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Exploring Non Fungible Tokens in the Digital Economy: Stakeholders, Ecosystem, Risks, and Opportunity

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ABSTRACT



Purpose: In this research, we analyze what essentially drives the Non-Fungible Token (NFT) market, namely, NFT adoption, investor participation, content creator, technological infrastructure, market value and speculation.

Method: A quantitative research approach was adopted, employing the blockchain transaction data, NFT marketplace indices, and investor behavior analysis. Hypotheses testing and relationships between variables were performed using descriptive and inferential statistical techniques, including regression models.

Findings: The results indicate that NFT adoption has a positive effect on market utility and a negative effect on market value. A high level of participation amongst investors correlates with a stable market, whereas speculation causes price fluctuations. The behavior of content creators is considered a driving factor on the market, while technological infrastructure is important to improve efficiency in the market.

Novelty: This study is a novel combination of blockchain performance metrics with market value and investor participation. It builds on the existing literature by examining the phenomenon of content creators and technological elements behind market success.

Implications: For investors, content creators and platform developers, the findings have practical implications. Strategies based on these insights can help mitigate market risks, enhance market stability, and foster sustainable growth in the NFT ecosystem.

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1. Introduction

Non-Fungible Token (NFT) technology is a new innovation in the digital economy that has changed the model of creation, trading, and monetization. NFTs (non-fungible tokens) are unique digital representations of assets on the blockchain, which verify ownership and the scarcity of the asset. The excitement has gone up around the globe from artwork to gaming to sports collectibles to virtual reality (Ozdemir, 2023). According to Arnold et al., (2024), NFT trading volumes hit all-time highs, with billions of dollars worth of transactions occurring within the span of a few weeks. However, on the other side, the hype nature of the sector accompanied by its fast-changing environment evokes worries about market volatility and sustainability (Low et al., 2022; Moore et al., 2022). In Indonesia, NFT mania became a hot topic, as sales of very expensive digital art appear and require regulations (Frank & Rudolf, 2024). Although early research has indicated both economic opportunities and systemic risks associated with NFTs, confirming the disruptive potential of NFTs on traditional asset management systems (Liao et al., 2024; Wilson et al., 2022). It is therefore essential to



understand the roles of various stakeholders, the market mechanisms as well as the technological infrastructure of the NFT ecosystem so as to streamline energy, tokenize assets and mitigate carbon impact from this growing market (Ali et al., 2023; Rani et al., 2024).

While non-fungible tokens have exploded into the ether, there are a number of unresolved issues confronting them that will dictate their sustainability in the marketplace and mainstream acceptance. The productivity of blockchain networks used to mint and trade NFTs is also one of the biggest concerns (Christodoulou et al., 2022; Davies et al., 2024). The ecological concerns for implementing Proof of Work consensus mechanisms if not put into proper use due to their energy-intensive nature has gained traction and more discussions (Alzoubi & Mishra, 2023; Kohli et al., 2023). This has resulted in speculation-induced market volatility which in turn results into wide price fluctuations causing uncertainty for the investors (Antonakakis et al., 2019; Guo et al., 2022). Furthermore, regulatory barriers hinder market stability and growth potential, especially for countries like Indonesia where the legal framework governing digital goods is still evolving (Ariansyah et al., 2021; Li et al., 2020). There are also many intellectual property and fraud risks, with fake NFTs undermining consumer confidence (Chalmers et al., 2022; Flick, 2022). It's not the database of an uptrend and the difficulty of regulatory feasibility that boosts it. It's the entrepreneurial development of an NFT marketplace that solves these problems.

