Exploring the Mesoscopic Structure of Bitcoin During its First Decade of Life: Open Review

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Reviewers: Reviewer A, Reviewer B

Abstract. The final version of the paper "Exploring the Mesoscopic Structure of Bitcoin During its First Decade of Life" can be found in Ledger Vol. 9 (2024) 136-156, DOI 10.5195/LEDGER.2024.335. There were two reviewers involved in the review process, neither of whom has requested to waive their anonymity at present, and are thus listed as Reviewers A and B. Both reviewers recommended acceptance of the submission and provided feedback (1A). The author resubmitted their work with the recommended changes made, thus ending the peer review process.

1A. 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:

It shows a rigorous analysis of main properties of the Bitcoin network over an extended time period and connections to main events that happened during this time.

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

Yes

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.

This paper presents an analysis of the evolution of the Bitcoin transaction network over its first decade of existence. The authors did a good job at calculating a wide range of standard measures used in network science and interpreting them in the context of the history of Bitcoin, also specifically matching to important events that happened (e.g. several price "bubbles", the crash of MtGox, etc.).

I think a main shortcoming of this paper is that the authors only analyze network obtained with one temporal aggregation window (one week). I understand that this choice might not matter too much, however, it would be good to add more discussion on why this window was used and how this choice might affect results. Similarly, some more explicit discussion on the differences among the two kinds of networks (BAN and BUN) could improve the results.

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 paper unveils a groundbreaking approach to examining the mesoscale structures within the Bitcoin User Network (BUN) and their intricate relationships with significant market phenomena such as price bubbles. It employs sophisticated network science techniques to reveal the profound impact of network configurations on Bitcoin's economic

behaviors, providing insights that were previously unexplored in blockchain studies.

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

Yes

Please assess the article's level of academic rigor.

Excellent (terms are well defined, proofs/derivations are included for theoretical work, statistical tests are included for empirical studies, etc.)

Please assess the article's quality of presentation.

Excellent (the motivation for the work is clear, the prose is fluid and correct grammar is used, the main ideas are communicated concisely, and highly-technical details are relegated to appendixes).

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

Top 5%

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

The scholarly article titled "Exploring the Early Bitcoin Mesoscale" by authors Nicolò Vallarano, Tiziano Squartini, and Claudio J. Tessone offers a meticulous examination of the mesoscale structures within the Bitcoin User Network (BUN) from 2009 to 2017. This study is pivotal as it employs comprehensive network science methodologies to delve into the complexities of Bitcoin's transaction network, thereby correlating these findings with economic behaviors during periods of price fluctuations, particularly the price bubbles.

Strengths:

Robust Methodological Application: The approach taken by the researchers is commendable for its depth and rigorous application of network science techniques. The use of heuristic clustering to group Bitcoin addresses into user entities and their subsequent analysis through various network models (like core-periphery structures) is not only innovative but also effectively executed. The methodologies are explained with sufficient detail, which provides clarity and enhances the replicability of the research.

Exemplary Presentation and Structure: The paper is structured in a logical manner that enhances the reader's ability to follow the complex analyses presented. The language used is clear and professional, with technical jargon well-explained and minimized to broaden the accessibility of the content. Visual aids such as graphs, tables, and diagrams are used effectively to underscore key points and illustrate trends, making complex data more

digestible.

Significant Economic Insights: The findings on the structural dynamics of the BUN and their impacts on Bitcoin's economic indicators during bubble periods are of high significance. This aspect of the study not only contributes to academic knowledge but also has practical implications for economists, traders, and policy makers who are engaged with cryptocurrency markets.

Areas for Improvement:

While the paper is fundamentally sound, enhancing its comparative scope could further solidify its contributions:

Expansion of Comparative Analysis: Including a comparative analysis with other prominent cryptocurrencies such as Ethereum or Ripple could enhance the breadth of the study. This comparison would help ascertain whether the observed network dynamics are peculiar to Bitcoin or prevalent across other cryptocurrencies, providing a more comprehensive understanding of the cryptocurrency ecosystem.

Inclusion of Predictive Analytical Models: Integrating predictive models to forecast future network changes or price dynamics based on identified structural characteristics could transition the study from a descriptive to a prescriptive resource that could be invaluable for financial forecasting and strategic planning in cryptocurrency investments.

Detailed Technological and Regulatory Recommendations: Extending findings to propose specific technological improvements or regulatory frameworks could make the research more utilitarian. For instance, suggesting modifications in Bitcoin's protocol to mitigate risks associated with centralization or providing guidelines for policymakers on overseeing cryptocurrency transactions would further elevate the paper's relevance and applicability in real-world contexts.

Conclusion:

The paper "Exploring the Early Bitcoin Mesoscale" represents an excellent scholarly contribution to the fields of network science and cryptocurrency analysis. It methodically applies sophisticated network science techniques to uncover and elucidate the structural dynamics of the Bitcoin User Network (BUN), linking these dynamics clearly and convincingly to economic phenomena such as price bubbles.

While the paper is fundamentally sound and well-prepared for publication, minor enhancements could further solidify its impact. Specifically, expanding the discussion to contextualize Bitcoin's network dynamics within the broader landscape of other cryptocurrencies could provide a more comparative perspective that enriches the paper's contributions. Additionally, suggestions for practical technological or regulatory measures, based on the study's findings, would offer valuable insights for both practitioners and policymakers.

These minor corrections and expansions do not detract from the paper's core achievements and can be addressed in coordination with the editor to refine the final manuscript. The paper's clarity, depth, and methodological rigor make it a worthy addition to the journal, providing significant insights that are likely to influence future research in this area. I recommend its publication, conditional upon the incorporation of the suggested minor enhancements.