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Effect of bitcoin and Etherium on non-fungible token (NFT)

Sina Osivand[1], Hanieh Abolhasani[1*]
1. Group management of TOBTC, iran.

Abstract
Non-fungible tokens (NFTs) are transferrable rights to digital assets, suchas art, in-game items, collectables or music. The phenomenon and its markets havegrown significantly since early 2021.We investigate the interrelationships betweenNFT sales, NFT users (unique active blockchain wallets), and the pricing of Bitcoinand Ether. we show that aBitcoin price shock triggers an increase in NFT sales. As of 2021, fewer transactions occur but thetraded value is much higher. We find that NFT submarkets are cointegrated andfeature various causal short-run connections between them. The success or adoptionof younger NFT projects is influenced by that of more established markets. The results contribute to the overall understanding of the NFT phenomenonand suggest that NFT markets are immature or even inefficient.

Keywords: *NFTs; non-fungible tokens; cryptocurrency*

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I. Introduction

Prominent examples of *non-fungible tokens (NFTs)*, such as the artist *Beeple* selling a piece of digital art for $69 million (Christie's, 2021) or Twitter CEO *Jack Dorsey* auctioning off his first-ever tweet for $2.9 million (Valuables, 2021), show that NFTs have received mainstream attention.

While the idea of NFTs existed long before blockchain technology (Protos, 2021a), Bitcoin's underlying technology is the first to offer a secure decentralized infrastructure to digitally map non-fungible values. Blockchain technology represents a secure and transparent basis for the mapping and (peer-to-peer) transfer of values over the Internet (Steinmetz et al., 2020).

Specifically, the blockchain is used to store metadata that represent ownership or other rights to an asset. Additionally, the technology provides a suitable infrastructure for the application of smart contracts, which are scripts that enable the automation of business logic (Ante, 2021b; Wang et al., 2019).

Within less than half a year (by May 16, 2021), hundreds of thousands of NFTs worth over $800 million were traded (NonFungible, 2021). Most of these referred to digital art, collectibles, music, in-game items or metaverses. Like cryptocurrency and other types of tokens, NFTs rely on blockchain technology and smart contracts as their digital infrastructure (Ante, 2021); however, they significantly differ from traditional cryptocurrencies such as Bitcoin or Ethereum in other respects. NFTs serve not as a currency, a commodity or a technology but as an asset (Dowling, 2021a)

We extract macro dataon the Ethereum-based NFT market, more specifically the trading volume of all NFTs in USDand the number of blockchain wallets participating in the NFT market (sellers and buyers), andanalyze how these relate to the pricing of Bitcoin and Ethereum using a cointegrated *vectorautoregressive (VAR)* model, i.e. a *vector error correction model (VECM)*. This allows us toidentify to what extent these markets influence each other, or co-move.

II. Methods

Our dataset comprises 1,231 daily observations (January 01, 2018 to May 16, 2021) on the volume of NFT sales in USD, the number of blockchain wallets holding or interacting with NFTs on a particular day, and the prices of Ether (ETH) and Bitcoin (BTC) in USD. The first two metrics are collected from *NonFungible Corporation* (nonfungible.com) and cover data on the Ethereum blockchain only, which (historically) accounts for a majority of the NFT market. Price data (daily close) are collected from the cryptocurrency exchange *Bitfinex* (bitfinex.com). In line with Dowling (2021a), as cryptocurrency reference markets we use ETH, the most relevant currency for issuing and trading NFTs, and BTC, the largest and most significant

cryptocurrency. Figure 1 shows the extreme increase in the trading volume of NFTs since early 2021. Forexample, on the single day of May 03, 2021, over $100 million worth of NFTs were traded, andthe daily average trading volume of the year to date is much higher than in previous years ($6.13million, compared to $0.18 million in 2020, $0.07 million in 2019, and $0.10 million in 2018).The figure also shows that the number of wallets on the Ethereum blockchain holding NFTshas increased significantly.

