

# Innovations

## Dynamic Analysis for Future Prediction of Bit coin Return, Evidence from ARCH Model Using Select Macro-Economic and Financial Variables in the US Market

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### Abstract

*Bitcoin (BTC) and other cryptocurrencies have been around for a while however acceptability and volatility issues persist. The value of Bitcoin has seen significant variations throughout time, with notable price increases and decreases. If more individuals and businesses decide to accept Bitcoin as a legitimate form of investment or payment, the price of Bitcoin may increase. This study examines Bitcoin with similarities of an asset, commodity and currency; therefore bitcoin is categorized as a hybrid because it has characteristics of a commodity, currency and asset. Using Autoregressive conditional heteroskedasticity (ARCH) model, the current study investigates the influence of macroeconomic and financial factors from the US Market like Gold prices, Energy prices, US Stock Index S&P 500 returns, foreign currency exchange rates USD/EURO, USD/CNY, Inflation rates and Interest rates on Bitcoin return, volume and supply. The study spans the period from 1<sup>st</sup> June 2015 to 31<sup>st</sup> May 2023 based on the availability of weekly time series data. According to the results of the Autoregressive conditional heteroskedasticity (ARCH), there is a long-term correlation between the returns, volume and supply of bitcoin and select macroeconomic and financial variables. The present study's findings have important ramifications for market players and investors that use Bitcoin as an additional financial asset in their portfolios. Furthermore, based on the results of the current study, a roadmap is laid out for projecting the future volatility of Bitcoin.*

**Key words:** Bitcoin, Gold price, Exchange rate, Stock Index, Inflation, Interest rates

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## Introduction

Cryptocurrencies like Bitcoin use blockchain technology and cryptography to create a decentralized, open, and secure system of value exchange. Transactions are validated and added to a distributed ledger called the blockchain, which is maintained by a network of nodes or computers. Blockchain technology adoption ensures the security, openness, and immutability of all transactions. As an alternative to traditional fiat currencies, cryptocurrencies have grown in popularity because of its decentralized structure, lower transaction fees, and speedy transaction times. They are viewed as high-risk investments in addition to their volatility, lack of regulation, and lack of inherent value. As cryptocurrencies are not backed by physical assets like gold or other commodities, their value is solely decided by market supply and demand. It's important to fairly balance the benefits and risks of investing in cryptocurrencies before making any decisions.

The digital currency known as Bitcoin was created in 2009 by Satoshi Nakamoto, an unnamed person or group, according to his paper "Bitcoin: A Peer-to-Peer Electronic Cash System" (*Nakamoto, 2008*). Bitcoin transactions are verified by a decentralized network of computers using cryptography, and the blockchain is used to keep the history of those transactions. The blockchain is a distributed ledger technology that keeps track of all transactions in a decentralized, open ledger. Every block on the blockchain contains a cryptographic hash of the one before it, making it secure and impregnable to manipulation. It becomes a reliable technique for data storage and transmission with a wide range of potential applications outside of financial transactions.

Bitcoin is a decentralized currency; no one entity, such as a government or financial institution, controls it. A decentralized computer network confirms these transactions in a more transparent and safe manner. Anyone with an internet connection may use Bitcoin to send and receive money from any location in the world without a bank account or credit card. Since bitcoin transactions don't require any personal information, users can choose to remain anonymous. Bitcoin transactions frequently have lower fees when compared to conventional bank transfers or credit card transactions. Bitcoin transactions are shielded against fraud and hackers by the use of encryption.

## Literature Review of Bitcoin and its Price drivers

### Bitcoin

Compared to other assets like the S&P BSE 500, HDFC ETF Gold, S&P BSE Oil & Gas, and S&P BSE Realty, Bitcoin provides better returns but has a far higher risk. The Markowitz efficiency test shows that adding Bitcoin to a portfolio increases the risk and return of the portfolio. Investors with a high tolerance for risk could want to consider include Bitcoin in their portfolio to maximize their gains, while risk-averse investors would want to avoid doing so (*Bhatia et al., 2018*).

