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A Trend Differential Analysis of
Cryptocurrency Growth and Price
Performance

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Abstract: Although Crypto currency is growing fast in the digital money market, it is nascent, hence its behaviour appears confounding to investors and users. **Objective.** This paper aims to analyse significant different and trend between the 2017 and 2021 Bitcoin price and market capitalisation. **Prior work.** the paper relies on prior work on cryptocurrency and leans its results on conformability with efficient market hypothesis. **Method.** it uses a t-test for mean difference and trend analysis. Data on price and market capitalisation for Bitcoin covered 357 days in 2017 and 357 days in 2021. **Findings.** at a P value of 0.000001 show that the 2021 Bitcoin price and market capitalisation performance is significantly higher than the 2017 – with over a thousand percent growth in value. In addition, the trend analysis shows that at the earlier stage of Bitcoin, the market is not much efficient and investors can beat the market, but five years after in 2021, the market efficiency has increased. **Significance**. it provide the cryptocurrency operators, investors, and users with additional investment decision information to determine five years hence regarding when to invest in cryptocurrency for best profit and minimal loss. It thus provides a digital money case study for university business schools. **Value**: cryptocurrency may manifest non-compliance to efficient market hypothesis when the digital money asset is relatively new to the digital money market and may show compliance to efficient market hypothesis after about five years maturity in the digital money market. It thus contributes as it has manifested new light to money market hypothesis and literature.

Keywords: Cryptocurrency; Bitcoin; Money market; blockchain

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1. Introduction

The rapid information technology advancement of the 21st century contributes to the emergence of digitised commercial medium of monetary exchanges. These developments have equally disrupted stock and money markets given the currently non-controlling nature of cryptocurrency money market. One amongst the latest advances in money market is the unprecedented emergence and proliferation of crypotocurrency or digital currency. Hence, money markets have expanded to a new genre of money in a digital form to enable parties buy, sell, and settle exchanges without involving the third party security – namely the banking system. Accordingly, the cryptocurrency market and the support technology permits two individuals to conduct their exchange remotely with encrypted money exchange security only known to the two parties in the money market. Hence, the need for third party security becomes irrelevant in cryptocurrency money market. Unlike conventional money, the digital money has no central authority command and no central storage since the multiple ledger is stored in multiple network locations, which enables multiple users to buy and sell cryptocurrency simultaneously, also known as blockchain. Albeit the nature of cryptocurrency as digitalised money in a digital money market, investors require some guiding information similar to conventional money and stock markets. For instance, players need to understand the trend behaviour, price and market capitalisation performance.

Cryptocurrency money markets is bourgeoning with some of its behaviour and performance mimicking conventional portfolio markets (the stock and money markets). Furthermore, current research indicates that the cryptocurrency market has the propensity to influence conventional stock market (Jimoh & Benjamin, 2020). However, what stands out is that not much is yet known about its dynamics; additionally, given the currently lack of central authority and control, it does seem that cryptocurrency market may not wholly be amenable to the views of efficient market hypothesis – at least within the early stages of appearance of a cryptocurrency in the money market. This is because lack of authority and control of cryptocurrency may seem to insulate it from market or other information that causes fluctuations in conventional stock and money markets, which are under the control of centralised authorities and regulated. Given this milieu under which the current cryptocurrency market operates, researchers are looking at the cryptocurrency volatility dynamics to understand types of information that affect the performance and trend of cryptocurrency (Katsiampa, 2019; Tan et al, 2019). To assist investors and users of cryptocurrency, it is important to examine and compare the trend behaviour and performance of criptocurrency at the earlier stage and mature stage of the currency to identify the stage that is more predictable and the performance growth implicit with the time difference. Therefore, this current research uses a differential five years gap data for Bitcoin (2017 and 2018) to analyse the difference in performance growth and trend behaviour. None of the existing research have shown a nuance towards this

angle of cryptocurrency research; hence, this paper contributes a novelty to the literature. The findings have implication for money market theories such as the efficient market hypothesis; it also provides important implication for investors and users of cryptocurrency and provides further academic research agenda.

1.1. Problem of Paper

Cryptocurrency and the attendant cryptocurrency money market is nascent and not much research information exists about its behaviour, without which it is somewhat difficult to explore the dynamics of digital currency market (**Hossain, 2021**). This paper inclines on the problem that no earlier research on cryptocurrency has tended to connect cryptocurrency performance and behaviour with efficient market hypothesis, which indicates "impossibility of beating the market". Whether this is applicable to both the early and mature period of cryptocurrency is still scant in previous research. Hence, this paper contributes by filling this gap through conducting a differential trend and performance analysis between 2017 and 2021 Bitoin performance to determine the trend predictability between 2017 and 2021 and the attendant price and capitalisation performance.

