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# The Bitcoin Bubble: Insights of Herd Behaviour

**Joyita Banerji[1*], Kaushik Kundu[2] and Parveen Ahmed Alam[3]**

*[1]Research Scholar, Department of Management and Business Administration, Aliah University, Kolkata.*
*E-mail: joyitabanerji@gmail.com*
*[2]Associate Professor, Department of Management and Business Administration, Aliah University, Kolkata.*
*E-mail – kau_kun@rediffmail.com*
*[3]Associate Professor, Department of Management and Business Administration, Aliah University, Kolkata.*
*E-mail – ahmedparveen2003@yahoo.co.in*
*[*]Corresponding Author*

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***Abstract:*** The mispricing of assets is a fact and cannot be fully explained by the EMH (Cosgrove, Gasper, & Marsh, 2007). The dramatic behaviour of Bitcoin prices in 2018 has features of an Economic Bubble; it bears investigation into how and why such a bubble may have formed when there is no restriction on the information available to public. The unreasonable euphoria of people and its subsequent erosion needs to be studied from a behavioural perspective.

The paper will explore what are the features that make Bitcoins a source of such derision by the experts in the realm of finance. It hopes to add value to the existing body of knowledge by investigating the claims that Bitcoin has all the classical characteristics of being an Economic Bubble. Further, a point of interest for the article is exploring whether the herd mentality may influence the investment behaviour among the participants of the cryptocurrency market, especially Bitcoins.

Bitcoins are a new field of study, thus the research available on it is limited. In addition, due to its acceptance among the more technologically sound groups, it is an exclusive area of investment for the masses. Bitcoin is gaining acceptance among the financial institutions and merchants willing to accept it as a currency (Kelso, 2018) or at least an investment (Mourdoukoutas, 2018). It throws up important policy questions about regulation and monitoring. This paper has identified the features that made Bitcoin prices in 2017-18 a bubble and identified the reasons behind it in theory.

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## 1. INTRODUCTION

Cryptocurrencies are digital assets that function as mediums of exchange and are dependent on cryptography for regulating their trade. Cryptocurrencies such as Bitcoin require the participants to share their information on a peer-to-peer digital network without the intervention of any third party, thus guaranteeing anonymity (Yellin, Aratari, & Pagliery, 2013). Bitcoin, the most popular of cryptocurrencies, has exploded in value since 2017 but has then entered free-fall from September 2018, as evidenced by a yearly high of nearly 14,957 USD and a yearly low of 3,178 USD (Markets Insider, 2019). Bitcoins have been recognized as Economic Bubbles by multiple financial experts [ (Shiller, 2014), (Krugman, 2018) ]. Economic Bubbles are formed when the prices of an asset rise precipitately and fall just as rapidly. The meteoric rise of Bitcoin prices from 2010s and its subsequent fall in 2018 have prompted comparisons to the tulip mania of early 1600s. The original tulip mania started in Dutch Republic, when the speculators bet on the tulips being marketed as a luxury for the foreseeable future. The tulip mania reached its peak in 1637 when people were willing to pay through the nose to own a few bulbs of the prized variety of tulips (Mackay, 1841). Although modern research on the so-called tulip mania has thrown up conflicting results about the extent of such mass delusion on the Dutch Economy of the time (Goldgar, 2008), the dramatic volatility in the prices of the bulbs is the first noted example of an Economic Bubble (French, 2006).

Asset Bubbles, an archetype of Economic Bubbles, form when the assets are traded at prices that outstrip their intrinsic value, which may be caused due to fads (Camerer, 1989). The dramatic behaviour of Bitcoin prices in 2018 has features of an Economic Bubble; it bears investigation into how and why such a bubble may have formed when there is no restriction on the information available to public. The reasons why members of the general public find an unmonitored, intangible, volatile and opaque asset like Bitcoin a lucrative investment need to be understood. A behavioural interpretation of the apparently irrational reaction of the participants in the Bitcoin markets may be helpful in the prediction of when Economic Bubbles are created and the conditions of which lead to such mispricing.

Typical believers of Efficient Market Hypothesis (EMH) do not believe that Economic Bubbles can exist; the assumptions of the Hypothesis do

not leave any question of deviation in the intrinsic value and market value of the asset [ (Malkiel, 2010), (Chamberlain & Johnson, 1994)]. However, the mispricing of assets is a fact and cannot be fully explained by the EMH (Cosgrove, Gasper, & Marsh, 2007) and questions have been raised about the existence of the 'optimal financial decisions' which exist in these abstract theories (Olsen, 2010).

The unreasonable euphoria of people and its subsequent erosion needs to be studied from a behavioural perspective. Rather than rely on some textbook definition of what human beings are supposed to do, it is better to understand how actual humans behave.

