Is Bitcoin used to evade financial sanction?

Jinsha Zhao, Jia Miao [*]

Kingston University, United Kingdom

A B S T R A C T

Using Russian-Ukraine war as an exogenous event, we investigate whether Bitcoin is used to evade financial sanctions. We follow three avenues to explore this problem. First, we investigate Bitcoin trading volume pre- and post- Russia's invasion. Second, we explored price and return relationships between Bitcoin and other major asset classes during the same period. Lastly, we investigate the associations between Bitcoin trading volume and Russia oil export by sea. Overall, our results suggest that Bitcoin is not used to evade sanctions in large scale.

1. Introduction

Regarded as an alternative to the traditional financial system, blockchain-based cryptocurrencies can process payments internationally completely independent of any banks. There has been reports in the media that Bitcoin (BTC) is used by ordinary people to circumvent sanctions.[1] Some even speculate that Bitcoin is used by governments in large scale to evade sanctions (e.g., Tara 2022). As with all media speculations, these claims are never verified and whether Bitcoin is used for sanction has not been formally tested. In this paper, we examine the Bitcoin market and investigate whether Bitcoin is used to circumvent sanctions imposed on Russia.

We follow three avenues to examine whether Bitcoin is used for evading sanctions: First, using the Russian-Ukraine war as an exogenous event, our analysis explored trading data between Bitcoin and Russian Ruble (BTCRUB). A surge in BTCRUB trading volume can provide evidence that Bitcoin is used to evade the sanctions after the war broke out.

Secondly, we compared Bitcoin price data to a range of financial assets and commodities. If Bitcoin is used to facilitate sanction evading trades, it should have different price behaviours that are independent of movements of other assets.

Finally, we examined Russia oil export by sea and its relationship with BTCRUB and BTCUSD trading volume to explore the potential involvement of Russian businesses and State in Bitcoin market. If oil exports are facilitated by Bitcoin, correlations between oil exports and Bitcoin trading volume should also increase.

There is also a possibility that trades are happening directly on-chain between Russian and buyers/sellers without intermediaries or any centralised exchanges. However, exchanging oils or other goods and services into Bitcoin only solve one part of the problem, for Russia must also be able to buy goods/services directly using Bitcoin to completely evade financial sanction. This is simply not possible based on current market capitalization of Bitcoin.

These are our main contributions. While sanction evasion is studied previously (Wronka, 2021 and Macfarlane, 2021), most studies focus on specific cases and examine probability or chances of sanction evasion. Our results provide quantitative evidence that sanction

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[1] For example, Forbes (2018) reported that Iranian were using Bitcoin to send payment overseas, circumventing sanction. The article is available online at: https://www.forbes.com/sites/billybambrough/2018/05/10/iran-sanctions-people-are-turning-to-bitcoin-to-get-money-out/?sh=2b86dded613a

Table 1

Summary statistics. Variable names are self-explanatory, volumes are reported in number of bitcoins. EUI is Bloomberg economic uncertainty index. There are only 203 observations, which are 101 daily observations before the war and 101 daily observations after the war. Plus 1 observation on the day the war started.

Variables	Min	Max	Mean	SD	Skewness	Kurtosis	n
BTCRUB prices	1,707,655	5,072,792	3,356,756	798,898	-0.272	2.485	203
BTCRUB returns	-9.74%	19.90%	-0.38%	3.83%	48.84%	652.14%	203
BTCRUB volume	8.56	531.05	76.86	76.99	3.33	17.12	203
BTCUSD prices	28,598	63,625	42,104	7550	0.345	3.096	203
BTCUSD returns	-11.61%	14.52%	-0.33%	3.47%	6.00%	516.10%	203
BTCUSD volume	7994	154,393	32,368	19,523	2.8	14.9	203
DXY index	94.86	104.75	98.33	2.816	0.771	2.225	203
DXY returns	-1.09%	1.01%	0.04%	0.35%	-29.60%	400.71%	203
NASDAQ index	11,264	16,057	13,908	1317	-0.182	2.094	203
NASDAQ returns	-4.99%	3.82%	-0.12%	1.64%	-14.81%	352.90%	203
EUI index	44.5	507.7	141.9	63.1	1.910	9.475	203
EUI returns	-75.58%	250.73%	11.60%	55.50%	143.43%	554.07%	203

evasion at national level (in case of Russia) is simply not possible, as Bitcoin markets lack the size and depth to settle international trade at large scale.

