

# ARBITRARY BEHAVIOUR OF BITCOIN TOWARDS GOLD AND CRUDEOIL

Jeevan R\* & SHUBHASHREE P K ACHARYA\*\*

\*Research scholar, Department of commerce, Register no :- 1717107  
Christ (Deemed to be university), Dairy circle, Bangalore.

\*\*Asst.Prof, Department of Commerce, Christ (Deemed to be university),  
Dairy circle, Bangalore.

Received: September 17, 2018

Accepted: November 03, 2018

**ABSTRACT:** *An incredible number of financial specialists treat their Bitcoin investment as a speculative asset instead of using it as a means of payment. Off late Bitcoin has become one of the most traded and highly speculated assets. This speculation has resulted in Bitcoin becoming a highly volatile commodity. Other than becoming volatile, this phenomenon is impacting the price of other commodities like US Dollar, Euro, Equities, and Gold. This research paper deals with Bitcoin volatility effect on other variables like Crude oil and Gold. The statistical tool used for this study is GARCH model for which 5 years data has been taken. GARCH model is used when the time series data shows clustering volatility and arch effect, it is found that the Bitcoin volatility has a negative impact on the gold volatility and there is no impact on crude oil volatility. From this study it can be stated that gold and Bitcoin can be used as Hedging instruments.*

**Key Words:** BITCOIN, WTI, GOLD, GARCH

## INTRODUCTION

Bitcoin has gained importance across the globe as a tradable commodity from a few years and has also gained significant attention from media, regulatory authorities (Rainer Böhme, 2015). An incredible number of financial specialists treat their Bitcoin investment as a speculative asset instead of using it as a means of payment and suggest that Bitcoin useful mostly as assets rather than currency. Bitcoin is accepted from payment perspective by few countries while it is considered as a tradable commodity by several others. In the past few years crypto currency markets have experienced high level of volatility; as a result crypto currencies became one of the most controversial virtual currencies. Amongst all the crypto currencies, Bitcoin emerged as the most popular currency (Katsiampa, 2017). Enormous increase in the value of the Bitcoin and limited usability as a means of payment lead to the discussion that Bitcoin is a currency, investment asset, and has gold like storage value (Dirk G. Baur). Putting a check on the volatility in Bitcoin market is not an easy task since many stakeholders are still assessing this market. This new market has lucrative possibilities for investors in terms of managing their risk, portfolio analysis etc so, retaining the Bitcoin in their port\*folio gives strong movement across various instruments like Gold, crude oil fluctuation. Bitcoin has similarities to gold in terms of medium of exchange, store of wealth, high liquidity, 24x7 trading. This market is impacting and influencing commodities and currency market.

## REVEIW OF LITERATURE

Bitcoin is a standout amongst the most prominent digital money dependent on information technology which doesn't rely on national banks for traditional currency, rather depends on a decentralized PC system to approve transactions (J. Alvarez-Ramirez, 2018). From its prologue, it posed a great challenge to Policy Makers, Economists, Entrepreneurs and Consumers alike (Dyhrberg, 2015). The Financial Regulatory Authorities in various countries act differently towards Bitcoin( E.g. Japan prohibited its financial institutions from dealing in Bitcoin as it believed that Bitcoin is not a valid currency, but, later on allowed the use of Bitcoin as a Payment method (Wenjun Fenga, 2017). Bitcoin is more unstable than Stocks and Bonds and is delicate to Regulatory and Market Events (Mehmet Balcilar, 2017),(E.g. China restricted its Financial Institutions from Bitcoin transactions which provoked the fall of Bitcoin by 38.28% in four days). Bitcoin has similar features of Gold like tradability, mining and Bitcoin came into the limelight as its price exceeded the price of Gold. Majority of the investors benefit from correlation that exists between Crude Oil, Gold, S&P 500 and US dollar (Bunnag, 2016). The price of Crude oil, Gold, US Dollar in the free market is an indicator of collective expectations in the future world economy. These asset prices are a great reflection of the future market according to some investor (Bunnag, 2016). Gold and Bitcoin are negatively co-related assets that reduce the risk associated in investing in a portfolio.

## STATEMENT OF PROBLEMS

Bitcoin has gained importance as a speculative asset. The increase in speculative activity has made Bitcoin highly volatile. The Bitcoin speculation contributed to high volatility in other assets like US Dollar and Gold. Several researches have concluded that volatility in Bitcoin price has an impact on the price of US Dollar. However other widely traded market namely Gold and Crude Oil also need to be examined since these markets influence prices globally. This paper examines the impact of volatility on crude oil and gold by estimating the conditional volatility.

