

# Investigating the factors affecting the price of Non-Fungible Tokens(NFTs)

Sina Osivand<sup>1</sup>, Hanieh Abolhasani<sup>1\*</sup>

1. Group management of TOBTC, iran.

## Abstract

In early 2021, non-fungible tokens (NFT) became the first application of blockchain technology to achieve clear public prominence. The current popularity of non-fungible token (NFT) markets is one of the most notable public successes of blockchain technology. NFTs are blockchain-traded rights to any digital asset; including images, videos, music, even the parts of virtual worlds. Given the NFT market emerged out of cryptocurrencies, we explore if NFT pricing is related to cryptocurrency pricing. A spillover index shows only limited volatility transmission effects between cryptocurrencies and NFTs. A spillover index shows only limited volatility transmission effects between cryptocurrencies and NFTs. But wavelet coherence analysis indicates co-movement between the two sets of markets.

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## I. Introduction

Non-fungible token (NFT) markets emerged to some prominence in early 2021. These new markets for digital assets grew to about \$550m of lifetime total traded volume towards the end of March 2021, but over \$200m of that trade happened in the month of March alone. This trade growth was matched by large growth in public discussion and traditional media coverage of NFTs (Dowling, 2021).

An NFT starts with registering ownership of a digital asset on a blockchain, usually on an ethereum network. This digital asset can then be sold, with changes in ownership and the cryptocurrency payment received registered on the blockchain.

An NFT is a blockchain-recorded right to a digital asset. This can be anything digital; an image, a video, a song, a digital trading card of your favourite baseball player, a coded piece of virtual land, or a virtual tunic for your virtual character to wear while he explores his virtual land. NFTs primarily trade through online marketplaces, and early 2021 has seen these markets explode in popularity. A peak point (so far) was an NFT auction by Christie's auction house, which sold an NFT digital collage by artist Mike Winkelmann for \$69.3 million (Crow and Ostroff, 2021), one of the highest prices ever paid for any work of art.

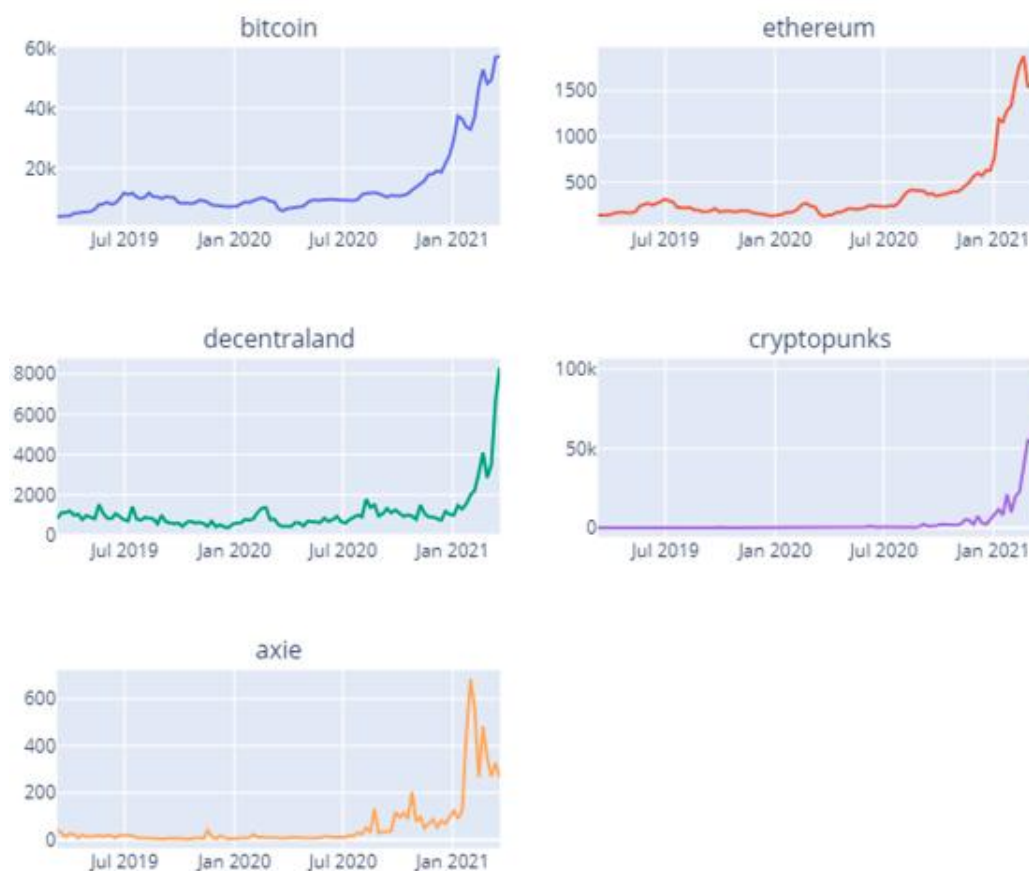
NFTs, while traded through cryptocurrencies, have some very different characteristics to cryptocurrencies, and this is important to bear in mind when trying to understand them. Cryptocurrencies are intended primarily as currencies, even if they maintain some asset-like properties (Baur et al., 2018). NFTs, on the other hand, are intended as pure assets. Indeed the term *non-fungible* in the NFT name is the clue to this difference. Fungibility, or interchangeability, is one of the defining characteristics of cryptocurrencies and money in general (one bitcoin is the same as another bitcoin, and one dollar the same as another). The non-fungibility of NFTs is one of the key asset characteristics that is valued.

