

Bitcoin Returns and the Frequency of Daily Abnormal Returns: Open Review

Guglielmo Maria Caporale,^{*} Alex Plastun,[†] Viktor Oliinyk[‡]

Reviewers: Reviewer A, Reviewer B

Abstract. The final version of the paper “Bitcoin Returns and the Frequency of Daily Abnormal Returns” can be found in Ledger Vol. 6 (2021) 17-41, DOI 10.5915/LEDGER.2021.216. 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. After initial review by Reviewers A and B, the submission was returned to the authors with feedback for revision (1A). The authors responded (1B) and resubmitted their work, and the decision was made that the revisions made were sufficient to address the given concerns, thus ending the peer review process. Reviewer comments in 1B have been italicized for 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:

The results of this paper have both academic (in terms of market efficiency) and practical (in terms of new trading strategies) implications.

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

Important references are missing

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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 10%

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

This paper explores the relationship between Bitcoin returns and the frequency of daily abnormal returns. For this purpose, a number of regression techniques and model specifications are used, including ARMA and ARMAX models, Logit and Probit regressions, piecewise linear regressions and non-linear regressions etc. Finally, in-sample and out-of-sample performance of the various models are compared. The author(s) conclude that the frequency of daily abnormal returns can be informative about Bitcoin returns. The results of this paper have both academic (in terms of market efficiency) and practical (in terms of new trading strategies) implications.

Please find below some suggestions:

- 1) Some more studies could be discussed in the literature review to highlight the novelty of the paper.
- 2) The authors use the static approach to calculate abnormal returns and refer to an earlier study by Caporale and Plastun (2019) to justify this choice. Some additional discussion of its advantages would be useful.
- 3) The Tables should have a uniform layout – at present there are notes in the case of Tables 2,3 and 4 but not for Tables 5, 6 etc.
- 4) The conclusions could be expanded slightly to explain better the implications of the analysis.

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:

Novel empirical approach

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.

Overview

This paper analyses price predictability in the Cryptocurrency market (case of Bitcoin returns) based on the frequency of one-day abnormal returns (the frequency of negative and positive abnormal returns, and their difference). The paper claims that there is a strong positive (negative) relationship between Bitcoin returns and the frequency of positive (negative) abnormal returns. These findings can be interesting both for academicians (additional evidences against the EMH) and practitioners (prediction of future prices gives advantage which can be used to create profitable trading strategies for the cryptocurrency market).

The use of the frequency of one-day abnormal returns as a predictor for returns is rather interesting idea as a result paper has certain novelty and contribution. Still some of the issues need to be clarified/additionally discussed.

1. According to author(s) this paper is an extension of Caporale, G.M., A. Plastun and V. Oliinyk, (2019), Bitcoin fluctuations and the frequency of price overreactions. *Financial Markets and Portfolio Management*, 33(2), 109-131.

I think there should be more information about the differences between these papers and the contribution and novelty about the current one.

2. Empirical section is overweighed with the Tables. I would recommend to move most of them into Appendix section or even separate Supplementary file and add some resulting Tables to ease the reading process.

3. I would suggest to expand the literature review section especially with the cryptocurrency market related papers. Furthermore, the authors should include the following related paper Salient features of dependence in daily US stock market indices. 2013. By LA Gil-Alana, J Cunado, F Perez de Gracia. In *Physica A: Statistical Mechanics and its Applications* 392 (15), 3198-3212.

1B. Author Response

Reply to Reviewer A

1) Some more studies could be discussed in the literature review to highlight the novelty of the paper.