## RESEARCH GAP

In several researches conducted till now, Bitcoin volatility is either based on volume and return prediction or finding the causal relationship among the crypto currencies. The principle motive behind this paper is to analyze the effect of Bitcoin volatility on the value of other financial assets to be specific Gold and Crude oil. Gold and Crude oil have been considered in this paper since both the items share comparable highlights such as Gold and Crude oil is natural resources which are limited and exhaustible.

## OBJECTIVES OF THE STUDY

1. To examine volatility clustering and ARCH impact in the Bitcoin.
2. To analyze impact of Bitcoin volatility on gold.
3. To analyze impact of Bitcoin volatility on crude oil.

## DATA AND METHODOLOGY

From February 2012 to January 2018 closing price data of Bitcoin, Gold and Crude oil value has been collected and Bitcoin closing value has been gathered from [www.coindesk.com/price.coin](http://www.coindesk.com/price.coin) (coindesk is a Bitcoin and other digital currencies informational site). Similarly Gold closing value has been downloaded from World Gold Council. On the other hand, Crude oil globally are categorised as Brent crude oil and WTI crude oil and this paper considers West Texas Intermediate ( West Texas intermediate is a benchmark in a crude oil pricing ) WTI closing data value is being collected from US Energy Information Administration. The paper uses the ARCH model propounded (Engle, 1982) and later on improved (Nelson, 1991). This model is used as a tool to measure the internal effect from the previous day's return information. The GARCH model which is the extension of the ARCH model helps us to understand the volatility in the dependent variable which is influenced by the internal effect. The GARCH tests demonstrate that it is a solid match for test on time series information (Bollerslev, Pyun et al, & Han and Park, 2008). The ADF Test, descriptive statistics, ARCH test and GARCH model was arrived at using E views software. For the unit root test purpose Log return series were estimated and return series are used for the rest of the analysis. The return value for Gold value, Bitcoin value and WTI value was determined as the logged differences as analyzed in the condition underneath:

$$R_t = \log(p_t) - \log(p_{t-1})$$

Where  $R_t$  represents daily return price of Gold, Bitcoin, WTI Spot price at Time.

$P_t$  is a price of the Gold, Bitcoin, and WTI closing value

$P_t - 1$  Indicate the price of Gold, Bitcoin, WTI closing value at time period (T-1).

## DATA ANALYSIS AND INTERPRETATION

### TABLE 1:- Descriptive Statistics

Descriptive statistics for Bitcoin price, gold price, and WTI spot price (in dollar) are presented below.

	<b>BITCOIN</b>	<b>CRUDE OIL(WTI)</b>	<b>GOLD</b>
<b>MEAN</b>	1094.699	70.86447	1330.666
<b>MEDIAN</b>	385.8600	60.18000	1277.250
<b>MAXIMUM</b>	18960.52	110.6200	1791.750
<b>MINIMUM</b>	4.270000	26.19000	1049.400
<b>STD.DEV</b>	2540.020	24.97631	180.2878
<b>SKEWNESS</b>	4.308955	0.095645	1.047299
<b>KURTOSIS</b>	23.00736	1.341239	3.024644
<b>JARQUE-BERA</b>	29877.69	175.5329	276.2580
<b>(JB TEST) (prob)</b>	(0.0000)	(0.0000)	(0.0000)

SOURCE: - Author calculation

Table demonstrates the summary of statistics of the Bitcoin value, WTI value, and Gold value. The mean value of the Bitcoin, WTI, gold value is 1094.699, 70.86447 and 1330.666 respectively. The maximum Bitcoin value during the study period was 18960.52 dollar, WTI value 110.6200 dollar and gold value is 1791750 dollar. Bitcoin had the largest standard deviation of 2540.020 Dollar from mean and the WTI had a smallest deviation of 24.97631 Dollar from mean .The skewness for the Bitcoin, WTI, gold was positive and kurtosis is concerned for Bitcoin is 23.00736, WTI is 1.341239 and gold is 3.024644.The JB test statistic for the above mentioned variables were significant, which signifies the fact that Bitcoin value, WTI value, Gold value was not normally distributed.

