

RESEARCH ARTICLE

Bitcoin, Intrinsic Value, and Herd Effect

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The intrinsic value of a good may be related to its production costs, so its price will never be less than this. Bitcoin prices can have behaviors similar to those existing in nature. The research aims to find similar behaviors between herds in the animal world and Bitcoin prices. Besides, the study analyzes the cost of production to determine if it is the intrinsic value of this cryptocurrency. Three scenarios in Bitcoin prices in the Momentum indicator were studied. The ANOVA and Tuckey test were helpful to find if the Momentum averages are related. The Momentum Index data worked with the number of herd members of the animal kingdom. The results show that the cost of production has a high correlation with the lower prices of the cryptocurrency. There is a particular type of relationship between the Momentum indicators and the formation of specific herds.

Keywords: Intrinsic value, herd effect, a momentum indicator, cryptocurrency, production costs

JEL Classifications: G15, G41

According to Wolla (2018), the great fool's theory says that the important thing is people's willingness to pay for the asset; its intrinsic value does not matter. There is an older fool, that is, the one who ends up paying a higher price. According to Barlevy (2015), the theory of the greatest fool revolves around the speculation in which traders think they will obtain profits that come from others. The speculator does not believe that the asset has overvalued price, and of course, another is the fool.

For Credit Suisse (2010), the price growth that can generate good sales profitability at the beginning

change into purchases based on greed where emotion is dominant than reason. Buyers generate price hikes after the bullish phase is over. For Sen (1977), the variation in prices accompanied by an individual interest in an economy with decentralized characteristics can cause a consistent use of resources.

According to Eng-Tuck and John (2015), the fundamental value of Bitcoin is zero, and it is very vulnerable to bubbles, reaching up to 48.7% of the market price. For Barlevy (2015), under efficient supply conditions, how much an asset should be worth is interpreting the fundamental value.

García et al. (2014) suggested that Bitcoin has a fundamental value that has to do with mining costs to be a lower limit. As popularity gains, this cryptocurrency increases its presence in social networks, which pushes its demand to increase, causing a price increase, increasing its search again, so there is a correlation between search and price. The growth of the number of Bitcoins is linear over time and is not related to its demand having a deflationary effect. So any growth in users of this cryptocurrency is transferred directly to the price.

For Baur et al. (2017), Bitcoin lacks intrinsic value and is entirely free from government interference. Allon (2018) suggests that the intrinsic value of gold is given by nature, making it preferential to fiat money. It is necessary to grant this same value to current digital technologies.

For Vucetich et al. (2015), there is a doctrine that defends that intrinsic value is exclusive to human beings, which has the name of anthropocentrism. According to Taylor (1996), natural capital such as wild animals, being sentient have intrinsic value. Intrinsic value can be distinguished when capital has value on its own. Fabricated capital has intrinsic value, as in animals that have undergone genetic modifications or even domesticated ones.

For Soulé (1985), the prolonged evolution and the simple existence of the species give them a value that nobody has given them and that at the same time is not revocable. For Bayram (2012), rationality in human beings is one intrinsically valuable characteristic. Similarly, non-human organisms can also be made possessors of intrinsic value by the peculiarities that possess. According to Rolston (1991), within a chain of life, each life has an intrinsic value of its own

According to Lammerts van Bueren et al. (2003), the intrinsic value of animals is on their differences and autonomies without regard to the utility they have for human beings.

For Trehan and Sinha (2019), herd behavior is evidenced when the rationality of a specific scenario is abandoned to adopt the actions of a crowd. Investors think that their information is of lower quality than that of others or that others can assimilate it in a better way. According to Bikhchandani y Sharma (2001), the agreement of the market wins out over individual beliefs when it is in difficulties, and at that moment, the herds are integrated. Koenig y Dickinson (2018) assure that an animal experiences feelings of fear when being

separated from its herd, but this discomfort guarantees that it can locate it again.

This article aims to determine the existence of a possible relationship between herds' behavior in the animal world with variations in Bitcoin price. Also, the research analyzes whether production costs are the intrinsic value of this cryptocurrency. The existence of herd behavior in the Bitcoin markets could help us begin to discover the intrinsic value it is. It is the reason why the research is structured in two parts; where the first is based on the existence of a relationship between mining costs and intrinsic value in Bitcoin. Unlike the second part that addresses the effect of the herd mentality.