We would to thank the referee for this comment. We have provided some additional discussion and references in the revised version. Specifically, the following references have been included:

- Baur, Dirk G., Daniel Cahill, Keith Godfrey, Zhangxin (Frank) Liu, “Bitcoin time-of-day, day-of-week and month-of-year effects in returns and trading volume.” *Finance Research Letters* 31 78-92 (2019)
- Carrick, J., (2016), Bitcoin as a Complement to Emerging Market Currencies. *Emerging Markets Finance and Trade* 52, 2321-2334.
- Cheung, A., E. Roca and J.-J. Su, (2015), Crypto-Currency Bubbles: An Application of the Phillips-Shi-Yu (2013) Methodology on Mt. Gox Bitcoin Prices. *Applied Economics* 47, 2348-2358.
- Corbet, Shaen, Veysel Eraslan, Brian Lucey, Ahmet Sensoy, “The effectiveness of technical trading rules in cryptocurrency markets.” *Finance Research Letters* 31 32-37 (2019)
- Dwyer, G. P., (2014), The Economics of Bitcoin and Similar Private Digital Currencies. *Journal of Financial Stability* 17, 81-91.
- Katsiampa, Paraskevi “An empirical investigation of volatility dynamics in the cryptocurrency market.” *Research in International Business and Finance* 50 322-335 (2019)

2) *The authors use the static approach to calculate abnormal returns and refer to an earlier study by Caporale and Plastun (2019) to justify this choice. Some additional discussion of its advantages would be useful.*

We thank the referee for this comment. Indeed, this is an important aspect of the analysis. We have now incorporated some additional discussion in the Data and Methodology section.

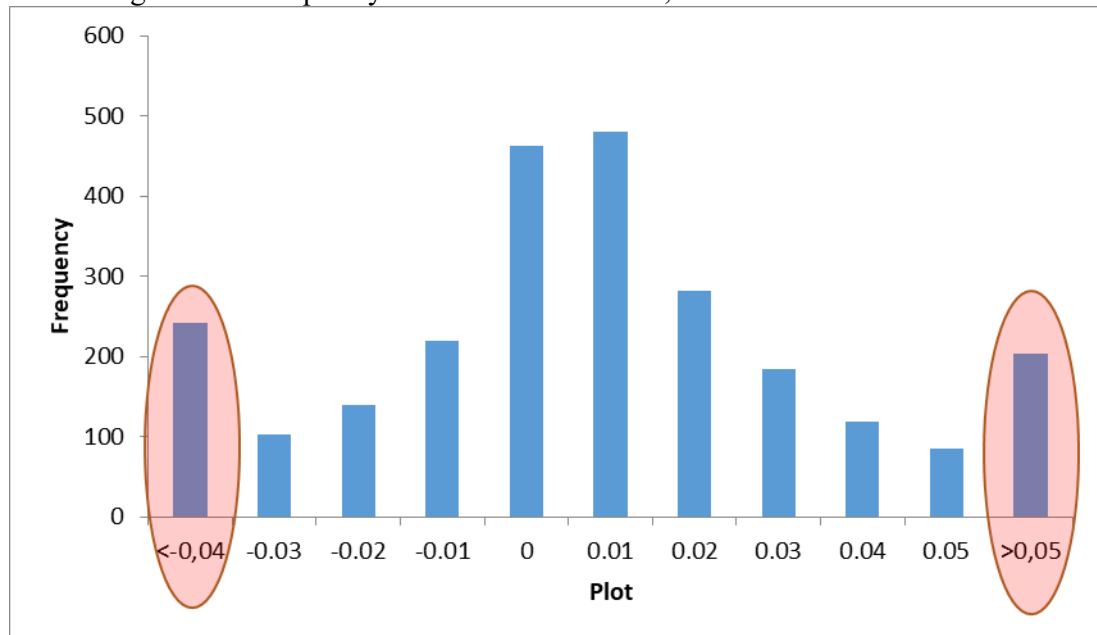
We had already explained in the paper that defining abnormal returns is a contentious issue in the literature. There are two main approaches: the dynamic trigger approach, which is based on relative values (usually the number of standard deviations added to the average), and the static approach (which uses actual price changes as an abnormal return criterion).

We decided to use the static approach on the basis of the results of Caporale and Plastun (2019) who compare these two methods and show that the static approach produces more reliable results.

We have now also added the following text:

“An additional argument in favour of the static approach is the presence of fat tails in the distribution of Bitcoin prices (see Figure A.1) which means that a dynamic trigger approach, which is based on a standard normal distribution, might provide misleading results.

