

# Digital Coins Eco-System: Analyzing the Network of Prices and Volume

Tiran Rothman\*

School of Management, Wizo Academic College, Haifa, Israel

\*Corresponding author: [tiran@wizodzn.ac.il](mailto:tiran@wizodzn.ac.il)

Received October 01, 2018; Revised November 20, 2018; Accepted December 19, 2018

**Abstract** The study provides an extent analysis of digital coins eco-system from November 2017 to October 2018 based on an hourly time interval. I focus on correlation among these coins and the Bitcoin as Bitcoin to become a mainstream investable asset class, thus studying these properties is necessary. The findings show that bitcoin price and volume is not correlated with most of the traded digital coins while several digital coins are highly and significantly correlated with other coins, This has implications for risk management and financial engineering (such as bitcoin derivatives)-both from an investor's as well as from a regulator's point of view.

**Keywords:** *Bitcoin, digital currencies, risk management*

**Cite This Article:** Tiran Rothman, "Digital Coins Eco-System: Analyzing the Network of Prices and Volume." *Journal of Finance and Economics*, vol. 6, no. 6 (2018): 250-253. doi: 10.12691/jfe-6-6-7.

## 1. Introduction

The most famous cryptocurrency, Bitcoin, was created by an unidentified programmer under the name of Satoshi Nakamoto, introduced it on 31 October, 2008 and released as open-source software in 2009 [1]. Bitcoin is the first decentralized digital currency and is a part of a growing family of more than 720 cryptocurrencies. The second and third largest cryptocurrencies are Ethereum and Ripple, representing 7.6% and 2.4% of the market. The top 10 of those 720 cryptocurrencies (Bitcoin, Ethereum, Ripple, Litecoin, Ethereum Classic, Monero, Dash, Augur, MaidSafeCoin, Waves) represent about 95% of the market.

In this paper, I examine whether bitcoin is connected with other digital coins movement and to what extent are the correlations among digital coins. I argue that bitcoin does not behave like other digital coins, while digital coins other than Bitcoin do correlate with each other.

In order to explore this eco-system of digital coins I analyze connection among digital coins on an hourly basis from November 2017 to October 2018.

### 1.1. Literature Overview

The literature on Bitcoin was initially dominated by studies on the safety, ethical and legal aspects of Bitcoin. Recently, some literature has examined Bitcoin from an economic viewpoint. Selgin [2] argued that investors have employed Bitcoin as currency as well as for investment purposes, although, they claimed that Bitcoin should be seen as a speculative commodity rather than a currency. Dwyer [3] finds that the average monthly volatility of Bitcoin is higher than that for gold or a set of foreign currencies, and the lowest monthly volatilities for Bitcoin

are less than the highest monthly volatility for gold and currencies.

Cheah and Fry [4] argue that if Bitcoin were a true unit or account, or a form of store of value, it would not display such volatility expressed by bubbles and crashes. Cheung et al [5] show the existence of bubbles in the bitcoin market over the period and find a number of short-lived bubbles but also three huge bubbles, the last of which led to the demise of the Mt Gox exchange. Brière et al [6] show that Bitcoin offers significant diversification benefits for investors while Dyhrberg [7] show that Bitcoin has similar hedging capabilities as gold and the dollar, and as such can be employed for risk management.

Fry and Cheah [8] develop a model to reveal that Bitcoin and Ripple are characterized by negative bubbles. Bouri et al. [9] and [10] scrutinize hedge and safe haven properties of Bitcoin vis-à-vis several stock, bonds and currency indices around the world. Its main finding is that the cryptocurrency is only useful as a diversifier device, but not as a hedge instrument. Finally, Balcilar et al. [9] detect nonlinearities in the return-volume relationship, which allows for return prediction. None of these studies analyzed, as to our knowledge, the correlation among this 'basket of coins'.

### 1.2. Hypotheses

We assert that the correlation between and among digital coins will be significantly high. Therefore, we hypothesize:

**H1 (correlation):** An upward in prices and volume in one digital coin will create a positive relation in other digital coins.

**H2 (Bitcoin correlation):** An upward in prices and volume in Bitcoin will create a positive relation in other digital coins.

## 2. Data and Methodology

To examine how digital coins behavior is related between different coins we conducted a correlation test on prices, as well as on volumes to measure degree of relationship. We gathered a wide sample of 16 digital coins from November 2017 until October 2018 from Binance, a well-known cryptocurrency stock exchange (<https://www.binance.com/en>). All data consist of prices and volume on an hourly base, creating a sample of 68,258 observations per digital coin and approximately 1

million observations.

Our methodology is based the Pearson product-moment correlation coefficient, also known as  $r$ ,  $R$ , or Pearson's  $r$ , is a measure of the strength and direction of the linear relationship between two variables that is defined as the covariance of the variables divided by the product of their standard deviations. This is the best known and most commonly used type of correlation coefficient. I check correlation coefficients that are over 0.5, which means that the volume is strongly correlated between the digital coins.