2. Related literature

Bitcoin and other cryptocurrencies attract attentions of both practitioners and academics. Surveys and reports published by market practitioners have documented a significant increase in the crypto investments over the years by individual investors (e.g. Perrin, A. 2022) and institutional investors (e.g. PWC 2022). On the academic side, researchers examined the crypto markets from various perspectives. Many focused on assessing the efficiencies and forecastability of the crypto markets (see recently, Sensoy 2019, Liu and Tsyvinski 2021), as well as the connections between crypto markets and traditional financial markets such as stocks, bonds and commodities (see, for instance, Wang et al. (2019), Baur et al. (2018) among others). Other researchers attempted to identify the key price events that drive the price movements in the crypto markets. For instance, Almaqableh et al. (2022) found that terrorist attacks positively contributed to the returns of cryptocurrencies whilst attacks also resulted in short-term risk shifting behavior for different cryptocurrencies.

There were reports suggesting that North Korea (Tara, 2022) and Iran (Meyer 2018) planned to use cryptocurrency to evade US sanctions. However, these economies are small in size. The case for Russia is different. Russia is the world's ninth-largest economy by nominal GDP, and the sixth largest by PPP (IMF 2022a). While the scale of the sanctions on Russia is immense, the International Monetary Fund (IMF, 2022b) warned that an active participation of the Russian in the crypto markets to evade sanction would have significant impact. Yet no studies directly examine sanction evasion in Bitcoin.

3. Data

We collected Bitcoin trading data directly from crypto exchanges, rather than surveying websites such as bitcoincharts.com and coinmarketcap.com, due to the increasing criticism of data quality from the latter, e.g. Bitwise (2019) and Alexander and Dakos (2020). In particular, we collected the BTCUSD trading data from seven crypto exchanges: Kraken, Bitstamp, Binance (including Binance.us), Coinbase, Bitfinex, Gemini and Bittrex. These exchanges account for over 85% global Bitcoin trading volume.[2] Most trading data for BTCRUB were collected from Binance, which is the only major crypto exchange that offers direct BTC trading in RUB.

Data for other economic and financial variables were collected from Bloomberg. These include gold, oil, Nasdaq, VIX index, dollar index (DXY), Treasury Yield and Euro/USD exchange rate. A complete discussion of each variable is provided in the next section. A unique variable in our analysis is Russian oil export by sea, this is also collected from Bloomberg which has been tracking Russian vessels since the war started.

4. Empirical analysis and findings

We divide this section into 3 parts; each part explores different aspects of the Bitcoin market and its connection with sanction evasion.

4.1. Part I: Bitcoin trading volume and impact of the war

In this part, we look at impact of the war on Bitcoin trading volumes. The expectation is that volume increases after the war as

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[2] The report, Bitwise (2019), was presented to SEC in 2019 and the report is available online at: https://www.sec.gov/comments/sr-nysearca-2019-01/srnysearca201901-5164833-183434.pdf

Table 2

Regression results. The table reports volume regression results, dependent variables are trading volume of BTCRUB and BTCUSD pair. The asterisks *, **, *** denote statistical significance at 10%, 5% and 1% levels, respectively. Panel A results are based on ordinary least square (OLS). Panel B report generalised least square (GLS) results assuming residual autocorrelation AR(1) of 0.4.