1.2. Objective of Paper

Given the above problem, this paper aims to provide an analysis of significant difference and trend dynamics between the 2017 and 2021 Bitcoin behaviour, price and market capitalisation. Therefore, the paper seeks to provide two distinct insights on the performance and behaviour of cryptocurrency, which are – the differential growth of cryptocurrency between 2017 and 2021 (five years after ascending a level of maturity) in the digital money market, and the behavioural trend of cryptocurrency between 2017 and 2021.

2. Literature Review

The following literature is logically organised to provide supportive insight to the main trust of this paper. In considering the growth and price performance of cryptocurrency, it is important to first ascertain the investment drive in cryptocurrency – reason being that before a growth may occur, investors have to invest and an accumulation of continuous investment may therefore result in growth amidst volatility inherent in investment trend, which might also affect price performance (Živkov et al, 2021). Hence, this literature provides insight on investment in crptocurreny, price performance of cryptocurrency and capitalisation performance of cryptocurrency.

2.1. Investment in Cryptocurrency

The information technology boom and attendant innovation has brought improvements in both the money and stock markets around the world and has attracted investors' interest more than ever (Jani, 2018). Recent research shows that the growth in cryptocurrency interest is more glaring amongst players with prior investment experience; characteristic determinants of such investments do not deviate from popularised investment behaviour literature in conventional stock and money markets (Xi et al. 2020). There are literature reasoning that technological factors have orchestrated digitalisation of money; according to Jani (2018) the quick improvement of data and communication innovations, numerous exercises in human way of life have been combined online and they have ended up more adaptable and more compelling. Jani (2018) maintains that a colossal development in a number of online clients has actuated virtual word concepts and made the cryptocurrency to encourage enhanced financial transactions such as buying, selling, and exchanging. Generally, cryptocurrency encapsulates the valuable and intangible digital money, which utilize electronic market gateway in different applications and systems such as online social systems, online social diversions, virtual and peer-to-peer systems. The utilization of digital money has been growing with every passage of time as awareness and interest grows amongst players in the money market (Jani, 2018).

Other researchers have focussed on factors that attract investors' attention to cryptocurrecy investment. These include *inter alia*, Xi et al. (2020) on the socio-demographic characteristics of behaviours in cryptocurrency, Muslim investors' behaviour in blockchain-based cryptocurrency (Ayedh et al, 2020), herding behaviour in cryptocurrencies (Bouri et al 2019), and factors that catalyse Bitcoin investment behaviour (Gazali, 2019). Xi et al. (2020) explored the socio-demographic characteristics, which cryptocurrency speculators show and the components, which go into their venture choices in numerous digital coin alternatives. They applied a web-based study among Australian and Chinese blockchain and cryptocurrency adherents, and a Multinomial Logit technique was used to analyze the characteristics of cryptocurrency speculators and their determinants of the choice of venture in "cryptocurrency coins" versus other sorts of money investments. Their analysis reveals a distinction between the determinant of these two choices among Australian and Chinese cryptocurrency investors. The noteworthy variables of these two choices incorporate age, gender, level of education, profession, and previous investment involvements (Xi et al, 2020). These findings differ from the study conducted in Malaysia on factors that spur Bitcoin investment amongst a religious grouping, indicating that factors may depend on social or religious setting. For instance, Ayedh et al (2020) examined the features, which may lead to an enhancement in Bitcoin investment market in Malaysian Muslim populations. They applied a survey technique and structural equation modelling with 200 sample data from respondents amongst Malaysian Muslim

population. Their results showed varied features which impact on Bitcoin investment by Muslim communities in Malaysia; these include awareness, compatibility, and enabling conditions.