## 2. PURPOSE OF PAPER

There is debate if the existence of cryptocurrencies such as Bitcoin is a threat to the existing forms of financial systems (Groshoff, 2014). Cryptocurrencies, including Bitcoins, are independent from the interference of any regulatory bodies and are impervious to tampering from one particular institution (Victor, 2017). If they are impervious to external tampering and do not require the permission of any centralized system, what is driving the price of Bitcoin to such volatile highs and lows? Is it merely part of the cycle of its development? Rapid devaluation of Bitcoin currency is not unprecedented, although the scales may differ. Bitcoin went through a crash in December 2013 which was blamed on the presence of a Bubble (Cheah & Fry, 2015). Economic Bubbles are disruptive to the fragile balance of financial markets; rapid increase in prices may drive excess investment towards bloated assets (Jones B., 2015). The paper will explore what are the features that make Bitcoins a source of such derision by the experts in the realm of finance. It hopes to add value to the existing body of knowledge by investigating the claims that Bitcoin has all the classical characteristics of being an Economic Bubble. The traditional models of Neoclassical Economics have so far been unable to either explain the motivation behind such reaction or the prediction of circumstances around them (Malkiel, 2010). Exploring the circumstances that surround the creation of Economic Bubbles will assist in foreseeing the volatility that may be caused by them.

Bubbles are not necessarily irrational; it may be that the investors themselves are aware that the prices of the assets are inflated, but they keep buying anyway, betting on the prices increasing further (Camerer, 1989). According to Camerer (1989), the deviation between the intrinsic value and actual value of an asset may be created because of fads; fads are irrational and is the widely shared enthusiasm over certain items generated due to social forces. In most analysis of human behaviour in Neoclassical

Economics, individuals are taken as the basal units capable of making independent judgments (Goldstone & Janssen, 2005). Neoclassical economics, however, is static in its definition of a person; all individuals form part of the collective consciousness which gives a structure to individual behaviour (Richerson & Boyd, 2005). The stock markets reflect the general mood of the society – and may cause financial market trends (Prechter, 2001). The author argues that trends are induced by the concerted actions of people, manifested as Herding. Herding occurs when a person who is capable of independent judgment prefers to rely on the group behaviour at the cost of ignoring private, relevant information (Baddeley, 2010).

In times of volatility, the speculators may be persuaded to follow common social practices that they do not otherwise (Keynes J. M., 1930). In as far back as 1936, Keynes pointed out that when people worry how others will perceive them, they would prefer to mimic the common opinion (Keynes J. M., 1936). Following the herd behaviour may be one of the reasons behind escalating extrinsic asset price volatility (Scharfstein & Stein, 1990). The paper will attempt to identify the causes behind the vacillation of the Bitcoin prices and scrutinize the reticent factors that may cause the purported volatility. Further, a point of interest for the paper is exploring whether the herd mentality may influence the investment behaviour among the participants of the cryptocurrency market, especially Bitcoins.

## 3. LITERATURE REVIEW

Although the Tulip Mania is the first major documented instance of the crowd mentality going berserk (Mackay, 1841), it is by no means the last one; history is witness to such repeated happenings. The term 'bubble' was used in the financial context for the first time in 1700s. The Bubble Act of 1720 was passed in the parliament of Great Britain in response to multiple Joint Stock Companies, notably the South Sea Company, attempting to raise money from the general public without disclosing the details about the outflow of the funds. A closer look at the Act and its legislation has revealed that the South Sea Company was itself involved in the formation of the Act; nevertheless the legislation is a turning point when the presence of Economic Bubbles was recognized (Harris, 1994). It is easy to attribute Economic Bubbles to deviant crowd psychology, but it is important to know what crowd psychology is before such relationships can be drawn. It is also necessary to understand the variables that cause individuals to form crowds. Can there be *a fortiori* explanation for crowds causing asset mispricing spawning an Economic Bubble?

### 3.1. Exploring the phenomenon of Herd Behaviour

Herding is a well-documented phenomenon (Shiller, 2000) that is of special interest to economics and finance. The influence of the many over a single opinion has first been noticed in philosophy. Kierkegaard, a Danish philosopher, was the first of the existentialist philosophers (Swenson, 1941) and pointed out how an individual prefers to conform to the crowd. The conflict between the individual and the crowd was one of the important sections of Kierkegaard's treatise *Upbuilding Discourses in Various Spirits* (Kierkegaard, 1847) where the author rues that the individual is drowned out by the actions of the crowd. The author further argues that the individual prefers to conform so as to avoid both responsibility and original opinions. Nietzsche reinforced the same negative outlook about the influence of the herd on the individual, where a particular culture evolves from the opinions of crowds (Nietzsche, 1887).