Panel A: OLS regression results		
	BTCRUB volume	BTCUSD volume
PostWar	-0.429*	-0.285**
	(-1.767)	(-2.141)
BTCRUB prices	1.879***	
	(3.868)	
BTCRUB returns	2.950*	
	(1.568)	
BTCUSD prices	-0.214	0.020
	(-0.228)	(0.036)
BTCUSD returns	-7.129***	-2.727**
	(-3.251)	(-2.296)
DXY index	-13.049***	-0.199
	(-2.556)	(-0.068)
DXY returns	19.503	15.169
	(1.467)	(1.446)
NASDAQ prices	-8.966***	-1.946
	(-4.992)	(-1.371)
NASDAQ returns	8.950***	2.559
	(2.767)	(0.982)
EUI prices	0.145	-0.013
	(0.997)	(-0.113)
EUI returns	-0.175*	-0.043
	(-1.744)	(-0.538)
Adjusted R^2	0.322	0.060
F-statistics	9.702	2.423
N	203	203
Durbin-Watson test	1.144	1.135
Durbin-Watson test (p-value)	0.000	0.000
Augmented Dickey-Fuller	-2.293	-3.782
Augmented Dickey-Fuller (p-value)	0.453	0.021
Panel B: GLS regression results		
	BTCRUB volume	BTCUSD volume
PostWar	-0.001	-0.165
	(-0.002)	(-0.792)
BTCRUB prices	1.271*	
	(1.661)	
BTCRUB returns	1.139	
	(0.718)	
BTCUSD prices	-0.300	-0.302
	(-0.206)	(-0.365)
BTCUSD returns	-4.130**	-1.964**
	(-2.221)	(-1.949)
DXY index	-18.043**	-1.506
	(-2.271)	(-0.318)
DXY returns	18.500*	15.489*
	(1.742)	(1.831)
NASDAQ prices	-7.076***	-1.200
	(-2.509)	(-0.556)
NASDAQ returns	7.327***	2.142
	(2.674)	(0.965)
EUI prices	0.297*	0.066
	(1.854)	(0.520)
EUI returns	-0.181**	-0.028
	(-2.000)	(-0.391)
McFadden pseudo-R-squared	0.097	0.057
Likelihood ratio test (p-value)	0.000	0.121
N	203	203

capitals flows from sanctioned assets into Bitcoin. If that is the case, we should observe statistical significance in volume measures before and after the war.

Table 1 report summary statistics of BTCUSD and BTCRUB for 100 days pre and post 24th Feb 2022, which is the start date of the war.

Table 1 shows that BTCRUB volume is very small, only about 0.1% of BTCUSD's volume. This demonstrates the miniature market

Table 3

Summary statistics for daily log returns on asset classes.

The table provides summary statistics for daily log returns on natural gas (UNG), WTI Crude Oil (OIL), Gold (GLD), CBOE Volatility Index (VIX), 3-month Treasury yield (IRX), 10 year Treasury Yield (TNX), Nasdaq Composite Index (NDQ), Bitcoin in USD (BTC), Euro Dollar exchange rate (EUR), and U.S. dollar index (DXY). Data used are 100 trading days before (panel A) and 100 trading days after (panel B) the invasion. The Table reports the log return (μ), log standard deviation (δ), skewness (s), kurtosis (k), minimum (min) and maximum (max) values.

Panel A: Before the war						
	μ	δ	s	k	min	max
UNG	-0.0022	0.0484	-0.0812	-0.0422	-0.1175	0.1267
OIL	0.0023	0.0209	-2.0806	10.5092	-0.1186	0.0510
GLD	0.0008	0.0074	-0.3233	0.7397	-0.0227	0.0189
VIX	0.0029	0.0909	0.9578	4.1944	-0.2204	0.4320
IRX	0.0250	0.1586	0.1586	2.7192	-0.5878	0.5368
TNX	0.0026	0.0315	-0.2646	0.9212	-0.1043	0.0856
NDQ	-0.0010	0.0148	-0.2409	-0.1689	-0.0381	0.0335
BTC	-0.0016	0.0372	0.3592	1.0816	-0.1096	0.1106
EUR	-0.0002	0.0039	-0.0767	0.6754	-0.0109	0.0119
DXY	0.0002	0.0035	0.1318	-0.0347	-0.0078	0.0094
Panel B: After the war						
	μ	δ	s	k	min	max
UNG	0.0050	0.0492	-0.8576	1.6022	-0.1737	0.1147
OIL	0.0016	0.0339	-0.7993	1.5581	-0.1240	0.0761
GLD	-0.0011	0.0099	-0.2765	0.4720	-0.0302	0.0270
VIX	-0.0024	0.0758	1.1278	1.0347	-0.1403	0.2182
IRX	0.0213	0.0644	0.3579	1.4627	-0.1846	0.2164
TNX	0.0043	0.0319	0.0660	0.0855	-0.0769	0.0885
NDQ	-0.0012	0.0220	-0.2844	-0.6356	-0.0512	0.0375
BTC	-0.0050	0.0491	-1.6563	7.2156	-0.2572	0.1049
EUR	-0.0010	0.0061	-0.0479	0.2540	-0.0175	0.0160
DXY	0.0010	0.0054	-0.3811	-0.0589	-0.0147	0.0129

depth of BTCRUB pair.

