MODELING OF THE BITCOIN CURRENCY WITH THE USE OF THE HETEROSKEDASTICITY CONDITIONAL AUTOREGRESSIVE MODEL

Aissa **BEDROUNI**[*]
M'hamed **BEN ELBAR**[**]
Hamza **GHARBI**[***]

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Corresponding authors: hamza.gharbi@univ-msila.dz

ABSTRACT

The purpose of this article has been the Bitcoin rates modeling, as the most important digital currency, by depending on 1932 daily observations. As a result , the Bitcoin rates follow the ARIMA(1,1,2) model while the residuals pursue GARCH(1.1) model . In the second semester of 2017, a structural change was noticed, at that moment, the Bitcoin has reached the highest level, and overcame the rate of 16560 Euro.

The Bitcoin leap is due to several factors, the most important ones are that it has been accredited as a legal currency by many great world governments , benefits of the tax exemption for its users , has been considered as an entertainment tool , and a short term hedging tool as many researchers have declared .

KEY WORDS

Digital currency, Bitcoin, standard modeling, structural change, hedging tool.

GEL CLASSIFICATION : G17, L63, C22.

[*] University of Mohamed Boudiaf, Msila, Algeria, aissa.bedrouni@univ-msila.dz
[**] University of Mohamed Boudiaf, Msila, Algeria, m'hamed.benelbar@univ-msila.dz
[***] University of Mohamed Boudiaf, Msila, Algeria, hamza.gharbi@univ-msila.dz

نمذجة عملة البيتكوين باستخدام نموذج الانحدار الذاتي المشروط بعدم ثبات التباين

ملخص

يهدف هذا المقال إلى نمذجة قيم البيتكوين كأهم عملة رقمية من خلال 1932 مشاهدة يومية، وقد تم التوصل إلى أن قيم البيتكوين تتبع نموذج ARIMA(1,1,2) بينما تتبع البواقي نموذج GARCH(1,1)، إضافة إلى رصد تغير هيكلي في السلسلة في السداسي الثاني من سنة 2017، فقد بلغ في تلك الفترة البيتكوين رقما قياسيا، حيث تجاوز البيتكوين الواحد مبلغ 16590 أورو.

ترجع طفرة البيتكوين إلى عدة عوامل، أهمها قبولها لدى العديد من الدول الكبرى كعملة قانونية، وإعفاء حاملها من الضرائب، إضافة إلى اعتبارها كوسيلة رفاهية، خاصة وما تتمتع به من مزايا، كما أكد العديد من الباحثين أنها أداة تحوط قصيرة الأجل.

كلمات مفتاحية:

عملة رقمية، بيتكوين، نمذجة قياسية، تغير هيكلي، أداة تحوط.

تصنيف جال: C22، L63، G17.

MODELISATION DE PIECES BITCOIN UTILISANT LE MODELE AUTOREGRESSIF HETEROSCEDASTICITE CONDITIONNELLE

RÉSUMÉ

Cet article vise à modéliser les valeurs de bitcoin comme la monnaie numérique la plus importante à travers les vues quotidiennes de 1932. Il a été constaté que les valeurs de bitcoin suivent le modèle ARIMA (1,1,2) tandis que les autres suivent le modèle GARCH(1,1), en plus de surveiller les changements structurels dans la série au deuxième semestre 2017, au cours de cette période, le bitcoin a atteint un record, dépassant 16590 euros.

Le boom du bitcoin est dû à plusieurs facteurs, dont le plus important est son acceptation dans de nombreux grands pays comme monnaie légale, l'exonération fiscale de son détenteur, en plus d'être considérée comme une méthode de luxe, en particulier avec ses avantages, car de nombreux chercheurs ont souligné qu'il s'agissait d'un outil de couverture à court terme.

MOTS CLÉS:

Pièce numérique, bitcoin, modélisation standard, Structural change, A hedgetool.

JEL CLASSIFICATION : G17, L63, C22.

INTRODUCTION

During the second decade of the third millennium, the world has witnessed a giant leap of the electronic dealing. Simultaneously, digital currencies; cryptocurrencies; have emerged, there were, in April of 2020, more than 2900 currencies. Their market value has reached 246.6 billion U.S Dollar. Despite of the Central Bank inexistence, of the physical opposite absence, of the only dealing on internet without intermediate, this type of currencies relies fundamentally on the coding.

One of the most crucial digital currencies, that has attracted the attention of investors, is the Bitcoin. In 2009, it appeared, nowadays, is the first, the most spread, and the most famous cryptocurrency. As its source is unknown, its transition requires only the Wallet Number knowing of the receiver. This operation is saved in the mass chain with a special serial number that doesn't contain any personal data neither of the sender, nor of the receiver.

The Bitcoin rates increased in 2007, no one had expected that one Bitcoin would exceed the rate of 10000 Euro, in July of 2018, its market capitalization overcame 110 billion Euro.

Because of the currency increasing, and its rate vacillation, this article is to treat the coming problematic:

Is it possible to model of the Bitcoin currency with the use of Heteroskedasticity Conditional Autoregressive model ?