The term 'Herd Behaviour' became common parlance for any research into behaviour of multitudes after the work of Wilfred Trotter - a student of social psychology who identified the intuitive tendency of individuals to imitate the rest of the individuals of a group for collective benefit (Trotter, 1916). Trotter was adding on to the existing theory of Le Bon - one of the most influential researchers in crowd psychology. He identified many features of crowd behaviour such as the immersive instinct of the individual into the crowd, the absence of critical thinking and tendency of overreaction. According to the theorist, crowds have the ability to override the individual's own character and reduce the individual to act on pure instinct, which may be contrary to the best interests of the individual (Le Bon, 1895). The pack mentality may arise due to the decision maker's perception of another's superiority (Veblen, 1899). Herding may be deliberate or unconscious. Adam Smith noted that individuals often mimic other's reaction by mentally placing themselves in their places. For example, flinching when someone is about to be hurt happens unconsciously and is almost a reflex. There is no reason or utility for such a reflex; it is merely an instinctive reaction. The unconscious sympathy, however, is aimed more towards the rich and famous rather than the common individual. He further proposed that the people dislike being judged negatively and underestimate the effect of social custom on their judgments (Smith A., 1759). Mimicking others decisions may be a neurological response due to the presence of mirror mechanisms that are observable among the primate species; it may be an instinctual reaction to imitate actions that a person observes others doing and may help learning (Rizzolatti & Craighero, 2004).

A person gains sense of the self from the social category to which he associates himself; the behaviour of such category may even influence a

person's preferences (Akerlof & Kranton, Economics and Identity, 2000). People may prefer to conform when facing any dubious circumstances and converge on the group opinion, especially when the individual first faces the unfamiliar situation on his own (Sherif, 1935). Deliberate herding may be understood as an extension of Bayes' response to imperfect arrangement where instead of independent judgments; all the individual decisions are interdependent and mutually supportive (Salop, 1987). Keynes (1936) had pointed out using his famed beauty contest example that the portfolio managers could fall prey to herd behaviour. According to Keynes, the winner of a beauty contest would be the one who is deemed to be the most attractive to the average audience rather than the decision-makers own perception. Further supported by empirical models (Banerjee, 1992) and practical evidence (Scharfstein & Stein, 1990), the fact that herd behaviour is an actual influence on decision-making is incontrovertible. Herding influences the prices of the assets (Chandra & Thenmozhi, 2017). *Rational Herding* may occur in cases of principal-agent concerns, i.e., when there is a superior-subordinate relationship. People choose to mimic others for the sake of 'sharing the blame', even when they have contrary private information (Devenow & Welch, 1996).

Jumping on the bandwagon is frequent practice for an investor who cannot rely on his own private information in the face of overwhelming crowd opinion (Graham, 1999). Trading in the financial markets are generally a result of sequential decisions; when a decision maker only relies on the cues offered by the antecedent decision maker while ignoring private information, they do not add any new information in the existing market. The subsequent decision maker will follow the precedent and so on, thus leading to masses conforming to a singular action on the basis of scant information (Bikhchandani, Hirshleifer, & Welch, 1992). Informational cascades occur when an individual observes the actions of prior decision makers and perceives that his utility will be maximised by following the previously observed actions, disregarding his own private cues (Anderson & Charles, 1997).

### 3.2. Formation of Economic Bubbles

Economics has spawned a number of economic theories to explain the working of financial markets, of which the most widely accepted ones are Efficient Market Hypothesis (Fama, 1970) and Capital Asset Pricing Model (Black, Jensen, & Scholes, 1972). Both these models of economic behaviour rely on certain assumptions, one of which is that the markets are efficient and reflect all the information in the asset prices. Clearly, this assumption is problematic; even Keynes pointed out the effect of 'animal spirits' before

such models came to existence (Keynes J. M., 1936). According to Shiller (2000), Economic Bubbles are formed when the increase in prices spark a maniacal investment spree when the later investors take their cues from the earlier ones either due to prevailing positive sentiment or being desirous to take their own share of the pie, ignoring their own doubts about the value of the investment itself (Shiller, Irrational Exuberance, 2000). Although the term 'bubble' invokes an image of a short-lived, easily burst phenomenon, real Economic Bubbles are rarely that easy to predict.