Energy expenses were determined to have no favourable impact on bitcoin profitability. It has been demonstrated that S&P 500 returns and bitcoin returns are favourably connected. The analysis found that supply expansion had a negative impact on bitcoin returns, even as volume growth had a positive impact. In other words, as bitcoins supply increased, profits decreased but gains from larger trading volumes increased (*D.Heuver et al., 2019*).

Changes in exchange rates, particularly those involving key currencies like the US dollar and Chinese Yuan, can have a considerable influence on the value of Bitcoin. For instance, a drop in the Yuan's value in relation to the dollar may make Bitcoin far more accessible to Chinese investors and traders, leading to increased demand and possibly higher prices. Late in 2016, there was a rush of Bitcoin purchases in China, which caused a sharp increase in the price of Bitcoin at a time when the Yuan was sharply depreciating against the US dollar (*Poyser, 2017*).

### Price Drivers

Bitcoin has a characteristic of a commodity specifically scarcity. Bitcoin is perceived as the new digital gold. The similarities are that gold and bitcoin are scarce and both investments have high price volatility (*Dyhrberg, 2016b*). There are contradictions as Gold has intrinsic value and Bitcoin value is derived from demand and supply. Gold is a safe haven investment and Bitcoin investment is high risk and volatility. (*Baur et al., 2018*) claims that Argentinians bought bitcoins to protect their savings against high inflation. Based on this it can be assumed that high inflation leads to more demand for bitcoins and therefore higher bitcoin returns can be achieved. Therefore, the inflation factor can be categorized under the demand and supply for Bitcoin. The production of gold can be compared to the mining of bitcoins because miners ensure the supply growth (maximum 21 million) of bitcoin with their production activities. The supply growth of bitcoin is linked to the demand and supply of Bitcoin.

(*Dyhrberg, 2016b*) researched bitcoin returns in relation to hedging it with the US dollar and found evidence that bitcoin can act as a hedge for the US dollar and yields a Bitcoin return. The factors that explain currency returns are inflation rate, interest rate, government control and expectations. Government control is not applicable to bitcoin because it is not regulated. Furthermore expectations are difficult to measure since the expectations about bitcoin differ greatly. Inflation rate and interest rate are best measurable in variables (*Purnomo, 2017*).

Technological changes can be a boom and bane to mining of Bitcoin. Energy is responsible for the production of bitcoins and has an effect in the Bitcoin pricing. Technological development can result in both a lower or higher bitcoin return (*Hayes, 2019*). The demand and supply factors highly influence bitcoin returns. The demand is driven in crypto exchanges and supply depends on Bitcoins available for circulation (*Ciaian et al., 2016*). (*Dyhrberg, 2016a*) concluded that investing in bitcoins is a substitute for the traditional market. Factors such as inflation, interest rates and S&P 500 can strengthen bitcoin as a substitute for the traditional market. (*Ciaian et al., 2016*) researched the effect of volume on the bitcoin and examined that volume has a positive effect on the bitcoin returns due to its usage.

## **Research Methodology**

### **Data type and Sources of data**

This research examines the fluctuation in Bitcoin return, volume and supply as a result of changes in International gold prices, International Energy prices, Stock Index S&P 500 returns, foreign currency exchange rates USD/EURO, USD/CNY, Inflation rates and Interest rates as taken from the US Market. Weekly data collected for a period from 1 June 2015 to 31 May 2023, 418 observations.

The data used for the study based on US market related data, as this is the largest market in the world and retrieved from the website. The selected US market related data and time-period for the present study created to data availability. As Bitcoin considered a commodity also, the effect of changes in International gold prices on Bitcoin investigated. Bitcoin as sort to be a risky investment asset has a close relationship to International stock index, we study this relationship to determine the extent of influence on Bitcoin return, volume and supply with reference to the most popular US Index S&P 500. Impact of volatility in the foreign exchange rates of Euro and Chinese Yuan with respect to US Dollar is also studied. Macroeconomic variables like Interest rates and Inflation rates in US Market have an influence on any investment and thereby used in this study to determine the extent of

influence on Bitcoin variables. Bitcoin mining consumes a lot of energy and thus the energy prices in the US market used to study its impact on Bitcoin return, volume and supply.

