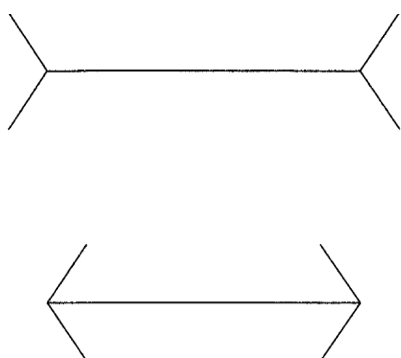


Bursting The Bitcoin Bubble

An Analysis Through Behavioral Finance

Pragti Rathore, Simran Panesar

Take a look at the figure given below. An extremely common optical illusion, it begs the question: Of the two horizontal lines, which looks longer?



Many would say, the top line. In fact, both the lines are of exactly the same length. Look again. Although you now know that both the horizontal lines are of equal length, the top line still ‘looks’ longer. The purpose of this exercise was to prove the fact that merely knowing about the illusion does not dilute its effect. However, if you had to make a decision based on these lines, the knowledge that this is an illusion would help you avoid a mistake.

Unfortunately, the brain cannot work like a computer. Although the human mind is equipped to be rational, it cannot match the unfiltered logic of a machine. The brain frequently processes information through shortcuts and emotional filters to shorten the analysis time. The decision arrived at through these shortcuts is very different from the choices you would make without them. These filters and shortcuts are called psychological biases, which form the very foundation of Behavioral Finance.

The aim of this paper is to explain the concept of ‘Market Bubbles’ by analyzing

‘Bubble’, a current phenomenon, and try to understand its rise and predict its fall.

Speculative bubbles have had a long and continuous history in the world markets. The progression of time or the changing economic scenario have not prevented their arrival or reduced their frequency. A bubble is a spike in the value of a particular asset caused by exaggerated expectations of future growth. The over-optimism drives trading volumes higher, and as more investors herd around these heightened expectations, buyers outnumber sellers, pushing prices beyond what an objective analysis of intrinsic value would suggest. Although every speculative bubble has its own driving factors and determinants, most involve a combination of fundamental and psychological forces. In simple terms, a bubble is an overheated market which has too many buyers who are too keen to buy. As a result, prices rise exponentially and the situation soon becomes unsustainable. Eventually, some people realize that this euphoria cannot last too long and start to withdraw from the market. The whole process goes into reverse, even more rapidly, a selling frenzy sets in, prices crash and the bubble bursts.

The Bitcoin has all the hallmarks of a classic speculative bubble and the cryptocurrency’s volatility has alarmed regulators worldwide.

Anchoring

One of the major heuristics affecting the rise of the Bitcoin bubble is what behavioral economists define as the anchoring and adjustment effect. Kahneman and Tversky in their seminal paper first defined anchoring as a cognitive heuristic by saying that people make estimates by starting from an initial value that is adjusted to yield the final answer. They implied that human beings make decisions based on an “anchor” The anchor, or starting point, may be suggested by the formulation of the problem, or it may be the result of a partial computation. In either case, adjustments are typically insufficient. That is, different starting points yield different estimates, which are biased toward the initial values. You would expect the estimates to be closer to the actual values, but the variance in the different estimates is very high to suggest a close correlation. To sum it up, human beings make mistakes while predicting the value of a quantity, or the answer to a question, simply due to an initial “anchor” formed by them.

The use of anchors is ripe in the world of economics, business, finance and even everyday life. In our undergraduate courses, we are taught time and again, about prices being sticky. Couldn't anchoring explain the sticky prices so talked about by economists? So long as past prices are taken as suggestions of new prices, new prices will remain very close to old prices as people will “anchor” their expectations of new prices on previous ones.

So how does anchoring play a role in financial markets? What aspect of the mechanism by which stock values are determined is infiltrated by the anchoring bias? The answer, is the most important part of the stock markets. As Shiller says, values in the speculative market, like the stock markets are inherently ambiguous. Does anyone actually know what the value of Dow Jones will be next week, tomorrow or even the next hour? Is it really “worth” 6,000 today? Or 5,000 or 7,000? There's nothing elementally physical about the stock market. People usually anchor their valuations of stock prices on past prices, or what they've heard

the price of stocks to be. In a lot of cases today, the expected value of stock is estimated for the future by certain experts, and influences the expectations of amateurs. This value, or the past value of a stock, acts as an anchor to which people base their value of stocks, or even commodities. This is the simple way through which bubbles are formed and keep rising and rising.

Overconfidence

In a book by a well-known mystery writer (the name rhymes with Ban Drown), I came across a trick used by scientists, and mathematicians and scholars in numerous other fields. When faced with a confounding problem, they trick their minds onto believing they know the answer, and alas, many a times their brain comes up with a solution that solves the problem. The trick is good when it works, but sometimes the belief that we know the answer to all problems, and the answer found by us is better than any other answer found by any other person can lead to some disastrous results. The tendency to over-estimate our intelligence and capabilities relative to others is a common human trait, defined as overconfidence.

