Cryptocurrency Competition and Market Concentration in the Presence of Network Effects: Open Review

Konstantinos Stylianou,[*] Leonhard Spiegelberg,[†] Maurice Herlihy,[‡] Nic Carter[§]

Reviewers: Reviewer A, Reviewer B, Reviewer C

Abstract. The final version of the paper "Cryptocurrency Competition and Market Concentration in the Presence of Network Effects" can be found in Ledger Vol. 6 (2021) 81-101, DOI 10.5915/LEDGER.2021.226. There were three reviewers involved in the review process, neither of whom has requested to waive their anonymity at present, and are thus listed as Reviewers A, B, and C. After initial review by Reviewers A, B, and C, the submission was returned to the authors with feedback for revision (1A). The authors responded (1B) and resubmitted their work. After subsequent evaluation by Reviewer C, revisions made were deemed sufficient to address any concerns, thus ending the peer review process. Author responses have been bulleted for reader clarity.

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 is a more careful analysis of network effects related to cryptocurrencies

---

[*] K. Stylianou (k.stylianou@leeds.ac.uk) is an Associate Professor of Law at the University of Leeds.
[†] L. Spiegelberg (lspiegel@cs.brown.edu) is a Computer Science Ph.D. student, Brown University.
[‡] M. Herlihy (herlihy@cs.brown.edu) is the An Wang Professor of Computer Science, Brown University.
[§] N. Carter (nic@coinmetrics.io) is the co-founder of Coin Metrics.

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.

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 10%

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

I enjoyed reading this careful analysis. Too often, network effects are used for hype. Here, the authors work hard at measuring network effects (upside as well as downside) across cryptocurrencies, which makes the analysis more useful. It did get me thinking if there is any value in studying cross-currency elasticities.

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 significantly advances empirical analysis of the existence and size of network effects in a range of cryptoassets, finding network effects are not as strong as previously thought.

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 20%

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

The paper builds on a new, small but important empirical literature seeking to quantify the existence of network effects in crypto assets. Network effects are well known in economic analysis of other technologies, particularly digital communication technologies, and are particularly important for several reasons. the first is business strategy, particularly at launch. the existence or expectation of powerful network effects implies particular launch, pricing strategies and investment and asset valuations. it also implies focusing on particular market dynamic metrics, such as user uptake, and even the social graph of users. On the policy side, the existence of network effects are a harbinger of competition policy (called antitrust in the US) enforcement and concerns. the combination of these factors provides a framework from which to seek to value early stage businesses that have or are expected to have network effects that is different from standard capital asset of NPV models of forecast revenue of market growth. So the existence or otherwise f network effects, and the estimated size and confidence ion those estimates is especially important for business strategy.

Cryptocurrencies and cryptoassets have long been suspected to have powerful network effects, due to the platform growth nature of the technology. early work, building on Metcalfe's law formulation of network effects, indeed claimed to find such effects and confirmed they were indeed powerful. this was useful to know for valuation metrics, and concerning with respect to future competition policy enforcement. But the studies were limited in a number of important ways, relating to range of assets considered, time periods of analysis, and measures of user base. This study seeks to provide a more general analysis, across a range of assets (6), an dover a longer and more consistent time period. It's a much better study than what has been done in the past. the findings are particularly interesting, because they suggest that earlier estimates of network effects are weaker than initially thought. the paper sets out the data approach, the estimation procedures, and presents the 5 specific results. the basic technique is relatively simple,, with a measure of correlation between two estimated variables - value and userbase.

The paper is good to go more or less as is. however, i have some suggestions that the authors may wish to consider. But these are not in my view conditions of publication - just

suggestions. Do with them as you will.

First - the theoretical explanation in terms of Metcalfe's law is the computer science version of network effects, which is about a correlation between two variables. economists have a different way of framing this basically in terms of Coasean externalities, where a network effect is a production technology, where the production of utility is facilitated by external adoption, so a flow of benefits goes to those who have already adopted by the decisions of subsequent adopters. It is possibly worth pointing that out because it gets at the actual mechanism and incentives underneath network effects (beyond the surface measurement of the phenomenon)

Second - obviously, and this will always be true, the data set might benefit from being updated with the late 2020 an dearly 2021 bull run, particularly as it affected DOGE. I think this all strengthens the argument, so maybe just a footnote, but it does raise a further issue that goes to the significance of thinking about the underlying mechanism that generate the network effects (and i do understand that that is beyond the scope of this paper, as an applied empirical analysis). One way that interdependent utility can arise is when it also matters who else adopts in the network, so Elon Musk for instance tweeting about DOGE drove adoption in part because of the public communication effects. This is a network effect, but not in the Metcalfe law sense, but rather in the sense of utility from public signalling caused by adoption by other agents. The 'meme-coin' aspect of network effects is a real phenomenon in this sense.