Below is the legend of our digital coins sample:

Name	Bitcoin	Bitcoin-Cash	Cardano	Dash	EOS	Ethereum	Kyber-Network	Litecoin
ID	1	2	3	4	5	6	7	8
Name	Monero	NEO	Ripple	Storm	TRON	Verge	Walton	ZenCash
ID	9	10	11	12	13	14	15	16

**Table 1. Correlation of 16 digital coins prices, November 2017-October 2018 (intra-day)**

	price_d1	price_d2	price_d3	price_d4	price_d5	price_d6	price_d7	price_d8
price_d1	1							
price_d2	0.0418	1						
price_d3	0.0408	0.891***	1					
price_d4	-0.00535	0.801***	0.860***	1				
price_d5	0.0427	0.862***	0.793***	0.754***	1			
price_d6	0.00319	0.755***	0.732***	0.836***	0.845***	1		
price_d7	-0.0101	0.843***	0.894***	0.913***	0.807***	0.840***	1	
price_d8	0.0166	0.915***	0.863***	0.839***	0.912***	0.883***	0.887***	1
price_d9	0.0116	0.650***	0.754***	0.865***	0.642***	0.774***	0.813***	0.692***
price_d10	0.00833	0.828***	0.881***	0.889***	0.848***	0.877***	0.942***	0.907***
price_d11	-0.00947	0.856***	0.804***	0.837***	0.918***	0.914***	0.852***	0.932***
price_d12	0.0106	0.870***	0.925***	0.920***	0.829***	0.843***	0.959***	0.902***
price_d13	0.0331	0.914***	0.897***	0.858***	0.925***	0.866***	0.901***	0.949***
price_d14	0.0195	0.870***	0.934***	0.891***	0.729***	0.719***	0.923***	0.832***
price_d15	0.00528	0.772***	0.750***	0.841***	0.858***	0.928***	0.865***	0.893***
price_d16	0.0629*	0.0903***	0.0317	-0.166***	0.0237	-0.147***	-0.0255	0.0524*
	price_d9	price_d10	price_d11	price_d12	price_d13	price_d14	price_d15	price_d16
price_d1								
price_d2								
price_d3								
price_d4								
price_d5								
price_d6								
price_d7								
price_d8								
price_d9	1							
price_d10	0.799***	1						
price_d11	0.729***	0.878***	1					
price_d12	0.830***	0.954***	0.872***	1				
price_d13	0.744***	0.918***	0.934***	0.927***	1			
price_d14	0.800***	0.881***	0.773***	0.942***	0.869***	1		
price_d15	0.748***	0.895***	0.923***	0.876***	0.888***	0.758***	1	
price_d16	-0.302***	-0.006	-0.100***	-0.0352	-0.00348	-0.0166	-0.123***	1

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

Table 2. Correlation of 16 digital coins volume, November 2017-October 2018

	volume_d1	volume_d2	volume_d3	volume_d4	volume_d5	volume_d6	volume_d7	volume_d8
volume_d1	1							
volume_d2	0.849***	1						
volume_d3	0.310***	0.674***	1					
volume_d4	0.944***	0.949***	0.415***	1				
volume_d5	0.911***	0.991***	0.620***	0.969***	1			
volume_d6	0.852***	0.880***	0.730***	0.811***	0.911***	1		
volume_d7	0.861***	0.990***	0.576***	0.973***	0.982***	0.821***	1	
volume_d8	0.875***	0.998***	0.657***	0.958***	0.997***	0.897***	0.988***	1
volume_d9	0.910***	0.977***	0.503***	0.993***	0.984***	0.826***	0.993***	0.981***
volume_d10	0.234***	0.630***	0.996***	0.357***	0.566***	0.668***	0.532***	0.610***
volume_d11	0.826***	0.987***	0.763***	0.904***	0.980***	0.931***	0.956***	0.988***
volume_d12	0.187***	0.583***	0.992***	0.302***	0.519***	0.641***	0.479***	0.562***
volume_d13	0.424***	0.717***	0.987***	0.484***	0.683***	0.821***	0.617***	0.709***
volume_d14	0.403***	0.703***	0.989***	0.465***	0.667***	0.808***	0.601***	0.694***
volume_d15	0.686***	0.961***	0.836***	0.827***	0.924***	0.847***	0.927***	0.949***
volume_d16	0.672***	0.942***	0.863***	0.797***	0.908***	0.865***	0.898***	0.932***
	volume_d9	volume_d10	volume_d11	volume_d12	volume_d13	volume_d14	volume_d15	volume_d16
volume_d1								
volume_d2								
volume_d3								
volume_d4								
volume_d5								
volume_d6								
volume_d7								
volume_d8								
volume_d9	1							
volume_d10	0.452***	1						
volume_d11	0.938***	0.718***	1					
volume_d12	0.398***	0.998***	0.677***	1				
volume_d13	0.559***	0.969***	0.811***	0.964***	1			
volume_d14	0.542***	0.974***	0.798***	0.969***	1.000***	1		
volume_d15	0.885***	0.810***	0.974***	0.772***	0.848***	0.839***	1	
volume_d16	0.855***	0.835***	0.967***	0.801***	0.879***	0.871***	0.989***	1

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ .

