A Statistical Analysis of Bitcoin – A Decentralized Network

Figure 1

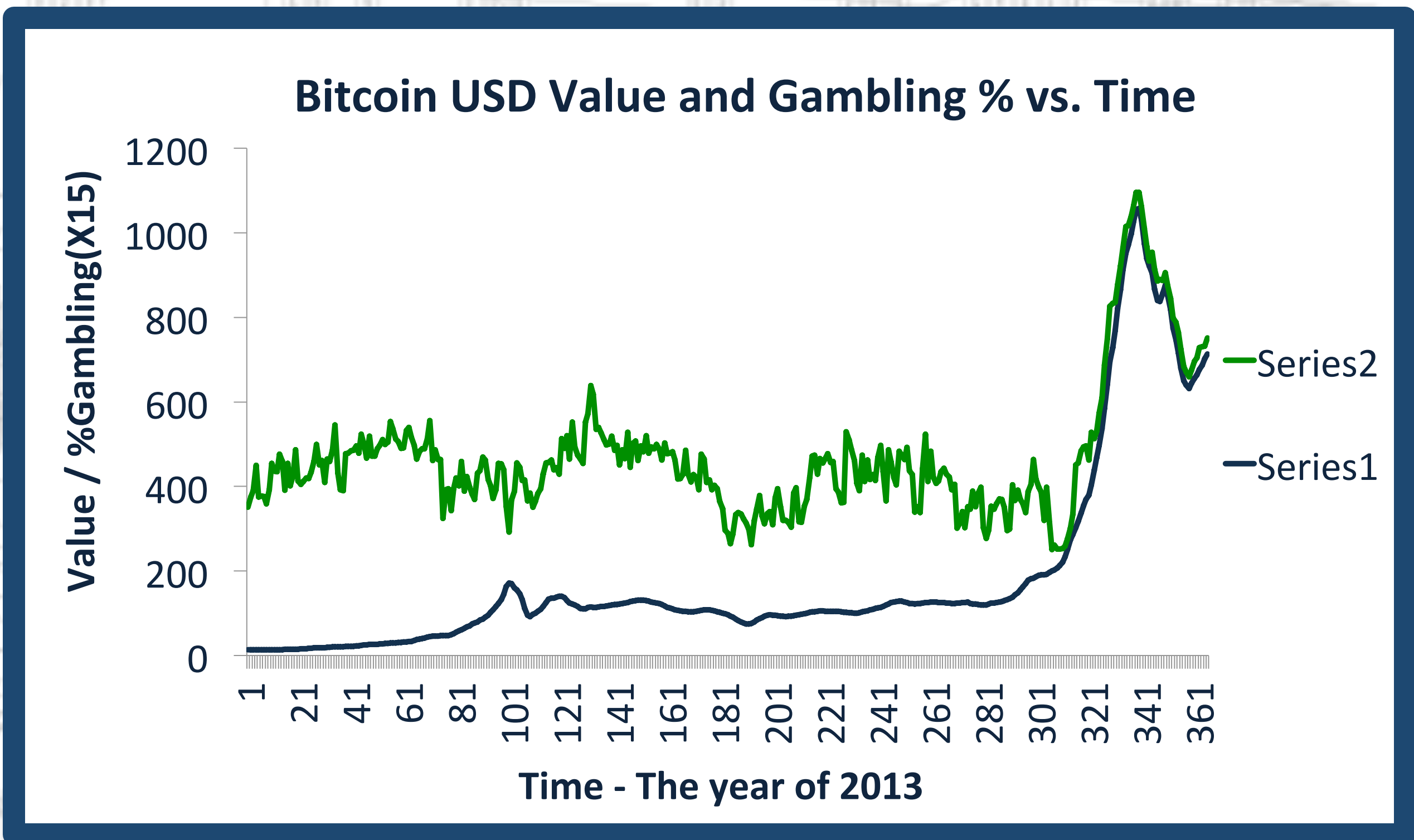**Bitcoin USD Value and Gambling % vs. Time**

Figure 1: This graph shows the relationship between the value of Bitcoin in United States dollar and the percentage of gambling transactions that occur over time.