NFTs and the theory behind NFTs, digital scarcity and tokenomics the concept of digital scarcity, which is the theory underlying NFTs, was introduced by Nakamoto (2019) who demonstrated how leveraging the ability of blockchain to create and replicate tokens, that can hold unique value and cannot be replicated forms new paradigms of ownership of assets (Sunyaev et al., 2021). Tokenomics is the economic model that governs the blockchain ecosystem and is key to understanding the utility, value and ultimately the process of implementing NFT (Behl et al., 2024). Ultimately, the logic is built on the foundation of transaction cost economics (TCE), which manifests itself in the demonstrated efficiencies and cost savings made possible through the use of blockchain technology (Javaid et al., 2021, 2022). These theories are summarized below and together serve as a conceptual toolbox for how we might analyze the role and influence of NFTs on asset trading, value formation and market dynamics in digital economies (Wang et al., 2019).

There is much more to research before claiming the same for NFTs, research studies have made conflicting conclusions on their market impact. Have proven promising NFT, digital frontier for creators and collectors, (Bao et al., 2023; Belk et al., 2022). NFT Market Leaders and Growth, 2022 by contrast, negative impacts Griffiths et al. (2024), Wang et al. (2024), like those illustrated Toufaily et al. (2021), Zalan & Toufaily (2024). that itself creates speculation that drives down price stability and, ultimately, affects investor confidence. From that point forward, the focus of the literature shifted to market mechanics (Yoon et al., 2020), technical frameworks (Garcia et al., 2021), and consumer behavior Wilson et al. (2022), while only a few studies specifically assessed the implications of stakeholder interaction and regulatory aspects (Alshater et al., 2024). This work also the treats gaps by providing a conceptual tridimensional map of the NFT ecosystem, muanting the interactions among creatorrrs, intermediaries, investors, and consumers. Finally, it addresses the paradoxical role of speculation itself: as both wind in the flaming market and an enormous economic risk factor, hence graduating its analysis of the NFT economy. In this context, the study on case countries like Indonesia, which are rapidly developing their blockchain ARs despite having no appropriate regulatory framework yet, may be of particular interest (Paul et al., 2022; Wong et al., 2020).

This study addresses these questions by analyzing how the adoption of NFT creates advantages in terms of market value and stability of digital assets and how technological infrastructure is crucial for the successful adoption of NFT. It also looks at the behavior of content creators in their acceptance of the market and how speculation can float or sink prices. The results will yield concrete recommendations for lawmakers in creating measured policies that enable innovation without ignoring potential pitfalls, guidance for content creators and investors, on navigating NFT markets proactively, and recommendations for technology developers to build out blockchain infrastructure, for long-term solution scaling.

2. Critical Review



2.1 Aspects of the theory of innovation

The importance of adapting to changing economic paradigms for which traditional models no longer provide timely solutions is rooted in innovation theory. Schumpeter (1934) creative destruction model shows that it leads to replacement of the older out-dated systems with the newer systems which leads to economic renewal and economic competitiveness. Such innovation could be transformative in the context of how the digital economies work, in which the adoption of the blockchain and NFT are a good example of this kind of innovation. In Rogers' (2003) Diffusion of Innovations theory, the stages of technology adoption show the critical part played by early adopters in bringing innovations to scale. Similarly to this, Christensen's (1997) theory of disruptive innovation illustrates how NFTs disrupt traditional markets by generating new classes of assets as non-fungible tokens that were not previously salable (Garcia et al. 2021). These theories each highlight the critical importance of ongoing innovation in maintaining relevance in the market and offer a lens for understanding economic shifts through the lens of NFTs (Williamson, 2020; Tan et al., 2024).

2.2 The effect of NFT adoption on the market value of digital assets

NFTs having ownership and scarcity which are the two property of any digital asset that makes its market value. Non-fungible tokens (NFTs) are backed on blockchain technology to create uniqueness for certain items in the digital world to ensure uniqueness and transferability (Chen et al., 2021). Studies by Lee et al. NFT adoption creates greater market liquidity as show leading toward more investor and collectors based [4] (2022). Moreover, Tan et al. NFTs deliver a greater intrinsic and market-perceived value through their programmability. (2023) Nonetheless, one prominent concern is speculative driven volatility (Lin et al., 2023). A similar positive impact from NFT infusion was also discovered in the Indonesian digital art market where it increased earnings from assets and popularity (Putra & Anggraeni, 2022). As a result, NFTs are a game-changer in how we value digital assets—they are disrupting everything from the market to the investment model.

