

# The impact of Russian-Ukrainian Conflict on the Dynamics of Bitcoin

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**Abstract.** On February 24, 2022, Russia's invasion of Ukraine marked a full-scale escalation of the Russian-Ukrainian conflict into war. The global economy and finance were affected by the Russian-Ukrainian conflict, which most obvious is that crude oil prices continued to rise rapidly. With the development of the times, cryptocurrencies are becoming more and more important and cannot be ignored. Cryptocurrency may serve as an effective alternative or balancing asset to cash, which may depreciate over time due to inflation. In addition to the real commodity market, the Russian-Ukrainian conflict would certainly have a certain impact on the cryptocurrency market. Bitcoin is the largest cryptocurrency and can represent the changes in the entire cryptocurrency market to a certain extent. This paper examines the dynamic impact of the Russian-Ukrainian conflict on Bitcoin returns and volatility. There are two main results in this paper: the increase in the futures crude oil price has a significant dynamic correlation with the Bitcoin yield, but this relationship is short-term and will disappear over time; the increase in futures crude oil prices will not lead to greater fluctuations in Bitcoin yields. This result can be generalized to the entire cryptocurrency market, which means the Russian-Ukrainian conflict would have a short-term impact on the entire cryptocurrency, but this effect won't continue for the long-term. Also, this research shows that the cryptocurrency market is independent to some extent.

**Keywords:** Bitcoin Russian-Ukrainian conflict cryptocurrency crude oil.

## 1. Introduction

On February 24, 2022, Russia launched an attack on Ukraine, prolonging the Russo-Ukrainian War. With almost 6 million Ukrainians fleeing the country and a quarter of the population displaced, the invasion has produced Europe's biggest refugee crisis after World War II [1]. In 2014, Russia invaded Ukraine, and Moscow rebels seized part of Ukraine's Donbas area, sparking a regional conflict [2]. Russia initiated a major military buildup near the Ukrainian border in 2021, amassing up to 190,000 men and weaponry. On February 21, 2022, Russia recognized the Donetsk People's Republic and the Luhansk People's Republic in Donbas held by insurgents [3]. The next day, the Russian approved the use of military force overseas, and Russian forces invaded both territories openly [4]. Putin announced a "special military operation" to "demilitarize and denazify" Ukraine on the morning of February 24. Minutes afterward, missiles and airstrikes landed across Ukraine, including in Kyiv, the capital, and were quickly followed by a massive ground invasion from various directions [5]. This marks the official escalation of the Russian-Ukrainian conflict and the beginning of the Russian-Ukrainian War. Local wars and conflicts are bound to have a certain degree of impact on the world economy. This impact involves many aspects, such as energy, chemicals, agricultural products, metals, and so on. These effects have led to great changes in commodity prices, especially crude oil futures prices have also been increasing and are still at a very high-level today.

The existing research showed that national income accounting hides the cost of war by discounting the loss of life as well as the destruction of physical and human capital. Furthermore, rather than being valued as production costs, war-related resources are valued as finished goods or services. This article does not adjust these aspects of national income accounting. It is only concerned with the effect of war on per capita GDP. The majority of people's beliefs that conflict is good for the economy, ostensibly as it increases jobs and production, have been challenged. According to rigorous war appraisal in the setting of large data, conflict is bad for the economy. Apart from the deaths and damage to both capital of substance and humans that government revenue accounting ignores, and

the cost of conflict and war as a specific benefit by government revenue counting, fighting has the potential to drastically reduce GDP per capita. In terms of output and consumption, countries in war underperform. Fewer labor and total factor productivity, owing to the destruction of existing physical and human capital, a lack of investment in new physical and human capital, and lower earnings from both internal and external commerce, all lead to lower GDP per capita [6]. The existing literature on the relation between war and economy focuses on the situations where the economy grows and the real-world economy changes. War or conflict must have an economic or financial impact.