The secondary questions are:

1. How able is the Autoregressive Conditional of Heteroscedasticity errors pattern to model the Bitcoin values?
2. According to the Bitcoin values used model, howharmonised are the real values and the predictable values?
3. What are the factors those led to the Bitcoin values leap?

The research hypotheses

1. Autoregressive Conditional model of Heteroscedasticityis able to model the Bitcoin values and to observe the structural changes, in

taking in consideration that the Bitcoin values are a financial time series .

2. Because of the currency vacillation, there is not any harmony between the real values, and the predicted values.
3. There are many factors those lead to the Bitcoin rates inceasing, one of them is the investors desire to preserve their privacy, actually this is what Bitcoin provides.

The article aimsare, as following:

1. In general, the determination of the crypto currencies concept, precisely, the Bitcoin notion.
2. The begining, and the growth of this currency presentation.
3. Checking the possibility of depending on Autoregressive Conditional of Heteroscedasticity to model the Bitcoin values.
4. Measuring how, according to the used model of the Bitcoin values, the real values and the predicted values are harmonised.
5. Determining the influencer factors on the Bitcoinleap.

Throughout a series of Bitcoin daily values from January 1st 2015 till April 15th 2020, the study problematic, and the secondary questions are answered, the hypotheses are verified as well. These two operations are done on dividing the article on three axes, the fisrt one is, the empirical, about the precedent studies presentation and critics, the second axe is for the measuring modeling of Bitcoin values, and the third axe content is about the results description and analysis.

1- THE FIRST AXE (THE EMPIRICAL)

Its content is the precedent studies of this current topic, the definition, the beginning, and the growth of Bitcoin.

1.1- The precedent studies

In 2012, the first scientific research, about the Bitcoin issue, was established. More than 1100 researches of the same issue, in 2019, indexed on Web of Science. This topic has been important, in spite of its modernity, by the researchers and the authors. (Merediz-Solà & Bariviera, 2019, p. 294), the Bitcoin prices and values in the market,

and its risks, have been the main concern of those studies .By the GARACH models use, for modeling the cryptocurrencies volitions, Fakhefekh and Jeribi approved that the cryptocurrencies, Bitcoin among them, have changed somehow effectively through TGARCH with the double exponential distribution. thetendency of investing in the cryptocurrencies markets, is due to that thevolition of, in increasing, the positive shocks response is higher than the negative one. (Fakhfekh & Jeribi, 2020, p. 8).

Is it a tool of investment, or of speculation? That was the question of Baek and Elbeck 2015 about the Bitcoin. It was approved that Bitcoin has been a big tool of speculation, in depending on the daily income of the Bitcoin indicator. In 2017, Blau said the opposite, his study of five years approved that there is not any relation between the positive and negative of the Bitcoin values, and the speculation.

In 2018, Conte et al. Conte et alstudied the economic importance of Bitcoin publishing campaigns, and the beginning of dealing in Bitcoin by anonymous users with several and different pseudonyms. Thus, it has led hackers to exploit searches in the publishing operations by using programs those encrypt files. They request ransoms for the files decryption, and these ransoms operations are economically explained.

Bitcoin has remained an unreal currency, and cannot be in the place of paper money because of its inability of functioning the fundamental functions of money. The absence of a legal and regulatory cover for its structure, design and trading mechanism, is considerbaly another reason of being unable to replace the habitual money. Study on the challenges of virtual cash, Al-Rais 2019 The risks of that currency make it a speculative and betting tool as Al-Raisconfirmed. Bitcoin is about to be a financial bubble, and far away of new money, This saying is dependent on different reasons as following:

1. The use in illegal transactions,
2. Its consumption of electricity,
3. The price fluctuations,
4. Thefts those it is exposed to, (Marzouk, 2019, p. 73).

Naas and Ben Sania, in their study 2020, tried to define the relationship between bitcoin and investor sentiment, were based on monthly data during the 2012-2019 period, in using the GARCH model. They concluded that there is a significant impact on investor sentiment in predicting bitcoin price changes. (Naas and Ben Sania, 2020, p. 112).

There are three types of the previous studies:

1. Studies, those have dealt with the function of bitcoin as an investment tool or a risk tool,
2. Knowing that it is not trackable, some studies have treated bitcoin as a ransom tool.
3. The third one have seen this currency from the angle of the possibility of being a real cash currency or being just a financial bubble.

We can remark from these types that they did not research the reason of the significant rise of the Bitcoin currency. For instance, in 2009, one Bitcoin was equal to 0.001 USD, the surprising rise was on December 11, 2017, one Bitcoin reached the rate of 19,400 USD.

The importance of this article, in accordance to the results of the previous studies, is dependent on the surge in bitcoin values. In our article, the appropriate model for bitcoin values, is identified, and not like the other studies, the most important reasons, those have led this cryptocurrency to a significant rise, are present.