Literature Review

Mining costs and intrinsic value in Bitcoin

For Kirill Gourov (2020), the intrinsic value works using different means, among which is the discount made to the cash flow. In the case of cryptocurrencies—they do not generate flows and, worse, still dividends. The value of Bitcoin is transactional. A comparable analysis is not possible because there are no similar products. The research proposed the following formula to calculate the intrinsic value: $1 \text{ BTC} = \text{Total Expenditure} / \text{Velocity} * \text{Active Coins}$.

For Corbet et al. (2017), Bitcoin experienced a bubble when it broke the US\$ 1,000 USD barrier. According to CoinGeko (2019), the price of Bitcoin on September 4, 2019, was US\$ 10,521. It is essential to mention that for Kondor et al. (2013), Bitcoin was an experiment, along with public attention, that began to work as a currency.

García et al. (2014) argued that public attention is the cause of the increase in Bitcoin price in another scenario; its value was low. According to Dilek and Furuncu (2018), in China, low production prices explain the growth of mining.

According to Moberg (2018), an asset gets an overvaluation if its fair price is the highest in the market. This fair price is calculated with future flows. The problem is that it is not possible to calculate these flows for Bitcoin.

According to Bendiksen and Gibbons (2019), most Bitcoin mining is in China, with 60% of the world total. In Sichuan, the hash rate produced is 50%; 35% are in Iran, Iceland, Quebec, New York,

Labrador, Washington, Sweden, Georgia, Norway, Newfoundland, Alberta, and British Columbia.

For O'Dwyer and Malone (2014), Bitcoin's value is decided by those who trade with it because it lacks some intrinsic value. The costs of mining a Bitcoin in China is:

China	US\$3,172
United States	US\$4,758

Source: *elitfixtures* (2019)

The Herd Mentality Effect

Herds

For Stobbs (1978), within a herd, the leader is the one who has the possibility of grazing first so that the herd consumes the grass that is left over. According to Baskin (1971), when putting masks on sheep, they begin to follow the sunlight or they move towards the heat of the same. A blind sheep could be kept in a flock guided by the smell. The area that the herd has trampled on is where the sheep stay overnight.

According to Werner and Dyer (1993), individuals feel safe in the pack; the possibility of being prey to a predator decrease. In a herd, it is not necessary to observe much time before feeding. A predator is more naturally recognized with more noses and eyes working for that. Herds often use circular defensive formations or joint attacks.

According to Werner and Dyer (1993), the predator can be confused by having several very similar objectives. When one has attacked the others, move around so that it continually changes its objective, and the prey tries to hide behind one another using the selfish grazing strategy in which an animal uses a shield, which is another animal. Security of the center of the herd will compensate for access to resources that those in the periphery have. A predator takes longer to get prey when it is in a group. The herd may begin to develop better group defense and signaling strategies.

According to Jachmann (1996), the average size of a group of elephants is 4.43. According to Morteo et al. (2004), the average dolphin group size is 11, where the most frequent number was 4 to 6 and 13 to 15. For Muller et al. (as cited in CITES, 2019), the number in a herd of giraffes was from 20 to 30 also in open areas in a number greater than 50. For Guerrero et al. (2006),

the sperm whales average 25 animals, and their groups are up to 20 and 40 individuals.

According to Defler and Rodríguez (2019), the primate known as araguato or cotudo (*Alouatta seniculus*) forms groups of six, on average. The primate known as maicero (*Oebus apella*) lives in groups of 8 to 10. The nocturnal mico or marteja (*Aotus* sp.) have groups of 2 to 5 animals; the primate tití (*Saimiri sciureus*) in groups of 15 to 20. The cusumbo Najua Niasua forms herds of 20-30. The zaíno or báquiro (*Tayassu tajacu*) is a hog, on average of 6 to 9 individuals. The otter (*Lutra longicaudis*) has herds formed by 6 to 8 individuals. The primate *Saguinus inustus* or tití diablito or hueviblancos form herds of 5 to 9 animals.

For Mech (1999), pack behavior in wolves in summer is no different from that of another social group in which there is kinship.