Reviewer C

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 authors of this paper attempt to draw insights about network effects in cryptocurrencies using simple but objective user-value relationships for a selection of major cryptocurrencies. Although the conclusions are not groundbreaking, and there are serious unresolved issues about the meaning and interpretation of the "userbase" metrics (i.e., address balance count), the work nevertheless helps move our understanding further.

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 20%

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

The authors of this paper attempt to draw insights about network effects in cryptocurrencies using simple but objective user-value relationships for a selection of major cryptocurrencies. Although the conclusions are not groundbreaking, and there are serious unresolved issues about the meaning and interpretation of the "userbase" metrics (i.e., address balance count), the work nevertheless helps move our understanding further. Subject to revisions, noted below, I believe this work could be suitable for publication in Ledger.

I have written my comments below roughly in order from most important to least important.

- A major problem with the paper in its current form is its lack of citations to literature in the appropriate parts of the text. There are numerous sentences throughout the paper (I will give a few examples below) where the authors state "studies showed that" in part of a sentence, but then provide no citations. In many places this omission is particularly egregious because those sentences are establishing the novelty of the current manuscript relative to "the literature" but it is not clear which literature is being compared to.
Examples:
--- A. Page 1 - "While early analyses focused on simple economic illustrations" <-- missing citation, ideally should be included immediately following the word "analyses"
--- B. Page 1 - "...later work started exploring market-wide phenomena" <-- missing citation to "later work"
--- C. Page 2, top of 2nd paragraph "Indeed a number of studies" <-- no citations given
--- D. Page 2, top of 3rd paragraph "Extant literature on network effects" <-- no citations given
--- E. Page 2, middle of 3rd parapgrah "...missing key parts in the cryptoasset market evolution." <-- no citation, which paper is missing these key parts?
--- F. Page 2, end of 3rd paragraph "Additional research has fine-tuned..." <-- what additional research?! no citations are given... how are we supposed to find this additional research?
--- G. Page 3, first paragraph, "...the results obtained in previous studies which sampled" <-- missing citations
--- H. Page 11, first large paragraph in Analysis "valuation tool as previous literature suggests" <-- no reference/citation to said literature
--- I. I won't include additional examples, but I would appreciate if the authors could please add citations to the relevant studies in every sentence that mentions/refers to such studies.

- In all of the figure plots, the text is unacceptably small. Particularly in Figures 2-5 the font sizes for the x-axis and y-axis labels (and legends) should be tripled

- The discussion of the limitations of non-zero addresses as a proxy for userbase should be

expanded. I appreciate that the authors pointed out that one user can have multiple addresses, but the authors fail to mention and discuss explicitly the opposite can also be true. Many users can share one address (for example, a currency exchange can have a million customers but only a handful of Bitcoin addresses for all of them). This latter example seems particularly important to discuss given that, increasingly, more and more "users" of cryptocurrency are only interfacing with cryptocurrency at exchanges and never withdraw to their own wallets. However, these same users purchase cryptocurrency and so certainly contribute to price rise. I am NOT saying the authors were wrong to use non-zero address counts... estimating users is a very difficult thing to do, but I would like to see an expanded discussion of the disclaimers/limitations one needs to apply when using such data as a userbase proxy.

- One of the first results of the analysis in Section 6 is that "Network effects do not provide precise valuation predictions" - was there any ever expectation of this? Even in the literature the authors are referring to (which incidentally, should be cited explicitly here), did that prior literature make the claim that network effects could provide "precise" valuation predictions? What does "precise" mean in this context? This section would be stronger if it was more clear what was previously claimed could be done, but which the authors show can't actually be done.