### 3. Results

Table 1 and Table 2 show the results of the correlation test on price and volume, respectively. As show in Table 1, most of the prices are positive and statistically significant correlate between the different digital coins. All the digital coins, except Bitcoin and ZenCash, are strongly correlated in the price, with a positive and significant correlation. Bitcoin is positively correlated with most of the coins, yet its only significant correlate with ZenCash. ZenCash is positively and significant correlate with Bitcoin, Bitcoin-Cash and Litecoin, but has a negative and significant correlation with Ethereum, Monero, Ripple, Walton. EOS and Ripple are highly correlated in a way one can see an investment in EOS as a way of investment in Ripple as shows in Table 1.

Data in Table 2 we can see that all coins have a positive and significant correlation in their volume. Most of the correlation coefficients are over 0.5, which means that the

volume is strongly correlated between the digital coins. That is supports our H1 and H2 hypothesis.

The table below shows simple correlation of the percentage changes in daily exchange rates for pairs of currencies and assets like gold, with all exchange rates measured against the U.S dollar. Correlations are calculated for the same period as calculated above, i.e. November 2017 until October 2018.

Table 3. A correlation of Bitcoin and other daily exchange rates currencies

	EUR	IPY	CUF	GBP	Gold	Bitcoin
EUR	1.00	0.18	0.61	0.64	0.20	-0.05
IPY		1.00	0.33	0.20	0.07	0.01
CUF			1.00	0.42	0.19	-0.04
GBP				1.00	0.21	-0.02
Gold					1.00	-0.06
Bitcoin						1.00

## 4. Discussion

In this paper, I studied whether there is an eco-system of digital coins; if a movement in one digital coin will create an effect and to explore rather Bitcoin, the largest digital coin in value, is also correlated with other digital coins and to what extent.

To this purpose, I analyze the correlation among 16 digital coins from November 2017 to October 2018 based on an hourly interval of time. We find, as far as we know for the first time, a correlation in between and among several digital coins. To wit, we find that all digital coins, except Bitcoin and ZenCash, are strongly correlated in price and volume, with a positive and significant correlation, supporting our H1 hypothesis. We also find that Bitcoin is positively correlated with most of the coins, yet its only significant correlate with ZenCash, supporting our H2 hypothesis.

I assert that high volatility of Bitcoin in related to other stock exchange currencies lead to the non-correlation we show. In related to other small digital coins Bitcoin seems an island of stability, thus we find lower correlation between Bitcoin and most of the other digital coins.

## Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal. This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license.

## References

- [1] Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system.
- [2] Selgin, G. (2015). Synthetic commodity money. *Journal of Financial Stability*, 17, 92-99.
- [3] Dwyer, G. P. (2015). The economics of Bitcoin and similar private digital currencies. *Journal of Financial Stability*, 17, 81-91.
- [4] Cheah, E. T., & Fry, J. (2015). Speculative bubbles in Bitcoin markets? An empirical investigation into the fundamental value of Bitcoin. *Economics Letters*, 130, 32-36.
- [5] Cheung, A., Roca, E., & Su, J. J. (2015). Crypto-currency bubbles: an application of the Phillips-Shi-Yu (2013) methodology on Mt. Gox bitcoin prices. *Applied Economics*, 47(23), 2348-2358.
- [6] Briere, M., Oosterlinck, K., & Szafarz, A. (2015). Virtual currency, tangible return: Portfolio diversification with bitcoin. *Journal of Asset Management*, 16(6), 365-373.
- [7] Dyhrberg, A. H. (2016). Bitcoin, gold and the dollar-A GARCH volatility analysis. *Finance Research Letters*, 16, 85-92.
- [8] Fry, J., & Cheah, E. T. (2016). Negative bubbles and shocks in cryptocurrency markets. *International Review of Financial Analysis*, 47, 343-352.
- [9] Bouri, E., Gupta, R., Tiwari, A. K., & Roubaud, D. (2017). Does Bitcoin hedge global uncertainty? Evidence from wavelet-based quantile-in-quantile regressions. *Finance Research Letters*, 23, 87-95.
- [10] Bouri, E., Azzi, G., & Dyhrberg, A. H. (2016). On the return-volatility relationship in the Bitcoin market around the price crash of 2013.
- [11] Balcilar, M., Bekiros, S., & Gupta, R. (2017). The role of news-based uncertainty indices in predicting oil markets: a hybrid nonparametric quantile causality method. *Empirical Economics*, 53(3), 879-889.