Momentum

Credit Suisse (2010) stated that the Momentum indicator measures whether a trend is accelerating or decelerating. The indicator is positive when the price is higher than that of five days prior. Otherwise, it is harmful and therefore is below the zero lines. The asset is overbought when the oscillator is above this line.

For Kahn (2010), the momentum indicators measure the speed of specific price movements where the speed is the slope of the trend. Markets remain in the same direction until some force affects them. If the moment is negative and crosses the zero line, prices accelerate because new buyers enter. Momentum is not a tool for decision-making but the search for opportunities.

According to Biondo et al. (2013), the momentum indicator is calculated as the subtraction between a value $I(t)$ and the value $I(t-\tau M)$, where τM is an interval expressed in days. The prediction if $M(t)$ is greater than 0 because there is a possibility of a close at a higher price. According to Peachavanish (2016), the prices have a moment and tendency until they changed.

For Murphy (1999), Momentum measures how fast prices change in fixed periods. The 10-day Momentum is quite common, but the calculation for five days produces lines with higher sensitivity and, at the same time, oscillations that are more pronounced. Its calculation formula is:

$$M = V - V^x$$

Research Method

The methodology used in this study is quantitative and qualitative. One purpose of the research is to determine the fundamental value of Bitcoin to find the stage of overvaluation of the cryptocurrency to avoid falling into the trap of speculation, which will break the vicious circle of the greater fool. This study will prevent unsuspecting people from losing their savings by following uptrends of poorly informed agents.

The study will investigate the costs of producing a Bitcoin in different scenarios to be able to have some notion of what its fundamental value could be and try to determine the price increase for speculative reasons. These costs will be from the ASIC Miner Value (2020) and BuyBitcoinWorldwide (2020) page, which allows calculating costs and revenues by changing the price of electricity — achieving the cost of producing a Bitcoin using an Antminer S17 + (73Th) miner. Because most of the world's mining comes from China, calculations of production costs are the cost of electricity in this country.

In addition, the research will calculate the cost of mining a Bitcoin, taking into account the cost of energy, the price of the miner, and the hours that the equipment is kept in use multiplied by the minimum wage per hour. The salary to be used is of the Xinjiang Province in China. The search for intrinsic value will also approach from the point of view of widespread use and acceptability. The analysis will try to find a possible trend through the number of unique addresses from October 4, 2020, to April 21, 2021. Trought, the indicator Simple Moving Averages of period 12.

Subsequently, the Momentum index was calculated about five days prior for three different scenarios. In which the price of Bitcoin is in a lateral, ascending, and descending scenario. The upward paths will be built with Bitcoin price rises between December 12 and 16,

2017, January 2 and 6, 2018, April 24 and 28, 2019, June 21 and 25, 2019, August 2 and 6, 2019, August 14 and 18, 2019. The price experienced minor variations between June 7 and 11, 2015, April 18 and 22, 2016, July 25 and 29, 2016, March 8 and 12, 2019, June 28 and July 2, 2019, August 27 and 31, 2019, which will be used to calculate the lateral trajectory Momentum index.

Finally, falling prices were found between January 21 and 25, 2018, September 3 and 7, 2018, November 18 and 22, 2018, July 21 and 25, 2019, November 4 and 8, 2019, December 29, 2019, and January 2, 2020, with which the downward trajectory will be determined. The ANOVA test was helpful to find if the means were equal or not. Finally, the Tukey test for post-hoc analysis between the previous scenarios and analysis shows the average numbers of how the herds of different animals are formed in the animal kingdom.

Brown (2005) related that ANOVA performs analysis of variations between and within groups. Also, if the relation F is significant, it tells us that at least one of the means is different without specifying which one. Tukey's method, also called honestly significant differences (HSD), maintains the error rate by making comparisons. According to Sow (2014), the difference between ANOVA and the t-test is that it works with more than two groups.

Although the literature review addresses the conformation of different animals in herds, the analysis was carried out with the herds with the most extensive groups, such as Dolphins, Giraffes, Sperm whales, Primate maicero, Primate titi, and the Cusumbo.

Results

Mining costs and intrinsic value in Bitcoin

The "China electricity prices" (2019) per kWh is 0.078 for households and 0.095 for businesses.