The investors may be aware that their investment has no fundamental value but instead keep betting on it in the sheer hopes that a buyer will be willing to pay more to hold the investment (Petersen, 2014). The phrase "irrational exuberance" was coined to explain the curious phenomenon of people betting on the prices of a certain asset increasing in the forseeable future (Miller, 2010). Economic Bubbles arise in situations that lead to a rapid increase in prices due to speculative demand which is unsustainable in the long term. There may be multiple reasons of what causes such Economic Bubbles – herding (Harmon, et al., 2015), overconfidence (Scheinkman & Xiong, 2002), or even excess liquidity (Porras, 2016). Economic Bubbles are not rare phenomena; they are a recurring aspect of any financial system. For something that has grabbed headlines every time it occurs, there is a sad lack in the predictability of these Bubbles. Any explanation of such complex, large scale occurences needs to be studied from the viewpoint of the variable social, political and culture influence of the time (Teeter & Sandberg, 2017). Depending on human behaviour being consistent and linearly predictable is a mistake that the acolytes of Efficient Market Hypothesis (EMH) make (Tversky & Kahneman, 1979).

There may be various kinds of Bubbles- rational, intrinsic or contagious. Rational Bubbles may be formed when the people expect the prices of a certain asset to increase on the basis of their market fundamentals. The expectation of higher returns may be based on actual improvement of the market fundamentals or it may be due to the larger market reacting to the actions of a few, informed insiders. The perspicacity of the investors may turn out to be in vain, but the motive and their actions remain rooted in 'rationality' i.e. consistent and utility maximizing (Garber, 1990). However, further research found that the Rational Bubble found no support from empirical analysis of stock prices and their fundamentals (Diba & Grossman, 1988). Expounding on the Rational Bubble model, the Intrinsic Bubbles were proposed. The Intrinsic Bubbles depend entirely on the exogeneous fundamentals of the firm, such as dividend and remove the influence of any inconsequential variables such as perception or motive of investors. Intrinsic Bubbles have the ability to explain the volatility of asset

prices in relation to the fundamentals, stepping up from Rational Bubbles (Ma & Kanas, 2004). The author, however, has found it difficult to reconcile to the idea that all investors will have rational expectations of the future as suggested by models such as EMH but still participate in Economic Bubbles (Froot & Obstfeld, 1991).

The idea that individuals play a more active role in asset pricing was explored in later research into how individuals frame their expectations. According to the model, the individual is aware about the limited information he has and thus makes adjustments for the price expectations he has. The investor first rationalises about the value of the investment according to the information he has (limited rationality) and then proceeds to mimic the actions of others around him by adjusting the calculated value to the average prices socially transmitted by others around him (Orlean, 1995). This action of mimicking the actions of others around the investor is known as *mimetic contagion*. *Mimetic Contagion* may lead to excessive volatility in asset pricing when combined with the inability of the investor to gain access to all relevant information, causing Economic Bubbles (Topol, 1991).

### 3.3. Causes of Economic Bubbles

As previously reported in the review of literature, there may be multiple causes of Economic Bubbles. One of these causes may be excessive cash in the hands of the investor in short term. Otherwise used synonymously as liquidity (liquidity is a broader term), excess cash may exist in the financial system due to factors such as intervention of a central bank for the sake of reducing short term interest rates. The expansionary monetary policy of a central bank will leave the investors flush with money, which may stimulate demand for assets whose demand remains fixed in the short term (Amadeo, 2018). Research has conclusively proved that excess cash causes overvaluation of assets, increasing price volatility and leaves the financial markets vulnerable to Economic Bubbles [ (Caginalp, Porter, & Smith, 2001), (Caginalp & Balenovich, 1999) ]. The authors have found that although the expansionary policy encourages the stock markets to rise, it also has a significant relationship with inflated prices of the assets which then threaten going bust.

A behavioural cause may be overconfidence of the investor. People are often overconfident about their knowledge or ability (Brenner, Koehler, & Tversky, 1996) which induces them to trade excessively, even at the cost of returns (Odean, 1998). The overconfident investors are faithful to their own beliefs about the prices of a certain asset, either logical or unfounded. Research has shown that the size of the bubble increases in a direct relation with the

overconfidence of the investor i.e. bubble sizes will increase with the increase in confidence of the investors themselves (Michailova & Schmidt, 2016). The diverse opinions of the investors and the resultant valuation is a reason for speculative trading leading to bubble formation (Scheinkman & Xiong, 2002). Overconfident investors may attribute excess value for riskier assets due to miscalibration of the probability of finding an investor who is willing to pay more for the risky asset (Michailova & Schmidt, 2016).

