"Metcalfe's law and herding behaviour in cryptocurrencies market"

Authors studied time series of some cryptocurrencies from three different analyses: (i) log-return distribution, (ii) Metcalfe’s law, and (iii) Log-Periodic Power Law (LPPL) model of bubble crash. They conclude that Metcalfe’s law may be valid in the long-run, however in the short-run, on various data regimes, its validity is highly debatable.

The three different aspects of cryptocurrencies have been studied independently by several researchers. Although the paper is written about the three different analyses, the lack of the relationship among the analyses is considered as a major weakness of the paper. In addition to this weakness, the obtained results described in this paper seems to have own weakness, e.g. the lack of methodological novelty (originality) and usage of the easily available data are considered as weaknesses of the paper. For these reasons, a reviewer does not recommend the current draft of the paper as a publication for Economics.

As a reviewer’s opinion, the authors need to revise their manuscript according to the following major and minor comments.

Major comments:
(1) Page 4, section 2
The authors are required to describe clearly theoretical reasons to apply the three different analyses in section 2. The authors must rationalize why the three analyses are needed to characterize the time series of cryptocurrencies and must explain what is expected in the empirical analyses from a theoretical point of view.
(2) Page 12, section 2.3.2
The authors apply rolling time window to capture the temporal change of the validity of the Metcalfe’s law. Especially analyses in 250 days-windows and 500 days-windows, the period of low validity are identified. The temporal change of the validity might be observed in the shape of the log-return distribution, parameters to characterize its shape estimated for the whole period are listed in Table 2 of section 3.2. The authors are required to apply the rolling time window to capture the temporal change of the functional shape of the log-return distribution in different period. This might answer the reason why Metcalfe’s law may not be valid in a certain period of time.
(3) Fig.9 in Page 18 and Fig.11 in Page 20
In Fig.9 and Fig. 11, it seems like that LPPL mode do not reproduce the characteristic oscillations observed in the actual data of BITCOIN price and CRIX index. The model is intended to reproduce this oscillation until the point of market crash. We do not understand whether the fitting is successful
or not, although values of $R^2$ shown in Table 9 and Table 10 are quite high. The authors are required to explain why the characteristic oscillations are not reproduced in their model fitting.

4) Table 9 in Page 17 and Table 10 in Page 19
The authors wrote “model 1”, “model 2”, and “model 3” in the results of LPPL fitting in Table 9 and Table 10. However, we do not find any description explaining the difference among “model 1”, “model 2”, and “model 3”.

5) Eq. (7) in Page 17 and Eq. (8) in Page 18
Eq. (7) is basically identical to Eq. (4) in section 2.2, except for suffix k. However, we do not find any results related to suffix k. The authors are required to explain the difference in suffix k. This is the same for Eq. (8) in Page 18. The authors are also required to explain the rolling window used in LPPL fitting. We do not see any windows in the results shown in Fig.9, Fig.11, Table 9, and Table 10.

6) Herding behavior in Page 6, line 1
The authors described in Page 6 “… we are using LPPL models to test the propensity for herding behavior…” However, in section 3.2, we do not find any description on the herding behavior. This is logical inconsistency in the purpose and the results of LPPL model fitting. The authors are required to add empirical results and to discuss the herding behavior in section 3.4.

Minor comments:
(7) Page 5, section 2.2
In the Metcalfe’s law, the authors used symbols: $\alpha$ and $\beta$. These symbols are used in Eq. (1) and (2) to explain alpha-stable distribution of log-returns of cryptocurrencies. The authors need to use different symbols.

(8) Page 5, section 2.3
In LPPL mode, the authors used symbols: $\alpha$, $\beta$, and $\delta$. These symbols are used in Eq. (1) and (2) to explain alpha-stable distribution of log-returns of cryptocurrencies. The authors need to use different symbols which are not used in both alpha-stable distribution and the Metcalfe’s law.

(9) Page 5, line 31
Reference (Blanchard 1979) is not found in bibliography at the end of the paper.

(10)Page 6, line 7
At a sentence of “the dataset presented in the table below…”, the authors should refer the table using the number of the table, i.e. Table 1.

(11)Page 10, line 21
“…results for the equation (5) are shown below…” should be “…results for the equation (5) are shown in Table 3 …”.

(12) Page 10, the bottom line
“… is illustrated in the figure below.” should be “… is illustrated in the figure 4.”
“…results for the equation (6) are shown below.” should be “…results for the equation (6) are shown in Table 4.”.