Table 1. *Income and benefits per year*

Miner	Number of Bitcoins * year	Cost per kWh	Electricity cost per year	Income / year	Benefit	Exchange rate Bitcoin (01/09/2020)
Antminer S17+(73Th)	0.6295	0.07	1766.02	4977.32	3211.30	7906.77
Antminer S17+(73Th)	0.6463	0.09	2270.59	5108.15	2837.56	7902.48

Source: *Asic Miner Value (2020)*

Table 2. *Income and benefits per year*

Miner	Number of Bitcoins * year	Cost per kWh	Electricity cost per year	Income / year	Benefit	Exchange rate Bitcoin (01/09/2020)
Antminer S17+(73Th)	0.4757	0.07	1766.02	3730.64	1964.62	7842.33
Antminer S17+(73Th)	0.4757	0.09	2270.59	3730.64	1460.05	7842.33

Source: *Buy Bitcoin Worldwide (2020)*

Table 3. *Cost and Lower prices experienced by Bitcoin*

Bitcoin cost	Lower prices experienced by Bitcoin
3172	3236.76
2805.43	3242.48
3513.21	3252.84
3712.46	3313.68
4773.15	3399.47

Source: *Yahoo! Finance (n.d.), "Bitmain Antminer S17" (2020), Buy BitcoinWorldwide (2020)*

Table 4. *Pearson's Coefficient*

Pearson's Coefficient	0.950287788
Determination	0.903046879

Source: *Yahoo! Finance (n.d.), "Bitmain Antminer S17" (2020), Buy BitcoinWorldwide (2020)*

If the cost of generating 0.6295 BTC is US\$ 1766.02, the cost of 1 Bitcoin US\$ 2805.43 at 0.07 cents/kwh. If the cost of generating 0.6463 BTC is US\$ 2270.59, the cost of 1 Bitcoin is US\$ 3513.21 at 0.09 cents/kwh.

If the cost of generating 0.4757BTC is US\$ 1766.02 at 0.07 cents/kWh, the cost of 1 Bitcoin is US\$ 3712.46. When the cost of generating 0.4757 BTC is US\$ 2270.59, the cost of 1 Bitcoin is US\$ 4773.15.

By obtaining the Pearson coefficient between the different costs of Bitcoin as opposed to the lower historical prices of this cryptocurrency, the value is 0.95, with which the regression fits the data.

If the cost of Bitcoin production considers the cost of electricity, the price of the miner in the market,

and the number of hours that the equipment is used, multiplying the latter by the minimum wage per hour, the cost is different. For Cambridge Center for Alternative Finance (2020), the region of China with the highest average hash rate taken from September 2019 to April 2020 is Xinjiang Province, with 30.13% of China's total hash rate. The AliExpress page (2021) shows the price of the Antminer S17 + (73Th) miner, which is 6999 USD. For Bloomberg (2021), in Xinjiang, the cost of electricity per kWh is 0.03 cents. When using the minimum hourly wage of Urumqi, which is the capital of Xinjian, which according to China Briefing (2021) is 17 RMB (2.62 USD) per hour, the result is:

Table 5. *Bitcoin cost*

Miner	Number of Bitcoins * year	Cost per kWh en Xianjian	Electricity cost per year	Price Antminer	24hrs/	Bitcoin cost	Exchange rate Bitcoin (04/27/2021)
Antminer S17+(73Th)	0.6295	0.03	756.86	6999	22.636.8	30392.66	53597.96
Antminer S17+(73Th)	0.6463	0.03	756.86	6999	22.636.8	30392.66	53597.96

Source: *Asic Miner Value (2020), Bloomberg (2021), AliExpress (2021), China Briefing (2021)*

If 0.6295 of Bitcoin costs 30,392.66, generating 1 Bitcoin costs 48,280.63. If 0.6463 of Bitcoin costs 30,392.66, generating 1 Bitcoin costs 47,025.62. This value greatly exceeds the lower costs experienced by Bitcoin.