H1: Non-fungible token (NFT) adoption has a positive effect on the market value of traded digital assets.

2.3 Effect of investor participation on NFT market stability

The level of investor participation is crucial in determining the stability and growth path of NFT markets. According to Lin et al. (2023) argues that increased investor engagement creates a more diverse market as a market with more participants is less sensitive to price manipulation and speculative bubbles. The active involvement of the investors facilitates liquidity which leads to a smoother transaction flow and makes pricing models more predictable (Zhang et al., 2023). On the other hand, insufficient investor participation can lead to market power being concentrated and heavily concentrated in a few players, and so the risk of volatility goes up (Kim et al., 2022). Nurhadi and Sari (2023) have shown empirically that a good investor ecosystems promotes trust and transparency, thereby strengthening market resilience. For instance, the increasing involvement of retail and institutional investors in Indonesia has been associated with growing depth and stability of NFT market conditions, signifying the need for a broad-based market participancy.

H2: The level of investor participation has a positive effect on the stability of the NFT market.

2.4 The influence of the role of content creators on NFT market acceptance

NFT markets are largely driven by content creators. The unique assets of NFT marketplaces are the creation of digital artists and creators, who are the triggers of demand and cultural relevance (Yoon et al., 2020). According to research by Lee et al. (2022), the presence of high-profile creators serves to increase the trust of consumers and, ultimately, encourages a greater uptake of the solution in the market. On the other hand, producing non-credible content will have a negative impact on market interest and also on trust (Smith et al.,

2020). Research by Huang et al. Dressedikin et al. (2023) emphasises that NFT content that is perceived as authentic and artistically valuable strongly influences consumer purchasing decisions. The practice of buying and selling digital art in Indonesia has become more democratised (Putra & Anggraeni, 2022), as successful creators are using NFTs to reach out to audiences all over the world. Therefore, the development of a robust ecosystem of creators is key to the long-term expansion of the NFT market.

H3: The role of content creators digital artists has a positive effect on the market acceptance rate of NFTs.

2.5 Effect of technological infrastructure on the successful adoption of NFTs

Another factor that influences the adoption of NFT is the availability and sophistication of the infrastructure of the blockchain technology. In addition, a strong technology architecture ensures transaction protection, scalability and effectiveness, which lays the foundation for users to trust and the market to grow (Chen et al., 2021). Empirical research by Park et al. One such study conducted by Li et al. (20-23) shows that advanced smart contract features increase flexibility and functionality of NFTs and attract adoption among diverse user groups. On the other hand, technical barriers, such as slow transaction speeds and high gas fees, are contributing to reluctance to adopt more widely (Kim et al., 2022). On the other hand, efforts to strengthen the blockchain infrastructure in Indonesia could further boost the performance of the NFT market in line with global technology trends (Tan et al., 2024). As a result, this increase in investment in blockchain innovation is essential for the further development of the NFT market.

H4: The availability and advancement of blockchain technology infrastructure has a positive effect on the successful adoption of NFTs by consumers and investors.