Figure 2

Bitcoin USD Value vs. % Gambling

$$y = 398.77e^{-0.003x}$$
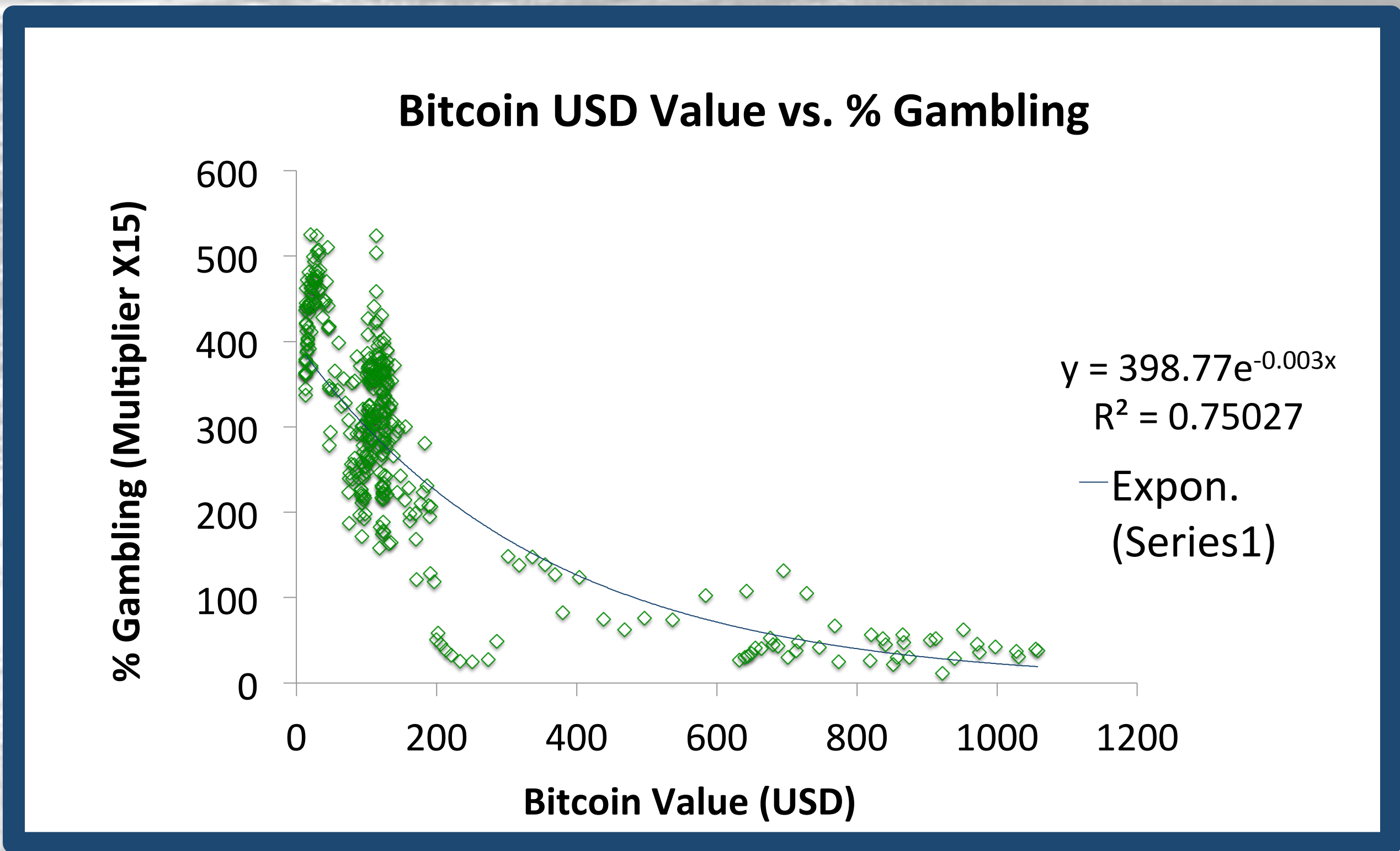$$R^2 = 0.75027$$

Expon. (Series1)

Figure 2: This graphs shows the relationship between the values of Bitcoin in United States dollar versus the percent of gambling transactions for three hundred sixty five days.

Figure 3

Get start date for data collection → Obtain blocks from blockchain → Split blocks into transactions

