LEDGER
ledgerjournal.org

Granger-Causal Effects of Consumer Behavior on NFT Sales

Stoyan R. Angelov[*]

Reviewers: Reviewer A, Reviewer B

Abstract. The final version of the paper "Granger-Causal Effects of Consumer Behavior on NFT Sales" can be found in Ledger Vol. 9 (2024) 16-29, DOI 10.5195/LEDGER.2024.312. There were two reviewers involved in the review process, neither of whom have requested to waive their anonymity at present, and are thus listed as Reviewers A and B. After initial review by Reviewers A and B, the submission was returned to the authors with feedback for revision (1). The author resubmitted their work but did not respond to reviewer comments, and so their revisions were left to speak for themselves. Reviewers A and B responded to the author's resubmission (2A) and recommended publication, although Reviewer B had further recommendations. The author then responded to those comments (2B), thus ending the peer review process. Author responses have been bulleted for reader clarity.

1. Review

Reviewer A

Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?

Yes

If you answered "yes" to the previous question, in one sentence, describe in your own words the novel contribution made by this paper:

the author highlights a statistical relationship between the number of NFT buyers and future NFT sales

Is the research framed within its scholarly context and does the paper cite appropriate prior works?

Important references are missing

Please assess the article's level of academic rigor.

---

[*]Stoyan R. Angelov (stoyan.angelov@stern.nyu.edu) is studying Finance and Mathematics at NYU Stern.

Good (not excellent but a long way from poor)

Please assess the article's quality of presentation.

Good (not excellent but a long way from poor)

How does the quality of this paper compare to other papers in this field?

Top 50%

Please provide your free-form review for the author in this section.

The author presents an econometric analysis of the time series of NFT sales, suggesting a Granger-causal relationship between the average price paid by NFT buyers ("BVM") or the average number of NFTs bought by each buyer ("BAM") and the total value of NFT sales up to 4 months in the future.

The paper is overall well written and the statistical analysis is technically well executed. However I think there is a lack of framing within the existing literature on NFT markets, as well as some further statistical analysis that is needed before the article is publishable.

My comments follow:

1) the author uses the average quantities "BAM" and "BVM" to characterise buyer's behaviour on the NFT market. Given that BVM = Sales/#Buyers Granger-causes Sales, but Sales do not Granger-cause Sales, I would suppose that #Buyers is the quantity responsible for the GC relation. If that's the case, the BAM relation may just be a consequence of #Buyers appearing in the definition of BAM too. An independent GC test should be performed on each of the individual components of BAM and BVM (i.e. #trades, #Buyers and Sales) to exclude the possibility that the two tests are actually reporting the same GC relation
2) in https://doi.org/10.1038/s41598-021-00053-8 the authors provide a forecasting framework for NFT sale prices. How does the present paper compare with their methodology and accuracy?
3) finally, the author should report the value of the VAR coefficients estimated for the GC test, to give a clear indication of the quality and size of the relation between sales and past BAM/BVM (or #Buyers).

Reviewer B

Does this paper represent a novel contribution to cryptocurrency or blockchain scholarship?

Yes

If you answered "yes" to the previous question, in one sentence, describe in your own words the novel contribution made by this paper:

The author devises two metrics that capture the behavior of NFT consumers and shows through Granger causality tests that these measures can predict future changes in NFT sales.

Is the research framed within its scholarly context and does the paper cite appropriate prior works?

Important references are missing

Please assess the article's level of academic rigor.

Good (not excellent but a long way from poor)

Please assess the article's quality of presentation.

Good (not excellent but a long way from poor)

How does the quality of this paper compare to other papers in this field?

Top 50%

Please provide your free-form review for the author in this section.

The manuscript addresses a relevant and timely topic, that is, it investigates the market dynamics of Non-Fungible Tokens (NFTs) by focusing on the relationship between user behavior and NFT sales; it is well written, and the methodology is clear and well explained. However, the following aspects need to be improved and discussed.