However, with the development of science and technology of the times, blockchain has also become a very important part of the economy and finance. The global COVID-19 pandemic that started in 2020 has had a very big impact on cryptocurrency markets. The existing recent research showed that The COVID-19 pandemic has had a major influence on the global economy, including in the cryptocurrency markets. We investigated a range of indicators to check whether there were any differences between before and after outbreaks, and we discovered that these markets had altered considerably during the pandemic time. Erratic variations in mutual data results have been seen since the outbreak of COVID-19, Ethereum, Verge, and Qtum have supplanted Golem, Dash, and Stratis as the most important cryptocurrencies. Because it can house both autonomous apps and other virtual currencies or money, Ethereum is one of the most popular cryptocurrencies. Decentralized finance (DeFi) first appeared in 2020, and it implanted financial operations into virtual ledgers called blockchains, allowing someone to perform things like loan cash and earn interest on a deposit account without the use of traditional financial middlemen. Because many DeFi apps use the Ethereum blockchain, Ethereum's importance has grown even more in 2020 as a result of the COVID-19 epidemic [7]. Similarly, it knows that the Russian-Ukrainian war had a certain impact on the cryptocurrency market. Therefore, this paper collected and studied the price dynamics of Bitcoin, the largest traded currency in the cryptocurrency market, from three months before the start of the Russian-Ukrainian conflict. This paper study and explore the impact of the Russian-Ukrainian conflict on Bitcoin earnings. This paper also collected and studied the price changes of WIT crude oil futures during the same period. This paper hopes to compare it with the price dynamics of Bitcoin and study the similarities and differences between the virtual cryptocurrency market and the real-world commodity market in the face of war and conflict.

This paper's findings provide evidence that the increase in the futures crude oil price has a significant dynamic correlation with Bitcoin yield, but this relationship is short-term and will disappear over time. Also, the increase in the futures crude oil price will not lead to greater fluctuations in the Bitcoin yield.

The following parts of the paper are organized as follows: Section 2 is the research design, containing model specifications and introducing the identification strategy; Section 3 contains estimation results of the models and impulse response; Section 4 is discussion; Section 5 is conclusion.

## **2. Research Design**

### **2.1 The source of the data**

This thesis analyzes the Bitcoin price and WIT crude oil futures price. All the daily data are collected from Investing [8]. Yahoo Finance states that Investing.com is a financial platform and news website; one of the top three global financial websites in the world. It has just breached two key milestones in its growth; breaking into the list of the world's top 400 websites and exceeding 10 million Android downloads [9]. Hence, the Investing database is significantly trustworthy. It is worth a mention that daily closing prices are the basic data that this paper used and studied in this research. Considering the effect of the Russian-Ukrainian conflict, this thesis studies the daily data (Bitcoin price, WIT crude oil futures price) from 24 Nov 2021 to 13 Apr 2022 when three months before the outbreak of the Russian-Ukrainian conflict to today. During the long-term period, there does exist some deficiency in three main objectives. To ensure the accuracy of data matching, it set DATE as the main consideration, and the existence of all two data (Bitcoin price, and WTI crude oil futures

price respectively) is indispensable. If not, the corresponding date would be ignored and not be studied. Therefore, it excludes the price of Bitcoin every weekend.

## 2.2 The unit root test

This part uses the unit root test to test whether it is stable. Below shows the formula of the unit root test.

$$x_t = c_t + \beta x_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta x_{t-i} + e_t \quad (1)$$

The null hypothesis of this test is  $\beta = 1$ , and the alternative hypothesis of this test is  $\beta < 1$ . And the null hypothesis is the data is not stable.

To check whether the daily data of Bitcoin price, Bitcoin return, crude oil future price, and crude oil future return are stationary or not, this thesis does the test of the unit root to check them. The existing research showed that it should determine whether there is a unit root in the time series before testing the time trend, and only after the unit root assumption is rejected, can a steady process with a trend be further studied [10]. Table.1. shows all the results that all daily data are checked.

Variables	t-statistic	p-value
Price		
Bitcoin	-1.653	0.7710
Crude oil	-3.031	0.1236
Rate of return		
Bitcoin	-6.895	0.0000***
Crude oil	-6.888	0.0000***

Note Bitcoin return =  $\ln(p, t) - \ln(p, t - 1)$ ; crude oil future return =  $\ln(p, t) - \ln(p, t - 1)$ .

From Table 1, it is easy to check that all Test Statistics are smaller than 1% Critical points. The MacKinnon approximate p-value is all 0.0000. Hence, this test could reject the null hypothesis and get the result that Bitcoin price returns crude oil future return stationary. The examination of Bitcoin and crude oil return is the guarantee of further research.