- The third result "Cryptoassets do not seem to be a winner-take-all market" does not obviously stem from the evidence of the paper. Sure, once can simply point to the existence of multiple non-zero-value cryptocurrencies as evidence of this, but that doesn't really require any of the analysis of the paper. What is it about the analysis the authors specifically did that led to drawing this conclusion? If the authors' analysis wasn't necessary to draw this conclusion (because clearly there is not a winner, yet, that has "taken it all" so to speak), then this should not be listed as a key result of the paper (but rather as an important and self-evident point of context).

- The paper emphasizes, as a kind of competitive advantage over extant literature, that it has included the "resurgence" of cryptocurrency in 2019. However, over the past decade, Bitcoin (and other cryptocurrencies) have experienced many sharp increases/declines... Particularly when viewed on a log scale, the 2019 increase is quite small relative to past rallies. Hence, there doesn't seem anything particularly special about the activity in 2019 (except that more data is always better, of course). Am I missing something? In addition to responding to me, it would be helpful if the authors could clarify in the manuscript whether there is something uniquely significant about the "resurgence" in 2019, or if the authors simply want to indicate that they have more data and hence their analsysis is better in that regard.

- What are the "relatively smoother network effect curves" that the authors refer to on page 12? Can the relative smoothness of these curves be shown in a plot? It would make the point clearer.

- The first paragraph of section 2 is highly repetitive of the text in the introduction, parts seem almost copied/pasted verbatim. Please remove in one place or the other.

- The final paragraph on page 4 is also very repetitive of earlier descriptions of network effects and should be removed (or made much more concise).

- There does not need to be a separate section #3 "Prior literature" - rather, the text currently in Section #3 should be included in the first two sections (which are already discussing prior literature anyway).

- There is a sentence on page 10 "with LTC showing the next highest correlation, which is, however, average and only holds when value is measured as value in fiat currency" ... I have no idea what the authors are trying to say here. What is the distinction between BTC and LTC here?

- At the bottom of page 3, the superscript citations are placed awkwardly such that they appear to be exponents in the mathematical functions. Sometimes this is unavoidable, but in this case it would be easy to fix by putting the citation superscripts after the words "linearly" "logarithmic" and "quadratic" for example. I'd also like to note that there is no citation for the 2^u example despite the authors saying that it is a "most common" function for network effects.

- Statements throughout the paper (such as at the top of the 4th paragraph on page 2) that the author's analysis "confirms" that network effects occur (or don't) in cryptoassets should be weakened, given the shakiness of the user metrics. At best, the author's analysis "suggests" such network effects but as they say in their own words, there are many limitations to methodology used and also the whole market may be too immature for such analyses to give meaningful results (again as the authors themselves say in the conclusions).

- I spent a few confused moments staring at authors definition of network effects (i.e., $Delta\_V > Delta\_u$) before finally realizing that $Delta\_V$ and $Delta\_u$ were defined as ratios (not as $Delta\_V = V(t\_2) - V(t\_1)$ as I had assumed). Perhaps that may happen to other readers too, in which case I think it would be helpful to move equations (1) and (2) slightly earlier.

- There is a missing end-bracket in the first paragraph on page 4 (before "It is no surprise")

- Top of page 8 "toke" should be "token"

- Perhaps it is common in some other fields, but writing "read: userbase" and "read: value" comes across as colloquial to me. I would suggest removing "read:" and replacing with "i.e.," but do not have strong feelings about this.

In addition to enjoying reading the paper as a whole, I particularly appreciated the conclusion where the limitations of the methodology were discussed some more. I think the paper would be stronger to also include more of that discussion in the methods section and expand on it (as noted in my comments above). I look forward to reading the revised version of the paper.

1B. Author Responses

Reviewer B

The paper builds on a new, small but important empirical literature seeking to quantify the existence of network effects in crypto assets. Network effects are well known in economic analysis of other technologies, particularly digital communication technologies, and are particularly important for several reasons. the first is business strategy, particularly at launch. the existence or expectation of powerful network effects implies particular launch, pricing strategies and investment and asset valuations. it also implies focusing on particular market dynamic metrics, such as user uptake, and even the social graph of users. On the policy side, the existence of network effects are a harbinger of competition policy (called antitrust in the US) enforcement and concerns. the combination of these factors provides a framework from which to seek to value early stage businesses that have or are expected to have network effects that is different from standard capital asset of NPV models of forecast revenue of market growth. So the existence or otherwise f network effects, and the estimated size and confidence ion those estimates is especially important for business strategy.