2.6 Effect of speculation on NFT price volatility

Speculation plays an important role in the price fluctuations of NFTs. It affects not only market dynamics but also investment outcomes. This leads to rapid price dynamics, but also reduces market predictability and investor confidence (Lin et al., 2023) due to immense speculative trading. Nonetheless, speculation attracts liquidity and provides market exposure, which enhances growth in the short run (Lee et al., 2022). Studies by Garcia et al. Speculation entails transformative and systemic dualisms, as noted by Singh et al. (2021) More broadly, speculative trends in Indonesia have facilitated significant increases as well as significant price corrections (Putra & Anggraeni, 2022). NFTs' potential for massive gains over a short period of time is what compels institutional and retail traders to buy them. The prices of digital collectibles like CryptoPunks and Bored Ape Yacht Club, which have witnessed explosive price increases followed by equally rapid declines, illustrate the kind of speculative price dynamics we find here (Zhang et al., 2024). In addition to that, speculations have been further accelerated by market sentiments, media coverage, and celebrity endorsements, thus strengthening of short term market cycles (Kim & Taylor, 2023). Aggressive limit orders originating from speculative trading, though risky, provide substantial liquidity and continue to be a major source of market depth, and hence price discovery and transaction efficiency. More balanced regulation may prevent negative impacts whilst maintaining the innovative drive that is an integral part of speculative markets (Nurhadi & Sari, 2023). What speculative NFTs do, on the one hand, is to be a growth opportunity, and on the other, a threat to the stability of NFTs in the future..

H5: The level of speculation in the NFT market has a positive effect on NFT price volatility.

3. Method Innovation

3.1 Research design

The empirical aspect of this research takes a quantitative research design as its central theme, focusing on hypothesis testing of NFT adoption, investor participation, content creators' influence, technological infrastructure, and market outcomes which includes market value, market stability, and price volatility

between entities. Quantitative research in this respect involves the systematic collection of data, measuring variable, and statistical analysis to test a given hypotheses (Creswell & Creswell, 2018). The correlational method examines the direction and strength of associations between variables and does not involve manipulation (Saunders et al., 2019) This approach is appropriate for seeking causality in financial markets, where independent variables like speculation levels and investor participation are evolutionarily dynamic. This study uses secondary data, such as Blockchain transaction records, financial market index and NFT marketplace such as OpenSea, Rarible and Binance NFT. By emphasising objectivity and replicability of findings, the study adopts a positivist paradigm. This design is in line with previous research on the valuation of digital assets (Lin et al., 2023) and the economics of the NFT market (Tan et al., 2023).

3.2 Research Sample

The sampling method used is purposive sampling, which is an attempt to describe the complexity of the NFT markets through the use of a population and a sample slice, he said. The sample consists of 700 transactions that will be registered between January 2020 and December 2024 across different segments of the NFT market, such as digital art, virtual real estate and gaming assets. Plus, it includes 43 popular content creators, whose NFTs move the market. We chose this sample size as the balance between strong statistical power without overkill, and a reasonable diversity that reflects the market. This is a more relevant approach as this only contains transactions automatically metadataed, a validated price in an existing market, and fully attributed to the blockchain. Etikan et al. (2016) undergird this approach, contending that non-random sampling should be used when investigating specialised markets. Investors may be defined based on their participation through public accounts on the blockchain (active wallet addresses) and their trading volume.

3.3 Variable Instrument

Using structured instruments, the study measures key variables in the NFT market, ensuring both the validity and reliability of the data. NFT adoption metrics are obtained from the blockchain transaction logs, counting minted and traded NFTs; and the marketplace reference indicators, as OpenSea, are used to compute digital assets market value. Unique wallet addresses engaged in active trading are counted to assess investor participation, giving an insight to the scale of market activity. One way to measure this market stability is by examining price volatility, using specific indices like the ones indicated in Tan et al. (2023) that assists in understanding the general changes in NFT prices. Measures the Role of Content Creators the role of content creators is assessed based on the number and popularity of NFTs they produce, using creator ranking reports to analyze their market trends. Technological infrastructure a key enabler of market operations is evaluated with blockchain performance measures on speed, cost and security of the platforms. Finally, speculation can be measured through high-frequency trading behaviour and measured in terms of asset price variance, which serves as a proxy for overall speculation in the market. Overall these instruments provide a full suite of tools for understanding the dynamics of NFT markets.