### **Research Design**

The performance of bitcoin quantified by calculating returns using historical data, which helps investors in efficiently predicting the direction of Bitcoin's price in the future. The dependent variables in this study are Bitcoin return, Bitcoin Volume and Bitcoin Supply. The study's independent variables are US gold prices, US Energy prices, US Stock Index S&P 500 returns, foreign currency exchange rates USD/EURO, USD/CNY, US Inflation rates and US Interest rates.

### **Research Objectives**

Through the previous literature review, the following variables adopted to research the drivers of Bitcoin Returns, Volume and Supply - US gold prices, US Energy prices, US Stock Index S&P 500 returns, foreign currency exchange rates USD/EURO, USD/CNY, US Inflation rates and US Interest rates (Seven Independent Variables), data collected from the US Market.

The Null Hypothesis indicates no relationship of each independent variable on the dependent variable BTC Returns, BTC Volume and BTC Supply, that each variable does not influence the volatility of BTC.

### **Empirical Methodology**

This part of the research focuses on the methods adopted in achieving the objectives of the study- Investigating the impact of select macroeconomic and financial factors on Bitcoin Returns, Volume and Supply. It contains and presents the model specification, variables descriptive and strategies of estimation of the developed model. Using Autoregressive conditional heteroskedasticity (ARCH) model, the current study investigates the influence of macroeconomic and financial factors of the US Market on Bitcoin return, volume and supply

### **Model Specification**

The study has adopted a panel model for estimating Bitcoin Returns in US market. Pannel estimation techniques is reliable following the panel kind of data set and also, it takes into consideration the heterogeneity among the variables in the US Bitcoin market. The equation is specified as follows:

$$USBTR_{it} = \beta_0 + \beta_1BTCVol_{it} + \beta_2BTCSupply_{it} + \beta_3USIntRate_{it} + \beta_4USInfRate_{it} + \beta_5USC_{it} + \beta_6EC_{it} + \beta_7RetS\&P500_{it} + \beta_8GP_{it} + \beta_9EP_{it} + \varepsilon_{it} \dots\dots\dots(1)$$

$$USBTV_{it} = \beta_0 + \beta_1BTCVol_{it} + \beta_2BTCSupply_{it} + \beta_3USIntRate_{it} + \beta_4USInfRate_{it} + \beta_5USC_{it} + \beta_6EC_{it} + \beta_7RetS\&P500_{it} + \beta_8GP_{it} + \beta_9EP_{it} + \varepsilon_{it} \dots\dots\dots(2)$$

$$USBTS_{it} = \beta_0 + \beta_1BTVol_{it} + \beta_2BTCSupply_{it} + \beta_3USIntRate_{it} + \beta_4USInfRate_{it} + \beta_5USC_{it} + \beta_6EC_{it} + \beta_7RetS\&P500_{it} + \beta_8GP_{it} + \beta_9EP_{it} + \varepsilon_{it} \dots\dots\dots(3)$$

Where (USBTR) stands for US Bitcoin Return, (USBTV) stands for Bitcoin Volume, (USBTS) stands for Bitcoin Supply, US interest Rate(USIntRate), US Inflation Rate (USInfRate), USD/CNY exchange rate (USC), USD/Euro exchange rate (EC), Return on S&P500(RetS&P500), Gold Price(GP) and Energy Price(EP) in Stock respectively.  $\beta_0$  is the intercept,  $\beta_{is}$  ( $i= 1,2,3,\dots,9$ ) are the coefficient of the respective independent variables to be estimated and  $\varepsilon$  is the error term,  $i$  and  $t$  shows the  $i$ th bank in year of  $t$  and  $u_i$  is the individual effect which constant over time.