Cryptocurrencies and cryptoassets have long been suspected to have powerful network effects, due to the platform growth nature of the technology. early work, building on Metcalfe's law formulation of network effects, indeed claimed to find such effects and confirmed they were indeed powerful. this was useful to know for valuation metrics, and concerning with respect to future competition policy enforcement. But the studies were limited in a number of important ways, relating to range of assets considered, time periods of analysis, and measures of user base. This study seeks to provide a more general analysis, across a range of assets (6), an dover a longer and more consistent time period. It's a much better study than what has been done in the past. the findings are particularly interesting, because they suggest that earlier estimates of network effects are weaker than initially thought. the paper sets out the data approach, the estimation procedures, and presents the 5 specific results. the basic technique is relatively simple,, with a measure of correlation between two estimated variables - value and userbase.

The paper is good to go more or less as is. however, i have some suggestions that the authors may wish to consider. But these are not in my view conditions of publication - just suggestions. Do with them as you will.

First - the theoretical explanation in terms of Metcalfe's law is the computer science version of network effects, which is about a correlation between two variables. economists have a different way of framing this basically in terms of Coasean externalities, where a network effect is a production technology, where the production of utility is facilitated by external adoption, so a flow of benefits goes to those who have already adopted by the decisions of subsequent adopters. It is possibly worth pointing that out because it gets at the actual mechanism and incentives underneath network effects (beyond the surface measurement of the phenomenon)

- Thank you. Please let us know if the description we provide in the Background section does not capture the economic definition: "for every user added to the userbase of a

product, value is created not just for the joining user but for existing users as well. As a result, each new user derives value from joining a network that is relative to the size of the network (pure network effects) **and creates an externality in the form of value that is captured by the network of existing users (network externality)** … The powerful implication of (direct) network effects is the increasing returns to the userbase and ultimately to the product exhibiting network effects. Because for products that exhibit network effects every new adopter makes the product more valuable relative to existing size of its network, it creates incentives for other adopters to adopt the product with the bigger network over its competitors. **Consequently, the more the userbase grows the more it invites further growth rendering the product increasingly more valuable and competitive**." We measure network effects by correlating variables, but the reasons to do so are the ones described more fully in the background section, including the above excerpt.

Second - obviously, and this will always be true, the data set might benefit from being updated with the late 2020 an dearly 2021 bull run, particularly as it affected DOGE.

- Thank you, we, too, are eager to update the data. The team is facing unexpected setbacks in generating and analysing updated datasets, but if we can produce them before publication, we will make sure they are reflected in the final manuscript.

I think this all strengthens the argument, so maybe just a footnote, but it does raise a further issue that goes to the significance of thinking about the underlying mechanism that generate the network effects (and i do understand that that is beyond the scope of this paper, as an applied empirical analysis). One way that interdependent utility can arise is when it also matters who else adopts in the network, so Elon Musk for instance tweeting about DOGE drove adoption in part because of the public communication effects. This is a network effect, but not in the Metcalfe law sense, but rather in the sense of utility from public signalling caused by adoption by other agents. The 'meme-coin' aspect of network effects is a real phenomenon in this sense.

Reviewer C

The authors of this paper attempt to draw insights about network effects in cryptocurrencies using simple but objective user-value relationships for a selection of major cryptocurrencies. Although the conclusions are not groundbreaking, and there are serious unresolved issues about the meaning and interpretation of the "userbase" metrics (i.e., address balance count), the work nevertheless helps move our understanding further. Subject to revisions, noted below, I believe this work could be suitable for publication in Ledger.

I have written my comments below roughly in order from most important to least important.

- A major problem with the paper in its current form is its lack of citations to literature in the appropriate parts of the text. There are numerous sentences throughout the paper (I will give a few examples below) where the authors state "studies showed that" in part of a sentence, but then provide no citations. In many places this omission is particularly egregious because those sentences are establishing the novelty of the current manuscript relative to "the literature" but

it is not clear which literature is being compared to.

Examples:

--- A. Page 1 - "While early analyses focused on simple economic illustrations" <-- missing citation, ideally should be included immediately following the word "analyses"

--- B. Page 1 - "...later work started exploring market-wide phenomena" <-- missing citation to "later work"

--- C. Page 2, top of 2nd paragraph "Indeed a number of studies" <-- no citations given

--- D. Page 2, top of 3rd paragraph "Extant literature on network effects" <-- no citations given

--- E. Page 2, middle of 3rd parapgrah "...missing key parts in the cryptoasset market evolution." <-- no citation, which paper is missing these key parts?