## 2.3 VAR model specification

The vector autoregression (VAR) statistical model is used to illustrate the changing relationship between many variables over time. A VAR model is a stochastic model. In economic research, VAR models are extensively utilized. The formula for the VAR model is presented below.

$$y_t = \beta_0 + \beta_1 y_{1,t-1} + \dots + \beta_p y_{1,t-p} + \gamma_1 y_{2,t-1} + \dots + \gamma_p y_{2,t-p} + \varepsilon_t \quad (2)$$

Each variable has a formula that predicts its evolution through time, similar to the autoregressive model. This equation includes the lagged values of the variable, the lagged values of all the other variables in the model, and standard errors. VAR models demand less information about the forces that impact a variable than structural models with simultaneous equations. The only information required is a set of variables that are expected to interact over time.

## 2.4 ARMA-GARCH model specification

The GARCH model was used to analyze the volatility and it was more precise than the ARCH model which was also used to analyze the volatility of financial factors as well. The variance equation used in the ARMA-GARCH model is shown below.

$$x_t = \varphi_0 + \sum_{i=1}^p \varphi_i x_{t-i} + a_t - \sum_{i=1}^q \theta_i a_{t-i} \tag{3}$$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \gamma D_t \tag{4}$$

By adding the ARMA model into the GARCH model, it could predict the rate of return and volatility at the same time. The model used the Bitcoin returns and crude oil returns as the exogenous variables of the ARMA-GARCH model.

### 3. Empirical Results and Analysis

#### 3.1 VAR identification and stability

In this case, the model used the Vector autoregression pricing. It used the Bitcoin returns and crude oil returns as the exogenous variables and built the VAR pricing. Below shows the result of the VAR pricing table. Below shows the results of the VAR pricing table which were used to confirm the p used in the modeling, as shown in Table.2.

Table.2. VAR model identification

Lag	LL	LR	df	p
1	339.33	2.0129	4	0.733
2	340.162	1.6626	4	0.798
3	341.238	2.1526	4	0.708
4	342.231	1.9869	4	0.738
5	345.686	6.9083	4	0.141
6	350.404	9.4359	4	0.051*
7	354.66	8.5125	4	0.075*
8	359.105	8.8906	4	0.064*
9	362.294	6.3782	4	0.173
10	368.034	11.479*	4	0.022**
11	369.326	2.5844	4	0.630
12	370.893	3.1354	4	0.535

Based on the VAR pricing above, p=12. This paper also tests the VAR model stability, below figure shows the stability of the VAR model.

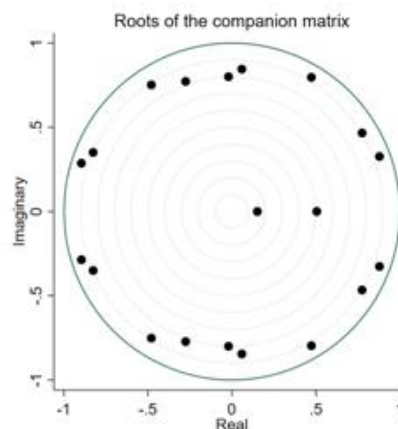


Figure. 1. VAR stability

In this figure, it is obvious that all the eigenvalues fall within the unit circle. So the VAR model is stable.

### 3.2 Analysis of experimental results

After VAR pricing, this paper used impulse response to explore the relationship between crude oil futures price changes and Bitcoin returns. Below shows the formula for the impulse response function.

$$\frac{\partial y_{t+s}}{\partial \varepsilon'_t} = \omega_s \tag{5}$$

It means that when the disturbance term of the variable in the period increases by 1 unit (while other variables and the disturbance terms in the other periods are unchanged), the effect for the variable in the period is the value  $y$ .

The model used the Bitcoin returns and crude oil price as the exogenous variables and chose the impulse response model to confirm  $p$  and  $q$  in lag ( $p, q$ ), to study the impact of crude oil prices on Bitcoin yields. Below shows the results of the impulse response figure.