The intrinsic value could be related to its widespread use and acceptability. The increase in the number of unique addresses could be interpreted as the acceptance and generalization of Bitcoin worldwide. The figure # 1 shows that when using a long-term simple moving average of 12 periods in which 200 days are used as data from October 4, 2020, to April 21, 2021, there is

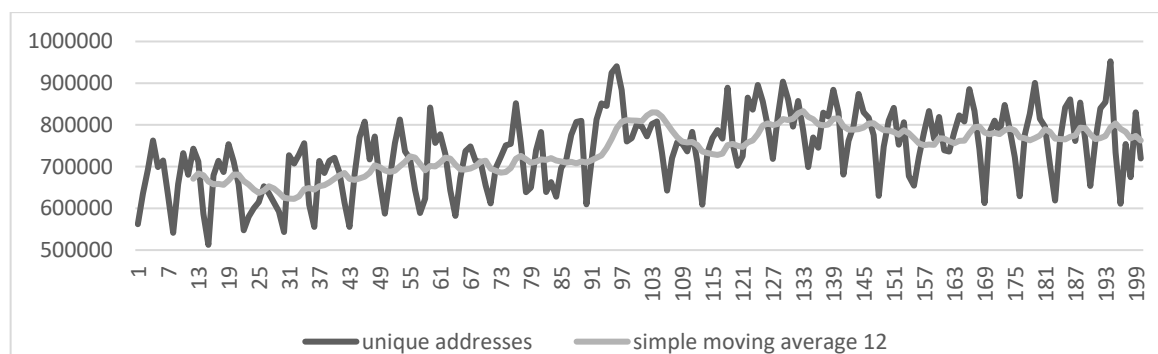
no trend present despite that market prices have risen. It could represent that its users know its real value despite the huge rises experienced in recent years Bitcoin, and it never changed.

Momentum Index

$$M_5 = U - P_{N-5}$$

U= Last closing price

P_{N-5} = Closing price of the session that took place five days before



Source: *Blockchain.com (2021)*

Figure 1. *Moving Average***Table 6.** *Ascending Path April 24, 2019- April 28, 2019*

Date	Price	M_5
April 28, 2019	5,247.35	36.83
April 27, 2019	5,285.14	
April 26, 2019	5,268.29	
April 25, 2019	5,279.35	
April 24, 2019	5,210.52	

Source: *Yahoo! Finance (n.d.)*

Table 7. *Ascending Path January 02, 2018- January 06, 2018*

Date	Price	M_5
January 06, 2018	17,527.00	2,544.90
January 05, 2018	17,429.50	
January 04, 2018	15,599.20	
January 03, 2018	15,201.00	
January 02, 2018	14,982.10	

Source: Yahoo! Finance (n.d.)

Table 8. *Ascending Path December 12, 2017- December 16-2017*

Date	Price	M_5
December 16, 2017	19,497.40	2082
December 15, 2017	17706.90	
December 14, 2017	16,564.00	
December 13, 2017	16,408.20	
December 12, 2017	17,415.40	

Source: Yahoo! Finance (n.d.)

Table 9. *Ascending Path June 21, 2019- June 25, 2019*

Date	Price	M_5
June 25, 2019	13,016.23	2314.54
June 24, 2019	11,790.92	
June 23, 2019	11,011.10	
June 22, 2019	10,855.37	
June 21, 2019	10,701.69	

Source: Yahoo! Finance (n.d.)

Table 10. *Ascending Path August 02, 2019- August 06, 2019*

Date	Price	M_5
August 06, 2019	11,941.97	1120.24
August 05, 2019	11,478.17	
August 04, 2019	11,805.65	
August 03, 2019	10,970.18	
August 02, 2019	10,821.73	

Source: Yahoo! Finance (n.d.)

Table 11. *Ascending Path August 14, 2019- August 18, 2019*

Date	Price	M₅
August 18, 2019	10,916.05	604.5
August 17, 2019	10,345.81	
August 16, 2019	10,231.74	
August 15, 2019	10,374.34	
August 14, 2019	10,311.55	

Source: Yahoo! Finance (n.d.)

Table 12. *Lateral Trajectory August 27, 2019- August 31, 2019*

Date	Price	M₅
August 31, 2019	9757.97	3.55
August 30, 2019	9630.66	
August 29, 2019	9598.17	
August 28, 2019	9510.20	
August 27, 2019	9754.42	

Source: Yahoo! Finance (n.d.)

