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SURVIVAL OF THE FITTEST: A NATURAL EXPERIMENT FROM CRYPTO EXCHANGES

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SUSTAINABLE DEVELOPMENT GOALS AND EXTERNAL SHOCKS IN THE MENA REGION:

FROM RESILIENCE TO CHANGE IN THE WAKE OF COVID-19

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Abstract

This article explores the applicability of universal cryptocurrency exchange by analyzing crypto exchanges of Binance, Latoken, Kucoin, and Qash, which also have their own cryptocurrencies in the crypto market. Results of the recursive Johansen cointegration test proved that even though all of the cryptocurrencies have cointegration among each other, Binance positively disassociated itself from others after it moved to Malta on 23 March 2018. Based on the daily prices of cryptocurrencies over the period from November 6, 2017, to November 10, 2019, taken from coinmarketcap, we conclude that Binance can be considered as a survival of the fittest among all of the crypto exchanges in this natural experiment.

Keywords: stock market universality, cryptocurrency exchanges, distributed ledger, Binance

JEL codes: C30; E58; G28; G34; G38; O35

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Survival of the Fittest: A Natural Experiment from Crypto Exchanges

1. Introduction

Money, as an influential symbol of independence of nation-states, is one of the most crucial binding factors between a state and its citizens. Indeed, trust is a central ingredient for a national currency while relying on the hard power of the nation-state. Therefore, rulers and regulators of national states are accepted as the main trust-provider for their own citizens. Albeit, in the financial system, people invest in cryptocurrencies as store value. Financial safe harbors are more preferable for investors, by virtue of protecting their wealth. Hence, a confidence loss in the system triggers an even more risk-averse investment environment for the investors (OECD, 2013).

Stock markets have their impacts on economic activity by providing the creation of liquidity through international capital inflows and outflows. Larger stock markets in asset size provide more vibrant market liquidity, which allows investors superior diversification opportunities, less risky, and more attractive prospects. Companies in the emerging markets, for example, could acquire more stable access to finance especially in risky times through more efficient and liquid stock markets. However, during the financial crises, emerging markets are often disproportionately affected as compared to their more developed counterparts due to their financial imperfections. These challenges, considering previous financial crises, gave rise to the discussion of the value of a universal single market to increase the efficiencies of the stock markets. Many emerging market countries have relatively small stock markets. However, due to the nationalistic pride and legitimacy concerns, they tend to have their own stock markets regardless of the inefficiencies stemming from the size of their markets. However, the question of whether some small developing countries really need a distinct domestic stock market is discussed even more in recent years (Demirgüç-Kunt and Levine, 1996).

A broad-spectrum has been already driven by scholars about the concept of universality of stock markets as a remedy for the issues of the international financial system. Theories and empirical investigations show that stock market integration and efficiency boost economic growth (Mollah & Mobarek, 2016). Furthermore, Chuu-Sheng (2007) states that stock market integration improves the efficiency of the local market. Gourinchais and Jeanne (2006) discuss the importance of the concept of ‘‘international financial architecture’’ which lay stress on increasing productivity of developing economies through international financial integration by promoting competitiveness and liquidity in the global economy. There have been a number of studies about the benefits of stock market integration. Golçalves et al. (2011) disclose the possible characteristics of stock market universality by taking into consideration Standard & Poor’s 100 (S&P100) daily index with respect to positive returns. Moreover, as Lauria (2000) indicates that the alliances and mergers & acquisitions of the top stock markets such as the New York Stock Exchange and NASDAQ across Atlantic countries have increased the potentiality of a new global exchange market. Based on these mergers and alliances of the top stock markets in the world, there has already been discussion about the possibility of a universal stock market among investors and academic scholars. Hence, this paper aims to extend the existing literature on the possibility of a universal stock market model with a natural experiment of the borderless crypto exchanges.

As the Fintech sector evolves and the number of technology-oriented companies grows, global financial markets are removing restrictions and regulatory barriers to capital flow. Furthermore, Demsetz’s research (1968), very early, reveals that a trader’s behavior is affected by the structure of the stock market in the process of the formation of the prices. If a trader arbitrates optimal price order, the number of traders plays an important role in the behavior for market liquidity. However, complex structured stock markets might dictate some rules to the traders e.g; time, process, orders, and limits of the submission. Thus, these constraints influence the

traders and indirectly the market liquidity. Hence, as Maureen (2001) underscores that the simplicity of the market structure increases market liquidity.

