0.00302	−14.537***	0.00	22:26	0.00351	−8.725***	0.00
[0, 48]	17:31	−0.00493	−22.576	0.00	15:33	−0.00882	−30.013***	0.00	19:29	−0.00612	−18.012***	0.00

***,**,*Indicate significance at the 1%, 5%, and 10% levels.

Table 2. Event study results for Chainlink, Uniswap, and Decentraland following positive events.

Positive Events	LINK/USD				UNI/USD				MANA/USD			
Event Window	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.
[0, 0]	27:21	0.00189	7.372***	0.00	26:22	0.00132	4.735***	0.00	18:30	−0.00232	−18.241***	0.00
[0, 1]	25:23	−0.00151	1.182	0.24	21:27	−0.00245	−10.739***	0.00	20:28	−0.00234	−12.053***	0.00
[0, 6]	27:21	0.00023	7.372***	0.00	26:22	0.00039	4.735***	0.00	22:26	−0.00265	−5.865***	0.00
[0, 12]	22:26	0.00042	−8.103***	0.00	23:25	−0.00036	−4.549***	0.00	19:29	−0.00191	−15.147***	0.00
[0, 24]	25:23	0.00773	1.182	0.24	25:23	0.00248	1.640	0.10	16:32	−0.00688	−24.429***	0.00
[0, 48]	21:27	−0.00485	−11.198***	0.00	21:27	−0.00734	−10.739***	0.00	12:36	−0.02513	−36.805***	0.00

***,**,*Indicate significance at the 1%, 5%, and 10% levels.

Table 3. Event study results for Bitcoin, Ethereum, and Litecoin following negative events.

Negative Events	BTC/USD				ETH/USD				LTC/USD			
Event Window	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.
[0, 0]	53:48	0.00097	2.761**	0.01	54:47	0.00129	2.993***	0.00	45:56	−0.00053	−10.625***	0.00
[0, 1]	54:47	0.00086	4.231***	0.00	57:44	0.00101	7.406***	0.00	49:52	0.00045	−4.740***	0.00
[0, 6]	57:44	0.00183	8.643***	0.00	50:51	0.00151	−2.891***	0.00	60:41	0.00335	11.444***	0.00
[0, 12]	54:47	0.00467	4.231***	0.00	52:49	0.00440	0.051	0.96	58:43	0.00680	8.501***	0.00
[0, 24]	56:45	0.00581	7.172***	0.00	52:49	0.00434	0.051	0.96	56:45	0.00859	5.559***	0.00
[0, 48]	55:46	0.00798	5.702***	0.00	48:53	0.00479	−5.833***	0.00	57:44	0.01338	7.030***	0.00

***,**,*Indicate significance at the 1%, 5%, and 10% levels.

Table 4. Event study results for Chainlink, Uniswap, and Decentraland following negative events.

Negative Events	LINK/USD				UNI/USD				MANA/USD			
Event Window	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.	Ratio	CAAR	Sign Test	Prob.
[0, 0]	50:51	0.00006	−2.648***	0.01	53:48	−0.00029	2.222**	0.03	53:48	0.00076	3.999**	0.00
[0, 1]	57:44	0.00133	7.648***	0.00	51:50	0.00071	−0.719	0.47	41:60	−0.00159	−13.646***	0.00
[0, 6]	58:43	0.00493	9.119***	0.00	54:47	0.00484	3.693***	0.00	42:59	0.00135	−12.175***	0.00
[0, 12]	56:45	0.00635	6.177***	0.00	47:54	0.00634	−6.602***	0.00	43:58	−0.00034	−10.705***	0.00
[0, 24]	57:44	0.01155	7.648***	0.00	48:53	0.00615	−5.131***	0.00	38:63	0.00259	−18.057***	0.00
[0, 48]	54:47	0.01591	3.235***	0.00	50:51	0.01069	−2.190**	0.03	40:61	−0.00641	−15.116***	0.00

***,**,*Indicate significance at the 1%, 5%, and 10% levels.

(Kumar, Patel, and Gubareva 2023), and avoidance of a 'proximity penalty' (Diaconas, Mehdian, and Stoica 2023) due to the location-independent nature of cryptocurrencies, suggesting diversification benefits.[4]

The increased resilience compared to traditional financial assets may be derived from their decentralized and global nature. Unlike global currencies or region-specific assets, digital assets operate across borders and evade economic sanctions, insulating them from geopolitical instability. Similar safe-haven properties with gold, limited correlation with traditional financial markets (Hsu, Sheu, and Yoon 2021) and an ability to absorb external shocks (Balli et al. 2020) attract investors looking to diversify, especially during crises.[5]

Additionally, 24/7 trading allows for rapid price adjustments and quick market recoveries compared to traditional markets. Assets such as DeFi and metaverse tokens also respond uniquely to geopolitical events, adding to their appeal. For

[4]See online Appendix C1.
[5]See online Appendix C2.