Table 13. *Lateral Trajectory June 7, 2015- June 11, 2015*

Date	Price	M₅
June 11, 2015	229.98	1.49
June 10, 2015	229.71	
June 9, 2015	228.80	
June 8, 2015	229.05	
June 7, 2015	228.49	

Source: Yahoo! Finance (n.d.)

Table 14. *Lateral Trajectory April 18, 2016-April 22, 2016*

Date	Price	M₅
April 22, 2016	450.28	14.77
April 21, 2016	445.74	
April 20, 2016	449.42	
April 19, 2016	441.39	
April 18, 2016	435.51	

Source: Yahoo! Finance (n.d.)

Table 15. *Lateral Trajectory July 25, 2016- July 29, 2016*

Date	Closing Price	M₅
July 29, 2016	655.05	3.27
July 28, 2016	656.99	
July 27, 2016	655.03	
July 26, 2016	654.35	
July 25, 2016	651.78	

Source: Yahoo! Finance (n.d.)

Table 16. *Lateral Trajectory March 08, 2019- March 12, 2019*

Date	Closing Price	M₅
March 12, 2019	3,909.16	8.03
March 11, 2019	3,905.23	
March 10, 2019	3,951.60	
March 09, 2019	3,963.31	
March 08, 2019	3,901.13	

Source: Yahoo! Finance (n.d.)

Table 17. *Lateral Trajectory June 28, 2019- July 2, 2019*

Date	Closing Price	M₅
July 2, 2019	11,961.27	1.9
July 1, 2019	10,801.68	
June 30, 2019	10,583.13	
June 29, 2019	10,817.16	
June 28, 2019	11,959.37	

Source: Yahoo! Finance (n.d.)

Table 18. *Descending Trajectory 21 July, 2019- 25 July, 2019*

Date	Closing Price	M₅
July 25, 2019	9870.30	-472.81
July 24, 2019	9911.84	
July 23, 2019	9811.93	
July 22, 2019	9900.77	
July 21, 2019	10,343.11	

Source: Yahoo! Finance (n.d.)

Table 19. *Descending Trajectory September 3, 2018 - September 7, 2018*

Date	Closing Price	M₅
September 7, 2018	6225.98	-1,135.68
September 6, 2018	6467.07	
September 5, 2018	6529.17	
September 4, 2018	6792.83	
September 3, 2018	7361.66	

Source: Yahoo! Finance (n.d.)

Table 20. *Descending Trajectory November 18, 2018 - November 22, 2018*

Date	Closing Price	M₅
November 22, 2018	4365.94	-1,257.6
November 21, 2018	4602.17	
November 20, 2018	4451.87	
November 19, 2018	4871.49	
November 18, 2018	5623.54	

Source: Yahoo! Finance (n.d.)

Table 21. *Descending Trajectory November 4, 2019 - November 8, 2019*

Date	Closing Price	M₅
November 8, 2019	8,804.88	-607.73
November 7, 2019	9,267.56	
November 6, 2019	9,360.88	
November 5, 2019	9,342.53	
November 4, 2019	9,412.61	

Source: Yahoo! Finance (n.d.)

Table 22. *Descending Trajectory December 21, 2018 - December 25, 2018*

Date	Closing Price	M₅
December 25, 2018	3,815.49	-81.05
December 24, 2018	4,078.60	
December 23, 2018	3,998.98	
December 22, 2018	4,014.18	
December 21, 2018	3,896.54	

Source: Yahoo! Finance (n.d.)

Table # 23. *Descending Trajectory 29 December, 2019 - 2 January, 2020*

Date	Closing Price	M₅
2 January, 2020	6985.47	-437.18
1 January, 2020	7200.17	
31 December, 2019	7193.60	
30 December, 2019	7293.00	
29 December, 2019	7422.65	

Source: Yahoo! Finance (n.d.)

Table 24. *Lateral*

Date	M₅
25-29 July, 2016	3.27
18-22 April, 2016	14.77
7-11 June, 2015	1.49
28 June - 2 July, 2019	1.9
8-12 March, 2019	8.03
27-31 August, 2019	3.55

Source: Yahoo! Finance (n.d.)