1.2- The Bitcoin currency definition

The definition of any Virtual currency is a digital representation of a value that can electronically be stored, transferred, or traded. This currency is neither issued by the central bank nor any public authority, there is not any link between this currency and the fiduciary currency, which gets its power from the people's acceptance of it as a means of payment (Zaidan, 2018, page 34). The Virtual currencies European Banking Commission defines the virtual currency, as digital representations of value that are neither issued by public authorities nor a central bank. It is accepted by ordinary, and legal persons as a means

of payment because of its ability to be stored, transferred and traded electronically (International Monetary Fund, 2016).

Bitcoin is a virtual currency of a global payment system, which is in comparison to the other currencies, such as the dollar, and the euro. Its transactions are conducted in a peer-to-peer network between users without an intermediary through the use of encryption. An unknown person (possibly a group of people) called Satoshi Nakamoto was the inventer of Bitcoin. It was released as an open source software in 2009. The Bitcoin first appearance was in January 2009, one euro was equal to 1309.3 bitcoins.

1.3- The Bitcoin emergence and growth:

The cryptocurrencies development and emergence, Bitcoin among them, can be introduced in some details, as follows: (Numbers, 2017).

In 1977, at the Massachusetts Institute of Technology, Leonard Adleman, Shamir Ade and Rivstronad invented the RSA algorithm, which is a pivotal point in the history of cryptocurrencies, because of its ability to make investors receive revenue;

In 1993, mathematician David Chum invented ecash, an electronic money based on cryptographic protocols, to be served as an innovative digital currency that is currently in existence;

In 1997, he established a company DigiCash to run echash, but the company bankrupted, for the reason of the lack of a sufficient number of merchants accepting this currency;

In 1996, E-gold was launched, by Douglas Jackson, to be served as an international private currency that trades independently away from government controls, the user had to open an account on the company's E-gold website.

In 1997, Buck Adam invented the Hashcash system to reduce spam emails which have become very common in cryptocurrencies, and were part of a new coin mining algorithm;

In 1998, the publication of a blueprint for b-money on an online mailing list, with the aim of enabling post-tax electronic economies, helped Nakamoto create Bitcoin. It was considerably the foundation for cryptocurrencies, that was laid by Weday;

In 1999, PayPal was established in this year. This site enabled users to transfer money via the Internet. After five years, in2004, the revenues reached 1.4 billion US dollars, and the biggest achievement of this site was that it brought convenience to users towards the idea of transferring money via the Internet;

In 2003, Thor was released by the following inventers Paul Severson, Roger Dingelden and Nick Mathewson. It is a program that provides privacy by allowing users to hide their identities, in order to ensure that they are not tracked while doing crypto currency transactions and using a TP address;

In 2004, Hal Finney, a programmer, unveiled the reusable PROW protocol that is an economic measure to deter denial of service attacks and other breaches of services such as spam on a network. It has been seen as a precursor to the emergence of cryptocurrencies;

In 2005, the number of E-gold accounts increased to 3.5 million accounts in over 165 countries, many fraudsters entered this system to launder money, which prompted the US Federal Investigation to arrest Jackson and charge him with money laundering, this event hindered the operations of E-gold;

Exactly in October of the year 2008, Nakamoto published a research paper that included the business and objectives of the Bitcoin currency, which caused a concern between governments, because of the transferring money method that is done without the need for a financial institution, and outside the control of national and international authorities. In that year, he created the Block Chain, which represents a record of transactions in the virtual currency, and allows a secure exchange of valuable materials such as money, stocks, etc., without the need of an intermediary or a central registry system to follow the exchange movement;

On January 3rd 2009, fifty Bitcoins were mined, just days after the first coin deal between Nakamoto and Hal Finney.

Exactly in February 2010, the first real global transaction with Bitcoin was made, when 10,000 Bitcoins were paid for pizza on the bitcoin forum.

In 2011, exactly on the February 09th, the value of the Bitcoin currency jumped, to be equal, for the first time, to the dollar on the MTGOX exchange. In trading of the virtual currencies, it continued to rise with the passage of months. In the same year, many programmers, after the success of Bitcoin, introduced many cryptocurrencies, one of them; Name Coin which was revealed in April 2011, and created by Vincent Durham. Its developers added a DNS system that was not in Bitcoin, and allows users to storing their personal information in a more secure manner.

In 2012, the Ripple currency was issued, has worked as a digital currency, for an electronic network of the financial transactions. This network has accepted all cryptocurrencies, and the traditional ones.

Peercoin was also issued, that has differed from other cryptocurrencies in being the first coin to use the common protocol, as a result of its emergence, more coins were mined without consuming a large amount of electricity.

Exactly in March 2013, many Bitcoins in circulation, reached 11 million units, and the value of one unit reached 92 dollars, which led the total value of bitcoin to overcome one billion dollar. In addition to that, the first bitcoin ATM was opened, in October, in Vancouver. This opening made the convertion of Bitcoins to traditional currencies possible. Also in the same year, the University of Nicosia accepted the idea of thetuition fees payment in Bitcoin.