To investigate whether Bitcoin is used to evade sanction, we examine trading volume from major centralised exchanges, which offer the most liquidity and speed for fast transaction. Less known decentralised exchanges are good for stealth trading, but they offer little liquidity for large scale transactions. Even if there are significant evasion trades in OTC market, they still leave a trace on major exchanges since OTC trading desks also use centralised exchanges to execute their trades. As a result, trading activities in OTC markets can still affect price actions in major centralised exchanges.

To examine whether trading volume significantly increased after the war, we use the following time-series regression equation:

$$BTCvolume_i = \beta_0 + \beta_1 PostWar_i + \Sigma\beta_{2-11}Controls + \varepsilon_i \tag{1}$$

PostWar is a dummy variable that equals 1 if the date is on or later than 24th February 2022, the start date of the Russian-Ukraine war. If Bitcoin is used to evade sanction, then its volume should increase substantially as capital flows in. A positive coefficient on β_1 indicates increased trading after the war and provides evidence of a capital inflow, a possible consequence of sanction evasion. We examined volume directly rather than prices or returns because BTCRUB volume is quite small, as shown in Table 1. Capital flows from Russian Ruble to Bitcoin in low volume are unlikely to impact Bitcoin price significantly, even the rate of change of the former is big. Zhao (2022) employed a similar approach to examine whether Bitcoin is traded as a safe haven asset during local economic crises.

Eq. (1) treats the war as an exogenous event and uses the dummy variable PostWar to capture changes in volume patterns. This approach is similar to studies that examine regulation change, where variables are compared pre- and post- the exogenous events in a regression setting, e.g. Ibrahim et al. (2021), Li and Zhao (2020). The control variables are Bitcoin prices in RUB and USD, and Bitcoin price returns as trading volumes are closely linked to prices and returns. We also included the dollar index (DXY) and Bloomberg economic uncertainty indicator (EUI), both of which capture the macroeconomic environment in the period. NASDAQ index was included to measure the general market conditions of a typical risky asset.

The regression results for both BTCRUB and BTCUSD pairs are reported in Panel A of Table 2. In BTCRUB regression, the post war dummy is significant and negative suggesting a reduced trading volume after the war. Most variations in BTCRUB volume were explained by BTCRUB price, BTCUSD price, as well as the NASDAQ. Results from BTCUSD regression show that no single factors contribute to the variations in its trading volumes, as the adjusted R-squared in Panel A is very small. The post war dummy is also significant and negative, again suggesting reduced volume after the war.

The regression results from both markets show that either Bitcoin was not used to evade sanctions, or that sanctions evasion with Bitcoin was small in scale. Volume would not have dropped if Bitcoin were used to facilitate sanction evading trade. The decline in volume may be driven by reduced interests in trading risky assets as the war scared the market.

We tested unit root on the two volume measures, and the augmented Dickey-Fuller test (Panel A of Table 2) shows that BTCRUB volume is not stationary and BTCUSD volume is stationary. As one of the volume measures is not stationary, we also test residual autocorrelation. Durbin-Watson test (Panel A, Table 2) shows that both regressions have positive autocorrelation. To correct bias

Table 4

Reports the cross-market correlation of returns. Correlations that are higher than 0.5 and lower than -0.5 are highlighted with *. Data used are 100 trading days before (panel A) and 100 trading days after (panel B) the invasion. Correlations between different asset classes are quite low during both periods and most correlations are insignificant.

Panel A: Before the war										
	UNG	OIL	GLD	VIX	IRX	TNX	NDQ	BTC	EUR	DXY
UNG	1									
OIL	-0.043	1								
GLD	0.002	0.076	1							
VIX	-0.063	-0.477	0.006	1						
IRX	0.050	0.081	-0.082	-0.088	1					
TNX	-0.106	0.396	-0.342	-0.361	0.304	1				
NDQ	0.115	0.199	-0.059	-0.787*	0.071	0.191	1			
BTC	-0.063	0.051	-0.010	-0.276	0.117	0.173	0.407	1		
EUR	-0.165	0.008	0.025	-0.055	-0.107	0.028	0.027	0.168	1	
DXY	-0.060	0.046	-0.284	0.032	0.034	0.217	-0.078	-0.114	0.056	1