**Estimation Strategy**

In estimating the Equation (1), Equation (2) and Equation (3) the study used VAR model. The Null hypothesis of the Husman test suggest that the random effect is reliable test else the alternative hypothesis suggests that the fixed effect is appropriate. Thus, the null hypothesis is rejected if the P value is significant at the 5% level of significance implying that a fixed effect is reliable test. On the other hand, if the p value is not significant, the null hypothesis is accepted implying the appropriateness of the random effect estimator.

The reliability of the outcome depends on the assumption that the estimation is free from non-stationarity and econometric problems, such as heteroscedasticity and autocorrelation. Due to volatility of financial and economic data differs over period of time, it suffer from heteroscedasticity problems. This condition is regularly observed in panel data when the variance in  $\varepsilon$  in different periods is not zero. To overcome this problem the Breusch-Godfrey test and the Breusch-Pagan test has been used to check the presence of autocorrelation problem and heteroscedasticity problem. The above test shows, the null hypothesis that states

the absence of autocorrelation and heteroscedasticity is tested against the alternative hypothesis, which indicates the occurrence of this problems.

### Results and Discussion

The empirical result has been shown in this part, is segregated into four subsections. The first one deals with descriptive statistics, the second one consist of Correlation test and third one consist of Husman specification test and regression output. The final section consists of diagnostic test results.

### Descriptive Analysis

The outcome of the descriptive statistics of select US macroeconomic and financial variables and Bitcoin variables are reported in the Table 1.

**Table 1: Descriptive Statistics of BTC variables and Independent Variables**

Variables	Mean	Median	Std. Deviation	Minimum	Maximum
BTC Return	1.72%	0.90%	10.69%	-41.69%	43.61%
US Interest rate	1.192	0.830	1.250	0.040	5.080
US Inflation rate	1.888	1.770	0.571	0.300	3.560
BTC Volume	126162386179	104968495002	129295613380	115888900	7666797758
BTC Supply	17470302	17732293	1428876	14231600	19387450
USD/CNY	6.696	6.701	0.253	6.200	7.250
USD/EURO	0.890	0.890	0.044	0.802	1.032
S&P 500 Return	0.20%	0.34%	2.46%	-14.98%	12.10%
Gold Price USD	1498.615	1352.150	285.196	1057.400	2031.150
Energy price USD	154.215	133.863	67.615	55.891	376.412

Table 1 shows that the average return Bitcoin from US market is 1.72%, the maximum return is 43.61% from investment in Bitcoins in US market. The value traded in Bitcoin in US market is profoundly very high. The average US Interest Rate trading is 1.192 with standard deviation of 1.250 lower to its mean value. Maximum interest rate is 5.080% while the minimum is 0.040. the average inflation rate in US is 1.888 with standard deviation of 0.571 indicating a moderate prevailing of inflation in US market. The minimum and maximum inflation is 0.300 and 3.560. The average USD market value is 6.696 with standard deviation of 0.253 indicating nominal currency market fluctuation. The minimum and maximum value is 6.200 and 7.250. Average Euro currency is trading at 0.890 with standard deviation of

0.044, indicating higher performance of Euro currency in US market. The minimum and maximum value is 0.802 and 1.032. The average return from S&P 500 in US market is 0.20% with standard deviation value of 2.46% indicating an abnormal return form investment in S&P 500. The minimum and maximum return is (-14.98%) and 12.10%. The average market for Gold Price trading is very high in US market 1498.615 with standard deviation of 285.196. The minimum and maximum indices value of Gold price trading is 1057.400 and 2031.150. The average market for Energy Price in US market is 154.215 with standard deviation of 67.615. The minimum and maximum value of US Energy Price is 55.891 and 376.412. BTC shown higher return due to higher trading volume and lower inflation rate.

**Correlation Summary**

To ensure the results obtained is not influenced by multicollinearity, correlation analysis has been conducted for dependent variables Bitcoin Return and the independent variables of US market indices has been examined and the results are shown in Table 2.