In January 2014, Overstock became the first online retail site in the United States of America to accept payments in Bitcoin, and in the same year, months later, the site has started accepting other cryptocurrencies around the world. In the same year, the MTGOX exchange was hacked, that was a reason to close the site for several days. Consquenthly, the market witnessed a loss of 8.75 million USD, and the company lost about 400 million USD, that led to its bankruptcy.

Rosivitalik Potrine, a programmer, created the Ethereum platform, and currency. They do not just form a system of encrypted payment, compose a platform to safely issue intelligent contracts. As a platform, they have realized a huge success, its market value, after two years, overcame 28 billion USD.

At mid-September 2017, one golden ounce reached 1331.60 USD whereas one Bitcoin was equal to 3363.42 USD . At that time, LedjerX became the first platform to exchange cryptocurrencies, that got the American delayed merchandise committee approval for working as a stock market of cryptocurrencies contracts.

In September 2017, Russia banned the cryptocurrencies deals, and imposed harsh sanctions – emprisonment period of seven years - on the persons who do not obey. After short time, a desire to make the cryptocurrencies deals legal, was declared by the Russian government. The legislaty of these treatments, was finally applied in 2020.

As a result of this growth journey, the Bitcoin stock capitalization overcame 113.8 billion USD in July 2018. Its international market part jumped from 56.04% in January 2019 to 69.85% in January 2020. The Bitcoin pockets users, over the world, became more than 44.7 millions on September 31st. (Statistica, 2020).

The Bitcoin has been exposed to many criticisms despite of its spread, and high value. Being unknown user – as a feature of this currency – is the base of any deal, this fact provides an opportunity to the non-governmental and criminal organizations for creating an uncontrolled international source of finance. On the other side, there are some opinions confirm that this currency is a flexible means of data storing , and safely and permanently provides electronic services. Another encourging option of this currency is the investors freedom of storing their money away from the governments eye.

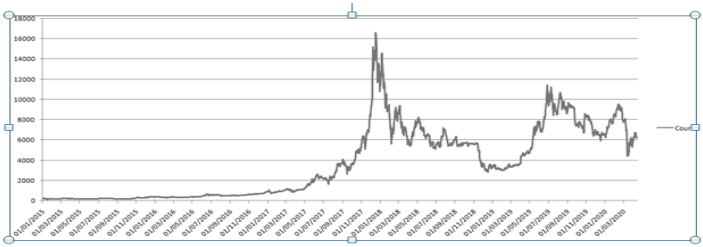
2- THE SECOND AXE

The Bitcoin chain modeling, and the statistical analysis:

Throughout the daily values of Bitcoin, in euro, from 2015 to 2020, we get the model of the Bitcoin chain .

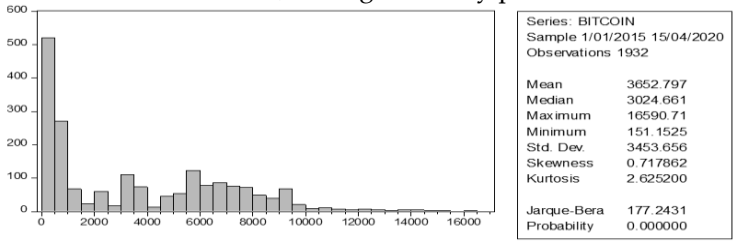
2.1- the descriptive analysis and the natural distribution:

After the data processing, 1932 remarks were obtained. This study diagram (n°01) of the Bitcoin values from January 1st to April 15th, 2015.



Source: Excel data processing

The following study diagram includes the descriptive, statically features of the Bitcoin chain, during the study period.

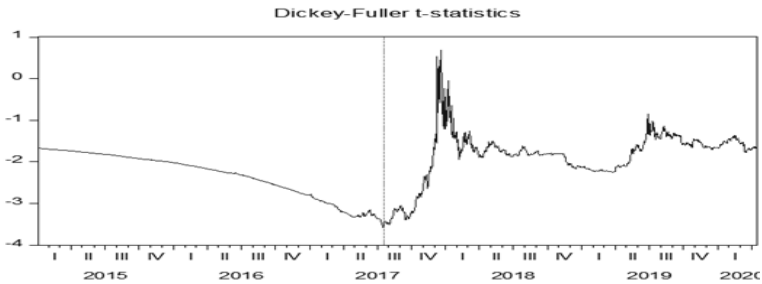


Source : the statistically processing of Eviews.V10 program .

Depending on the diagram, the smallest value of the Bitcoin chain is 151.15 euro on the January 14th 2015 whereas the biggest one is 16590.71 euro on December 16th 2017. Skew modulus rate is 0.717862 that is positive, and indicates that the errors distribution has a long tail to the right (Positive Skew).

Jarque-Bera statistics are (177.2431), this rate indicates that the chain has wide parts and is Flat and scattered, and the Bitcoin chain does not follow the natural distribution at level of (05%).

The structural changes of Bitcoin chain during the study period.



Source: the statistically processing of Eviews.V10 program.

Depending on the 3rddiagram, the time series of that period knew structural changes in the second semester of 2017. The rise of Bitcoin values is the reflection of these changes, in this semester, exactly.