Table 25. *Ascending*

Date	M₅
24-28 April, 2019	36.83
2-6 January, 2018	2,544.9
14-18 August, 2019	604.5
2-6 August, 2019	1,120.24
21-25 June, 2019	2,314.54
12-16 December, 2017	2,082

Source: Yahoo! Finance (n.d.)

Table # 26. *Descending*

Date	M₅
21-25 July, 2019	472.81
3-7 September, 2018	1,135.68
18-22 November, 2018	1,257.6
4-8 November, 2019	607.73
21-25 December, 2018	81.05
29 December, 2019 - 2 January, 2020	437.18

Source: Yahoo! Finance (n.d.)

For Yahoo Finance (2020), on December 18, 2017, the closing price of Bitcoin reaches its maximum (US\$ 19,114.20), whereas its lowest closing price was on December 14, 2018, with US\$ 3,242.48.

According to Meynkhart (2019), the prices of cryptocurrencies directly affected by technical information are helpful for investors to build their portfolios based on their risk tolerance. In the same

way that investors use information, the animal world uses it to make decisions. Kameda and Hastie (2015) state that when the bees need to form a new colony, the scout bees look for new possibilities for nesting, the same ones that in return share the information through waggle dances. The time of the dance is related to the good properties of the site. This feedback helps new scout bees to visit the places most promoted by their predecessors.

Table 27. *Lateral, Ascendant, and Descending*

Lateral	Ascendant	Descending
3.27	36.83	472.81
14.77	2544.9	1135.68
1.49	604,5	1257.6
1.9	1120,24	607.73
8.03	2314,54	81.05
3.55	2082	437.18

Source: Yahoo! Finance (n.d.)

Table 28. *Anova*

ANOVA: Single Factor

DESCRIPTION					Alpha	0,05			
Group	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper	
Lateral	6	33	5,5016667	26,02986	130,14928	261,87952	-552,6813	563,684654	
Ascending	6	8703	1450,5017	1033264	5166319,3	261,87952	892,31868	2008,68465	
Descending	6	3992	665,34167	201166	1005830,1	261,87952	107,15868	1223,52465	

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	6279780	2	3139890,1	7,630625	0,0051765	3,6823203	1,1277282	0,42420729
Within Groups	6172280	15	411485,3					
Total	12452060	17	732474,1					

TUKEY HSD/KRAMER

alpha 0,05

group	mean	n	ss	df	q-crit
Lateral	5,5016667	6	130,1492833		
Ascending	1450,5017	6	5166319,268		
Descending	665,34167	6	1005830,126		
		18	6172279,543	15	3,673

Q TEST

group 1	group 2	mean	std err	q-stat	lower	upper	p-value	mean-crit	Cohen d
Lateral	Ascending	1445	261,8795216	5,51780449	483,1165173	2406,88348	0,003805836	961,88348	2,252634
Lateral	Descending	659,84	261,8795216	2,519631913	-302,043483	1621,72348	0,209180988	961,88348	1,028635
Ascending	Descending	785,16	261,8795216	2,998172577	-176,723483	1747,04348	0,119222418	961,88348	1,223999

There is a difference between the lateral and ascending price; between the lateral and the descending price, there is no difference; between the ascending and the descending, there is no difference.

According to Morrell and James (2007), in the animal world, the direction of movement can be resolved in hundredths of a second if there is some unforeseen risk so that the animal can immediately determine its destination location.

The relationship analyzed is between the highest average numbers in the conformation of the herds with the indicator that synthesizes the speed with which the price of Bitcoin experienced increases or decreases through accelerations, decelerations, and declines. Stages represented as an ascending, descending, and lateral phase in which the price rose, fell or experienced a relatively stable situation:

Table 29. *Lateral, Ascendant, Descending, and Herds*

Lateral	Ascendant	Descending	Herds
3.27	36.83	472.81	11 dolphins
14.77	2544.9	1135.68	25 giraffes
1.49	604.5	1257.6	25 sperm whales
1.9	1120.24	607.73	9 primate maicero
8.03	2314.54	81.05	17.5 primate tití
3.55	2082	437.18	25 cusumbo

Source: Yahoo! Finance (n.d.), Morteo et al. (2004), Guerrero et al. (2006), Defler y Rodríguez (2019), Muller et al. (as cited in CITES, 2019)