--- F. Page 2, end of 3rd paragraph "Additional research has fine-tuned..." <-- what additional research?! no citations are given... how are we supposed to find this additional research?

--- G. Page 3, first paragraph, "...the results obtained in previous studies which sampled" <-- missing citations

--- H. Page 11, first large paragraph in Analysis "valuation tool as previous literature suggests" <-- no reference/citation to said literature

--- I. I won't include additional examples, but I would appreciate if the authors could please add citations to the relevant studies in every sentence that mentions/refers to such studies.

- Thank you for pointing out these gaps. We have added numerous references or cross-references where indicated as well as in additional places. In total, we also added 10 new sources.

- In all of the figure plots, the text is unacceptably small. Particularly in Figures 2-5 the font sizes for the x-axis and y-axis labels (and legends) should be tripled

- Agreed, we have increased font size to make them more readable. In the new versions, there is partial overlap between the labels and the price line, but the obscured areas are not critical for our analysis. We are looking to find a better way to present the graphs (perhaps by placing the label at the bottom of the graph altogether).

- The discussion of the limitations of non-zero addresses as a proxy for userbase should be expanded. I appreciate that the authors pointed out that one user can have multiple addresses, but the authors fail to mention and discuss explicitly the opposite can also be true. Many users can share one address (for example, a currency exchange can have a million customers but only a handful of Bitcoin addresses for all of them). This latter example seems particularly important to discuss given that, increasingly, more and more "users" of cryptocurrency are only interfacing with cryptocurrency at exchanges and never withdraw to their own wallets. However, these same users purchase cryptocurrency and so certainly contribute to price rise. I am NOT saying the authors were wrong to use non-zero address counts... estimating users is a very difficult thing to do, but I would like to see an expanded discussion of the disclaimers/limitations one needs to apply when using such data as a userbase proxy.

- Agreed, we expanded the discussion with links to literature.

- One of the first results of the analysis in Section 6 is that "Network effects do not provide precise valuation predictions" - was there any ever expectation of this? Even in the literature

x

the authors are referring to (which incidentally, should be cited explicitly here), did that prior literature make the claim that network effects could provide "precise" valuation predictions? What does "precise" mean in this context? This section would be stronger if it was more clear what was previously claimed could be done, but which the authors show can't actually be done.

- Agreed, we replaced the word 'precise' with the word 'reliable'. It is true that authors do not promise precise valuation preditions as such, but Peterson (2019), chiefly, notes that he provides 'convincing empirical evidence that bitcoin's price formation is not a noisy result of emotional investing but instead is founded on economic principles of value that have only recently begun to be recognized: network economics.' Other authors use similar language. We take those statements to promise reliable but not precise predictions, hence the revised language.

- The third result "Cryptoassets do not seem to be a winner-take-all market" does not obviously stem from the evidence of the paper. Sure, once can simply point to the existence of multiple non-zero-value cryptocurrencies as evidence of this, but that doesn't really require any of the analysis of the paper. What is it about the analysis the authors specifically did that led to drawing this conclusion? If the authors' analysis wasn't necessary to draw this conclusion (because clearly there is not a winner, yet, that has "taken it all" so to speak), then this should not be listed as a key result of the paper (but rather as an important and self-evident point of context).

- Thank you, we revised the language throughout to include the "winner-take-most" phrasing and we added a relevant clarification in 6.3. In the network effect literature, scholars acknowledge the theoretical outcome of a winner-take-all market, but in practice it is uniformly acknowledged, that the vastly more likely outcome of network effects is a winner-takemost market. That said, the expression winnertake-all is much more common in the literature and is used almost synonymously with winnertake-most (hence our use of it). However, this is simply a terminology issue and does not have a bearing on our analysis. In other words, we use "winner-take-all/most" to mean "tends to monopoly/oligopoly". We think it is important to keep 6.3 as a separate insight because some cryptoassets (mainly Bitcoin as the main one, and Ethereum as the biggest alt-coin) are routinely called winner-take-all/most and we want to provide as scientific explanation to the contrary even if it obvious under current

- The paper emphasizes, as a kind of competitive advantage over extant literature, that it has included the "resurgence" of cryptocurrency in 2019. However, over the past decade, Bitcoin (and other cryptocurrencies) have experienced many sharp increases/declines... Particularly when viewed on a log scale, the 2019 increase is quite small relative to past rallies. Hence, there doesn't seem anything particularly special about the activity in 2019 (except that more data is always better, of course). Am I missing something? In addition to responding to me, it would be helpful if the authors could clarify in the manuscript whether there is something uniquely significant about the "resurgence" in 2019, or if the authors simply want to indicate that they have more data and hence their analsysis is better in that regard.