Google Trend data shows the term NFT having virtually no interest up until January 2021, to peak interest currently. News media interest also shows significant recent growth. Trade in NFTs matches the news growth, with a popular transaction website estimating lifetime trading volumes to 17th March 2021 at \$440m, but that \$200m of those sales were just in the single month up to 17th March.

NFTs, on the other hand, are conceptualised as pure assets, just in digital form. Nevertheless, given NFTs are most frequently bought with cryptocurrencies as the means of payment, and are based on ethereum smart contracts, there should be some commonalities. We also expect that traders of cryptocurrencies will be the leading traders in NFTs, due to their familiarity with buying and using cryptocurrencies. Therefore, we expect some inefficiency in pricing behaviour in NFTs, similar to early cryptocurrency pricing (Cheah and Fry, 2015; Urquhart, 2016).

NFT pricing might also influence cryptocurrency markets, as NFTs and their popularity shows a strong business use case for the blockchain. This, therefore, addresses an open business point about what practical uses there are for the blockchain and the cryptocurrencies built on top of blockchains (Morkunas et al., 2019; Trautman and Molesky, 2019). Moratis (2021) shows there is a large level of volatility shock

transmission between cryptocurrencies, with Bitcoin dominating this transmission. Given the crossover of trading between cryptocurrencies and NFTs, and the potential leading influence of cryptocurrency pricing on NFTs, we investigate if volatility also spills over to NFT markets. To boost this investigation we further examine whether there is co-movement between cryptocurrency and NFT returns, as co-movement has been shown to be a major feature within cryptocurrency markets (Qiao et al., 2020). The discovery of links between the two sets of markets would be beneficial to researchers and practitioners alike as we could then examine trends in cryptocurrency pricing for guidance on likely trends in NFT markets.



**Fig. 1.** Weekly pricing plots as named for all NFTs and cryptocurrencies, March 2019 to March 2021.

Figure 1 emphasises the large 2021 run up in prices for both cryptocurrencies and NFTs, although the price rise of NFTs appears more abrupt.



**Fig. 2.** Rolling (50-week) net spillovers for all NFTs and cryptocurrencies, February 2020 to March 2021.

In Fig. 2 we check if there might be time variation to the spillover effects. We are limited here by our short time frame and so we choose a 50-week rolling window, meaning results are available for the last year of our sample - 2020/21. Figure 2 reports net spillover effects for each NFT and cryptocurrency, and we see that these are generally negative for NFTs and generally positive for our two cryptocurrencies.

## II. Conclusions

We make two important conclusions. First, NFT pricing seems quite distinct to cryptocurrency pricing in terms of volatility transmission. This has interesting implications for investment portfolios, as low-correlation assets are highly desirable for their diversifying characteristics. We need further investigation of NFT pricing to other asset classes to confirm the low-correlation status of NFTs.

Another interesting conclusion from the volatility spillover analysis is that there is little spillover between NFT markets. This is unlike cryptocurrencies (Moratis, 2021) and stock markets (Bhattarai et al., 2020) which tend to have high spillover effect among their individual markets. A possibility here is that we need to consider that NFT markets might contain multiple asset classes. A second conclusion is that, despite the low volatility transmissions between NFTs and cryptocurrencies, wavelet coherence suggests some co-movement between the two sets of markets. This suggests there is a value to applying understanding of cryptocurrency pricing behaviour to NFT pricing. A possibility worth considering is that there are common factors driving both markets. It would be interesting, for example, to consider whether sentiment and uncertainty (Lucey et al., 2021) might be driving both groups of assets. Cryptocurrency research has grown significantly in recent years, and being able to apply this learning to NFT pricing and valuation can greatly speed up knowledge development. Notwithstanding our main conclusion that NFTs do appear to be a distinct (and exciting) new asset class.

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