In the second semester of 2017, the Bitcoin values highly raised to the growth average 25.58%, on December 7th, the second high average was 22.86%, on July 20th.

2.2- The Bitcoin stability chain test

UNIT ROOT TEST RESULTS TABLE (PP) Null Hypothesis: the variable has a unit root		
AtLevel		
		BITCOIN
With Constant	t-Statistic	-1.6870
	Prob.	0.4378
		n0
With Constant & Trend	t-Statistic	-2.6626
	Prob.	0.2525
		n0
Without Constant & Trend	t-Statistic	-0.7667
	Prob.	0.3843
		n0
At First Difference		
		d(BITCOIN)
With Constant	t-Statistic	-42.9385
	Prob.	0.0000
		***
With Constant & Trend	t-Statistic	-42.9278
	Prob.	0.0000
		***
Without Constant & Trend	t-Statistic	-42.9442
	Prob.	0.0001
		***
UNIT ROOT TEST RESULTS TABLE (ADF) Null Hypothesis: the variable has a unit root		

	AtLevel	BITCOIN
With Constant	t-Statistic	-1.6666
	Prob.	0.4482
		n0
With Constant & Trend	t-Statistic	-2.6057
	Prob.	0.2778
		n0
Without Constant & Trend	t-Statistic	-0.7513
	Prob.	0.3911
		n0
	At First Difference	d(BITCOIN)
With Constant	t-Statistic	-42.9255
	Prob.	0.0000
		***
With Constant & Trend	t-Statistic	-42.9147
	Prob.	0.0000
		***
Without Constant & Trend	t-Statistic	-42.9303
	Prob.	0.0001
		***

Notes:
a: (*)Significant at the 10%; (**)Significant at the 5%; (***) Significant at the 1% and (no) Not b: Lag Length based on SIC Significant c: Probability based on MacKinnon (1996) one-sided

Source :the statistically processing of Eviews.V10 program .Chart 01: Unit root test.

In accordance to PP, ADF, from the Chart (01), the Bitcoin chain activity is noticeable. It stabilizes at level of (01%). In conclusion, the Bitcoin chain is, of the first degree,integrated, CI~(1).

2.3- The estimation of ARIMA model parameters:

After the confirmation of the Bitcoin chain stability, we move to the first phase of the implementation phases of Box &Jenkins methodology . Many models of ARIMA were tested , in case of getting more than one model of the statistically parameters , we choose the perfect one, that is compatible to the highest rate of Likelihood Logarithm, and to the lowest rate of the data parameters BIC & AIC.

2.3.1. The MA, and RA rank determination

The rank is automatically determined without depending on the autoregressive and partial autoregressive form. The chart (2) displays the automatic rank of the ARIMA models.

Automatic ARIMA Forecasting
Selecteddependentvariable : BITCOIN
Sample : 1/01/2015 15/04/2020
Includedobservations : 1931
Forecastlength : 0
Number of estimated ARMA models: 75
Number of non-converged estimations: 0
Selected ARMA model : (4,4) (0,0)
AIC value : 13.8840821732

We can conclude the following:

The autoregression degree is 4, AR(4).

The moving averages degree is 4, MA(4).

The integration degrees 1.

The perfect model is ARIMA(1,4,4) because of the degree of autoregression is 4, the degree of moving averages is 4, and the degree of integration is 1.

2.3.2- The parameters of the ARIMA (p, d, q) model for modeling the Bitcoinchain:

The significant test results of the estimated model parameters, which is ARIMA(4,1,4) , are found on the chart (03).

DependentVariable : BITCOIN
Method: ARMA Maximum Likelihood (OPG - BHHH)
Includedobservations : 1931
Convergence achievedafter 108 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.168216	6.077918	0.521267	0.6022
AR(1)	-0.589859	0.018165	-32.47162	0.0000
AR(2)	0.243925	0.018393	13.26147	0.0000
AR(3)	-0.579085	0.016665	-34.74950	0.0000
AR(4)	-0.856194	0.019494	-43.92033	0.0000
MA(1)	0.608482	0.015527	39.18928	0.0000
MA(2)	-0.273598	0.014752	-18.54703	0.0000
MA(3)	0.621862	0.013145	47.30821	0.0000
MA(4)	0.931140	0.016078	57.91294	0.0000
SIGMASQ	61935.39	591.8745	104.6428	0.0000
R-squared	0.026168	Meandependent var		3.107383
Adjusted R-squared	0.021606	S.D. dependent var		252.2551

S.E. of regression	249.5151	Akaike info criterion		13.88248
Sumsquaredresid	1.20E+08	Schwarz criterion		13.91130
Log likelihood	-13393.53	Hannan-Quinn criter.		13.89308
F-statistic	5.735577	Durbin-Watson stat		1.982370
Prob (F-statistic)	0.000000			
Inverted AR Roots	.59+.77i	.59-.77i	-.89+.36i	-.89-.36i
Inverted MA Roots	.61+.78i	.61-.78i	-.91+.35i	-.91-.35i

Depending on the chart (03), it is noticeable that the estimated model parameters are all statistically significant at the level of significance of 1%, and the Durbin-Watson test corresponding value equals 1.98, that is very close to the value 2.This means that the ARIMA(4,1,4) model residuals do not have a stochastic error boundary autocorrelation problem.