- Thank you, it's a bit of both. Our data is more recent than of previous studies which helps test the network effects hypothesis over a longer period of time. Indeed, the activity in 2019 which is not recorded in previous literature helps debunk the myth of constant network effects. We slighlty amended the end of the introdution to highlight this.

- What are the "relatively smoother network effect curves" that the authors refer to on page 12? Can the relative smoothness of these curves be shown in a plot? It would make the point clearer.

- Thank you for catching this, the word 'smoother' was in fact incorrect, and we rephrased that part to express that up until 2018 there was a closer fit between the price curve and price prediction curve based on network effects.

- The first paragraph of section 2 is highly repetitive of the text in the introduction, parts seem almost copied/pasted verbatim. Please remove in one place or the other.

- The final paragraph on page 4 is also very repetitive of earlier descriptions of network effects and should be removed (or made much more concise).

- Thank you, but, respectfully, we find little overlap between the indicated parts, besides the definition of network effects. Since the concept of network effects is central to the paper, we feel that repetition of the definition in appropriate places with the purpose of linking it to other arguments discussed in the different parts, is warranted. Happy to reconsider if the repetition significantly impacts readability.

- There does not need to be a separate section #3 "Prior literature" - rather, the text currently in Section #3 should be included in the first two sections (which are already discussing prior literature anyway).

- Thank you. No strong feelings on whether parts are merged, but it is quite common in cs and economics papers to have a dedicated section on prior literature even if some of the ideas are necessarily discussed in the introduction and the setting up of the study. We are happy to discuss this with the editors which option is best, as other reviewers commented that they found the structure of the paper and the separation between parts 'excellent'.

- There is a sentence on page 10 "with LTC showing the next highest correlation, which is, however, average and only holds when value is measured as value in fiat currency" ... I have no idea what the authors are trying to say here. What is the distinction between BTC and LTC here?

- Thank you, we revised the wording to clarify.

- At the bottom of page 3, the superscript citations are placed awkwardly such that they appear to be exponents in the mathematical functions. Sometimes this is unavoidable, but in this case it would be easy to fix by putting the citation superscripts after the words "linearly"

"logarithmic" and "quadratic" for example. I'd also like to note that there is no citation for the 2^u example despite the authors saying that it is a "most common" function for network effects.

- Thank you, added commas to separate them better, and also added the missing reference (Reed's Law).

- Statements throughout the paper (such as at the top of the 4th paragraph on page 2) that the author's analysis "confirms" that network effects occur (or don't) in cryptoassets should be weakened, given the shakiness of the user metrics. At best, the author's analysis "suggests" such network effects but as they say in their own words, there are many limitations to methodology used and also the whole market may be too immature for such analyses to give meaningful results (again as the authors themselves say in the conclusions).

- Thank you, toned down the language throughout as regards our own contribution to the literature.

- I spent a few confused moments staring at authors definition of network effects (i.e., Delta_V > Delta_u) before finally realizing that Delta_V and Delta_u were defined as ratios (not as Delta_V = V(t_2) - V(t_1) as I had assumed). Perhaps that may happen to other readers too, in which case I think it would be helpful to move equations (1) and (2) slightly earlier.

- Thank you, this makes sense. In terms of structure we feel it is appropriate for the methodology section to include the technical definition of network effects. We can include it earlier too, and we welcome suggestions in terms of where, to avoid repetition.

- There is a missing end-bracket in the first paragraph on page 4 (before "It is no surprise")

- Thank you, fixed

- Top of page 8 "toke" should be "token"

- Thank you, fixed

- Perhaps it is common in some other fields, but writing "read: userbase" and "read: value" comes across as colloquial to me. I would suggest removing "read:" and replacing with "i.e.," but do not have strong feelings about this.

- Thank you, replaced.