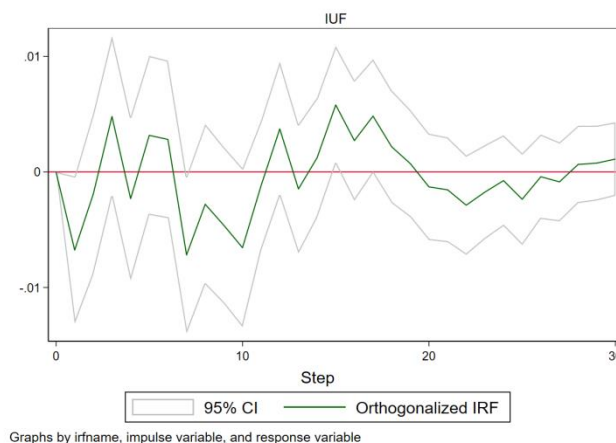


Figure. 2. Impulse and response

The above showed the result of the impulse response, based on the impulse response above,  $p=1$  and  $q=10$ . The result shows that the increase in the futures crude oil price has a significant dynamic correlation with Bitcoin yield, it is obvious that Bitcoin returns and crude oil prices were highly related when the Russian-Ukrainian conflict first broke out. However, their correlation started to decrease as the war ended, and it even will disappear after a long time.

### 3.3 ARMA order identification

In this case, the model used the Bitcoin returns. It used the Bitcoin returns as the exogenous variables and chose PACF and ACF to confirm  $p$  and  $q$  in ARMA ( $p, q$ ), which was used to build the ARMA model.

First, it regressed the values of the time series at all lesser lags using the partial autocorrelation function (PACF) to get the correlation coefficients of a stationary time series with its own delayed values. It is a good tool to conduct order identification for the AR model.

The autocorrelation function (ACF) was then used to characterize how data points in a time series are connected on average. In other words, it assesses the signal's self-similarity over a range of delay durations. It's a useful tool for ordering MA model identification. The ACF function's formula is shown below.

$$\rho_k = \frac{Cov(x_t, x_{t-k})}{\sqrt{Var(x_t)Var(x_{t-k})}} = \frac{Cov(x_t, x_{t-k})}{Var(x_t)} = \frac{\gamma_k}{\gamma_0} \tag{6}$$

Then it can draw the two graphs of PACF and ACF for ARMA identification. Below shows the results of the PACF and ACF figures which were used to confirm the p and q used in the modeling.

Based on the PACF and ACF tests above, p=1 and q=1. Below shows the results of the ARMA models.

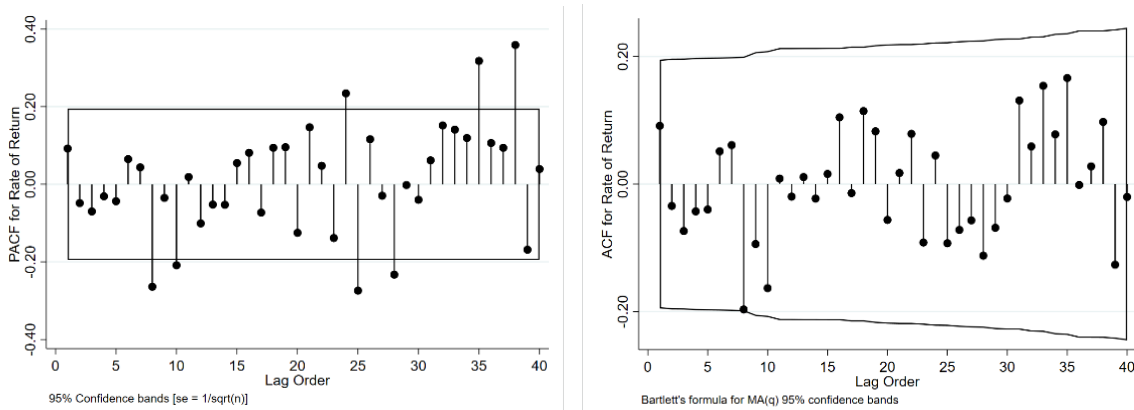


Figure. 3. PACF and ACF for ARMA identification

Through PACF and ACF, this paper estimates the ARMA (8,0) model.

### 3.4 ARMA-GARCH model estimation results

By adding the crude oil price into the variance equation, this paper found that from the order of magnitudes and significance, Bitcoin return and crude oil price influenced the Russian-Ukrainian conflict differently. In this case, based on all the results above, on the background of the float returns, it shows that higher crude oil futures prices won't lead to greater volatility in Bitcoin yields.

