Zero Theorem Literature Review

"The Inefficiency of Bitcoin, A. Urquhart, 2016"

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Highlights

- Analyze the market inefficiency of BitCoin by conducting different tests that will capture all the dynamics of Bitcoin.
- Explore the market efficiency of different BitCoin tests by conducting a battery test.

Background

Due to advancements in technology and increasing popularity of cryptocurrency, BitCoin has received a substantial attention. Hence, it is evident that Bitcoin has garnered a lot of attention. However, still there remains scepticism and a lack of understanding of this cryptocurrency. Therefore, there is a need to study the market efficiency of BitCoin that makes it a keystone of cryptocurrency.

Introduction

To overcome the loopholes due to which market efficiency of BitCoin suffer a lot, it is required to explore the informational efficiency of BitCoin. In this context, Urquhart (2016) studied the market efficiency of Bitcoin by carrying out contrasting tests on bitcoin data to capture all the dynamics of Bitcoin. For this purpose, a battery of tests is employed by Urquhart (2016) to investigate the evidence related to market inefficiency.

Proposed Methodology

Furthermore, to explore the market efficiency of BitCoin different tests which includes the Ljung-Box test, Runs test, Bartels test, AVR test, BDS test, and R/S Hurst are analyzed. To validate these test, data is obtained from Bitcoinaverage

which includes daily closing prices for Bitcoin in USD from 1st August 2010 to 31st July 2016. This means that the efficiency of Bitcoin was examined over a full data sample period and over two sub-samples to find out whether the level of efficiency has varied over time. As a result of this, BitCoin return is calculated which is represented in such a way: $R_t = \left[\frac{L_n(P_t)}{L_n(P_{t-1})}\right] \times 100$ where R_t is the return of Bitcoin that uses natural logs of BitCoin prices in time t and $(t-1)$ respectively.

Details of Proposed Methodology

To have a better understanding how proposed system works let's have a look at the details in which firstly, the auto-correlation of returns was assessed through the Ljung-Box test. After this, the runs test and the Bartels test were carried out to determine whether returns are independent. In third step, the variance ratio (AVR) test was carried out, where the variance of the price difference of order q equals p times the variance of the first difference. Then, the BDS test (a popular non-parametric test for serial dependence in stock returns) was carried out. Finally, the re-scaled Hurst exponent (R/S Hurst) for long memory of stock returns was employed.

Results and Discussion

In order to evaluate the dynamics of BitCoin, the full sample period results are analyzed that indicate a significant inefficiency in Bitcoin while Bitcoin becomes less inefficient for the sub-sample period. For the first sub-sample, the R/S Hurst statistic indicates strong anti-persistence and each of the tests rejects the null hypothesis of randomness. However, for the second sub-sample period, the AVR and Ljung-Box tests fail to reject their null hypotheses, indicating no auto-correlation and that Bitcoin is inefficient. The test results are shown in Table 1 below.

Table 1: Summary of the test results

Test	Ljung-Box Test	Runs Test	Bartels Test	AVR Test	BDS Test	R/S Hurst
Full-Sample (2010 - 2016)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	0.353
Sub-sample1 (2010 - 2013)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	0.363
Sub-sample2 (2013 - 2016)	(0.35)	(0.00)	(0.00)	(0.64)	(0.00)	0.406

Conclusion

This led to the conclusion that the analysis carried out by Urquhart (2016) showed that Bitcoin has an inefficient market over the full sample period but appears to be less inefficient in the second sub-sample period. Therefore in future there is a need to conduct further empirical analysis of the changing degree of market efficiency along with comparing Bitcoin to emerging markets and other alternative investments.

References

Urquhart, A. (2016). The inefficiency of bitcoin. *Economics Letters*, 148:80–82.