Figure A.1: Frequency distribution of Bitcoin, 05.2013-02.2020



This is confirmed by Caporale and Plastun (2019b) who showed that the correlation between the frequency of abnormal returns (based on the two aforementioned methods for abnormal returns detection in turn) and the VIX index dynamics is much higher when using the static approach, which is crucial for the purposes of our analysis (i.e. price prediction); specifically, the dynamic trigger approach produces a correlation coefficient of 0.12 whilst the static one yields a coefficient equal to 0.81. Therefore, the static approach will be applied here.”

3) *The Tables should have a uniform layout – at present there are notes in the case of Tables 2,3 and 4 but not for Tables 5, 6 etc.*

We would to thank the referee for this suggestion. In the revised version of the paper the tables have a uniform layout with notes in all cases.

4) *The conclusions could be expanded slightly to explain better the implications of the analysis.*

We would to thank the referee for this comment. We have expanded the conclusions with an additional discussion of implications of the analysis for both practitioners and academics which reads as follows:

“On the whole, the results suggest that the frequency of abnormal returns is informative about price dynamics in the cryptocurrency market. They are of interest to both practitioners (who can use this information for their investment decisions) and academics (since they represent evidence against the EMH). More specifically, they imply that investors and traders can use the frequency of abnormal returns for the purpose of predicting prices and designing profitable trading strategies in the cryptocurrency market. For example, the number of days with negative and positive abnormal returns during a month can be used to predict Bitcoin returns - the models estimated in this paper provide benchmark values against which buying/selling decisions can be made. The detected lack of efficiency in the Bitcoin market also represents an interesting issue for academics to investigate in the future by testing empirically alternative explanations and/or developing new models based on the more realistic assumptions of bounded rationality and learning.”

Reply to Reviewer B

1. According to author(s) this paper is an extension of Caporale, G.M., A. Plastun and V. Oliinyk, (2019), Bitcoin fluctuations and the frequency of price overreactions. Financial Markets and Portfolio Management, 33(2), 109-131. I think there should be more information about the differences between these papers and the contribution and novelty about the current one.

We thank the referee for this comment. We have included some additional discussion in the literature review section about the novelty of the present paper, specifically:

“The present study extends the previous one by Caporale et al. (2019a) by using different methods (quantile regressions, Logit and Probit regressions, piecewise linear regressions and non-linear regressions are used in this paper instead of the VAR and ARIMA models estimated by Caporale et al., 2019a), examining a longer sample (up to 2020), including different variables (the difference between the frequency of positive and negative abnormal returns parameter introduced in this paper), and evaluating both the in-sample and out-of-sample performance of the estimated models using various criteria such as AIC, BIC, MAE, Theil’s statistic etc.)”

2. Empirical section is overweighed with the Tables. I would recommend to move most of them into Appendix section or even separate Supplementary file and add some resulting Tables to ease the reading process.

We would to thank the referee for this suggestion. We have moved most tables to a separate Supplementary file leaving only two tables in the main body of the paper.

3. I would suggest to expand the literature review section especially with the cryptocurrency market related papers. Furthermore, the authors should include the following related paper Salient features of dependence in daily US stock market indices. 2013. By LA Gil-Alana, J Cunado, F Perez de Gracia. In Physica A: Statistical Mechanics and its Applications 392 (15), 3198-3212.

We would to thank the referee for these suggestions. We have expanded the literature review section, focusing especially on the cryptocurrency market. Specifically, the following references have been included in the revised version of the manuscript:

- Gil-Alana, L.A., Cunado J., Perez de Gracia F. “Salient features of dependence in daily US stock market indices” *Physica A: Statistical Mechanics and its Applications* 392 (15), 3198-3212 (2013)
- Baur, Dirk G., Daniel Cahill, Keith Godfrey, Zhangxin (Frank) Liu, “Bitcoin time-of-day, day-of-week and month-of-year effects in returns and trading volume.” *Finance Research Letters* 31 78-92 (2019)
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- Cheung, A., E. Roca and J.-J. Su, (2015), Crypto-Currency Bubbles: An Application of the Phillips-Shi-Yu (2013) Methodology on Mt. Gox Bitcoin Prices. *Applied Economics* 47, 2348-2358.
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