**Table 2: Correlation summary of BTC Return variables**

Variables	1	2	3	4	5	6	7	8
BTS Return	1.000							
US Interest rate	-0.041	1.000						
US Inflation rate	-0.110	0.165	1.000					
USD/CNY	-0.012	0.487	-0.258	1.000				
USD/EURO	-0.072	0.334	0.066	0.499	1.000			
S&P 500 Return	0.180	-0.009	-0.050	0.015	-0.068	1.000		
Gold Price USD	-0.053	0.098	0.550	0.095	0.025	0.021	1.000	
Energy price USD	-0.112	0.266	0.867	-0.106	0.358	-0.053	0.497	1.000

Table 2 shows that multicollinearity is not present in the study, it is due to the correlation coefficient (R) value which is less than 0.500. The values are lesser then the rules of thumb value of 0.800 indicating a big multicollinearity problem.

Following the works of *Dyhrberg (2016)* and *Baur et al. (2018)*, Bitcoin price, volume and supply data is calculated from Coindesk Price index and Bitcoin charts. Price index of US energy price is collected from US Bureau of labour statistics and from statista. Data related to



US inflation rates is collected from trading economics and usinflation calculator. S&P 500 Index, USD/CNY and USD/Euro data is collected from Investing.com to calculate the US Stock Index return and exchange rates of USD/Chinese Yuan and USD/Euro Currency. Gold prices are collected from data provided by World Gold Council. Data related to US interest rates collected from St Louis Federal Reserve. All the observation are weekly observation from 01<sup>st</sup> June 2015 to 31<sup>st</sup> May 2023, based on data availability of Bitcoin Return, Bitcoin Volume and Bitcoin Supply. The changes in the price of the above assets are plotted in below Figure 1.

The finding shows that Bitcoin and other US financial market assets are strongly linked and sending a warning to the end users, which lead to need for analysing the tail behaviour of financial assets. To observe this estimation with VARs on Bitcoin’s Return at both 1% and 5% level, 1% and 5% on Bitcoin Supply and 1% and 5% on Bitcoin Volume are plotted.

