Using Analytics to gain insights into the cryptocurrency market

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Abstract

The Internet of Things (IoT) has brought new opportunities for other technologies such as the blockchains to be applied to every sector of the economy. Blockchains opened many new business prospects made possible through its promise of secure and efficient ledgers distributed over a large number of computers. But blockchains rely on the participation of individuals to download the blockchain code onto their computer and make them available to record new entries into the blockchain. To encourage individuals to participate the blockchain provide rewards in form of coins or tokens. What was originally thought as a reward for participation turned quickly into a crypto currency, with over 1,000 coins or tokens created in 2017. This study advocates multiple analytics perspectives for providing insights into the cryptocurrency market from different viewpoints. Using descriptive analytics can identify potential research questions in cryptocurrency markets.

Keywords: Blockchain, cryptocurrency, descriptive analytics, predictive analytics, prescriptive analytics

Introduction

The Internet of things (IoT) refers to all things connect to the internet. In another word, the Internet of Things (IoT) solves the problem of object-to-object communication. The vast majority of these IoT devices are consumer grade electronics. However, with the recent explosion of interest in blockchains, the application of blockchain has been expanded to the Internet of things. The blockchain solves the problem of information encryption by emphasizing data encryption. As IBM has made people aware of, the use of blockchain technology can provide interesting possibility for the world of the internet of things. Additionally, new markets will be created by the internet of things because of the potential of matching supply and demand. Moreover, the combination of blockchain-IoT can be powerful and can cause significant transformations across various industries, creating new business models and distributed applications (Christidis, 2016).

“The blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value” (Tapscott, 2016). The blockchain technology was largely made possible by the popularity of the cryptocurrency, because it provides the fuel for the distributed ledgers needed for blockchains. And it is considered a revolutionary new way of sharing information through transformative technology. The cryptocurrencies are made up by digital tokens, and it is treated as digital assets that “it ties to the value of a particular blockchain protocol” (Sharma, 2017). Therefore, both concepts are inseparable; the coins are a reward for participating in the blockchain through mining. However, the tokens and coins have taken on a life of their own as investments leading to over 1,500 coins with a total market cap of $450 billion in February 2018. With the interest in this form of currency increasing, understanding the trends of cryptocurrency market is important. According to (Lim, 2018), the chief global investment strategist at Charles Schwad, Jeffrey Kleintop, said, that “for a potentially destructive bubble of form, cryptocurrencies need to be far more adopted and become a much larger share of household assets or the assets of leveraged investors like banks or some hedge funds”. No matter what side is correct, the optimists who see a continued rise in crypto currencies or pessimists, who foresee a crash
of cryptocurrency market near, there is no doubt that this market has received great attentions from entrepreneurs and academics across various disciplines, especially after the cryptocurrency rapid growth in the fourth quarter of 2017. In order to build a better version for cryptocurrency market, research that focuses on predicting the trends or potential increase in price, volume and number of cryptocurrencies is critical to understanding the nature of these currencies. The cryptocurrency exchanges are open 24 hours seven days a week. Without any regulation or law enforcement of the cryptocurrency markets (Grinberg, 2012), there are many potential abuses. This research is an attempt to gain insight and better understanding of the cryptocurrency market through analytics.

According to the website coinmarketcap.com, there are 1522 different cryptocurrencies and over 70 exchanges. Several websites have sprung up to provide information about crypto currencies. For instance, a website BitPremier is helping investors make the entrance into the cryptocurrency market by providing help in determining the best cryptocurrency exchange (BitPremier, 2018). Bitcoin, Ethereum and Litecoin are the top three popular digital currencies in the market and they are the three major cryptocurrencies that can be easily transferred to US dollars directly (Wilmoth, 2018). Bitcoin was the original cryptocurrency, which is not issued by any government, bank, or organizations. It was the first cryptocurrency and remains the most prominent and highest valued one. Since then bitcoin has become an open-source project, other developers started to create their own cryptocurrencies with bitcoin’s codebase as a starting point, and these digital currencies are known as altcoins. Litecoin was an early altcoin created to improve on bitcoin, which was introduced by developer Charlie Lee in 2011, considered the “silver to bitcoins gold” (Wilmoth, 2018). Ethereum drastically changed how the blockchain usually operated. It includes the decentralized computing platform, which processes complex smart contracts and serves for myriad of use cases. It does everything bitcoin does and more (Wilmoth, 2018). Bitcoin cash, which was introduced on August 1st, 2017, is a separated derivative currency of bitcoin’s blockchain. Bitcoin cash is considered a duplicate version of bitcoin that shares the same history but independent future from each other (Tepper, 2017), (Smith, 2017). The Tether coin is one of particular importance to the cryptocurrency trades. Exchanging crypto currencies to US dollars is difficult and time consuming. It takes about 5 business days to convert bitcoin into US dollars. Tether is a digital currency that is was proposed to be linked to the US dollars (Buntinx, 2018). The Tether allows frequent trades in and out of different currencies.