2.3.3. Heteroskedasticity test of the estimated model ARIMA(4,1,4) residues:

The chart (04) displays the Heteroskedasticity test of the estimated model ARIMA(4,1,4) residues

HeteroskedasticityTest : ARCH				
F-statistic	214.1614	Prob. F(1,1928)		0.0000
Obs*R-squared	192.9507	Prob. Chi-Square(1)		0.0000
Test Equation :				
DependentVariable : RESID^2				
Method : Least Squares				
Includedobservations : 1930 afterajustements				
Variable	CoefficientStd. Error		t-Statistic	Prob.
C	42375.44	7531.393	5.626507	0.0000
RESID^2(-1)	0.316187	0.021606	14.63426	0.0000
R-squared	0.099974	Meandependent var		61967.48
Adjusted R-squared	0.099508	S.D. dependent var		343116.5
S.E. of regression	325598.0	Akaike info criterion		28.22575
Sumsquaredresid	2.04E+14	Schwarz criterion		28.23152
Log likelihood	-27235.85	Hannan-Quinn criter.		28.22787
F-statistic	214.1614	Durbin-Watson stat		2.068316
Prob (F-statistic)	0.000000			

It is noticeable that the probability rate is (0.000) lesser than 0.01. ARCH influence is seen, in other words, there is Heteroscedasticity in the residues of the estimated model, during the study period.

2.4- The GARCH model parameters estimation, and Heteroscedasticity test of residues

2.4.1 The GARCH model parameters estimation

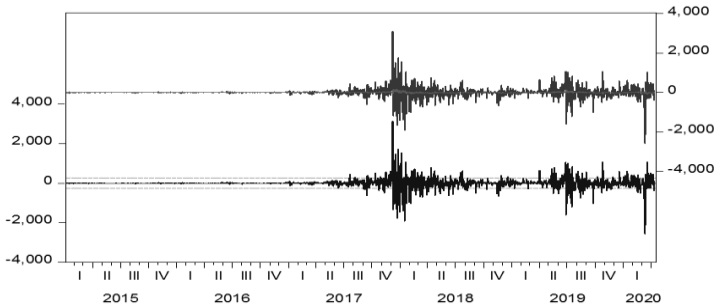
After the reveal of Heteroskedasticity, the significance of the model*ARIMA(1,1,2), and GARCH(1,1)* parameters test is done.

Dependent Variable: BITCOIN
Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)
Included observations: 1930 after adjustments
Convergence achieved after 109 iterations
Coefficient covariance computed using outer product of gradients
MA Backcast: 1/01/2015 1/02/2015
Presample variance: backcast (parameter = 0.7)
GARCH = C(5) + C(6)*RESID(-1)^2 + C(7)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	1.361620	0.723977	1.880750	0.0600
AR(1)	0.990853	0.007126	139.0522	0.0000
MA(1)	-1.034466	0.021402	-48.33568	0.0000
MA(2)	0.054485	0.020568	2.648953	0.0081
	Variance Equation			
C	1.227399	0.794938	1.544017	0.1226
RESID(-1)^2	0.295692	0.093990	3.146002	0.0017
GARCH(-1)	0.873413	0.012354	70.69868	0.0000
T-DIST. DOF	2.426639	0.168552	14.39700	0.0000
R-squared	-0.008370	Mean dependent var		3.107678
Adjusted R-squared	-0.009940	S.D. dependent var		252.3205
S.E. of regression	253.5715	Akaike info criterion		10.80685
Sum squared resid	1.24E+08	Schwarz criterion		10.82992
Log likelihood	-10420.61	Hannan-Quinn criter.		10.81534
Durbin-Watson stat	1.862579			
Inverted AR Roots	.99			
Inverted MA Roots	.98	.06		

It is remarkable from the chart n°. (04) that there is no autocorrelation in the residuals of the estimated model. Therefore, this model is the most convenient and compatible with the standards in all models. The result is due to that all the mean and variance equations parameters are significant at the level of significance of 1%, and the value of the Durbin-Watson test equals 1.86, which is close to the value 2.

2.4.2. Heteroskedasticity test of the estimated model residues



After testing the estimated model, and making sure that it is GARCH (1,1)-ARIMA (1,1,2), the residuals Heteroscedasticity of this model will be tested.

Figure (4) shows the series of residuals for the estimated model.

Chart No. (4) displays the residuals estimated model GARCH(1,1)-ARIMA(1,1,2), and confirms that because of the high volatility of financial chains in general, this model is appropriate to capture the volatility trend of Bitcoin values.

