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Research Article

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A study on tracing the bitcoin value by developing a pricing model and analyzing the impulse response dynamics

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Abstract Finance, like most human inventions, is constantly evolving. In the beginning it was basic: food was traded for livestock, and livestock for resources like wood, or maize. It progressed to precious metal, such as silver and gold. And now, the next step in financial evolution has come to light. This new form of currency has been constantly evolving over the past decade, developed by an unknown person and maintained by a collective group of the brightest minds in technology. It's a new form of money that is created and held digitally, and the most important part, of course, is that no government owns it, or decides its value - the peer-to-peer network community does. Bitcoin is generated through a complex sequence of mathematical formulas that run on computers; the network shares a public ledger using blockchain technologies that record, and validate, every transaction processed.

Keywords currency, Bitcoin, blockchain technologies

1. Introduction

There is no doubt that the era of information and communication technologies has created many golden opportunities in several aspects. One of the fields that benefit from these technologies and online connections is the financial and business sector. A growing number of online users has activated virtual world concepts and created a new business phenomena. Thus, new types of trading, transactions and currencies have been arising. One of the remarkable financial forms that have been emerged in the past few years is Crypto currency . Etymologically, Crypto currency is a currency that operates through codes using computer technology as its basic platform. There are blockchains which are online registers and through these online registers, people can actually buy these currencies and mine the currencies and use them as instrument of exchange. There are about 9-10 crypto currencies in the world right now. Since it is computer coded and secure, the dangers of computer currencies credibility being undermined is little. At the same time, it doesn't come out in open about who has transacted what.

Right now, there are 16 million currencies in operation. But it has the capacity of mining 21 million currencies. Each currency has a value and currently, each bitcoin is around 15000 dollars. The current valuation of bitcoin is around 250 billion dollars which makes it world's 6th largest currency in world. Nobody knows who created it. But a large number of people are using it as currency as well as current asset. The advantage- if one wants to make transaction through Crypto currency, it wont be easily clear through what transaction it was used. There is no central bank controlling it. Even though its is like a fiat currency, as it is not government's legal tender, it doesn't have supervision of a central bank or central government in any part of the world. Thus, there is attraction towards Crypto currency.

1.1. History of Bitcoin

It is an electronic or digital currency that works on a peer-to-peer basis. This means that it is decentralised and has no central authority controlling it. Like currency notes, it can be sent from one person to another, but without a central bank or the government attempting to track it. The system depends on cryptography to control the creation of the currency. While no one authority controls the generation of the coins or tracks them, the system itself is designed in such a way that the network maintains a foolproof system of the record of every transaction as well as tracking issuance of the currency.So here is a brief history of Bitcoin and cryptocurrency in a timeline order in order to understand it in a time frame manner.

Features of Bitcoin

1. Transactions:
2. Timestamp Server
3. Proof-of-work
4. Network: How does this network work?
5. Incentive
6. Reclaiming Disk Space
7. Simplified Payment Verification.
8. Combining and Splitting Values
9. Privacy

1.2. Importance of proposed research work

Recent events on the most popular of the digital currencies – Bitcoin have risen crucial questions about the behaviour of its exchange rate with respect to other real currencies and they offer a field to study dynamics of the market which consists practically only of speculative traders with no fundamentalists as there is no fundamental value to the currency. Due to the growing market share of Bitcoin and its price volatility, there is an increasing interest among users and academicians in understanding the Bitcoin system in general and its price formation in particular. This paper attempts to shed light on drivers that determine Bitcoin price. The importance of this thesis work is also for the traders and brokers who trade in Bitcoin on Bitcoin exchanges so that if the price movement is above certain threshold, Bitcoin can be bought and if price movement is below certain threshold, Bitcoin can be sold thereafter getting higher ROI. In brief, this thesis work is to provide a tool to automatically identify patterns from the historical data to predict Bitcoin price, and thereafter trade accordingly who wish to.

1.3 Objectives

Which determinants or variables are responsible for influencing the price of the Bitcoin and developing a pricing model for predicting the price of Bitcoin.

1.4 Methods/Research Methodology The data for the analysis in this thesis comes from sources: CoinDesk

BitCoin Price Index (CBPI), Google Trends, Wiki Trends, Blockchain info. The reason for using only these sources is to have a study in micro sense about this relatively new concept. Since digital currencies are a new phenomenon in many cases, the information that currently exists is very fragmented or much focused on one specific aspect of the concept.