Research Methodology

Analytics has been defined as “the scientific process of transforming data into insights for the purpose of making better decisions” (Informs). It relies on the application of statistics, computer programming and operations research with respect to quantitative studies involved in the process. While analytics has been categorized into three distinct methods, descriptive analytics, predictive analytics and prescriptive analytics (Informs). In this study, descriptive analytics will be used which is the first step in the analytics process. The objective is to gain insight from the data through visualization, dashboards and tables. Descriptive analytics helps to discover associations between variables, can reveal factors that may affect a target variable and supports finding unusual patterns. In this study, we use historical data from the website of CoinMarketCap.com and build a dashboard visualizing issues in the crypto currency market.
Figure 1 illustrates the volatility changes, price changes and circulating supply changes from October 1st, 2017 to January 31st, 2018 for five major cryptocurrencies, Bitcoin, Bitcoin-cash, Ethereum, Litecoin and Tether. The historical data contains the values of open, high, low, close, volume and market capitalization for each cryptocurrency of each day. Since the prices are continuously updating over 24 hours, the price of each day is identified at 11:59pm in UTD time. The Volatility is measured by the fluctuation over each day, which is

\[ \text{Volatility} = \frac{\text{Highest Price} - \text{Lowest Price}}{\text{Highest Price}}. \]

The circulating supply is the best approximation of the number of coins that are circulating in the market and in the general public’s hands (CoinMarketCap.com), which is

\[ \text{Circulating Supply} = \text{Market Capitalization} / \text{Price}. \]

The dashboard, shows that there is no apparent different behavior of the circulating supply for Bitcoin, Bitcoin-cash, Ethereum and Litecoin. However, Tether’s circulating supply shows some interesting patterns. For instance, there was a large increase of circulating supply in late January. Since this coin is supposedly linked to the U.S Dollar, this would infer that overnight an investment of approximately $500 million was made for this coin. Also, the extremely high volatility of 50.94% for Bitcoin-cash on certain dates also requires exploring. Table 1 provides some insights into what coins are exchanged with each other. Table 1 shows the transaction flow for major cryptocurrencies during one 24 hour period in February. During this period close to 80% of the volume measured in US dollars was exchanged between less than 1% of the coins. The transaction flows between the cryptocurrencies over time provide some insight into where funds are coming from. Over 30% are exchanged from USDT while only 9.18% are from US dollars. Because there are too many cryptocurrencies in the market, Table 1 only depicts a small proportion of transfers which make up 77.63% of the transfers. Table 1 also shows that exchanges with Bitcoin made up 29.33% of all transfers. Although many cryptocurrencies were exchanged that day, to Bitcoin, accounted for 18.10% of all transfers. Also, over half of exchange with US dollar is from Bitcoin. An interesting potential research question is how these flows affect the price of the currencies. Further research will look at flow-price changes from day to day.