3.4 Data analysis

This framework assembles descriptive and inferential statistics in a systematic manner to allow for robust inquiries between the independent and dependent variables of the NFT marketplace. Descriptive statistics will capture trends in NFT market prices and investor participation, central tendency (mean, median) and dispersion (standard deviation) measures for key variables (e.g., NFT average prices) in each month (i) over the 12-month period (t) from the blockchain performance metrics. Assumption of regression models will be checked with classical assumption testing. We will check multicollinearity using the variance inflation factor (VIF) test and stop the retention of predictors that are associated with multicollinearity. The presence of heteroscedasticity will be tested by Breusch-Pagan or White tests in order to confirm homoscedasticity, while the normality of the residuals will be assessed through Kolmogorov-Smirnov and Shapiro-Wilk tests, to

analyze the normal distribution of this aspect. Six hypotheses will be tested using multiple regression analysis by building regression models for each hypothesis. The first equation is $\text{Market Value} = \beta_0 + \beta_1 * \text{NFT Adoption} + \varepsilon$, which will test the relationship between NFT adoption and its influence on market value. Likewise, other market stability, market acceptance, NFT adoption success, and price volatility hypotheses will be respectively validated through corresponding regression models. Results will be interpreted by looking at the coefficients (β) to see how strong the different relationships are and whether they are positive or negative. If the p-value is smaller than 0.05 the statistical significance will be confirmed and the adjusted R^2 value will show the goodness of the model fit. Computations will be made with statistical tools (SPSS, STATA, or R) (Hair et al., 2020). With this overarching analytical model, the results of the analysis are statistically sound and generalize well, providing valuable insights into the behaviour of the NFT market.

4. Result Innovation Research

4.1 Descriptive statistics of NFT segments

In the bustle of the city, all kinds of sounds fill the air, interfering with each other like competing musicians. The bright neon lights of colossal buildings pierce the night sky. This bizarre glow covers the city below. A stupefying mass for pedestrians. In firecracker-like succession, the smell of food being barbecued by the side of the road mixes with the fumes of gaseous states. It is all a kind of overdose of aromatic saffron that lingers for a long time. Despite all this chaos, there's an unmistakable vitality that runs through the city. It's a relentless heartbeat that drives things into the night. These elements provide an overview of market trends and activity throughout the study period. Even when we calculate the average price, digital art NFTs are worth more money on average per unit. This indicates a relatively higher average total market value for this type of participant compared to either virtual real estate or gaming assets (see Table 3). Trading volumes are particularly high in line with increasing investor enthusiasm, but only in the areas of gaming assets and digital art. The volatility index suggests that volatility will continue to increase in the gaming assets segment. This is in line with the higher level of speculation in this part of the segment.

4.2 Multicollinearity and assumptions testing

None of the independent variables correlate significantly with each other in any of the regression models ruling out multicollinearity as per the test results shown in Table 4. Particularly, all variable VIF values are lower than 10, which suggests that multicollinearity is not an important problem in the analysis. NFT Adoption with a VIF of 2.5, Investor Participation with a VIF of 2.1, and the Role of Content Creators with a VIF of 3.0 all show moderate correlations with other variables, though in a range low enough to allow for robust regression results. For the next predictor, Technological Infrastructure, we find a VIF value of 1.8, therefore, it has a very low correlation with others predictors confirming that we don't have issues of multicollinearity. The VIF value for Speculation, which is 2.7, is also acceptable. These Results indicate that the regression models are significant and that the independent variables can be interpreted individually without multicollinearity interfering. Thus, the analysis can safely assume that no high inter-correlations skew the relationships between the variables.

4.3 Heteroscedasticity and normal tests

The heteroscedasticity and normality tests' outcomes additionally confirm the robustness of the regression models employed within this study. Heteroscedasticity was evaluated using the Breusch-Pagan test, which indicated that the assumption of homoscedasticity is met for all the models. This means that the residuals should have constant variance at every level of the predictors, or in other words, the spread of errors should be uniform at every level of the predictors to ensure that the true regression coefficients are both unbiased and efficient. We performed routine tests on residuals, both ordinary least squares (OLS) tests and multiple

linear regression tests, in addition, residuals were checked for normality (using the Kolmogorov-Smirnov and Shapiro-Wilk tests). Both tests showed that residuals are normal distributed, which is important for the regression validity. All this indicates that the regression models are well specified, and that these could be generalized to a wider population, without any skewness or kurtosis distorting the results. Collectively, these findings provide confirmation of the stability of the regression models, establishing that the assumptions necessary for valid inference hold true and that the models are appropriate for the generalization of the results.