Background and Literature

The manuscript lacks a section introducing background concepts, such as NFTs and their market dynamics. For instance, the paper does not define or describe in detail what a Non-Fungible Token is or how such markets work. Closely related to that, the literature is not exhaustive, and relevant papers are missing, such as:
- 'Non-fungible token (NFT): Overview, evaluation, opportunities and challenges' by Wang et al.
- 'Non-Fungible Tokens (NFT): A Systematic Review' by Hamed Taherdoost
- 'Mapping the NFT revolution: market trends, trade networks, and visual features' by Nadini et al.

And papers cited therein. It is therefore hard to contextualize the manuscript and the contribution of this work within the broader context of the literature on Non-Fungible Tokens. Adding a section that covers background concepts and existing literature before the data and methodology section would be helpful for the reader.

Data & Methodology

My primary concern regards the dataset utilized, which comprises only 69 observations per variable. Why are the data aggregated at the monthly level rather than at a more granular scale? As far as I understand, the data from CryptoSlam are available at the daily level. This aspect needs to be justified and discussed in greater detail.
In addition, the paper would greatly benefit from a thorough description of what cryptoslam is and how it works; for instance, it is not explained what an NFT collection is, which NFT collections are tracked by Cryptoslam, and how they are aggregated in this study; similarly, it is not clear what is meant here by transactions, i.e. if they are transactions executed on-chain or not and if they involve or not NFT marketplaces such as OpenSea.

Metrics for User Behavior

The metrics introduced in the paper are relatively simple and, as the authors mention in Section 3, part of the discussion is purely speculative. Cryptoslam also provides user-specific information (https://www.cryptoslam.io/nfts). This data may be used to construct additional metrics of user behavior or to provide further insights on the aspects discussed in section 3, p.7.

Additional comments:

- In the introduction, after citation 2: "such price fluctuations..." I would slightly rephrase this sentence since the previous one mentions volumes rather than prices.

- I suggest rephrasing the end of the introduction, stating that "extreme volatility is an intrinsic quality". I would replace 'quality' with 'characteristic', or a similar term. It is rather an issue than a quality of the DLT ecosystems.

- Figure 1: I think the linear (non-logarithmic) scale would be more suitable to show the growth phase and consequent reduction of NFT sales. Also, there is no need to specify for each figure that 'the author claims full credit for the figure'.

- Why (p.3) "The decentralized nature of the NFT market, in addition to its streaky nature, led to the hypothesis that changes in the average NFT consumer's behavior may significantly precede changes in NFT sales"? The link between decentralization and the hypothesis is not clear to me.

- It would be interesting to read more details, e.g. in the appendix, on the results of the Akaike criterion (p. 5).

- Citations 8 and 9 point to the same article. After citation 8, there's a typo: 'Park et al. notes...' instead of 'note'.

- Appendix: the formula for volatility is not clear to me. What do 'month1' and 'month0' stand for? As far as I understand, this formula calculates the monthly percentage change of each measure (BVM, BAM, NFT sales), not the volatility.

2A. Second Round of Review

Reviewer A

Did you review an earlier version of this submission? (If "no," please contact the editor.)

Yes

Has the submission been sufficiently revised to address your previous concerns?

Yes

Do you have any new concerns specific to this revision?

No

Please provide your recommendation to the Editor.

Accept

Reviewer B

Did you review an earlier version of this submission? (If "no," please contact the editor.)

Yes

Has the submission been sufficiently revised to address your previous concerns?

Yes

Do you have any new concerns specific to this revision?

Yes

If you answered "yes" to the previous question, please provide more detailed feedback here.

While the new version of the paper satisfactorily addresses most of the comments on the previous version, it is notable that the author did not produce a document for the reviewers to reply point-by-point to the remarks and to highlight the modifications made. I strongly suggest the author to avoid this in the future and attach a document for the reviewers highlighting and discussing the changes made. The absence of such a document might lead other reviewers to decide for a rejection.

Here are a few additional comments that would further improve the manuscript:

- I appreciate the inclusion of a background section in the manuscript. I think there is still some room for improvement here, as some sentences do not convey the message in a sound way ('Non-fungible Token is a form of cryptocurrency derived from smart contracts'; 'the tradeable digital property made possible by Non-fungible Token technology'; 'are unlike cryptocurrencies in the sense that...'). Also, please avoid using multiple direct quotations from the original manuscripts.