In another interesting study about cryptocurrency investment behaviour, Bouri et al (2019) and Kumar (2020) sought to understand if there is a collective behavioural tendency (herding behaviour) amongst crptocurrency investors. Both researchers Bouri et al (2019) and Kumar (2020) found that indeed herding in cryptocurrency market might occur depending on the method of analysis used and under time varying conditions. Hence, the researchers examined how digital money market investors collaborate or imitate in-group without a central command to do so. In their part, Bouri et al (2019) present double outcome findings – the suitable model implication and herding implication. Firstly, they find that a static model approach may not work reliably, but a rolling-window analysis offers more reliability and valid assessment. Hence, after applying the rolling-window analysis and logistics regression, they find a significant result that shows herding behaviour amongst cryptocurrency investors with time variation and that such herding is more revealing when there is an increased uncertainty in the digital currency money market. Accordingly, Bouri et al (2019) opine that these findings point to market dynamic issues normally seen conventional money and stock markets namely market efficiency issues, strategies for trading and portfolio risk management. These thus makes the stock market to be analogous with issues in cryptocurrency market. In their own research, Kumar (2020) analysed the trading behaviour pattern of crypto traders to understand their herding under different market conditions, which affects price developments. They applied the cross-section absolute dispersion (CSAD) and considered how this might differ in different market conditions namely the up and down market conditions, and the high and low volatile markets. In their application of static and time-varying methods, they replicate the findings of Bouri et al (2019) and showed that indeed herding does occur in cryptocurrency market but under a condition of highly volatile cryptocurrency market, with anti-herding in low volatility market (Kumar, 2020). In their study, Gazali (2019) also sought to understand behaviural factors that support Bitcoin investment; however, they could not find empirical support to confirm behavioural factors – likely because, their sample of 45 could have been too small to elicit empirical result.

2.2. Cryptocurrency Price Performance

In a quest to investigation factors driving cryptocurrency price, Smuts (2019) finds that in contrast to previous research findings, internet search volume via Google search show a negative correction with the price of Ethereum and Bitcoin within the observation period of June 2018. However, their research show that sentiments retrieved from investment groups in cryptocurrency via Telegram show a positive

relationship with Bitcoin and Ethereum prices respectively, but they find that this behaviour is predominant during periods of enhanced market volatility. They also find that Bitcoin price is strongly affected during the following week because of current Bitcoin-themed Telegram group message postings (Smuts, 2019). This finding during volatile period seem to corroborate Bouri et al (2019), who also found that cryptocurrency market behaviour fluctuates more during times of highly volatile market conditions. This provides investment information for cryptocurrency market players to be aware of the best action to take when the cryptocurrency market begins a volatile trend – during this time, profit or loss becomes imminent depending on the players' investment action – to buy short or buy long (Chang et al, 2013). Buying short refers to selling off the currencies when the players' sentiments grow negative and suspicious of impending loss. Buying long refers to the action whereby the players buy more currency with a positive sentiment that volatile conditions might favour profit making by buying more cryptocurrency; this analogy is comparable to buying long and short selling in stock markets such as in the research by (Chang et al, 2013). Other researchers have delved into the analysis of economics aspects of Bitcoin price performance determinants. For instance, Ciaian et al (2016) explored a combination of factors by combining the digital market nuances and conventional factors that affect currency price performance. Accordingly, Ciaian et al (2016) applied the time series technique and analysed daily Bitcoin price performance for five years. Their findings show that conventional market forces combined with the depth of cryptocurrency appeal to both the investors and users jointly. A closely related finding by Philips and Gorse (2018) corroborate the online or digital factors effect on crypotocurrency prices, wherein they concur that indeed crptocurrency prices are affected by market bubble and that this depends on the market regime. However, the findings by Philips and Gorse (2018) appear unique given their additional finding that systems hacking and system security breaches does contribute additional factor to cryptocurrency price fluctuation. This therefore, means that investors and users of cryptocurrency should be aware of next step to take in times of hacking and system breach in order to retain their profit and avoid losses unexpectedly. Researchers on cryptocurrency indicate the need for players to apply a forecasting strategy to remain informed on potential future price fluctuation. Accordingly, Dutta et al (2020) applied the gated recurring unit (GRU) technique to predict future cryptocurrency price and found that this approach performs better than conventional prediction approaches in predicting cryptocurrency. They also highlight that a combination of GRU and simple trading approach would lead to financial gains (Dutta et al, 2020). In further investigations regarding the impact of perception of users on crypotcurrency prices, Karalevicius et al (2018) evaluation the effect of media sentiments on the price of Bitcoin, the gathered information from different media articles and blog postings about Bitcoin performance and categorised the news and positing between positive and negative sentiments. They find that within the short period, investors in Bitcoin does react sharply to sentiments raised

in news articles and in blog postings, hence affecting the cryptocurrency price fluctuations.