In a 2006 study entitled "Behaving Badly", researcher James Montier found that 74% of the 300 professional fund managers surveyed believed that they had delivered above-average job performance. A majority out of the remaining 26% viewed themselves as average. Incredibly, almost 100% of the survey group believed that their job performance was average or better. Clearly, only 50% of the sample can be above average, suggesting the irrationally high level of overconfidence these fund managers exhibited.

It's simple how overconfidence leads to the growth of speculative bubbles, investors, speculators, even common people believe in the accuracy of their preferred investments much more than the actual probability of these investments. This leads them to invest in a commodity, even though it seems too good to be true, from tulip-purchases in 1600s to dot-com shares in the 90s, to the very recent and ongoing Bitcoin bubble. They invest in cryptocurrencies

believing they will yield higher returns, therefore pushing the price of these cryptocurrencies or their stock value higher and higher. Prices keep going higher, people who bought the currency sells it for more, earn a profit, and by selling the currency more than it was maybe worth, contribute to the growth of the bubble. Overconfidence is a common heuristic faced by each one of us in our everyday life, and just like anchoring, a knowledge of the boas doesn't mean you're immune to it, just see the studies on fund managers mentioned above.

Hindsight Bias

Shiller defines hindsight bias as 'a tendency to think that one would have known actual events were coming before they happened, had one been present then or had reason to pay attention. Hindsight bias encourages a view of the world as more predictable than it really is.' This is also known as the 'I-knew-it-all-along' effect, reflecting a common response to surprise.

The Hindsight Bias effect is explained in a formative work by Fischhoff and Beyth. Their model gave participants a detailed description of an event that could have had various outcomes. Judges who had estimated the likelihood of various outcomes of President Nixon's visit to Peking and Moscow were asked to remember, or reconstruct in case they had forgotten, their own predictions sometime after the visit was completed. Remembered-reconstructed probabilities turned out to be higher than the original ones for events which were believed to have occurred and on the other hand, lower for those which had not. To summarize, they increased the likelihood of the 'actual' outcome, suggesting a clear "I knew it all along" effect.

Due to the hindsight effect, We overestimate our ability to predict the future based on the recent past. With results from the recent past in hand, we feel we predicted it all along or as our brain forces us to think, know it all along. We look at returns in the Bitcoin stock, see our colleagues and friends making superb profits on their investment, and find in ourselves an uncanny ability to have predicted the outcome. We tend to over-emphasize recent performance in our thinking. We see a short-term trend in Bitcoin, and we extend that forward in the future with higher confidence than the data would mathematically support. And so on, the bubble keeps rising.

Confirmation Bias

Confirmation bias is a cognitive bias whereby one tends to notice and look for information that confirms one's existing beliefs, whilst ignoring anything that contradicts those beliefs. It is a type of selective thinking. It's no surprise that people ignore highly pertinent information about the problems involved in investing in Bitcoins. They look over the fact that there's no regulating body like the government of a country backing it, the various possibilities as well as past cases of hacking, theft of personal information and several cybercrimes associated with the crypto currencies.

Herd Behaviour

As people learn what others think about certain stocks, the general consensus forms. As people base their investing actions on this consensus, a herd forms. Investor herding is similar to deer. Deer stay together in herds for protection against predators. A deer always has its eyes and ears open to see what the other deer are doing. As the herd gallops, the deer gallops. As the herd grazes, every individual deer grazes. Similarly, investors also keep their eyes and ears open to what other investors are doing. Many people watch Zee Business every day or keep themselves updated on business websites. They like to act according to the investor sentiment since no one wants to be left behind. The problem with following the herd is that it magnifies and intensifies psychological biases. It causes investors to base their decisions on the 'feel' and 'mood' of the crowd

rather than on logical analyses. Investors also find it attractive to move with the herd, because the feeling of regret on picking a bad stock is lower, since everyone has suffered in the same manner. When a large number of people are affected by their psychological biases in a similar manner, a herd forms and this has the potential to affect market prices. frenzy.

The Bitcoin has become a buzzword overnight, especially among investors. An enigma in the online community, it frequently finds mention in headlines, media debates and is supposedly the next Tulip Bulb. In the age of cryptocurrencies, Bitcoin can be used to purchase anything from a motorbike to tickets for a music concert. Yet there is widespread confusion about what the Bitcoin truly is, and many question its legitimacy.

Why has Bitcoin recorded such a rally in prices?