Another behavioural cause may be herding – the collective action of multitudes causing price movements that may lead to a deviation from the intrinsic value of the assets (Zahera & Bansal, 2018). Previous to the world economic crisis of 2007-08, the market was ruled by Keynesian 'animal spirits'. The investors mimicked each other's actions before the meltdown and engaged in collective panicked sell-offs with negligible attention to exogeneous information (Harmon, et al., 2015). The participants of financial markets cannot all be enlightened; they may have to depend on observation of the market movement to decide what actions to take (contagion). Mimicking another's action leads to amplification of any price movements that happen. The uninformed investor may believe others have access to more information than he is privy to, thus making him more willing to act in the same manner others are – thus becoming a self fulfilling prophecy. The conjecture that other people are more informed than he is may be erroneous; nevertheless, his actions as part of the collective behaviour make the prices of the asset behave in the manner that the crowd expects it to (Lux, 1995). Even the sophisticated investors with knowledge of fundamental analysis have been found to prefer moving with the crowd when asset prices are rising (Caginalp & Ilieva, 2008). Further, when the general sentiment prevailing in the financial markets are optimistic, the economy is more prone to euphoristic tendencies among the participants who will escalate the sentiment by false predictions about asset price movements by word of mouth or otherwise. The feedback loop will bolster the herding contagion in the financial markets, thus magnifying instability in asset prices (Akerlof & Shiller, 2009). In December 2017, Bitcoins exceeded 16000 USD, leading some notable Bitcoin zealots to predict that the prices would keep rising (Smith N., 2018) and investors were caught up in the excitement of perceiving what they believed was a herald of Bitcoin's public acceptance by institutional investors when the Commodites Future Trading Commission (USA) allowed trading in Bitcoin futures (Price & McCrank, 2017).

### 3.4. Advent of Bitcoins

Cryptocurrencies use encoding to provide a secure platform for the transaction of digital marks in a decentralised manner. They function

beyond the regulation of any Central Bank and run on peer to peer software that validate the transactions (Dourado & Brito, 2014). The platforms rely on protocols that are highly complex with the codes built on the principles of mathematics and computer engineering and are difficult to imitate. The peer to peer network functions on anonymity and a decided lack of surveillance from any central agency. Originally, a form of anonymous centralised digital currency system was visualised in 1982 due to concerns about the traditional forms of banking lacking traceability and the online payments system depending on third party (Chaum, 1982). Online transactions allowed access to the users' private information by the banks, government or even outside parties. Chaum designed Blind Signature Technology to ensure user privacy that allowed the user to become untraceable by using coding protocol. Taking it one step forward, Chaum found DigiCash in 1989 to comercialize his visualisation. DigiCash enabled a person to transact in 'tokens' that mimic physical currency. The tokens would bear codes that could be modified by the receiver to guarantee anonymity but would not drastically change the code beyond recognition so that the original signature could be identified by the issuing body. However, it did not live up to its potential and filed for bankruptcy in 1998 (Grigg, 2014). After Digicash sank, PayPal took its place on similar terms but with a stronger consumer base. In 2008, Bitcoin was formed and is currently one of the most prolific alternatives to traditional currency (Spittler, 2013).

### 3.5. Structure of Bitcoin's Peer-to-peer Network

Bitcoin was proposed as a peer to peer electronic cash system that would allow online payments between two parties without the intervention of any third party by Satoshi Nakamoto (Nakamoto, 2008). To use Bitcoins, the user needs to download an online Bitcoin Wallet that will allow the user to transfer or store Bitcoins. The user must then transfer the physical currency issued by a Central Authority (fiat currency) into their account maintained at any of the Bitcoin exchanges to buy Bitcoin units. It is an electronic form of currency that relies on 'Blockchain technology' that maintains all the real time information of the transactions of Bitcoins and the creation of new units (Fortney, 2018). All participants of the Bitcoin network may maintain their own versions of the Blockchain. The 'blocks' are created by 'miners' who verify the legitimacy of the pending transactions and collect them to form a 'block candidate' depending on their ability to convince other participants to add their block candidates to their 'Blockchain'. However, the 'block candidates' must be able to fulfil certain predifined criteria. The miners receive newly created Bitcoins for

their efforts. Although there is no single regulatory body to enforce the creation of authentic block candidates, there is practically no incentive in falsifying the same. Accordingly, the miners work on a *Consensus Mechanism* (Berentsen & Schar, 2018).

### 3.6. Important Features of Bitcoins

Bitcoins guarantee anonymity – all the participants have pseudonyms. The Bitcoins themselves have a private key that can calculate the corresponding Bitcoin address for registration. The private keys are randomly generated and are therefore difficult to track. The user must have the private key to prove his ownership without which the Bitcoin network will not allow him access to his own funds. Due to their unique nature, the private keys are vital for the digital signature on all the transactions to be made by the user. Any transaction can only take place after the digital signature is validated with the private key after which the network provides a public key visible to any participant on the network (Antonopoulos, 2014).

On the Bitcoin system, the number of Bitcoin units are finite, unlike fiat currency which earns its value from the Issuing Body. Most of the Bitcoin users believe that a predefined currency issuing schedule and the limited number of units available make it impervious to inflation (Berentsen & Schar, 2018). Bitcoin has no intrinsic value; it earns its value from the belief of the buyer who trusts that he will be able to find another party willing to buy it from him at the prices the buyer will be willing to accept. Although it has been argued that Bitcoin earns its value from the cost of its production (mining requires significant amount of electricity and transaction costs), an application of the Labour Theory of Value (Marx, 1898). However, considering that the prices of each unit of Bitcoin have fallen below average mining cost of each unit i.e. 4758 USD, the theory fails to hold up (Sprick, 2018).