Get outputs of transactions → Compare outputs to addresses in list → Calculate daily % match, move on to next day
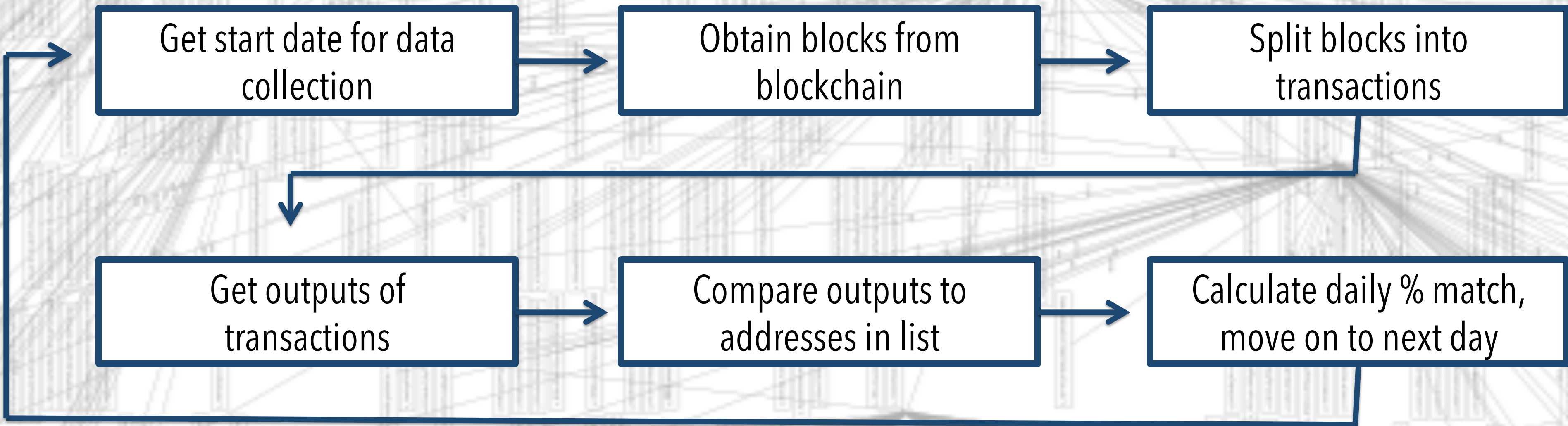
Figure 3: Flowchart for Python program to gather number of gambling transactions

Purpose

The purpose of this project was to create a way to determine what types of Bitcoin transactions were occurring on the public ledger. Considering the special use case of gambling as something that Bitcoin is used for, a program was written to determine the actual percentage of gambling transactions using Bitcoin.

Introduction

Following its origination in 2009, Bitcoin has gained a tremendous amount of media attention for both its advantageous and adverse qualities. Although a new and innovative idea for the global economy, Bitcoin has been the center of the largest illegal black market websites. The association of Bitcoin with these negative events has caused public and government regulators to shy away from adopting the currency.

Excluding the way Bitcoin works and the potential benefits the global economic market could reap from its uses, little research has been done on Bitcoin. Learning new things about Bitcoin will help provide data analysts and economists gain insight to the potential impact of Bitcoin on the global economy. At first, users in the community were under the impression that the majority of transactions that occurred using Bitcoin were used for illegal activity, for example, purchases on websites such as The Silk Road. In reality, the most common use for Bitcoin is online gambling, with gambling transaction volumes estimated to be anywhere from 25 to 50% of all Bitcoin transactions.

Hypothesis

It was hypothesized that the average percentage of gambling transactions that occur using Bitcoin in the year of 2013 was different from previously estimated amounts.

Procedures

- A program was created in Python that pulled blocks from the public ledger (blockchain.io).
  - Blocks were split into their subsequent transactions .
  - All outputs of gathered transactions were obtained.

- A comprehensive list of gambling wallet addresses was obtained and placed into a text file

Procedures Cont.

- The program that was created then took the obtained outputs of transactions and cross referenced them with the comprehensive list of gambling wallet addresses.
  - Matching outputs were then counted and compared to the total number of transactions in a specific day.
  - For the sake of this experiment, only the transactions in which a Bitcoin user is buying into a gamble is considered a gambling transaction.

- This process was then repeated for the whole year of 2013.

- A yearly percentage of gambling transactions that occur was calculated based on the daily amounts.

Results

The percent of gambling transactions occurring using Bitcoin in 2013 was calculated to be 19.2%. A one sample t-test was performed yielding a t-score of -34.5 and a p-value of <.0001. The hypothesis that the mean percentage of gambling transactions was not equal to 35% was supported. Furthermore, an exponential regression was run, producing the equation $y = 398.77e^{-0.003x}$ and yielding an r^2 value of 0.75027 (See figure 2).

Discussion

Based on the values that were collected in the experiment, the percentage of transactions that were calculated as gambling transactions is significantly less than that of recent estimates. Not only did the results of this project provide a more accurate representation of the gambling transaction volume, it also provides support that there may be a significant relationship between the gambling transaction volume and the price at which Bitcoin trades. With the information collected through this project, individuals in the Bitcoin community will be able to revise or create new use cases for the currency.

Improvements

A way to improve this experiment would be to analyze the inputs and outputs instead of just the outputs. Yielding results that could show both gambling buy ins and pay outs. If both the inputs and outputs of transactions were taken into account, payouts from the sites to the winners of the gamble could also be counted as a "gambling transaction".

Background imaged obtained from http://thinkdifferent.ly/