2.3. Cryptocurrency Capitalisation Performance

In the conventional stock market, the market capitalisation of stocks is normally derived by multiplying number of stocks by price per stock, as an instance (2 000 000 shares outstanding of AlphaBeta company in the market by $20 market per share) gives a market capitalisation of $40 000 000. Similarly, cryptocurrency market capitalisation is derivable by multiplying the number of digital currencies in circulation for the period by the price per currency. So, as an instance if a Bitatan cryptocurrency has 4 000 000 coins in circulation at a price of $200, therefore, the market capitalisation for Bitataan cryptocurrency market capitalisation will be $800 000 000. Amid inherent fluctuations, there has been a general boost in the growth of cryptocurrencies market capitalisation ranging between billions and trillions depending on the fluctuations. For instance, the Bitcoin, a leader in cryptocurrency, even grew to over a $trillion capitalisation in the months of 2021(Coinmarketcap, 2021; Kharpal, 2021). If the price per cryptocurrency fluctuates, it follows also that the market capitalisation will fluctuate over time. Similar to stocks, the demand for crypocurrency would likely influence the price, so higher demand would increase the price and simultaneously increase the market capitalisation. The reverse is the case when there is a reduction in the demand for cryptocurrency. According to Fortune (2021), the leading factor in cryptocurrency growth might be attributatble to increase in blockchain (the distributed ledger technology) and expansion in digital venture capital investment. This is also in addition to the increasing acceptance and investment in digital currency as a medium of exchange by increasing number of developing countries (Fortune, 2021). In addition, research by Vidal-Tomás (2021) indicates that addition of new cryptocurren into the digital markets also helps to boost the cryptocurrency capitalisation. In their cryptocurrency market capitalisation analysis, Caporale (2018) explored ryptocurrency market capitalisation by using long-memory analysis. They find that some crptocurrencies performance drop over time. However, they highlight that trend analysis and trading techniques are useful in forecasting and trading in cryptocurrency to make abnormal profits. Given this highlighted importance of trend analysis, the author uses this current paper to engage in trend analysis performance of some key cryptocurrencie.

Given that cryptocurreny is still emerging, its behaviour is still uncertain and research in the area of differential analysis of cryptocurrency market capitalisation is still scant. Hence, this paper contributes by presenting a differential and trend analysis of cryptocurrency price and market capitalisation performance.

3. Method

Research on cryptocurrency capitalisation is still emerging, investors and users are looking for information to assist them in predictions and guidance on the correct investment decisions to maximise profit and minimise potential loss in the cryptocurrency market. Therefore, this section applies a t-test differential analysis and a trend analysis to present the price and capitalisation performance of Bitcoin, which is the largest cryptocurrency in the digital money market in terms of market capitalisation and price per currency. Data on Bitcoin price and capitalisation were from the historical price and market value archives of one the cryptocurrency trading platforms namely the Coinmarketcap (2021). Data covers 357 days (in 12 months in 2017) and 357 days (in 12 months in 2021). The historical data provides more than enough repeat data to run the t-test of difference in means to determine if Bitcoin market behavior and performance in 2017 is significantly different from 2021. Hence two phase analysis – firstly the t-test statistics and secondly the trend analysis with line chart trends.

3.1. Results

The Bitcoin price and market value performance difference, which is showcased by the analysis result in Table 1 and Table 2 provides pertinent information for cryptocurrency investors and users with critical information to anticipate Bitcoin behaviour in five years –*ceteris paribus*. It does show that the more cryptocurrency mature, the more its behaviour and performance becomes somewhat difficult to predict – which thus means that maturity of a money market instrument helps in bestowing market efficiency in the particular money market portfolio – in this case the Bitcoin. This is clearly visible in the trend analysis in Figure 1 and Figure 2, which indicates apparent sign of predictability given steadily consistent trend in Figure 1 but undulating trend in Figure 2. Table 1 shows result for the t-test of significant difference between 2017 and 2021 Bitcoin price (five years gap). Similarly, Table 2 shows the result for the t-test of significant difference between 2017and 2021 Bitcoin market capitalisation (five years gap). The result indicate that after five years, the price and market capitalisation performance of Bitcoin increased significantly from the value in 2017 at a P-value of 0.000000001, which indicates high level significance and thus high level increase in value after five years. This significant increase in 2021 Bitcoin value from the value as of 2017 indicates that cryptocurrency maturity in the digital money market has the propensity to improve the market capitalisation. This is also indicates that investors and users can anticipate significant improvement in a digital currency after some years (five years in this research).