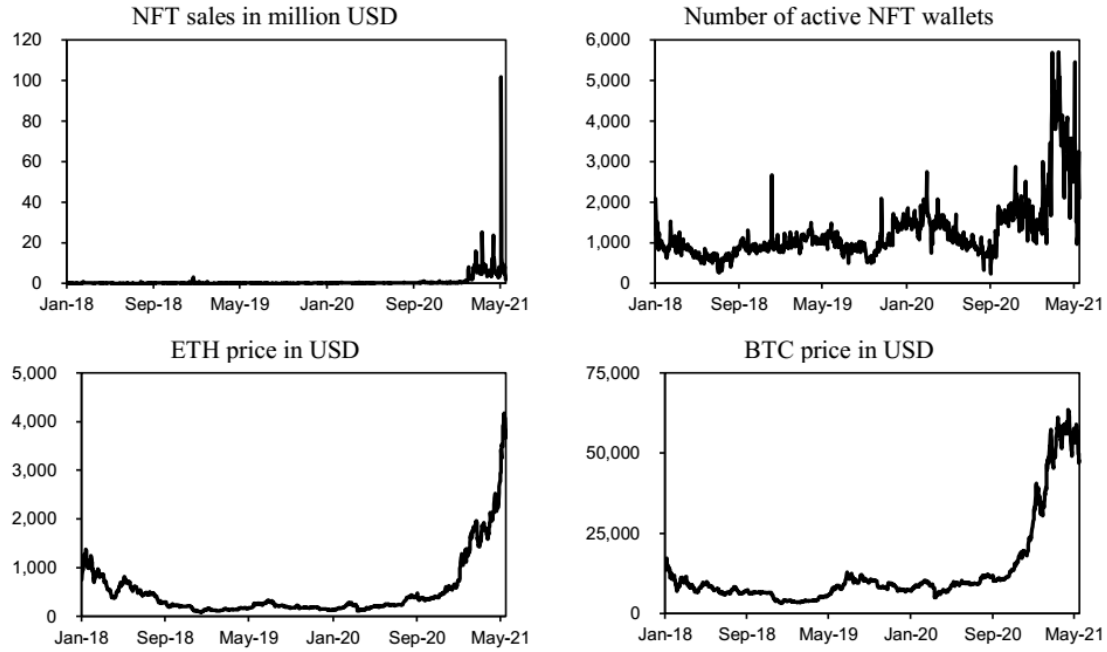

Figure 1. NFT and cryptocurrency market data

III. Results

In the following, we present two postestimation statistics to interpret the results of the cointegrated VAR. Table 4 lists short-run Granger causality test statistics that indicate whether a change in one variable precedes a change in another variable. The statistics are calculated for each combination of our dependent and independent variables. For example, the first line of results refers to the test whether all coefficients on 4 lags of NFT wallets as a potential predictor of NFT sales are zero. Since the p-value exceeds the significance threshold of 10%, we cannot confirm that NFT wallets Granger-cause NFT sales. NFT sales are, however, Granger-caused by the BTC price. Furthermore, NFT wallets are Granger-caused by the ETH price. BTC is not Granger-caused by any of the other variables, while ETH is Granger-caused by the BTC price. Accordingly, we find that NFT markets are influenced by cryptocurrency pricing, though Granger causality tells us nothing about the direction of these influences.

Dependent variable	Independent variable	*F*-statistic	*p*-value
NFT sales	NFT wallets	3.92	0.270
	BTC price	10.32	0.016**
	ETH price	4.68	0.197
NFT wallets	NFT sales	6.25	0.100
	BTC price	1.22	0.747
	ETH price	13.09	0.004***
BTC price	NFT sales	1.89	0.596
	NFT wallets	11.86	0.603
	ETH price	5.53	0.137
ETH price	NFT sales	5.23	0.156
	NFT wallets	2.14	0.544
	BTC price	6.81	0.078*

*** p < 0.01; ** p < 0.5; * p < 0.1.

To understand that direction of influence, impulse response functions are shown in Figure 1. They depict how a standard deviation shock to one variable affects another variable over a period of 30 days. One impulse is placed in reach row and one response in each column.
Unlike with the VAR, impulse response functions of a VECM need not return to their mean value, as series are cointegrated in the long-run. We find that one-time standard deviation shock increases in the prices of BTC and ETH have positive effects on NFT sales. The effects level off at around 0.03% for BTC and around 0.015% for ETH. Bitcoin price shocks have a clear positive effect on the number of active NFT wallets. Surprisingly, the reverse effect applies to the ETH price.

Concluding remarks

This paper has analyzed the interplay between the cryptocurrency market and the NFT market, contributing to the emerging literature on the latter. In line with Dowling's (2021a) conjecture, we find that BTC and ETH pricing affects the NFT market, while the NFT market does not significantly influence the pricing of cryptocurrencies. It thus appears that the smaller NFT market is driven by the cryptocurrency market. This is plausible, as cryptocurrencies are the common currency for buying and trading NFTs. A drop in cryptocurrency value means lower purchasing power, which is likely to depress the NFT market. Conversely, whencryptocurrencies appreciate, investors tend to look for new or alternative investment opportunities. This is especially plausible in the context of ETH, the standard denomination of NFTs. While the impulse response function indicates such a relationship between NFT sales and ETH, we do not find a significant Granger causality between these metrics—yet we do so for BTC.

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