**Figure 1 Price changes in Assets**

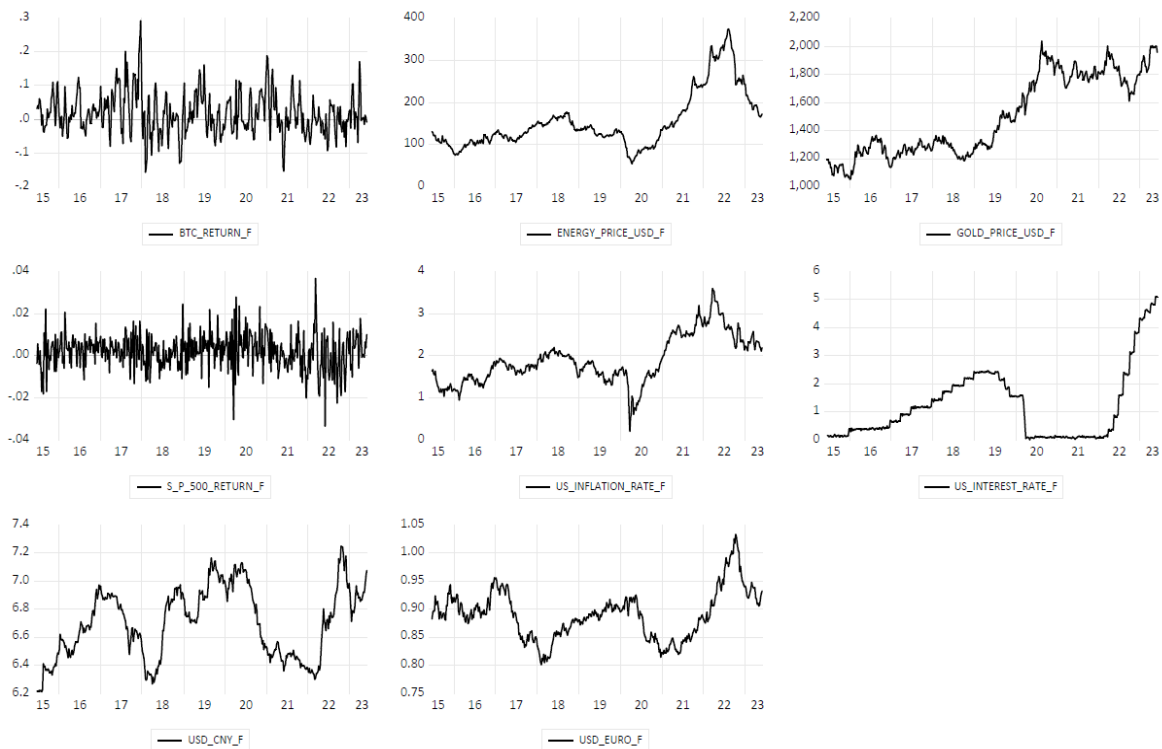


Figure 1 shows the Return on Bitcoin, Energy Price on US market, Gold Price, S&P 500, US Inflation Rate, US Interest Rate, USD/CNY market and USD/Euro market. The data has

obtained from number of sources. The sample period is weekly data from 1<sup>st</sup> June 2015 to 31<sup>st</sup> May 2023.

In order to determine which variables are highly significant for determining the return on Bitcoin, the model shown in equation has been employed and the results are shown in Table 3.

**Table 3: Results of the ARCH Model for Bitcoin Returns in US Market**

Variable	Coefficient	Std. Error	t-Statistic	P value
<b>ENERGY PRICE USD</b>	<b>-4.580</b>	<b>0.000198</b>	<b>-5.023173</b>	<b>0.000</b>
<b>GOLD PRICE USD</b>	<b>2.050</b>	<b>2.39E-05</b>	<b>2.085668</b>	<b>0.0318</b>
<b>S&amp;P 500 RETURN</b>	<b>0.747</b>	<b>0.211075</b>	<b>3.543669</b>	<b>0.000</b>
US INFLATION RATE	-0.019	0.022063	-0.891071	0.3734
US INTEREST RATE	0.00025	0.005201	0.049005	0.9609
USD/CNY	-0.0096	0.031693	-0.305143	0.7604
USD/EURO	-0.102	0.178364	-0.574796	0.5657
C	0.206	0.190587	1.081791	0.2800
R-squared	0.045	Mean dependent var		0.017238
Adjusted R-squared	0.029	S.D. dependent var		0.106853
F-statistic	2.802	Durbin-Watson stat		2.082766
Prob(F-statistic)	0.007			

Based on Table 3, the results of the Regression analysis, it is identified that all the predictive variables of the model show a significant impact on BTC returns. The Coefficient for the Energy price, Inflation Rate, US currency and Euro are negative, which indicates that investors in US market are considering Bitcoin as substitutional investment assets. Energy price have significant negative impact on BTC return, the coefficient value indicates that there is negative influence on BTC return higher the energy price leads to lower the BTC return. Gold price at US market shows positive relationship with BTC return, 2.050-unit change in gold price at US market leads to 1 unit change in BTC return. Hence investment in US Gold market gives higher return compare to BTC. S&P 500 Return have significant and positive impact on BTC Return, 0.748 unit change in S&P 500 shows 1 unit change in BTC return. Other factor shows no significant impact on BTC return.