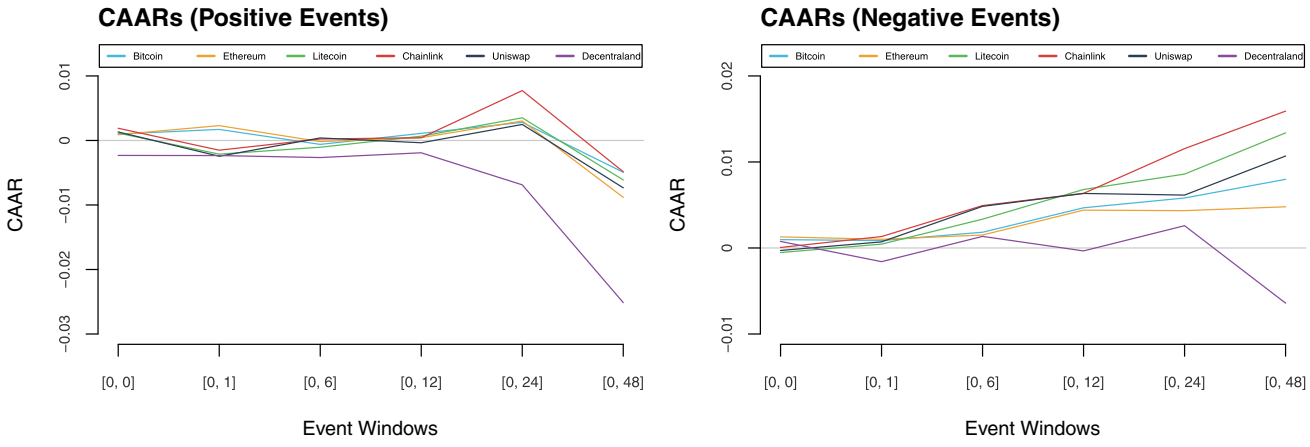

Figure 1. CAARs following positive (left) and negative (right) events for all event windows.

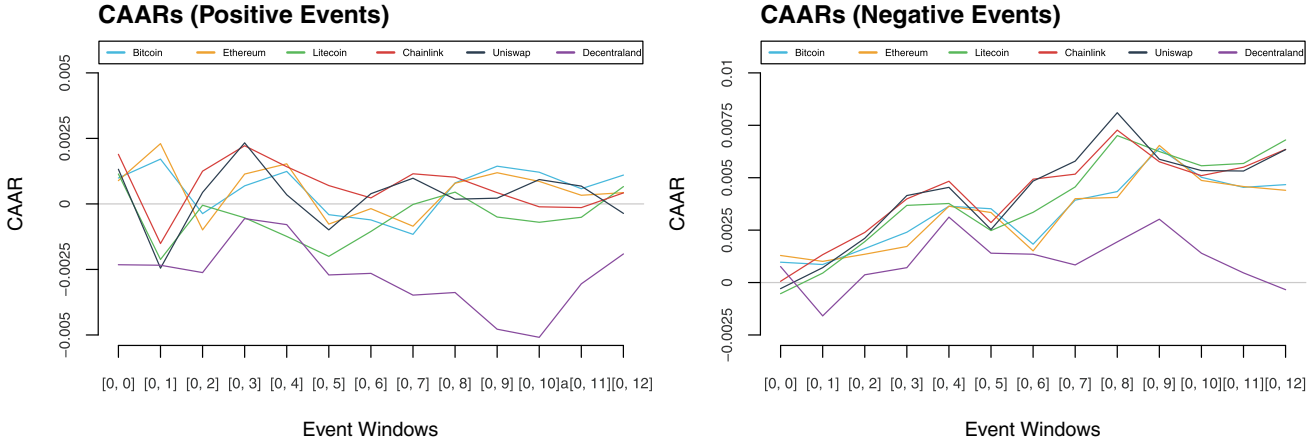

Figure 2. CAARs following positive (left) and negative (right) events for short event windows (0–12 hours).

investors, cryptocurrencies present a compelling opportunity during uncertain times, serving as effective diversification tools against war-induced market fluctuations. Their positive reactions can be leveraged to develop short-term strategies capitalizing on increased market activity following significant events. Regulators in regions affected by economic shocks could benefit from frameworks supporting cryptocurrency integration into financial systems. Developing official channels for digital asset transfers could provide alternative mechanisms during crises. However, policymakers must balance innovation with proper controls, requiring regulations that support stability while preventing financial crimes. Understanding digital asset resilience could ultimately inform more robust financial system design.[6]

IV. Conclusion

This study examines the Russia-Ukraine conflict's short-term impact on cryptocurrency markets using an event study. Contrary to the 'negativity effect' of wars on traditional asset markets, cryptocurrencies and DeFi tokens showed positive immediate and sustained responses. The decentralized nature of digital assets allows them to avoid adverse impacts, offering diversification benefits that attract investors seeking refuge from traditional market volatility. The findings advance understanding of military conflicts on financial markets and highlight cryptocurrencies' hedging potential during conflicts. Finally, our study suggests regulatory frameworks supporting cryptocurrency integration could benefit conflict-affected

[6]See online Appendix C3.

regions, while future studies should explore long-term impacts and trading dynamics.[7]

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Author contributions

CRediT: **Jeffrey Chu:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Validation, Writing – original draft, Writing – review & editing; **Stephen Chan:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Software, Writing – original draft, Writing – review & editing; **Yuanyuan Zhang:** Data curation, Formal analysis, Investigation, Writing – original draft, Writing – review & editing; **Nicholas Lord:** Investigation, Validation, Writing – original draft, Writing – review & editing.

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[7]See online Appendix D.

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