**TABLE 2**  
**ADF Unit root Test**

VARIABLES	t-statistic	Prob
BITCOIN	-8.424625	0.0000
WTI	-41.39732	0.0000
GOLD	-39.40707	0.0000

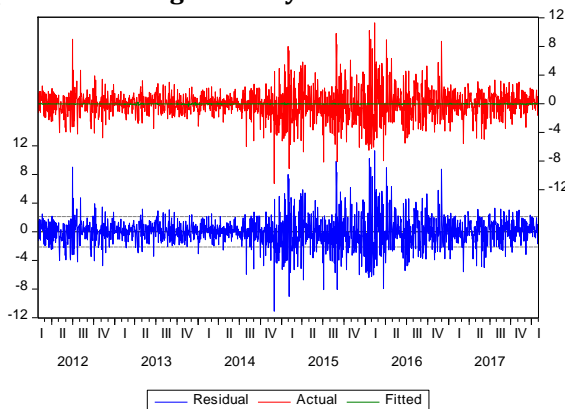
**Results of ADF statistics**

ADF test was connected to the Bitcoin return value, WTI return value and Gold return value. ADF test is important to find out stationarity, if data is non-stationary will prompt mistaken at conclusion (Fuller, 1979).The null hypothesis for Augmented dickey-fuller unit root tests shows that gold, WTI, Bitcoin time series data is non-stationary. The table 2 shows p-values and t-statistics of ADF unit root test. The calculated P-value for all the variables were 0.000 which demonstrating the way that Bitcoin value returns, WTI value returns and Gold value returns were all stationary at level so the null hypothesis is rejected.

**EVALUATION OF BITCOIN VOLATILITY**

- To examine volatility clustering and ARCH impact in the Bitcoin.
  - Volatility clustering

**GRAPH 1 shows graph of clustering volatility**



The time of low volatility is followed by time of low volatility for a longer time from 2012 to 2014. From 2014 onwards till end date the time of high volatility are followed by time of high volatility. This indicates the presence of clustering volatility.

- ARCH effect

**TABLE 3**

Prob. Chi-Square(1)	0.0000
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H0:- There is a no ARCH effect

H1:- There is an ARCH effect

ARCH test is done for exploring Autoregressive Heteroskedasticity’s presence .The prob.chi-square (1) value is 0.000. It is significant at 1% level, so the null hypothesis is rejected.This shows that there is no arch effect.

- To analyze impact of Bitcoin volatility on gold.

In order to examine this objective the following hypothesis is constructed.

H0:- There is no impact of Bitcoin volatility on gold value.

H1:- There is an impact of Bitcoin volatility on gold value.

This table gives information on Bitcoin volatility impact on gold price using GARCH (1, 1) test.

**TABLE 4**

VARIABLES	Co-efficient	Prob.
RESID(-1)^2	0.051827	0.00000
GARCH(-1)	0.891118	0.00000
BIT_R	-0.006269	0.00000

The co-efficient for ARCH (RESID (-1) ^2) AND GARCH were all significant at 5% which helps us to analyse the impact of Bitcoin volatility on the gold value. GARCH point out volatility clustering in gold value and the p-value is less than 5 %. Based on the above output it can be stated that Bitcoin negatively impact the gold price volatility by -0.006269

3 To analyze impact of Bitcoin volatility on crude oil.

In order to examine this objective the following hypothesis is constructed.

H0:- There is no volatility effect from Bitcoin on WTI value.

H1:- There is a volatility effect from Bitcoin on WTI value.

This table gives information on impact of Bitcoin volatility on WTI value using GARCH (1, 1) test

**TABLE 5**

VARIABLES	Co-efficient	Prob.
RESID(-1)^2	0.051827	0.00009
GARCH(-1)	0.891118	0.00000
BIT_R	-0.001293	0.6468

The co-efficient for ARCH (RESID (-1) ^2) AND GARCH were all significant at 5% which helps us to analyse the volatility impact of Bitcoin on the WTI value. GARCH point out volatility clustering in WTI value and the p-value is more than 5 %. Based on the above output it can be stated that volataiy of Bitcoin does not impact the WTI value.

**DISCUSSION**

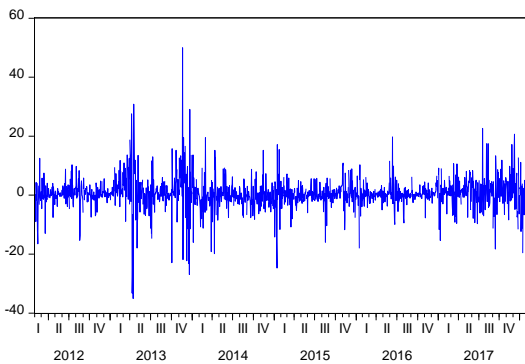
From the figure 1:- The time of low volatility is followed by time of low volatility for a longer time from 2012 to 2014 and from 2014 onwards till end date the time of high volatility are followed by time of high volatility. These results suggest that the residuals have conditionally Heteroscedasticity and can be further subjected to ARCH and GARCH test. In GARCH (1.1) model Residual derived from the mean equation is used in making variance equation. We shall estimate mean equation and variance equation simultaneous. Under this distribution ARCH is significant that is information of previous day WTI value and Gold value can influence today's WTI and Gold value. Under this test GARCH is also significant it means that previous day volatility can influence today's crude oil and gold volatility. GARCH is significant and ARCH is significant therefore ARCH and GARCH both influences volatility of the WTI and Gold value and the volatility of Bitcoin is transmitted to volatility of the gold but it is negative indicating that Bitcoin volatility and gold volatility move in different direction resulting in hedging opportunity. So we can conclude that volatility in Gold and crude oil is dependent on its own shock such as ARCH and GARCH. However the Bitcoin volatility has negative impact on gold however Bitcoin volatility has no impact on crude oil.