For the ARCH-LM test, Chart No. (06) shows that the probability of the statistic (Prob. Chi-Square = 0.7669) is bigger than (5%) that leads to accept the alternative hypothesis saying that the variance is not stable, which indicates that the optimal model does not suffers from the problem Heteroscedasticity, which is a good and desirable characteristic of the model. In consequence, the behavior of the volatility of the Bitcoin currency, which witnessed a significant increase in a short period (until the end of 2017), and then witnessed some fluctuations between the rise and fall in its values, is well described by the estimated model GARCH(1,1)-ARIMA(1,1,2).

Heteroskedasticity Test: ARCH			
F-statistic	0.087786	Prob. F(1,1927)	0.7670
Obs*R-squared	0.087873	Prob. Chi-Square(1)	0.7669
Test Equation:			
Dependent Variable: WGT_RESID^2			
Method: Least Squares			
Included observations: 1929 afteradjustments			

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.673360	0.082636	8.148541	0.0000
WGT_RESID^2(-1)	0.006749	0.022779	0.296287	0.7670
R-squared	0.000046	Meandependent var		0.677942
Adjusted R-squared	-0.000473	S.D. dependent var		3.564418
S.E. of regression	3.565262	Akaike info criterion		5.381388
Sumsquaredresid	24494.27	Schwarz criterion		5.387158
Log likelihood	-5188.349	Hannan-Quinn criter.		5.383510
F-statistic	0.087786	Durbin-Watson stat		1.999769
Prob(F-statistic)	0.767043			

3- THE RESULTS DESCRIPTION AND ANALYSIS

In this axis of our article, there is, in the begining, the findings presentation, then the results analysis.

3.1- Description of the results

Because of its market share of cryptocurrencies, is nearly 70%, at the beginning of 2020, and its stock market capitalization is 113.8 billion US dollars, in July 2018. Its first public emergence was in January 2009, at that time one dollar was equal to 1903.03 Bitcoin. For those facts, the currency Bitcoin is considerably the most important cryptocurrency. That importance was the reason to conduct a standard study on the values of bitcoin denominated in euros, through daily data from January 01st, 2015 to April 15th, 2020, and 1932 observations were gathered.

The most important results of this study are, as following:

The Bitcoin chain does not follow the normal distribution; as the results of the Jarque-Bera test showed at a significant level (5%), The descriptive statistics results found that there is a positive skew in the Bitcoin chain, and that the distribution is skewed towards the right.

The instability of the daily Bitcoin chain at the level, and its stability after taking the first difference to it, the unit root tests resulted.

Following the context of the random walk and the market is efficient at the weak level; there is the stability of the daily Bitcoin chain at the first difference, accordingly to results of the unit root tests.

The rank of autoregressive and moving averages that give the lowest value of the (AIC) criterion is at the rank (4,1,4), i.e. ARMA(4,1,4);

The results conclusion of the initial tests Ljung-Box and ARCH-LM is that the variations of the daily chain errors in Bitcoin, and the validity of applying the GARCH methodology to them are not stable.

After the comparison of several models, the study resulted that the daily Bitcoin series was represented by the ARIMA(1,1,2) model, and the residuals of the model are represented by the GARCH(1,1) model, which is one of the famous models in financial time series.

3.2- The results analysis

The cryptocurrency Bitcoin is considerably a technological transformation in the financial trading, in overcoming the traditional financial and monetary systems in the world. There are not any central bank or government can make it submitted to interest rates, or influence it, to exceed the global currencies (dollar and euro) and gold.

Because of different, and several factors; the most prominent of them is the official adoption of Bitcoin by many countries. In the second mid of 2017, Bitcoin knew a huge boom, by reaching record numbers of more than 15,000 euros per Bitcoin.

The traditional currencies exchange for the virtual currency units is exempt from value-added tax. Bitcoin is a currency and not a commodity, and should not be taxed, that it should be treated as a means of payment. These were the decisions of the Court of Justice of the European Union, in October 2015.

On July 01st, 2017. Australia officially confirmed that it will treat Bitcoin just like money, and that it will not be submitted to double taxes. In Canada, Bitcoin was considered as one of the intangible assets, and a part of the personal property, with the digital currency dealers regulation to combat money laundering and the financing of criminal activities.

United States of America considered, in September 2016, after a court decision, Bitcoin as money within the ordinary meaning of it. In 2017, Mexico legalized the transaction in Bitcoin.

In 2017, Japan approved the use of Bitcoin as a legal currency for buying and selling, thus it was also adopted by some airlines to buy tickets officially, that led to a significant increase in demand. After the consideration of dealing with cryptocurrencies as a crime and was punishable by imprisonment, Russia changed its position about the Bitcoin use in 2017, and announced that it was searching for legitimating the use of cryptocurrencies.

Whereas, in contrary to the previous positions, some countries, such as China, and Saudi Arabia declared that they did not reject the Bitcoin, but they held the bearer and dealer responsible for the risks that may result from it, for instance a theft, a fraud, an illegal financing, and money laundering,. Algeria, like other countries declared the illegality of dealing with bitcoin, did not allow bitcoin to be dealt with, following to the 2018 Finance Law in Article 117 that stipulates the prohibition of buying, selling and possessing virtual currency. Actually, the number of countries those banned dealing with cryptocurrency does not exceed ten countries over the world.