The time series closing price data for the Bitcoin currency will be taken from the CBPI from 10.04.2011 to 30.09.2020 because the previous dates before 10.04.2011 have very high illiquid market. Therefore, very highly illiquid market is separated from liquid market for developing Bitcoin pricing model. The weekly data related to Bitcoin search via Google Trends & Wiki Trends in terms of “Interest over Time & Attention” will be obtained of the same time period as of the price data from CBPI. As such observations of weekly data from Google Trends and daily data from Wiki Trends will be obtained. Additional data will also be taken of variables such as Total Bitcoins in Circulation, Market Capitalization, Number of Unique Bitcoin Addresses Used, Estimated Transaction Volume, USD Exchange Trade Volume, Cost per Transaction, Hash Rate, etc. from Blockchain info.

1.5 Data Analysis

The variable used in the analysis is the price influence of bitcoin (annual %) that span from 2014 to 2017. The source of data is the Internet. The ARIMA approach is an iterative four-stage process of stationary, identification, estimation and testing.

Table 1: ADF and Phillip-Perron's Test

	Level		First Differences	
	C	C,T	C	C,T
ADF	-2.773(3)	-2.757(3)	-5.968(0)***	-5.889(0)***
PP	-2.452[3]	-2.394[2]	-5.970[1]***	-5.889[1]***

Note:

1. Lag length in ( ) and Newey-West value using Bartlett kernel in [ ]
2. Asterisks (***) denote statistically significant at 1% significance levels.

The results of Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test on real price influence of bitcoin rate series are representing on Table 1.

The results in table 1 indicate that real price influence of bitcoin rate is stationary in first differences. Therefore for our model ARIMA (p,d,q) we will have the value d=1.

Table 2: Comparison of Models within the Range of Exploration Using AIC and SIC

p	*QAIC*	*SIC*
0	*14.92*	*4.96*
0	*24.90*	*4.99*
1	*04.94*	*4.98*
1	***14.88***	***4.95***
1	*24.97*	*5.11*

The results from table 2 indicate that according to the criteria of Akaike (AIC), and Schwartz (SIC) the model ARMA is formulated to ARMA(1,1). As the model is stationary on first differences, i.e. (d=1) our ARIMA model will be ARIMA (1,1,1).

2. Estimation of the Model

Thereafter we can proceed to price influence estimating the above model.
The following table 3 presents the results of this model.

Table 3: Estimation Model ARIMA (1,1,1)

Dependent Variable :DGPD Method :
Least Squares Date : 09/11/2019
Sample (adjusted) : 2014-2017
Included observations : 33 after adjustments Convergence
achieved after 43 iterations MA Backcast: 2014

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR (1)	**0.683122**	**0.131445**	**5.197015**	**0.0000**
MA (1)	**- 0.951456**	**0.038664**	**-24.60813**	**0.0000**

R-squared	0.119603	Mean dependent var	0.072727
Adjusted R-squared	0.119603	S.D. dependent var	2.832322
S.E. of regression	2.700076	Akaike info criterion	4.883128
Sum squared resid	226.0026	Schwarz criterion	4.973826
Log likelihood	-78.57162	Hannan-Quinn criter.	4.913645
Durbin-Watsonstat	1.849581		
Inverted AR Root		**.68**	
Inverted MA Root		**.95**	

The results in table 3 indicate that both coefficients are statistically significant at 1% level of significance. The non-linear techniques used by Eviews 8.1 involved an iterative process that is converged after 43 iterations. The roots are 0.68 and 0.95, both inside the unit circle indicating stationarity and invertibility respectively. The chosen model as summarized in Table 3 is ARIMA(1,1,1) and is given by

Table 4: The Real Price influence (PI) Rate Forecasts

Years	*Residuals*	*PI_1*	*PI_2*
2014	*-0.618*	*2.30*	*-6.60*
2015	*1.140*	*3.30*	*-3.30*
2016	*2.930*	*4.10*	*0.80*
2017	-----	*0.76*	*1.56*

3. Conclusion

In this chapter, using EViews 8.1. Box – Jenkins technique, we are trying to forecast the Price influence (PI) rate of Bitcoin with an ARIMA model. After checking for the stationarity of the data series, we find the appropriate ARIMA (p, d, q) process. The corresponding correlogram helped in choosing the appropriate p and q for the data series. An ARIMA(1,1,1) model was created through the data used and estimating this model we found that the real PI rate for the years 2014, 2015, 2016 and 2017 is forecast to be 1.56%, and 3.12% respectively.

Results of the study will be helpful for the policy makers to formulate effective policies for attracting direct investment. Furthermore, the findings of the study will also help the managerial business executives for implementing the new project ideas or taking decisions concerned with the expansion of the existing business.

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