4.4 Hypothesis testing and regression outputs

As seen in Table 5, the regression analysis results offer insightful interpretations regarding the relationships between the independent and dependent variables for all the hypotheses. The analysis confirms all five hypotheses, showing significant and positive relationships among the variables. *H1 NFT Adoption and Market Value*: The regression coefficient ($\beta = 0.45$) for NFT adoption reflects a highly significant positive relationship with market value. With a p-value of 0.001, well below the previous threshold of 0.05, we confirm that the strength and significance of this relationship is true. A model adjusted R^2 value of 0.62 means that the data explains 62% of the variance in market value, which is a solid and decent fit. *H2: The effect of investor participation on the positive effect on market stability* is supported by the regression coefficient $\beta = 0.33$ with p-value = 0.022 which is statistically significant. With an adjusted R^2 of 0.51, there is a relatively strong weight in trying to explain market stability based on investor participation.

H3 Role of Content Creators and Market Acceptance: The role of content creators had a highly favourable influence on market acceptance with a regression coefficient $\beta = 0.60$ and a p value is 0.005. This indicates a strong explanatory power since content creators explain 70% of the deviation in market acceptance, which results in the adjusted R^2 value of 0.70. *H4 Technological Infrastructure and NFT Adoption Success*: Technological infrastructure has a positive effect on NFT adoption success ($\beta = 0.52$), and p-value is 0.009, which signify statistical significance. The adjusted R^2 value suggests that the model explains around 67% of the variance in NFT adoption success, which is a strong result. *H5 Speculation and Price Volatility*: Speculation was found to have the strongest impact on price volatility among all independent variables with a regression coefficient of 0.71 ($\beta = 0.71$) and an extremely low p-value of 0.000, indicating a very significant relationship. Speculation explains 75% of variance in price volatility, the largest amount out of all models, indicated by the adjusted R^2 value of 0.75. In general, the results of the regression show that all hypotheses are supported by the data, as all relationships are significant and positive between the independent variables and dependent variables. Also, the adjusted R^2 of each model is fairly high, showing that the models sufficiently explain the variance. The study reveals how NFT adoption, investor engagement, content creators, technological infrastructure, and speculation impacted different areas of the NFT market.

4.5 Discussion of innovation studies

This study's findings give a meaningful background of NFT adoption, investors, creator's role, infrastructure, value, and speculation with ETF. Through this analysis, the study provides valuable insights into what influences NFT market performance and the implications for digital asset valuation. According to the findings of the study, there is a positive correlation between the adoption of NFTs and the market value of digital assets, which supports the theory that greater NFT adoption results in increased market value. This link aligns with previous studies (Lin et al., 2023), indicating that an increasing number of NFTs improve market liquidity and asset value.

Table 3: Summary of NFT Market Statistics (2020-2024)

Market Segment	Mean NFT Price (USD)	Median NFT Price (USD)	Trading Volume (Total)	Investor Participation (Wallets)	Price Volatility Index
Digital Art	3,2	2,85	45	1,2	15.4
Virtual Real Estate	6,45	5,9	22,5	850	12.1
Gaming Assets	1,5	1,35	35	1	18.7

Table 4: Variance Inflation Factor (VIF) Results

Independent Variable	VIF Value
NFT Adoption	2.5
Investor Participation	2.1
Role of Content Creators	3.0
Technological Infrastructure	1.8
Speculation	2.7

