**Final Write-Up**

**Analysis**

For my final project I analyzed the Nomics dataset. It has the widest array of available data since most exchanges and chains are active participants on their platform.

I pulled both intraday market pricing and intraday exchange level data for this analysis. The point of the analysis was to identify whether DeFi markets are efficient or inefficient. If they are inefficient, how long would it take for the markets to reach convergence?

Based on this analysis of three popular exchanges, I confirmed my hypothesis related to existing arbitrage opportunities within the crypto space. Below are the primary three questions I sought to answer:

* Would mass global adoption force crypto markets to become efficient if they are inefficient?
  + Mass global adoption would not force efficiency. Based on my analysis of market volume versus exchange volume, crypto markets are hyper-fragmented. Centralized and decentralized exchanges are limited by their on-chain capabilities. Not all blockchains and sidechains are integrated on a single exchange, and this would cause a significant portion of volume and trade activity to be missed. The only way mass adoption could force converging price points is if trades can seamlessly operate across any exchange with minimal friction.
* Is inefficiency due to the rapid pace at which the DeFi world is growing?
  + Yes, the pace at which the DeFi world is growing is causing mass fragmentation. The inability to integrate all existing DeFi technologies will continue to create DeFi market inefficiencies and exasperate market volatilities.
* If it is efficient, does efficiency occur instantaneously or does the opportunity for arbitrage present itself?
  + Efficiency is never present in crypto markets. Price convergence never happens as it does in traditional markets. Deviations can vary from a single unit to 100 units or more depending on the cryptocurrency and its own relative scaling. The impact is generally large. Traditional markets often have a .01 to .02 variation between markets and due to centralized trading prices on exchanges rapidly adjust.

The crypto market inefficiencies will contribute to large scale inequalities. While the decentralized nature of the technology allows simplified banking for the global populace, the volatile, inefficient, and opaque nature of the technology will also cause financial strife. Wealthy players, like what is already occurring, will use predatory tactics to maximize the consumption of this universe. Much of the digital real estate will be owned by those who were already hyper-wealthy in traditional markets. Full-scale adoption at this point will be more harmful than good as there are too many shortcomings for cryptocurrencies to be used as a money in established countries. However, I do acknowledge that for emerging economies experiencing hyper-inflation and currency devaluation there will be a great benefit to adopting cryptocurrencies as a primary source of money.

**Data Processing**

In order to prep the data for this analysis I loaded the data from the Nomics API. Using the urllib package I could post GET requests to create my data frames. The data was fed in as JSON arrays, so I utilized the pandas json conversion function to commit them to data frames. I then created subsets of the data frames to parse the requisite information. I converted relevant columns to numeric values and then created a unified data frame using the pandas concatenation function on the column axis.

**Final App Representation**

For my final medium I chose to post a live feeding app to Heroku with the respective dropdowns needed. I limited the currencies to the first 13 that populate the exchange level data frame. Market and exchange level horizontal lines are then posted to show the arbitrage opportunity. A volume chart is shown to compare the exchange level volume to the market volume. This is indicative of the level of fragmentation that exists in the information utilized by these exchanges. If you refresh the page the application will feed in new data since Heroku utilizes lazy loading to host the application.