Panel B: After the war										
	UNG	OIL	GLD	VIX	IRX	TNX	NDQ	BTC	EUR	DXY
UNG	1									
OIL	0.287	1								
GLD	0.145	0.566*	1							
VIX	-0.104	-0.055	-0.019	1						
IRX	-0.072	-0.142	-0.169	-0.037	1					
TNX	0.076	-0.004	-0.258	-0.037	0.325	1				
NDQ	0.050	-0.035	-0.135	-0.806*	0.047	0.027	1			
BTC	0.081	0.000	0.039	-0.515*	-0.012	-0.066	0.613*	1		
EUR	0.168	-0.018	0.038	-0.015	-0.271	-0.208	-0.003	0.055	1	
DXY	-0.014	-0.067	-0.253	0.364	0.123	0.006	-0.320	-0.272	-0.065	1

caused by autocorrelation, we re-ran the regressions with a generalized least square (GLS) specification assuming positive autocorrelation. Table 2 Panel B shows GLS estimation results. The results are largely the same as in Panel A. Prices and returns in BTCRUB and BTCUSD are still significant, suggesting that volumes are associated with prices and returns. The war dummy variable is not significant, suggesting that volume did not increase or decrease after the war. This confirms our previous finding that Bitcoin trading volume did not increase after the war. Again, there is no evidence indicating that Bitcoin is used to evade sanction.

4.2. Part II: Bitcoin and other asset classes

In this part, we look at statistical association of prices and returns between Bitcoin and a basket of assets. The idea is that if Bitcoin is used in large scale for evading sanction, returns and prices should display behaviours that is independent of other assets.

More specifically, Table 3 reports the descriptive statistic for daily log returns on the asset classes for two periods: 100 trading days before (panel A) and 100 trading days after (panel B) the invasion.

Data presented in Table 3 show that before the war, the markets followed typical moves under a stagflation environment: with low economic growth and high inflation, the benchmark interest rates started to increase, the commodities shined, and equities suffered. There were moderate movements in the currency markets: capital flavoured the currencies with higher yields. However, after the invasion, the dollar index rallied, and the USD appreciated by almost 10% against the Euro. Apart from the oil and natural gas which were both benefited from the sanction, all major asset classes experienced big losses. The short-term T-bill yield booked a similar gain in both periods. Excessive returns in the period after the invasion show that excluding the supply constrained oil and nature gas, the US dollar was the only "safe" asset.

Bitcoin performed quite poorly in both periods. In the first period, Bitcoin recorded a loss against both the US dollar and the gold during the stagflation. While in the second period, Bitcoin extended its slide, despite the prolonged inflation and worsened geopolitical confrontations.

In Table 4, we also report return correlations for all the asset class both before and after the war broke out. Bitcoin returns has low and insignificant correlations with returns of most major asset classes. However, it is negatively correlated to VIX, indicating that it is viewed as a risky asset by the market. Bitcoin returns are also positively related to returns of NASDAQ, confirming the riskiness of the former. Overall, the result indicates that Bitcoin remains to be a speculative asset. There is no evidence showing a demand surge for Bitcoin.

### 4.3. Part III: Bitcoin and Russian oil export

Lastly, we look at Russian oil export by sea and its correlation with BTCRUB trading volume. If oils are sold for Bitcoin, these Bitcoin will flow back into Ruble or other fiats currencies. This would cause a correlation spike between BTCRUB trading volume and oil export.