Table 5: Regression Results for Hypotheses Testing

Independent Variable	Dependent Variable	β	p-value	Adjusted R ²
NFT Adoption	Market Value	0.45	0.001	0.62
Investor Participation	Market Stability	0.33	0.022	0.51
Role of Content Creators	Market Acceptance	0.60	0.005	0.70
Technological Infrastructure	NFT Adoption Success	0.52	0.009	0.67
Speculation	Price Volatility	0.71	0.000	0.75

Data source: processed by the author 2024



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The findings of the current study witnessed a positive effect of the minted and traded NFTs number on its market value, which aligns with the theoretical consideration suggested by Tan et al. 2023, where NFT adoption serves as a catalyst for the growth of the market. This the significance of NFT adoption in boosting market value is consistent with economic theories about supply and demand. This could lead to a scarcity effect, where as the amount of NFTs in circulation goes up, the limited supply of digital assets leads to increased demand from investors or collectors looking to invest in perceived areas of growth. This encourages market participants to embrace these assets as they become increasingly available and helps in boosting the market valuation, especially applicable in the case of digital art, virtual real estate and gaming assets. Moreover, the results indicate that NFT adoption tends to not only positively impact market value but also help towards the market's maturation. The more participants mint and trade NFTs, the more mainstream acceptance and thus, confidence is bolstered into the market. This is consistent with Zhang et al. (2023) that the continued adoption of NFTs signifies a larger digital evolution across the art and entertainment industries.

On the one hand, the participation of investors (i.e., the number of active wallet addresses and trading volume) is an important factor in determining the stability of the NFT market. This is due to the positive correlation between increased investor participation and greater market stability, with a more diversified trading activity helping reduce price volatility. This behaviour agrees with findings by Hair et al. (2020), where they suggested that the high level of market participation is of a stabilizing nature that dampens hypothetical excessive speculative trading effects. But while participation tends to bring stability, the findings also expose that speculation is still an occupying force in the NFT market, especially in more volatile areas like digital art and gaming assets. High-frequency trading behaviors are reflected throughout the data, and higher-frequency speculation tends to derive NFT prices in the short run while the longest period

is simply left for the value accumulation and supply and demand for the longer period. We therefore demonstrate that more investor activity is not overly positive leading to excess speculation and periodic down markets despite improved information availability. This finding is consistent with those of Tan et al. (2023), who observed that investor sentiment and speculative trading can create unpredictability and volatility in an asset's price. Thus, investor and speculation play two ways in the NFT market to interpret it better. While wider participation leads to increased stability, speculation is still a key ingredient, and it can have a magnifying effect on volatility.

The analysis also depicts the content creators as critical drivers of market outcomes, including market value and price volatility. Among other findings, the study identified that content creators with large followings especially those producing digital art have a crucial role in establishing trends in the market. The relationship between influencers' creation of popular NFTs and the price variations in these encrypted assets demonstrate how extremely influential creators are in guiding investors' perspectives on NFT collections. This result is similar to Zhang et al. (2023), whose analysis emphasizes the visibility and credibility of content creators as a critical determinants for monetizing NFT sales. Key takeaways highlight the finding that demand generation doesn't simply stem from content creators themselves, who are able to produce desirable digital products they simultaneously ground the ecosystem through their ability to promote consumer trust and engagement. With popular creators, the market environment is a lot more predictable, as their established social proof acts as signals of quality and reliability. Therefore, their ability to temper the extreme price movements to which lesser-established projects are subject, creates a more sustainable growth dynamic throughout the ecosystem. But the study also shows there's complexity behind the content creator role. Highly influential creators helped provide stability to the market, but their dominance may also lead to a concentration of market power which in turn reduces

opportunities for smaller creators and adds to a market imbalance. The level of control by a few entities in the NFT market could lead to regulatory actions in the future to ensure fair opportunity in the space.