- The description of CryptoSlam and what data is used is now clearer; similarly, consider briefly describing also what WAX and Flow are, as these blockchains are likely less known by the audience.

- The authors removed Figure 4, 'NFT Sales and Forecasted Sales, Millions'. It is good practice to report a separate document for the reviewers, highlighting modifications such as this one and motivating them.

- Section 5: I suggest to avoid using the term 'speculation' in the section title (e.g., Possible/Plausible Theoretical Explanations of Results)

- Style: Use different numbers for tables in the manuscript (e.g., Tables 1 and 2 instead of 1.5 and 2.4; tables in the Appendix can maintain the 1.x, 2.x style). Figures report the nomenclature 'Fig. X' both in the title and captions; the one in the caption is sufficient.

- In the author footnote (p. 1), it is sufficient to specify the affiliation without mentioning the role covered.

- The paper is well written overall, but I suggest conducting a grammar and spell-check before publication. Please also avoid using informal or colloquial terms (e.g., the use of 'etc.' on p.2: 'Ethereum, Solana, WAX, etc.')

Please provide your recommendation to the Editor.

Conditional accept (the paper should be published if the author is able to address the

specific concerns in my review. By selecting this option, you agree to review the author's changes.)

2B. Author's Response to Second Round of Review

I appreciate the inclusion of a background section in the manuscript. I think there is still some room for improvement here, as some sentences do not convey the message in a sound way ('Non-fungible Token is a form of cryptocurrency derived from smart contracts'; 'the tradeable digital property made possible by Non-fungible Token technology'; 'are unlike cryptocurrencies in the sense that...'). Also, please avoid using multiple direct quotations from the original manuscripts.

- I revised the sentences as follows to convey a clearer message about and understanding of Non-fungible Token:
- "Non-fungible Token is a digital token, signifying a unit of value, available on a cryptocurrency blockchain (such as Ethereum, Solana, or WAX). These tokens are transactable through the smart contracts of the blockchain."
- "NFTs themselves – the digital property validated by Non-fungible Token – are unique individual assets. Unlike cryptocurrencies, "They cannot be exchanged like-for-like… making [them] suitable for identifying something or someone in a unique way" as Wang et. al explain."
- I also removed the second direct quotation for the manuscript, as the reviewer suggested.

The description of CryptoSlam and what data is used is now clearer; similarly, consider briefly describing also what WAX and Flow are, as these blockchains are likely less known by the audience.

- A brief overview of what differentiates WAX and Flow is now provided:
- "CryptoSlam scrapes its data directly from Ethereum, WAX, and Flow blockchains. WAX and Flow are blockchains that are specifically designed for digital asset creation and trading."

The authors removed Figure 4, 'NFT Sales and Forecasted Sales, Millions'. It is good practice to report a separate document for the reviewers, highlighting modifications such as this one and motivating them.

- I apologize for not providing a document earlier – I decided to remove this table because I felt it distracted from the main purpose of the paper. The purpose was to establish a Granger-causal relationship between consumer behavior and NFT demand, not to evaluate the use of a VAR model on the data.

Section 5: I suggest to avoid using the term 'speculation' in the section title (e.g., Possible/Plausible Theoretical Explanations of Results)

- The word "speculation" has been removed. The title has been changed to "Plausible Theoretical Explanations of Results".

Style: Use different numbers for tables in the manuscript (e.g., Tables 1 and 2 instead of 1.5 and 2.4; tables in the Appendix can maintain the 1.x, 2.x style). Figures report the nomenclature 'Fig. X' both in the title and captions; the one in the caption is sufficient.

- All of these changes have now been made.

In the author footnote (p. 1), it is sufficient to specify the affiliation without mentioning the role covered.

- I have changed the line to "Stoyan R. Angelov (stoyan.angelov@stern.nyu.edu) is studying Finance and Mathematics at NYU Stern".

The paper is well written overall, but I suggest conducting a grammar and spell-check before publication. Please also avoid using informal or colloquial terms (e.g., the use of 'etc.' on p.2: 'Ethereum, Solana, WAX, etc.')

- Spell and grammar checks were run, and changes were made accordingly. Colloquial and informal language has been removed.