Bitcoins are not subject to any regulation and are open-source so anyone may use the platform. The information about the transactions of Bitcoins are maintained on the software which is available for public access (Meola, 2017). The Blockchain system maintains all past records of the available Bitcoins, which as mentioned before, is available to the public at large. Public access to all information is not free from its own set of problems - any person may refuse to accept the Bitcoins that have obfuscated records (Ben-Sasson, et al., 2014). As a matter of fact, Bitcoin has often been treated with suspicion due to its past history of being used by undesirable elements of society (Bohme, Christin, Edelman, & Moore, 2015).

## 4. ANALYSIS OF THE BITCOIN PHENOMENON

### 4.1. Why is Bitcoin surmised as a Bubble?

A asset bubble may begin with the advent of new technology, which causes people to change their visions of the future and make the investors believe that they have stumbled onto the next 'big thing' that is a prospective gold mine (Cassidy, 2002). Bitcoins revolutionised the currency exchange system. It allowed, for the first time, fungible currency with widespread usage without any third party intervention. The power to transact, record and create the currencies rest with the participants themselves.

During economic growth, people's outlook may be optimistic, often morphing into elation that may or may not be warranted. The optimistic outlook will influence people to recognise opportunities in new areas; they will attempt to jump on the bandwagon (Kindleberger & Aliber, 2005). In case of Bitcoins, the buying frenzy was termed more of a 'Fear of Missing Out' mania (Chambers, 2018). The Fear of Missing Out, known in popular parlance as 'FOMO' is influenced by the social culture around the investors; with the popularisation of social media, people are often bombarded with information at all times. The information overload forces people to be selective about which information they will act upon; sometimes going so far as to follow what other people around them are doing. Just as informational cascades are formed when groups of people converge on an opinion on the basis of little information, the investment in Bitcoin may also be a result of the same (Calderon, 2018). From the year 2017 onwards, Bitcoin was in an expansionary phase as evidenced by historical highs of 19783 USD on 17$^{th}$ December, 2017 (Morris D., 2017). However, within a span of nearly a month from January to February 2018, Bitcoin prices declined rapidly (6851 USD on 6$^{th}$ February 2018), a decline of nearly 65% within a span of less than 3 months from December to February. The massive price volatility without any major external influence shows all the classic signs of being a Speculative Bubble (Paramore, 2018). This opinion was voiced widely by many stalwarts independently and repeatedly reported in the media [ (Imbert, 2018), (Moyer, 2017)].

### 4.2. Probable reasons behind the Bitcoin Bubble

As explained before, asset bubbles may form due to multiple reasons - change in the existing liquidity ratio may cause inflation of asset prices (Caginalp, Porter, & Smith, 2001), overconfidence may cause a biased rise of asset prices (Michailova & Schmidt, 2016) or herding may influence people to jump on the bandwagon (Lux, 1995). However, in the global economic trends of monetary policy, it may be observed that there was no

major quantitative easing around the world, [ (Fleming, 2017), (Morris B. , 2017), (Lee Y. N., 2017), (Yao, 2017)] implying that the role that excess liquidity plays in the creation of Economic Bubbles may be safely ignored in the aspect of the breakneck rise of Bitcoin prices in 2017. Additionally, the Bitcoin network works on a decentralised basis; extraneous factors such as the policy of financial regulators should have no influence on the investment patterns of the participants of the Bitcoin network.

Overconfidence of investors can arise from the belief that they have better information or abilities than others (Nofsinger, 2001). The investors may be fully aware that the prices of a certain asset are inflated; they may still end up buying the investment because they believe that there will another investor willing to pay more for the ownership of the asset, known as the Greater Fool Theory (Zou, 2018). The Greater Fool Theory may be an affectation of the overconfidence of investors because they believe they are capable of idetifying the price at which they think optimal profit will be made, gambling on others inability to recognise what they themselves have. However, in the case of Bitcoins, considering the freely available information and decentralised mechanism, it is difficult to believe that the investors may be deluded into thinking that they have access to better information. In addition, for an asset to have a market capitalisation of nearly three hundred billion (Market Capitalisation of Bitcoin Supply, 2017), people "must have hoped for unprecedented number of fools indeed". Bitcoin has already had a history of rapid rises and subsequent falls [ (Lee T. B., 2013), (Roberts, 2017) ], making it unlikely that people would keep making the same mistakes over and over. Although the Greater Fool Theory may have influenced the Bitcoin Bubble, this paper will investigate the established link between Herding and formation of Bubbles *in doctrina.*