**Table 4: Results of the ARCH Model for Bitcoin Volume in US Market**

Variable	Coefficient	Std. Error	t-Statistic	P value
<b>ENERGY PRICE USD</b>	<b>-1.420</b>	<b>1.510</b>	<b>-0.941686</b>	<b>0.3469</b>
<b>GOLD PRICE USD</b>	<b>3.160</b>	<b>18263698</b>	<b>17.28190</b>	<b>0.0000</b>
S&P 500 RETURN	-1.510	1.610	-0.935952	0.3498
<b>US INFLATION RATE</b>	<b>4.260</b>	<b>1.690</b>	<b>2.524227</b>	<b>0.0120</b>
<b>US INTEREST RATE</b>	<b>-2.130</b>	<b>3.970</b>	<b>-5.354497</b>	<b>0.0000</b>
<b>USD/CNY</b>	<b>9.240</b>	<b>2.420</b>	<b>3.814315</b>	<b>0.0002</b>
<b>USD/EURO</b>	<b>-3.850</b>	<b>1.360</b>	<b>-2.822747</b>	<b>0.0050</b>
<b>C</b>	<b>-6.560</b>	<b>1.460</b>	<b>-4.502885</b>	<b>0.0000</b>
R-squared	0.619	Mean dependent var		1.260
Adjusted R-squared	0.612	S.D. dependent var		1.290
F-statistic	95.295	Durbin-Watson stat		0.3715
Prob(F-statistic)	0.000			

Based on Table 4, the results of the Regression analysis, it is observed that all the predictive variables of the model reveal a significant impact on BTC volume. The coefficient of Energy price, Interest rate, and Euro are negative impact on BTC volume. While Gold price, US inflation and USD/CNY have significant and positive influence on BTC volume. Energy price have negative impact on BTC volume, 1.420-unit change in energy price leads to 1 unit down fall in in BTC volume. Gold price have positive and significant influence on BTC volume, 3.160 change in gold price in US market leads to 1 unit growth in BTC volume. US inflation rate have significant and positive influence on BTC volume, 4.260-unit change in US inflation rate leads to one unit growth in BTC volume. US interest rate have significant and negative influence on BTC volume, 2.130-unit change US interest rate leads to 1 unit decline in BTC volume. USD/CNY shows greater impact on BTC volume, a 9.240-unit change in USD/CNY exchange rate leads to 1 unit growth in BTC, thus higher the USD/CNY currency trading shows higher BTC volume. USD/Euro shows negative impact on BTC volume. 3.850 units change in USD euro leads to 1 unit decline in BTC volume.

**Table 5: Results of the ARCH Model for Bitcoin Supply in US Market**

Variable	Coefficient	Std. Error	t-Statistic	P value
ENERGY PRICE USD	6434.049	671.1767	9.586223	0.0000
GOLD PRICE USD	3141.246	81.17972	38.69495	0.0000
S&P 500 RETURN	-121289.3	716988.1	-0.169165	0.8658
US INFLATION RATE	277365.4	74944.38	3.700950	0.0002
US INTEREST RATE	89423.77	17668.30	5.061256	0.0000
USD/CNY	2451109.	107656.4	22.76789	0.0000
USD/EURO	-10046674	605876.8	-16.58204	0.0000
C	3666862.	647393.6	5.664038	0.0000
R-squared	0.938	Mean dependent var		17470302
Adjusted R-squared	0.937	S.D. dependent var		1428876
F-statistic	892.5738	Durbin-Watson stat		0.152968
Prob(F-statistic)	0.000			

Based on Table 5, the results of the Regression analysis, it is identified that all the predictive variables of the model show a significant impact on BTC supply. The Coefficient of USD/ Euro have significant and negative impact on BTC supply. While Energy Price USD, Gold Price USD, US Inflation Rate, US Interest Rate and USD/CNY have significant and positive influence on BTC supply. Energy price influence on BTC supply is 6434.049 unit change in energy price, leads to one unit change in BTC supply. Gold price have impact on BTC supply, 3141.246-unit change in Gold price leads to one unit change in BTC supply. US Inflation rate have significant impact on BTC supply. 277365.4 level change in inflation rate leads to higher growth in BTC supply.