In the opposite of the international policy about the Bitcoin recognition, studies approved a set of this currency benefits. Bitcoin has become a factor of well-being for investors, especially in terms of transaction fees, price, waiting time, privacy in transactions, scarcity of restrictions on them. The Coins that provide are those used in Blockchain. (Easley, O'Hara, & Basu, 2019, p. 91).

Through the GARCH model, in 2016, Dyhrberg proved that the Bitcoin currency has the ability to hedge against the stock risks, and the fluctuations of the US dollar in the short term. He also found that the Bitcoin currency is considered a store of value, in addition of being very important in the risk management, and the planning portfolio. (Dyhrberg, 2016, p. 90).

In an analysis of the hedging capacity of Bitcoin and the global uncertainty, in a study, by Bouri et al, of 14 financial markets, it was confirmed that there is a negative correlation between the Bitcoin returns and the international uncertainty, and concluded that Bitcoin acts as a cover against the global uncertainty. (Bouri, Gupta, Tiwari, &Roubaud, 2017, p. 88).

The value of Bitcoin is influenced by The investors behavior. A lot of investors make their decisions based on the behavior of other investors participating in the market. One of the main factors driving the price of this currency is the positive media coverage of Bitcoin. Media exaggeration usually affects the advantages of Bitcoin. Investors tend to demand this cryptocurrency through the technological means, and the social networking sites. It was confirmed, by Naas and Ben Sania in 2020, that there is an inverse relationship between the VIX fear index and the value of the bitcoin, and was demonstrated a positive relationship between the investor confidence index in the Eurozone and the bitcoin currency in the long term (Naas and Ben Sania, 2020, page 128).

The decline, after 2017, was a result of the split that occurred to the Bitcoin currency after the creation of a new digital currency and Bitcoin Cash, that was awarded to each owner of Bitcoin. The Bitcoin Cash program was able to excute thirty exchanges per second, that was four times the number of operations that the Bitcoin program can perform. The effectiveness of split was not as required, because of that most investors were not programmers, and did not understand the meaning of the split and its consequences , which explains the rise that happened after the decline in 2018, the understanding lack of the split got things back normal.

3.3- The hypotheses discussion

After the results presentation and analysis, the hypotheses discussion is possible. Hypotheses those were a part of the article introduction. The validity of the first hypothesis was proved, by the results, that the conditional autoregressive model with the instability of error variance can model Bitcoin values, and to monitor structural changes. This was confirmed by the values that follow the ARIM(1,1,2) model and that the remainders follow the GARCH(1,1) model.

The real values and the predictive values are compatible, is the conclusion of the standard study, which leads to the second hypothesis rejection saying that because the conditional autoregressive model of Heteroscedasticity is able to predict financial

time series that witness fluctuations and fluctuations in its return, then the real values do not correspond to the predictive values.

There are several factors that cause the values rise of Bitcoin, the most important of them is the investors desire to preserve their privacy which provided by Bitcoin. It is acceptable, because the desire of investors to preserve their privacy is an important factor in the demand of Bitcoin. At the same time, the other factors, such as its ability to hedge risks in short-term periods, and the role of the media and modern technology, as well as websites, to encourage people to deal with Bitcoin, was proven by researches. Therefore, we can say that the third hypothesis is accepted.

CONCLUSION

The importance of bitcoin as a virtual currency ; its relationship to investment or speculation, and its role in hedging against risks have been revealed by several studies. Although it is unanimously agreed that it is only a short-term hedging tool, studies have demonstrated the ability of this currency to hedge long-term against risks, and differed regarding whether Bitcoin is an investment currency or a speculative tool.

The standard study results of this article confirmed the 1932 daily observations of the value of Bitcoin in the euro, during the period January 01st, 2015 until April 15th, 2020. It was indicated that the values follow the ARIMA (1,1,2) model, meanwhile the residuals follow the GARCH (1,1) model. Because of their characteristics of volatility and volatility in values and returns, these models are well-known in the case of financial time series.

At mid of 2017, a structural change was showed by the study, that corresponded to a record for bitcoin, as its price was equal to 16590.7 euros per unit, due to several factors, such as the international acceptance of bitcoin, many countries have announced the legality of dealing with bitcoin as a currency. However, other countries have had reservations about their legality, but they have not prevented dealing with it , and holded its owner responsible for the risks that may occur

when dealing with it. The number of these countries, that have prevented dealing with Bitcoin, does not exceed ten countries.

There are other factors that have encouraged and reassured the behavior of investors to deal with Bitcoin, besides the international acceptance, one of them is being considered as a luxury method because of its advantages, after the studies confirmation of that it is a means of hedging against short-term risks.

The possibility to study some of the controls that Algeria can carry out to accept dealing with Bitcoin as a virtual, currency that imposed itself and its value, and to exploit the advantages of this currency for the benefit of Algeria. These can be prospects for research.

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