Predicting Cryptocurrency Price Change Direction from Supply-Side Factors via Machine Learning Methods

David Mayo advised by Dr. Heba Elgazzar

School of Engineering and Information Systems, Elmer R. Smith College of Business and Technology
Morehead State University

Abstract
Cryptocurrency prices are highly variable. Predicting changes in cryptocurrency price is a hugely important topic to investors and researchers, with much existing research on demand-side factors. The goal of this research project is to design and implement machine learning models to predict future cryptocurrency price change direction based primarily on supply-side factors. Different unsupervised machine learning techniques are used to build the predictive models. These techniques include K Nearest Neighbors (KNN), Artificial Neural Networks (ANN), Support Vector Machines (SVM), Naïve Bayesian Classifier, and Random Forest Classifier. A dataset of 10 daily supply-side metrics for three prominent cryptocurrencies (Bitcoin, Ethereum, and Litecoin) at four different time horizons (ranging from one day to 30 days) are used to build and test the machine learning models. The outputs of these models indicate the predicted direction of the price movement over the time horizon (i.e., whether the price would go up or down), not the magnitude of the movement. Experimental results show that predictions were very unreliable whether the price went up or down over the given number of days. Our methodology is:

1. Collect several months-worth of daily price and supply data for a few different cryptocurrencies.
2. For each day, determine whether the price increased or decreased over the next several days.
3. Train classification models using different machine learning techniques to predict whether the price went up or down over the given number of days.
4. Evaluate each of the models.

We chose ten different metrics to track, including daily price, and got 9 months of historical data from Coin Metrics [4]. Our methodology is: We chose three cryptocurrencies: Bitcoin, Ethereum, and Litecoin. We chose four different prediction intervals: 1 day, 7 days, 14 days, and 30 days. We chose five different machine learning techniques: K-Nearest Neighbors, Naïve Bayesian, Support Vector Machine, Random Forest, and Artificial Neural Net. In all, that gave us 60 (3×4×5=60) classifiers to create, train, and evaluate.

Conclusion and Future Work
We conclude that
✓ It is possible to predict the future direction of cryptocurrency price in the medium-term with high confidence.
✓ Longer term predictions can be made much more confidently than shorter term ones.
✓ Artificial Neural Net and Random Forest techniques are well-suited to this problem space.

Ideas for future work include
✓ Predicting the magnitude of the price change, not just the direction
✓ Extending the prediction timespan
✓ Performing feature selection to determine which of the data features are most predictive.

Experimental Results

Over the months we were collecting data, Ethereum’s price fluctuated significantly. Bitcoin and Litecoin also fluctuated quite a bit. Naïve Bayes Classifier was very weak. All classifiers were much better at predicting long-term trends than short-term ones.

References

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