Abstract NFT market remains temporary and involve technological infrastructure of BTC, ETH and data availability. Transaction speed, cost, and security, which are metrics of blockchain performance, were the main determinants of operational efficiency in the market. According to the analysis, blockchain platforms that boast faster transaction times, lower fees, and stronger security features are correlated with higher levels of both market adoption and investment participation. This finding is consistent with the work of Lin et al. According to Abderrazak et al. (2023), the strength of blockchain technology is critical for stable growth of the NFT market. Technological advancements will ultimately shape the future success of digital assets, and the growing adoption of decentralized platforms for NFT transactions highlights this reality. Additionally, as blockchain technologies evolve, transaction speed, cost and security will also improve, further increase market efficiency and scalability. The continued integration of advanced blockchain infrastructure will also likely serve to lower barriers to entry for new market participants, opening the door to a wider range of customers. It is necessary for long-term sustainability of NFT market as a wider range of creators and investors will be able to enter the ecosystem, which will help with the innovation in the industry and diversification of market.

Lastly, the research emphasizes a nuanced understanding of the interaction between speculating and price fluctuation within the NFT market. Speculation, as captured through high-frequency trading habits and asset price variance, emerged as an important price driver. Speculative activity has the potential to foster short-term growth in a market, but also brings the risk of significant volatility in price. These results indicate that speculative trading behaviors, driven by investor sentiment and market exuberance, can contribute to cycles of high price volatility, ultimately threatening the long-term utility of NFTs as an asset class. The findings align with the wider literature on

speculative bubbles in financial markets that can stem from irrational investor behavior resulting in distortions to the market (Hair et al., 2020). Clearly, the NFT market is highly speculative, and its nascent stage means that investor sentiment is an even bigger driver of price movement than it is for (much) older technologies. So what to do when speculative behavior leads to NFT market growth that is unhealthy? As the NFT market matures, it will be critical to develop mechanisms to mitigate the risk of speculation to ensure that the growth of the market is driven by innovation and long-term investment rather than speculative hype.

5. Conclusion

The study of these factors can shed light on different aspects of NFT economy. This multifaceted outlook on the NFT landscape reveals a positive correlation between NFT adoption and market value, a stabilizing force in the form of investor participation, the impact of content creators, the significance of technological infrastructure, and the hazards brought about by speculative trading activity. In that regard, it will be crucial for everyone involved to consider these elements to create a more sustainable, efficient, and inclusive NFT market as the market evolves. This impressive, as well as promising, set of findings could have important implications for existing models of market behavior, and future work should explore the set of relationships identified in this study while also examining potential new trends, such as the intersection of NFTs with other technologies like AI, and how these may both alter the findings presented here while also providing potential new paths for future behavior.

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Author Contributions

Mas'ud Basyri: Conceptual framework, research design, and data analysis, drafting and revising the manuscript. Imam Prayoga was involved in the

development of the literature review, interpretation of statistical data, and revision of the final manuscript critically. The authors read and approved the final manuscript.

Conflict of Interest

The authors declare no conflict of interest in publishing this article. The research was performed independently and no sources of data were omitted.

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A. Table Research Appendix Data

Table 1: Distribution of Research Samples by Market Segment

Categories	Number of Transactions	Number of Content Creators
Digital Arts	300	18
Virtual Real Estate	200	12
Game Assets	200	13
Total	700	43

Table 2: Variables and measurement instruments

Variable	Definition and Measurement	Instrument/Source
NFT Adoption	Number of NFTs minted and traded	Blockchain transaction logs
Market Value of Digital Assets	Aggregate market price of NFTs	Marketplace price indices (OpenSea)
Investor Participation	Active traders and transaction frequency	Number of unique wallet addresses
Market Stability	Price volatility and stability metrics	Volatility indices (Tan et al., 2023)
Role of Content Creators	Quantity and popularity of NFTs created by influencers	Creator ranking reports (Zhang et al.)
Technological Infrastructure	Speed, cost, and security of blockchain platforms	Blockchain performance metrics
Speculation	High-frequency trading and variance in asset prices	Price variance metrics

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