Zero Theorem Literature Review

"Predicting Bitcoin Returns Using High-Dimensional Technical Indicators, J. Huang and W. Huang and J. Ni, 2019"

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Highlights

- Investigates the solutions that can predict daily returns on bitcoin based technical indicators.
- Comparison of proposed model on different benchmarks such as ten simple strategies and a buy-and-hold strategy to evaluate the volatility.

Background

With the advancements in cryptocurrency, BitCoin have shown a significant impact. Hence, due to high volatility BitCoin provides a secure way for people to make digital transactions with anonymity that proves to be beneficial in predicting BitCoin return. However, limited studies have been done that analyzes the bitcoin return predictability but there remain some issues with speculative nature. Therefore, there is a need to investigates the solution that can predict daily returns on bitcoin based on its historical prices only.

Introduction

In this context, Huang et al. (2019) examined the possibility of predicting Bitcoin with a large set of technical indicators that are Bitcoin price-based. Moreover, Huang et al. (2019) construct a classification tree-based model for return prediction which utilizes 124 technical indicators that can be used to predict Bitcoin returns.

Proposed Methodology

For this purpose, a decision tree is built from a root node that involves partitioning the data space recursively into subsets containing similar values. To

have a better understanding, let's assume N_{train} is the number of observations in the training data set. Let $x_i \in R^P$ and $y_i \in R$ represent the i_{th} observations of input variables P and response variable y, respectively for i = 1, 2, ..., N_{train}. This led to the consequence that the input variables are continuous therefore, Huang et al. (2019) used a binary space partitioning based on thresholds of inputs.

Details of Proposed Methodology

First of all BTC-USD data is collected from investing.com which includes daily open, close, high, and low prices of Bitcoin from the time-period of 1st January, 2012 to 29th December, 2017. After cleaning the data set the sample was divided into three sub-samples where the first sub-sample consists of 120 observations that are used to compute the initial values of technical indicators which serves as inputs in the decision-tree analysis. The second sub-sample was used as a training data set in the decision-tree analysis. Finally, the third sample was used as the test data set.

Moreover, Huang et al. (2019) used 124 technical indicators that depend on past prices of Bitcoin. The indicators were grouped into five categories such as overlap study indicator, cycle indicators, momentum indicators, volatility indicators and pattern recognition indicators. Once all the technical indicators are analyzed Huang et al. (2019) conducted an analysis to implement these 124 technical indicators. After this, decision trees for return prediction are built using the CART method. For the inputs specified, cross-entropy was used as the measure of impurity such as Cross-Entropy, $H_{CE}\left(R_m\right) = -\sum_k p_{mk} * \log\left(p_{mk}\right)$.

Results and Discussion

In order to evaluate the volatility of proposed model, Huang et al. (2019) compared the proposed model to the ten simple strategies and a buy-and-hold strategy. For the ten simple strategies, the average information ratios based on the arithmetic and geometric average returns are 4.20 and 2.77, respectively. For buy-and-hold strategy,r_{A} is 12.62 and r_{G} is 8.65. Meanwhile, the proposed model has an average of 13.13 for r_{A} based information ratio and 8.99 for the r_{G} based information ratio. This shows that the proposed model has a higher average information ratio than the ten simple strategies and the buy-and-hold strategy. Also, the results showed that the average annualized volatility for the proposed strategy is 64.25% which is much lower than that of the buy-and-hold strategy that has 83.17%.

Conclusion

This led to the conclusion that the proposed model has strong predictive power for narrow ranges of Bitcoin daily returns. From the results, it is evident that

the model outperformed the buy-and-hold strategy. To further extend this study there is a need to investigate a continuous response by accessing the predictive power of the technical trading rules for the Bitcoin return levels.

References

Huang, J.-Z., Huang, W., and Ni, J. (2019). Predicting bitcoin returns using high-dimensional technical indicators. *The Journal of Finance and Data Science*, 5(3):140–155.