Remember your high school Economic lessons. When did the price of a commodity rise? When its demand rose. Simple demand and supply mechanism, excess demand for a good causes its price to rise. Though not so simple, but this basic mechanism is the thought with which I'd like to introduce the discussion on a huge rise in prices that Bitcoins and other digital currencies have witnessed. The method to create or mine Bitcoins is inherently complex, it involves complex computational problems, the difficulty of which is pegged to the amount of people trading in Bitcoins. So as the no. Of transactions increase, the difficulty scale of the problems also records a rise. On the one hand, this means a definite advantage for those who hopped on the Bitcoin bandwagon in the initial years of its birth, as they minted Bitcoins easily, selling them off to earn high returns. But this also means, that the no. Of new bitcoin to be created can be considered limited, if not entirely limited. There are only a finite number of Bitcoins on the interest right now. This is in direct contrast to standard government-issued currencies, which governments can always print more of. If the supply of Bitcoins remains finite, this should theoretically eliminate inflation, which is one of the biggest drawbacks of paper money. Because the number of Bitcoins is limited, their value

increases rapidly when more people want them. And when the value of something increases rapidly, even more people want them. So the initial price increases fuel future price increases which fuel more future price increases. But there are numerous other questions to be asked as well. Is this increase in price actually an increase in the value of Bitcoins, or is it simply a result of price speculation. This begs us to the question that we aim to answer with certain theories at hand, is the Bitcoin Bubble only a Price Bubble and on the other hand, is it really a Price Bubble at all?

Now, reason would say that the market price of the Bitcoin is composed of two estimates. First, the speculative 'bubbling' price estimate, and second, the intrinsic value of the Bitcoin. Whether Bitcoin is more of a currency or merely a Price Bubble relies on the trading incentives of the participants at a particular moment. In other words, it depends on the number of market participants who want to trade it as a medium of exchange as against speculative participants who want to hold Bitcoins until prices surge. Hence, it is important to estimate the different types of trading incentives to be able to decompose the Bitcoin price into a utility driven component and a speculative component. The first type of trader, namely the 'Utility Trader' purchases and saves Bitcoin as a means of payment. In doing this, he reinstates the function of Bitcoin as a medium of exchange, and ultimately defines its intrinsic value. The second type of trader is 'The Speculator', who aims to buy at a low price and sell at the highest possible price in order to make maximum profit. The speculator, instead of trading frequently, might also make big bets with the incentive to brew, ride the bubble and later cash out. There is also a third, slightly less important market participant, 'The Exchange', which facilitates trade and makes the market more liquid, making profit by charging fees for their services of bridging interested parties. Their services smoothen transactions and reduce friction in the Bitcoin market.

What affects the Prices of Bitcoins?

Jakob Bartos, in his paper analysing whether Bitcoins follow the Efficient Market Hypothesis given by Fama(1970) confirm that prices of cryptocurrencies namely Bitcoin react on publicly announced information and it follows hypothesis of efficient markets. They found that price of Bitcoin is higher during days of positive events and lower during days of negative events than during other days without any events. The detailed analysis confirmed the importance of events on prices of cryptocurrencies. According to the hypothesis of efficient markets, prices of cryptocurrencies reflect all known information and no one could outperform the market by using the same information that is already available to all speculators, except through luck or some insider information.

Secondly, analyses confirm that Bitcoin market determinants have an important effect on Bitcoin price. In the other words, supply and demand factors have crucial impact on the price of Bitcoin and it follows a standard economic model of currency price formation. Particularly, demand side factors are more important, because supply side is given exogenously and it will be fixed in future.

Let us analyse how information drove various components of trading incentives in the Bitcoin market. The Bitcoin started to have a positive price in relation to USD since August 26, 2010. Surprisingly, the Friction component dominated over the Utility and Speculative components of Bitcoin price during early circulation. The first piece of market information was the leave of Bitcoin founder, Satoshi Nakamoto, which ended up negatively affecting the utility driven as well as speculative traders. However, these negative trends reversed soon as the Silk Road, a famous underground market came into existence. Another dramatic event occurred in May 2011 as there was a large influx of Chinese investors in the Bitcoin market. This caused all three components of Bitcoin price to rise sharply, hence increasing the overall price of Bitcoin. During this climb, the speculative component dominated the other two components. This phenomenon clearly illustrates the role of capital influx in the creation and development of

price bubbles. A month later in June 2011, an attack occurred targeting an anonymous user and a famous Bitcoin Exchange. This fear and insecurity triggered doubt in the function of the Bitcoin exchange and this was reflected in the effect on the Friction component. This led to a series of events, with Bitcoin exchanges facing increasingly intense attacks every second. During the same time, however, the use of Bitcoin in transactions started becoming more widely accepted. Some countries such as Cyprus and Spain started recognizing it as a substitute to their national currencies. This increasingly wide acceptance can be validated by the sharp increase in the utility as well as speculative components of Bitcoin price. Online giants such as Baidu also started accepting Bitcoin as a mode of payment. On the contrary, the US government and the Chinese government to some extent worked to calm down the heated Bitcoin market. However, the Chinese Bitcoin market bounced back as soon as this news turned out to be fake, the speculative component reaching a historic high. This set into motion a chain of events, each inflating the price of Bitcoin, resulting in a vicious cycle where inflated demand led to inflated prices which fueled further price increases, reinstating the status of Bitcoin as a 'Price Bubble'.

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