**Conclusion**

Using Autoregressive conditional heteroskedasticity (ARCH) model, the current study investigates the influence of macroeconomic and financial factors of the US Market on Bitcoin return, volume and supply. The study spans the period from 1<sup>st</sup> June 2015 to 31<sup>st</sup> May 2023 based on the availability of weekly time series data. According to the results of the Autoregressive conditional heteroskedasticity (ARCH), there is a long-term correlation

between the returns, volume and supply of bitcoin and select macroeconomic and financial variables.

Average return of Bitcoin from US market is 1.72%, the maximum return is 43.61% from investment in Bitcoins in US market. The value traded in Bitcoin in US market is profoundly very high. The average US Interest Rate trading is 1.192 with a standard deviation of 1.250 lower to its mean value. Maximum interest rate is 5.080% while the minimum is 0.040. the average inflation rate in US is 1.888 with standard deviation of 0.571 indicating a moderate prevailing of inflation in US market. The minimum and maximum inflation is 0.300 and 3.560. The average USD market value is 6.696 with standard deviation of 0.253 indicating nominal currency market fluctuation. The minimum and maximum value is 6.200 and 7.250. Average Euro currency is trading at 0.890 with standard deviation of 0.044, indicating higher performance of Euro currency in US market. The minimum and maximum value is 0.802 and 1.032. The average return from S&P 500 in US market is 0.20% with standard deviation value of 2.46% indicating an abnormal return form investment in S&P 500. The minimum and maximum return is (-14.98%) and 12.10%. The average market for Gold Price trading is very high in US market 1498.615 with standard deviation of 285.196. The minimum and maximum indices value of Gold price trading is 1057.400 and 2031.150. The average market for Energy Price in US market is 154.215 with standard deviation of 67.615. The minimum and maximum value of US Energy Price is 55.891 and 376.412. BTC shown higher return due to higher trading volume and lower inflation rate.

The Coefficient for US Energy price, US Inflation Rate, US currency and Euro have a negative influence on Bitcoin return, which indicates investors in US market are considering Bitcoin as substitutional investment assets. The coefficient of US Energy price, US Interest rate and demand for Euro influence on BTC volume is negative. While Gold price, US inflation and demand for Chinese Yuan have significant and positive influence on BTC volume. The Coefficient of USD/Euro and S&P 500 return have significant and negative impact on BTC supply. While Energy Price USD, Gold Price USD, US Inflation Rate, US Interest Rate and demand for Chinese Yuan have significant and positive influence on BTC supply.

The dynamic analysis confirms the asymmetric co-integration effects of positive and negative changes due to macroeconomic and financial variables of the USD market on BTC return, Volume and Supply in the long-run. Using Autoregressive conditional heteroskedasticity (ARCH) model, the current study investigates mixed evidence with respect to long-run

estimates of BTC variables. Following (*Baur et al., 2018*) claims which suggest that Argentinians bought bitcoins to protect their savings against high inflation. Based on this it can be assumed that high inflation leads to more demand for bitcoins and therefore higher bitcoin returns can be achieved. As investigated by (*Hayes, 2019*), energy is responsible for the production of bitcoins and has an effect in the Bitcoin pricing.

The results of this study are in line with the earlier studies, in addition this study investigates impact of multiple macroeconomic and financial variables on BTC return, volume and supply in the long-run. In the US Market Energy price has the most significant negative impact on BTC return, since BTC consumes a lot of energy during the mining process, when the energy price increases there is a fall in BTC volume. Future studies are recommended in this area, since this study is confined to select macroeconomic variables and financial variables in the US Market. This study uses Autoregressive conditional heteroskedasticity (ARCH) model, other models can be used to analyse the impact of these variables on BTC return, volume and supply. Bitcoin have the potential to fundamentally alter the rising tide of Cryptocurrency with increased usage by businesses, investors across the world it proves its limitless potential to revolutionize the digital financial market with more security and transparency. The findings of the present study have significant implications on market participants and investors, who consider Bitcoin as alternate investment asset in their portfolio. It also carves a roadmap to predict the future volatility of Bitcoin based on the findings of the present study.

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