One of the most prolifically studied behavioural influences, Herding has often been linked to the formation of Economic Bubbles [ (Lux, 1995), (Brunnermeier, 2000), (Koppl & Yeager, 1996) ]. Herding may occur when the individuals rely more on the market movements rather than the fundamentals themselves. Bitcoin's much vaunted feature of anonymity is a new phenomenon that the investors have to face. The normal avenues of investment are traceable and regulated. As research has shown, people will tend to follow a group in inexperienced conditions (Sherif, 1935). Crowd Psychology has already studied the effect of anonymity on individuals of a crowd – Le Bon was one of the early researchers into the 'Deindividuation Theory' (Le Bon, 1895) which is the individual sublimation for adoption of the group mindset to enjoy the benefit of anonymity and loss of inhibition afforded by such lack of identification (Roeckelein, 2006). Le Bon's idea that anonymity appeals to the individual's primitive instinct

thus freeing up the members of the crowd from legal culpability is evidence that he saw the crowds as a negative influence only (Reicher, 2000). Deindividuation subsumes the individual constructs into a collective awareness viz. individuals may forget their unique characteristics and prefer to be part of the group with which they identify and lose their ability to think on their own, preferring to behave as if hypnotized. Doing so may increase the cohesiveness of a group, thus imbuing the group with its own identity that is free from disparate identification constructs of its members (Hazelwood, 1998). If conformity is defined as the modification of behaviour due to the influence of the social forces around them (Aronson, Wilson, Akert, & Sommers, 2018), then it may be said that the crowd exerts its own influence on the person. The theory of deindividuation is also used to explain how anonymity in online communication has reduced the inhibitory factors from such communication. Anonymity, as mentioned before, is a part of deinividuation and may increase chances of cyberbullying, but may also facilitate intimacy by allowing members to discuss difficult topics (Christopherson, 2007).

### 4.3. Evidence in support of Herding as the sole explanation behind Bitcoin Bubble

Conformity may happen due to two reasons – informational influence and normative influence (Deutsch & Gerard, 1955). Informational influence happens when a person faces an unfamiliar situation,is unable to theorise his own cues and looks towards his peers to make decisions in the hopes that they are more informed than he is (Cialdini, 2006). Normative influence is the tendency to ascribe to group ideals and opinions in fear of punishment (Schachter, 1951). It may be due to the fear of exclusion from the group, or the intention of presenting a worthwhile image of himself to the group (Bocchiaro & Zamperini, 2012). The more conventional investors may be vulnerable to normative social influence, leading them to accept the group opinion as edict (Baddeley, Pillas, Christopoulos, Schultz, & Tobler, 2007). Bitcoin's anonymity means that there can be no fear of backlash from not supporting Bitcoins, or removal from a group. The stratospheric rise of the Bitcoin prices has been related to the belief that the institutional investors will become key players in the Bitcoin market [ (Biggs, 2017), (Bovaird, 2017) ] and 'FOMO' in Bitcoin parlance (Spilotro, 2018).

As mentioned before, the 'FOMO' may become a driving source of investment because they believe that other people have more information than they do. Informational cascades are formed on similar lines of thinking; people converge on a single piece of information as a rallying point for decision making without verifying the reliability of the information. The

internet is a breeding ground for informational cascades as it offers unrestricte access to information about other's actions (Duan, Gu, & Whinston, 2009). Blockchains allow all the real time information to be accessed by a participant i.e. publicly accessible information about the transactions of the various participants, which makes it easier for any prospective participant to notice any trades that may have happened and leaves the deduction behind such transaction to the observer. Individual information is private and may be perceived to be flawed. The information overload of the internet (Jones, Ravid, & Rafaeli, 2004) and public networks such as Bitcoins make it even more imperative for a person to rely on the external cues due to the underlying uncertainity about the quality of private information. Uncertain situations precipitate the herding instinct; the endogeneous erraticity in volatile assets such as Bitcoins may influence the participants to fall back on the instinctive reaction to follow the herd (Prechter & Parker, 2007). Informational uncertainty may occur due to either cognitive limitations of the participants or the deficiency of the market itself (Fernandez, Garcia-Merino, Mayoral, & Santos, 2011).