Accordingly, the trend analysis of Bitcoin Market Capitalisation 2017 and 2021 in Figure 1 and Figure 2 respectively depict a unique performance of new and mature tradable portfolios. See for example, a unique behaviour of Bitcoin as new money market portfolio is discernible in Figure 1 wherein the trend appears steadily rising from January 2017 up to December 2017, when it showed first obvious fluctuation. Such steady rise in value mimics imperfect market that may characterise a new money market portfolio – at this early period of market arrival, not much information is available to influence the value of the portfolio and hence, its performance is somewhat predictable by investors and users.

Table 1. T-Test: Paired Two Sample for Means between Bitcoin 2017 and 2021 Prices

	Price-20121	*Price-2017*
Mean	47358.30874	3732.049496
Variance	98859796.67	13918934.03
Observations	357	357
Pearson Correlation	0.253279764	
Hypothesized Mean Difference	0	
df	356	
t Stat	85.02484447	
P(T<=t) one-tail	0.000000001	
t Critical one-tail	1.649145105	
P(T<=t) two-tail	0.000000001	
t Critical two-tail	1.966649995	

Table 2. T-Test: for Means Sample between Bitcoin 2017 and 2021 Market Capitalisation

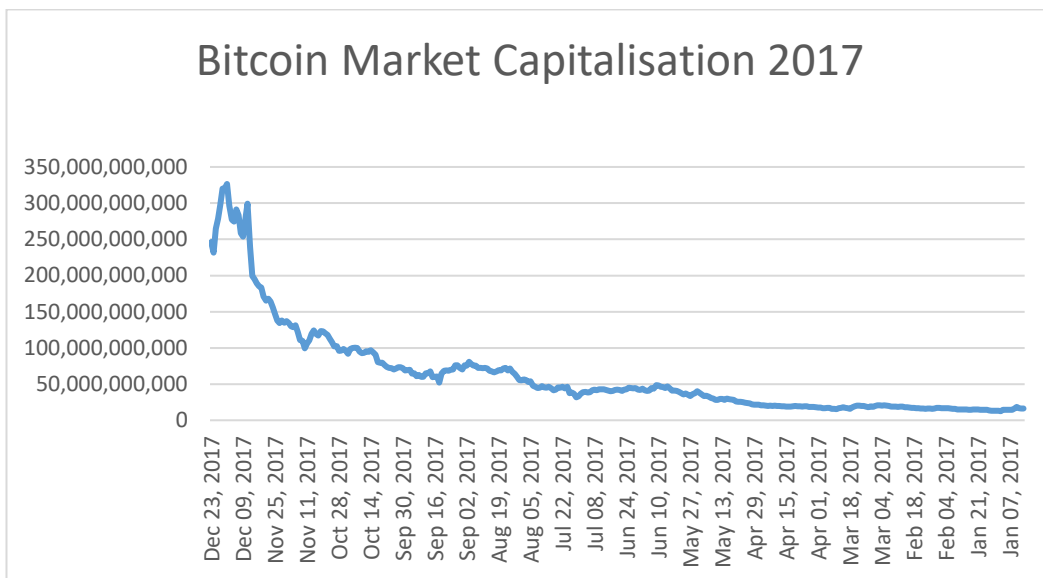|	*MKTCAPT-2021*	*MKETCAP-2017*
Mean	889050057455.19	62486150892
Variance	3.49078E+22	4.00682E+21
Observations	357	357
Pearson Correlation	0.267010439	
Hypothesized Mean Difference	0	
df	356	
t Stat	86.49848458	
P(T<=t) one-tail	0.000000001	
t Critical one-tail	1.649145105	
P(T<=t) two-tail	0.000000001	
t Critical two-tail	1.966649995	

Figure 3. Bitcoin Market Capitalisation 2017
Source: author's trend analysis with data from: Coinmarketcap (2021)

Figure 4. Bitcoin Market Capitalisation 2021
Source: author's trend analysis with data from: Coinmarketcap (2021)