Figs. 1 and 2 display the total Russian sea exports of crude oil (weekly data in 1000 barrels) vs the trading volume of BTCUSD and
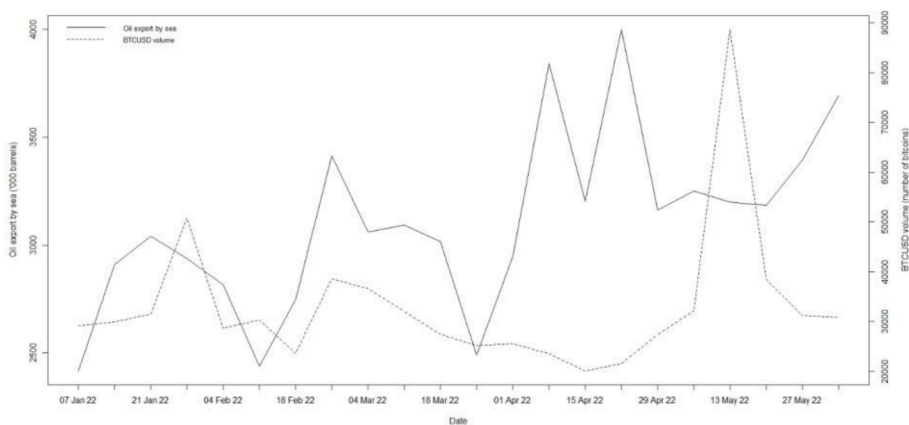
Fig. 1. Weekly Russia Sea Oil Export vs BTCUSD
This figure plot volume of Russia export by sea and trading volume of BTCUSD. Oil export volume are in thousands ('000) of barrel per week, BTCUSD volume are in number of bitcoins per week.
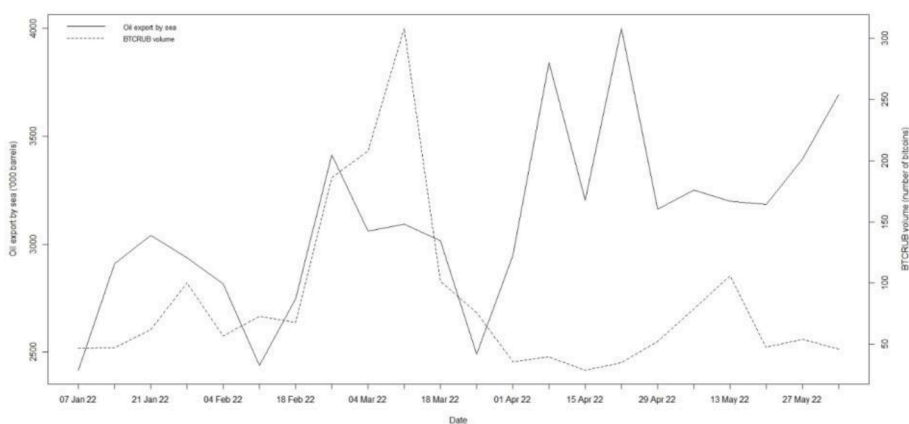
Fig. 2. Weekly Russia Sea Oil Export vs BTCRUB
This figure plot volume of Russia export by sea and trading volume of BTCRUB. Oil export volume are in thousands ('000) of barrel per week, BTCUSD volume are in number of bitcoins per week.

BTCRUB respectively. Oil export by sea was collected by Bloomberg. Their oil news team tracks Russia oil tanker via satellite and compiled the data.

First, the export of Russian crude by sea did not decrease as a result of economic sanction, in fact, it increased slightly post war. As shown in Fig. 1 and 2, there is hardly any association between oil export and Bitcoin trading volume. The two volumes move randomly with no pattern of co-movements. The correlation between oil export and Bitcoin trading volume is -4.9% in BTCRUB and -0.18% in BTCUSD. They are hardly any correlation. This is evidence that Bitcoin is not used for evading sanction in large scale. If Bitcoin is involved in oil export, co-movements between oil and Bitcoin volume should be observed.

Second, BTCRUB trading volume is too small to accommodate large capital flows from oil trade. Trading volume in the BTCRUB typically ranges from $0.7 million (or about 28 bitcoins) to $7 million (or about 308 bitcoins) per week, assuming an average BTC price of $25,000. This is an order of magnitude much smaller than that of Russian oil export by sea, which ranges from $200 million to $300 million per week, assuming an average price of $85 per barrel. It is simply not possible to evade sanction by trading oil for Bitcoin. While bigger than the BTCRUB market, trading volume in BTCUSD pair is also small for trade settlement. The data suggests that large scale sanction evasion is unlikely to happen in Bitcoin markets.

5. Conclusions

In summary, there is no evidence to support the hypothesis that the war in Europe and the economic sanctions afterwards encouraged the capital flow into Bitcoin. Both trading volume and price drops after the invasion, suggesting capital flight off Bitcoin instead of flowing in. The size of the Bitcoin market is also too small and illiquid to handle large trades, as compared to other financial markets, such as the oil and gas market that dominates Russia's export.

In addition, our results show that Bitcoin no longer has low correlations with major financial assets, and it no longer behaves independently from financial markets. The results reflect the fast-changing nature of Bitcoin as previous studies (e.g., Platanakis and Urquhart 2020) recommended a small allocation to Bitcoin, to benefit from its low correlation with financial markets. It would be interesting to re-examine Bitcoin's price properties and explore whether it still offers the same level of low correlation returns after the war.

CRediT authorship contribution statement

Jinsha Zhao: Conceptualization, Methodology, Data curation, Writing – review & editing. **Jia Miao:** Data curation, Methodology, Writing – review & editing.

Declaration of Competing Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome

Data availability

Data will be made available on request.

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