The above showed the result of the ARMA-GARCH model. Similarly, after considering the influence of the crude oil price on the rate of return, it could consider the influence caused by the volatility of the Bitcoin returns.

Table 3 ARMA-GARCH model			
Variables	(1)	(2)	(3)
Crude oil			
T=0	6.0219 (4.2162)	4.2592 (52.8175)	8.2798 (7.4242)
T=-1		-2.5364 (121.1582)	-12.5972* (7.3174)
T=-2			7.0919 (6.5073)
ARCH			
ARCH (-1)	-.0619 (.1468)	-.2122** (.0928)	-.0972 (.0671)
GARCH (-1)	-.1185 (.5466)	1.1099*** (.1068)	.6622** (.3037)
Constant	-6.4925*** (.5002)	-9.2459*** (1.1563)	-7.5667*** (.8856)

The result shows that ARCH term and GARCH term are neither significant in the first column, so the variance equation is not informative. However, the results have a significant GARCH effect in columns (2) and column (3). In all models, the crude oil futures prices and their lag term estimation coefficients have no significant positive results. Therefore, people can believe that the increase in

crude oil futures prices caused by the Russian-Ukrainian conflict did not affect the volatility of Bitcoin.

#### 4. Discussion

This paper has two main inspirations. First, the increase in the futures crude oil price had a significant dynamic correlation with the Bitcoin yield, both of them were affected by the Russian-Ukrainian conflict, but Bitcoin did not increase rapidly like crude oil. Also, the relationship between crude oil futures prices and Bitcoin yields is short-term and will disappear over time; Second, the increase in futures crude oil prices will not lead to greater fluctuations in Bitcoin yields, which means that Bitcoin is likely to be independent, its prices and yields were less affected by crude oil futures.

Most of the existing literature examines the dynamic effects of war on the economy. As the Russian-Ukrainian war just broke out, there is very little literature on the Russian-Ukrainian conflict. Also, the same is to study the impact of war and conflict on the economy, but the field of study in this article is cryptocurrency, which is relatively rare.

Bitcoin is the largest cryptocurrency, so the research in this paper can be representative of the cryptocurrency market to a certain extent. Investors in cryptocurrencies can read this paper to obtain some conclusions that interest them. This paper reminds investors not to take the impact of the Russian-Ukrainian conflict on the cryptocurrency market too important and long-term. From a long-term perspective, the Russian-Ukrainian conflict will not have much impact on the cryptocurrency market, and all fluctuations only exist in the short term. In the future, people can also study whether the entire cryptocurrency market has a certain connection with the financial market, or if it is completely independent. Also, it can study whether changes in the international situation and the world pattern will have a sufficient impact on the cryptocurrency market.

#### 5. Conclusion

This paper mainly focuses on the changes in the impacts of returns between Bitcoin and crude oil futures in the context of the Russian-Ukrainian conflict. The extended conclusion that crude oil futures price increase due to the Russia-Ukraine conflict impact on Bitcoin returns can also be summarized. The results from applying the empirical model, including impulse response and the ARMA-GARCH model, indicate that both Bitcoin and crude oil futures prices and yields were affected to some extent by the Russian-Ukrainian conflict. Among them, the increase in crude oil futures prices has a significant dynamic correlation with Bitcoin yields, the prices and yields of Bitcoin and crude oil futures had fluctuated to a large extent after the outbreak of the Russian-Ukrainian conflict.

A further conclusion can be drawn from this as the dynamic relationship between Bitcoin yields and crude oil futures is short-term and will disappear over time. It means that the dynamic impact of crude oil futures prices increase on Bitcoin yields due to the outbreak of the Russian-Ukrainian conflict is not long-term, and this short-term dynamic impact will disappear with time after the conflict.

People who are deciding whether to join the cryptocurrency market after the Russian-Ukrainian conflict could look at this article. This paper is just the case analyzing one of the most important and largest cryptocurrencies, Bitcoin, which changes due to the Russian-Ukrainian conflict. Investors who hold such types of cryptocurrencies can regard the change as an indicator to show whether there is a short-term or long-term change in the cryptocurrency market and take precautions to hedge the risk in time.

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