Table 30. *Anova*

ANOVA: Single Factor

DESCRIPTION

Alpha 0,05

Group	Count	Sum	Mean	Variance	SS	Std Err	Lower	Upper
Lateral	6	33	5,5016667	26,02986	130,14928	226,79935		478,59682
Ascending	6	8703	1450,5017	1033264	5166319,3	226,79935	977,4065	1923,5968
Descending	6	3992	665,34167	201166	1005830,1	226,79935	192,2465	1138,4368
Packs	6	113	18,75	54,775	273,875	226,79935	-454,3452	491,84515

ANOVA

Sources	SS	df	MS	F	P value	F crit	RMSSE	Omega Sq
Between Groups	8412088,8	3	2804029,6	9,085477	0,0005349	3,0983912	1,230547	0,502657
Within Groups	6172553,4	20	308627,67					
Total	14584642	23	634114,88					

TUKEY HSD/KRAMER		alpha 0,05			
<i>group</i>	<i>mean</i>	<i>n</i>	<i>ss</i>	<i>df</i>	<i>q-crit</i>
Lateral	5,501667	6	130,149		
Ascending	1450,502	6	5166319		
Descending	665,3417	6	1005830		
Packs	18,75	6	273,875		
		24	6172553	20	3,958

Q TEST									
<i>group 1</i>	<i>group 2</i>	<i>mean</i>	<i>std err</i>	<i>q-stat</i>	<i>lower</i>	<i>upper</i>	<i>p-value</i>	<i>mean-crit</i>	<i>Cohen d</i>
Lateral	Ascending	1445	226,799	6,3712705	547,32817	2342,6718	0,001143	897,7	2,6011
Lateral	Descending	659,8	226,799	2,9093558	-237,83183	1557,5118	0,201179	897,7	1,1877
Lateral	Packs	13,25	226,799	0,0584143	-884,42349	910,92016	0,999974	897,7	0,0238
Ascending	Descending	785,2	226,799	3,4619147	-112,51183	1682,8318	0,09995	897,7	1,4133
Ascending	Packs	1432	226,799	6,3128561	534,07984	2329,4235	0,001256	897,7	2,5772
Descending	Packs	646,6	226,799	2,8509414	-251,08016	1544,2635	0,21546	897,7	1,1639

When analyzing Tukey's method, it is a possible relationship between herd behavior in the animal world and the Bitcoin price behavior. Alpha is not more significant between lateral and herds and at the point of descending and herds. Some slight relationship between herd formation behavior could be when Bitcoin is not in an ascending phase. In the lateral phase, some relation of means and in the descending phase could be that the buyers are not protected in the price increase but before it and when the price is falling.

This behavior is similar to that of many species, including those of the Thomson's gazelle. According to Walther (1991), the herd of this animal moves to displacement after resting, so the animals stand up and threaten those who have not done so by indicating their horns, which becomes repetitive until the entire herd starts the march. In addition, the male pushes the animal in front of it, changes the route, or slows down.

Conclusions

The cost of production is strongly related to the lowest historical prices that Bitcoin has experienced. The difficulty of obtaining Bitcoin increases, and more electricity is needed, the minimum prices that Bitcoin will experience will be higher than the current ones.

The specific average of the groups of values obtained from the Momentum indicator differs from the factor that, in this case, is the price growth in a

lateral, increasing, decreasing way. F calculated is 7.63 is higher than F of tables is 3.68, and a p-value of 0.0005 less than 0.05%. With around 95% reliability, at least one of the means is different. Also, the stage in which the price of Bitcoin is affected its speed. The state in which the price of Bitcoin is lateral, ascending, or descending phase affects the force or speed with an alpha of 0.05.

The average speed of the Momentum indicator is the same when there is a price increase or a decrease. After realizing the buyers that those who are willing to buy the Bitcoin at a higher price are running out, they leave it with similar strength or speed. There is also a coincidence between the force on the side and the price drop. Nobody wants to be the older fool, and when they realize that buyers are becoming extinct, they begin to make their withdrawal.

When making a relationship with the average numbers of herds with the factor of the Momentum index in a lateral, ascending, or descending situation, it can be observed that the calculated F is 9,085 greater than that of tables; it is rejected that the means are equal. The p-value is less than the alpha, so the means are not equal.

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