<table>
<thead>
<tr>
<th>Row Labels</th>
<th>USDT</th>
<th>BTC</th>
<th>KRW</th>
<th>USD</th>
<th>Grand Total</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTC</td>
<td>18.28%</td>
<td>0.00%</td>
<td>3.54%</td>
<td>5.05%</td>
<td>29.33%</td>
<td>29.33%</td>
</tr>
<tr>
<td>LTC</td>
<td>5.17%</td>
<td>4.07%</td>
<td>1.21%</td>
<td>1.63%</td>
<td>12.14%</td>
<td>41.47%</td>
</tr>
<tr>
<td>ETH</td>
<td>4.48%</td>
<td>4.49%</td>
<td>0.00%</td>
<td>1.42%</td>
<td>10.44%</td>
<td>51.91%</td>
</tr>
<tr>
<td>ETC</td>
<td>1.90%</td>
<td>1.98%</td>
<td>3.18%</td>
<td>0.39%</td>
<td>7.71%</td>
<td>59.62%</td>
</tr>
<tr>
<td>BCH</td>
<td>1.45%</td>
<td>1.66%</td>
<td>0.13%</td>
<td>0.32%</td>
<td>3.57%</td>
<td>63.19%</td>
</tr>
<tr>
<td>NANO</td>
<td>0.00%</td>
<td>2.91%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>3.18%</td>
<td>66.37%</td>
</tr>
<tr>
<td>XRP</td>
<td>0.13%</td>
<td>0.29%</td>
<td>1.97%</td>
<td>0.37%</td>
<td>3.11%</td>
<td>69.48%</td>
</tr>
<tr>
<td>TRX</td>
<td>0.05%</td>
<td>1.01%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>2.39%</td>
<td>71.87%</td>
</tr>
<tr>
<td>ADA</td>
<td>0.03%</td>
<td>0.61%</td>
<td>1.28%</td>
<td>0.00%</td>
<td>2.00%</td>
<td>73.87%</td>
</tr>
<tr>
<td>HT</td>
<td>0.53%</td>
<td>0.44%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.93%</td>
<td>75.81%</td>
</tr>
<tr>
<td>ELA</td>
<td>0.00%</td>
<td>0.65%</td>
<td>0.00%</td>
<td>0.00%</td>
<td>1.82%</td>
<td>77.63%</td>
</tr>
<tr>
<td>Total</td>
<td>32.02%</td>
<td>18.10%</td>
<td>11.32%</td>
<td>9.18%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Transactions Flows

In order to obtain better understand the price changes from day to day, Table 2 depicts the correlation matrix between the top ten cryptocurrencies that were ranked by the volume of market capitalization with circulating supply. These correlations are all positive with the smallest value of 0.48. However, some coins have correlations which are over 0.9 indicating a very strong price relationship.
Table 2. Correlation Matrix for Top 10 Cryptocurrencies

Time series analysis was used to fit ARIMA models to the price of the top ten coins with respect to market capitalization. At the same time, a test for random walks was conducted. Table 3 shows the ARIMA model fit for the top ten cryptocurrencies based on two historical sets of price data. The second-time period was used because of a considerable increase in volatility of the coins after December 5, 2017. The results show that Bitcoin and Ripple prices can be modeled using ARIMA(1,1,1), while the prices of other coins are predictable to a lesser extent and behave more like a random walk.

Table 3. ARIMA Models for Top 10 Cryptocurrencies

In December of 2017, Bitcoin future options were introduced. To investigate whether the introduction of future options for Bitcoin has affected the volatility of the Bitcoin we computed the change in volatility before and after future options for Bitcoin were introduced. Table 4 depicts the average daily volatility before the future option was introduced from 10/01/2017 to 12/10/2017, and the average daily volatility after the future options were introduced from 12/11/2017 to 01/31/2018. Table 4 shows that the volatility increase for bitcoin is smaller than the volatility increase for both Ethereum and Litecoin. Therefore, the introduction of future options could have had a calming effect on bitcoin prices.
Table 4. Risk Difference for Future Option

<table>
<thead>
<tr>
<th>Cryptocurrency</th>
<th>Before</th>
<th>After</th>
<th>Volatility changes</th>
<th>t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitcoin</td>
<td>0.071</td>
<td>0.101</td>
<td>0.030</td>
<td>-3.507 ***</td>
</tr>
<tr>
<td>Ethereum</td>
<td>0.056</td>
<td>0.118</td>
<td>0.061</td>
<td>-6.313 ***</td>
</tr>
<tr>
<td>Litecoin</td>
<td>0.074</td>
<td>0.129</td>
<td>0.056</td>
<td>-4.073 ***</td>
</tr>
</tbody>
</table>

** *** p-value < 0.001  ** p-value < 0.005  * p-value < 0.1

Discussions and Conclusions

This paper attempts to provide some insight into the performance of the coins using descriptive analytics. The analysis revealed some interesting patterns that raise questions regarding the prices behavior of coins. While all coin prices are positively correlated with each other, some are more predictable than others. ARIMA models fit well for the Bitcoin and Ripple coin prices but other prices follow more a random walk. Bitcoin and Tether make up over 50% of the exchanges from and to other coins. The introduction of future options for Bitcoin may have had a calming effect on Bitcoin prices. As more data becomes available, better models can be developed. With exchanges distributed throughout the world, security and reliability become critical issues. Cryptocurrency market are the backbone of applying blockchain technology in the public IoT network. Hence, stability and critical market characteristics produce a necessary incentive mechanism in securing the blockchain technology for the IoT infrastructure.

References


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