The public nature of Bitcoin itself seems to point towards informational conformity rather than normative. It is also important to remember that Bitcoin is free from any Government intervention and is self regulating based on complex cryptographic tenets, most of which cannot be understood by the laity. Thus, the probability of informational cascades seems to be higher in the uncertain environment. The informational cascades are a result of individuals making sequential decisions taking cues from a single external signal due to their private and incomplete information (Banerjee, 1992). This leads to a very interesting dilemma – if the transactor's information is private, then how do the signals spread? Topol (1991) postulates that the if the investors are aware about the unreliability of their information, they may choose to formulate their opinions according to the others around them, *mimicking* the actions of those around him. *Mimetic contagion* cannot exist independent of herding behaviour. If the opinions of many influence the choices of an individual in the same direction as the group, they have already 'joined' the herd. The Bitcoin rally of 2017 may actually have heightened the effects of the herding phenomenon. Research has shown that herding happens more when optimistic sentiments prevail (Welch, 2000), thus reinforcing the explanation of herding as an explanation for the dramatic price rise of Bitcoins.

The tendency of an investor to ignore private cues for the sake of general group opinion may be related to the previously mentioned *Deindividuation Theory.* Although the theory was used as an explanation for deviant behaviour more noticeable among groups that provide anonymity to its

members, the unification of belief and ignorance of private cues may also influence financial decisions (Hua & Wang, 2018). In a group, a person's focus is outbound ; the lack of introspection reduces the rationality of the person and instead replaces it with the amplification of reaction to externalities, making individuals revert to more primitive forms of decision making (Postmes & Spears, 1998). The anonymity of Bitcoins and the freely available information along with the influence of the internet is a *perfect storm* for the prioritisation of group signals and subsumation of the self for the 'FOMO'.

## 5. CONCLUSION

For an asset that the experts have continuously warned against and still gives of the whiff of controversy, the historic highs of Bitcoins are a cause for concern. The price of one Bitcoin reached its peak at USD 19,783 on 17$^{th}$ December 2017 (Morris D., 2017), seemingly depending on market demand. Unlike fiat currency, which mostly earns its value from the backing from the issuing country, Bitcoin earns value from the willingness of the participants to accept it as a form of investment. Although there has been controversy over whether cryptocurrency is currency or speculative investment, its limited acceptability, high transaction costs and the investment patterns resemble a speculative motive more than transactional [ (Blakenhorn, 2018), (Aitken, 2018) ]. This paper has attempted to study the Bitcoin Bubble from a behavioural perspective, rationalising on herding as the *raison d'être* of this asset bubble. Even when the Bitcoin Bubble has burst, there is no guarantee that such an event may not occur again. The insights of the paper in the phenomenon of *mimetic contagion* causing informational cascades in the internet age hopes to provide the readers with an area for introspection. The contagion phenomenon led to the unjustified reaction to the Bitcoin prices both during the upswing and the subsequent crash. The investors led themselves into *mass delusions* that there would be more investors willing to pay nearly 20000 USD to hold a Bitcoin due to a misplaced belief in other's information and an optimistic outlook about the future. The cause of such delusions canot be expected from traditional finance; the psychological insights from this paper hopes to add to the existing literature about the existence of Bubbles in the crypto-age. The Bitcoin Bubble of 2018 may be likened to the mythical Icarus - it rose too far, too fast, on flimsy wings.

## 6. LIMITATIONS OF THE STUDY

Bitcoins are a new field of study, thus the research available on it is limited. In addition, due to its acceptance among the more technologically sound

groups, it is an exclusive area of investment for the masses. The limited time of the article may have left out the cultural, political and social influence of the various factors that may influence the prices of Bitcoins. The paper's approach from a behavioural perspective may have inadvertently ignored the more technical aspects of Bitcoin operations. The author has focused on a single explanation for the Bitcoin mania and may have accidentally ignored other theories that explain the phenomenon. It is a purely theoretical deliberation and requires an empirical investigation to reinforce its conclusions.

## 7. FUTURE SCOPE OF RESEARCH

Advent of cryptocurrencies offer a new investment class to the investors. Similar to all nascent concepts, it faces teething issues that need time to be ironed out. The bubble burst of Bitcoin does not mean condemn it to its death throes. Indeed, Bitcoin is gaining acceptance among the financial institutions and merchants willing to accept it as a currency (Kelso, 2018) or at least an investment (Mourdoukoutas, 2018). It throws up important policy questions about regulation and monitoring. This paper has identified the features that made Bitcoin prices in 2017-18 a bubble and identified the reasons behind it in theory. It is upto future research to develop a model for predicting Economic Bubble formations by observing the social and cultural factors during the period. Although there have been attempts to predict the behaviour of Bubbles (Rodrigue, 2017), there needs to be future research about what measures may be taken to eliminate or at least mitigate the circumstances that lead to the contagion effect. The role of the internet in amplifying the contagion effect and its use to combat it may also be an area of interest for future researchers. An indepth look at Bitcoins may also help understand the crowdfunding phenomenon (Edmondson, 2018) and how investor communication ameliorates information asymmetry in these internet based investment areas (Moritz, Block, & Lutz, 2015).

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