**Conclusion**

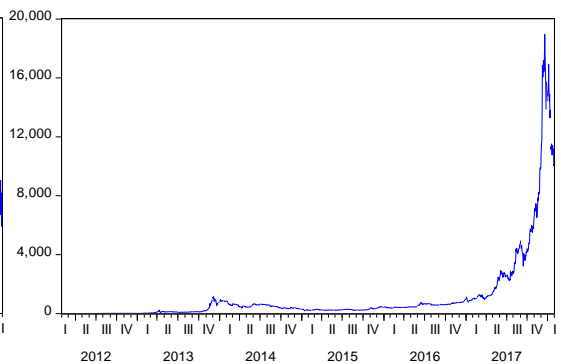
Globally, there are serval investment avenues available for trading. With the emergence of trading in the Bitcoin; an investor can take advantage of the volatility and its impact on other instruments. This paper examines the impact of volatility of Bitcoin price on two other important global instruments namely Gold price and Crude oil price. It can be concluded that as more trading avenues are introduced, they are anticipated to impact the returns of existing commodities in the financial market. With the introduction of technology, regulations and already volatile trading environment will fuel further volatility which will impact the returns of existing commodities. Policy makers need to give importance to Bitcoin as it provides opportunity to many investors to take advantage of its volatility.

Graph for return and closing price

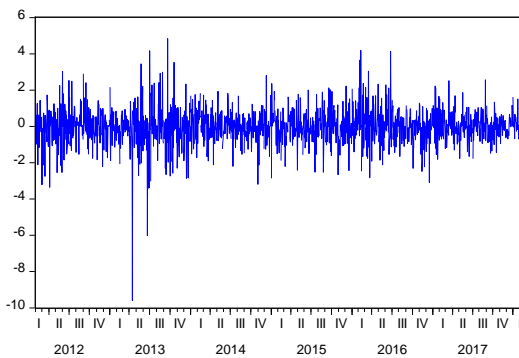
Graph 2  
BIT\_R



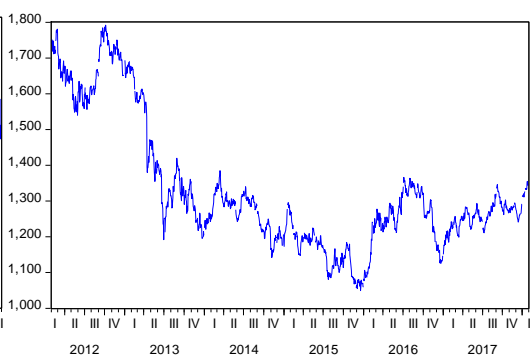
Graph 3  
BITCOIN



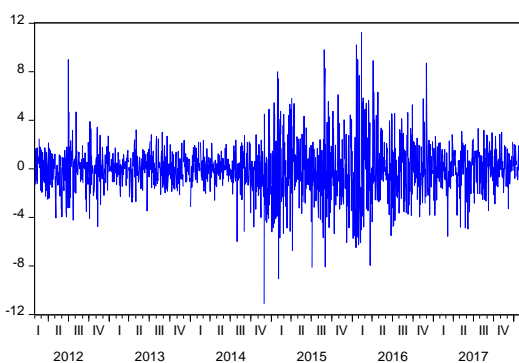
Graph 4  
Gold\_R



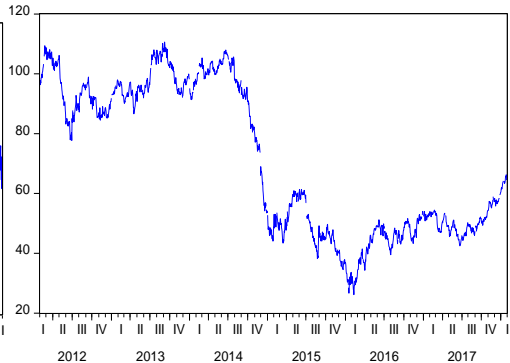
Graph 5  
GOLD



Graph 6  
WTI\_R



Graph 7  
WTI



**ACKNOWLEDGE**

We would like to show our gratitude to the **Dr NAMITHA K CHERIYAN, DR MANU K S** for sharing their pearls of wisdom with us during the course of this research.

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