Presentation :

1. Introduction

My research is about price discrepancy on cryptocurrency trading platforms.

When the price of an asset assets isn’t the same on different platforms, there is an opportunity for arbitrage. Arbitrage on cryptocurrency markets has been studied by numerous articles but none has tried to measure how big they can be, which is the focus of my research.

Studying it price discrepancy could help make markets more efficient and help people buy and sell at a better price.

1. Arbitrage

When at the same time a person A sells at price 𝑥 and a person B buys at price 𝑦, a person C can buy from A, sell to B, and make a profit.

1. Cryptocurrency Markets

Exchanges are platforms where people buy and sell cryptocurrencies, on the example: Kraken, Binance and Okex.

On these exchanges we find market pairs, which currency we can buy and at what price, like Bitcoin and Litecoin.

From one platform to another, prices may differ, and this is where arbitrage can occur, by sending a cryptocurrency from one platform to sell it higher than bought.

1. Example

Here is an example with real data:  
Somebody buys 1500$ of Bitcoin on a platform, send his Bitcoin to a Korean exchange to buy at the lowest price possible the ‘Litecoin’ currency, and then proceeds to send that Litecoin to Hubi, a Hong-Kong exchange where the Litecoin’s value is the highest at that time. For 1500$ invested, a profit estimated of 180$

1. Graph Theory Approach

This problem can be formulated as a max-flow problem:  
Finding all arbitrages is the same as finding augmenting paths when comparing prices among markets for all currencies, on all exchanges. A modified version of the Ford-Fulkerson could be used to solve the problem.

1. Statistical Approach

Using the data you can see on the slide we can compute a good enough estimation of the volume.

The advantage of the statistical method is that it is very fast to compute but doesn’t give the proof, while the graph theory method is very long to compute algorithm but returns the list of trades to compute.

1. Results

I couldn’t run the graph theory algorithm on the whole dataset but by running it on five random smaller samples of the dataset with a volume of 1 billion USD and then adjusting it with respect to the total volume, all results were matching the statistical estimation within a margin of ±10%.

Statistical method gave me an estimation of 200 063 807 USD that can be arbitraged at any minute for the  
 78 071 059 706 USD of volume analyzed, so around 0.25% of the volume, at any time.

Main consequence, if all market discrepancies were arbitraged, to match the total volume, we should expect an increase in volume traded of 65%.

Though these methods gave conclusive results and could be reused for further experiments, more precise datasets could help improve a lot algorithms efficiency.

Results seem accurate given the dataset but shouldn’t be extrapolated since the data is only about a single day and require replications.