Figure 2. Bitcoin Price 2017
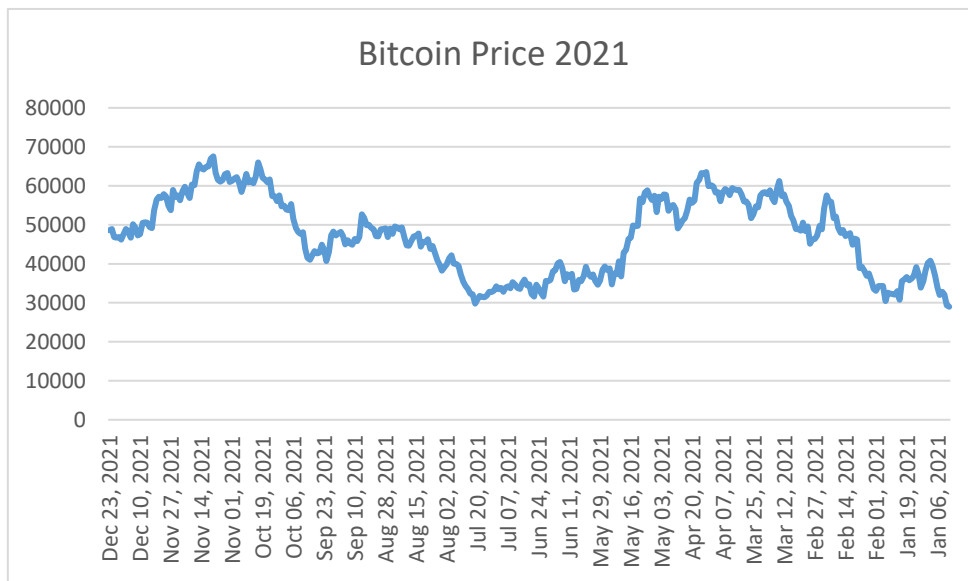*Source: author's trend analysis with data from: Coinmarketcap (2021)*

Figure 2. Bitcoin Price 2021
Source: author's trend analysis with data from: Coinmarketcap (2021)

3.2. Implications

The foregoing analysis and results provide important practical and academic implications. The results for 2017 price and capitalisation performance appear to be contrary to one genre of efficient market hypothesis "impossibility of beating the market" because the steady rise in Bitcoin performance for the 12 months of 2017 meant that investors could easily foretell and beat the market. Hence this paper provides one example where efficient market hypothesis may not apply – which is when the cryptocurrency asset is new in the market and not all available information is out and know to affect and to make the price to fluctuate unpredictably. This therefore provides an agenda for further research to examine other cryptocurrencies amenability to efficient market hypothesis. Practically, the results provide the cryptocurrency operators, investors, and users of Bitcoin further investment information to make decisions five years hence regarding when to invest. The paper is also provides novel case paper for university business schools - for students and faculty members for studying the behaviour and performance of this important digital money market portfolio.

3.3. Value (Contribution)

Given the above findings, this paper provides a maiden contribution to show that cryptocurrency may manifest non-compliance to efficient market hypothesis when the digital money asset is relatively new to the digital money market and may show compliance to efficient market hypothesis after about five years maturity in the digital money market. It thus adds further value as it has manifested new light to efficient hypothesis to the literature.

4. Conclusion

Cryptocurrency is a new medium of exchange and new in the digital money market. As such, its behaviour and long-term performance remains somewhat nebulous to investors and users. Earlier research have found middle to high levels of volatility in cryptocurrency and with varied reasons given for the volatility. These early reasons remain uncertain given that the current operations of cryptocurrency market is not under the operation and regulation of any central authority. This therefore connotes apparent divergence from the dynamics of efficient market hypothesis. This is because the completeness of market information (within and outside of the money market) which when combined bestows an efficient market may not yet be attainable within the status quo of cryptocurrency money market.

Accordingly, While Crypto currency is developing fast in the digital money market, its behaviour appears bewildering to investors and users. Hence, this paper

investigated how the performance and behaviour may differ after a time span of five years – this slant of examination has not been done in previous cryptocurrency research and therefore provides a new light to understanding the trend behaviour and performance of cryptocurrency in terms of price and market capitalisation. Relying on the two phases of analysis, the findings at a P value of 0.000001 indicate that the 2021 Bitcoin price and market capitalisation significantly outperform the 2017 Bitcoin price and market capitalisation with over a thousand percent growth in value. Furthermore, the trend analysis shows that at the earlier stage of Bitcoin, the market appears inefficient because, the trend similarity shows that investors can beat the market. Which is contrary to efficient market. However, after five years in 2021, the market trend exhibits signs of efficiency given the trend fluctuations. Therefore, this paper contributes and provides the cryptocurrency operators and players with additional investment for profitable investment decisions and loss minimisation. The results provide a good academic case study in universities and offers further agenda for researchers to explore this scenario of research using other currencies and by expanding the time span of observation.

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