After 2008 world financial crises, in the midst of harsh critiques against the reliability of national institutions, which can take fallacious decisions for their own citizens in the financial system, Nakamoto (2008) came up with Bitcoin as a critique of the hegemony of old-fashioned banks and their systemic malfeasance. It opened up a new discussion in the political economy whether a universal financial trust mechanism can be provided from peer to peer with the help of cryptography. In this context, blockchain technology has attracted attention in exploring the relationship between conventional and prospective styles of a monetary system. The new blockchain system that is organically provided by the community itself bestows an unconventional universal monetary approach.

Cryptocurrency exchanges provide distributed digital infrastructure for their investors to transact their cryptocurrencies. Cryptocurrency exchanges are manifesting themselves as an open financial platform where they give their investors more freedom and control to manage their own digital assets without subject to state's regulations.[1] Accordingly, investors, academic scholars, and government officials contemplate whether blockchain technology has the power to revolutionize the traditional stock market in the global financial systems. Carson et al, (2018)reported in their strategic business value article based on 90 use-cases that crypto-projects within cryptocurrency exchanges are in their nascent time and they operate under an unstructured and unregulated system. However, entrepreneurs and investors can provide cost reduction, capital relief, and global-scale data sharing through the blockchain system due to its decentralized structure (Carson et. al., 2018). Besides, according to World Economic Forum (2018), cryptocurrency exchanges can be seen as prospective gateways to draw more inclusive

[1] To see these points, web pages of Coinbase, Inc; Binance and Bitfinex provide examples.

financialization, especially for the marginalized groups of people within the society (Dow, 2018).

In the crypto exchanges, Binance is the top-traded cryptocurrency exchange and the world's largest crypto exchange. Binance has also its own BNB token, worth approximately $500 million. Coinbase, on the other hand, is the second-largest crypto exchange and has $40 million trading volume in one day (French, 2018). Moreover, in the first quarter of 2018, whilst Nasdaq has $209M net income, it is announced that the Binance cryptocurrency exchange has reached $200M net income just 8 months after its establishment (Nasdaq Report, 2018 and Baker, 2018). However, Changpeng Zhao, CEO of Binance, states that the gist of their purpose is not to pose an existential threat for traditional stock markets, national institutions, or states. Instead, he invites all of the investors/crypto users from all over the world without regarding on gender, race, identity, religion, culture and nationality to the Binance exchange market. Independently from the traditional world of finance, Binance's ultimate goal, as CEO of Binance declared, is to create its own universal crypto community by investing in across-continents to break communities' chain from limitations of the traditional systems (TechCrunch Blockchain, 2018).

Based on the literature, previous studies of Leung and Nguyen (2018) show the importance of constructing co-integrated crypto portfolios in the process of taking advantage of arbitrage opportunities for the crypto-investors by using the Johansen and Engle-Granger two-step approach. However, our main purpose in this paper is to present new empirical evidence on the possibility of a universal stock market in the crypto's borderless financial system. In the literature, the discussion of the possibility of a single stock market concept has already been discussed among scholars. However it is almost impossible to have a natural experiment to allow all the stocks to be traded in all exchanges. However, crypto exchanges provide an opportunity to test how the exchanges evolve over time that in the absence of borders and

national regulations when all the major cryptocurrencies are traded in all exchanges. To this end, we consider the prices of own cryptocurrencies of these exchanges as proxies and analyze their evolution over time to test our survival of the fittest argument. We have the prior to test empirically in this paper that better adopting cryptocurrency exchanges would survive by gaining more customers in the borderless world. Definitely, borderless and stateless cryptocurrency exchanges provide a natural set up to test how the conventional exchanges of countries would have evolved in the absence of states' regulatory coercive powers.

Price movements in the own coins of the crypto exchanges give information about the popularity and the prospects of the crypto exchanges. Hence, the paper contributes to the literature on the idea of applicability of the universal stock market by using the case of Binance's influence over other crypto exchanges. In general, the paper analyzes the Binance, Qash, Latoken, and Kucoin cryptocurrencies price data from November 21 2017 to November 10, 2019, results of the Johansen cointegration test reveal that even though all the cryptocurrencies have long-term relationship among each other, Binance positively disassociated itself from others, when its operation is moved to Malta after March 2018. Therefore, we conclude that Binance can be considered as a survival of the fittest among all of the crypto exchanges in a natural experiment setting.

Our long-term data sets permit us to conduct a recursive Johansen cointegration test. We conduct a recursive Johansen Cointegration test because our focus is to figure out the movement of the cointegrating relationship of our multivariate time series with respect to time rather than observing binary causality among them. Johansen cointegration test is the most appropriate technique as compared to other techniques for the problem at hand in terms of multivariate time series and non-causal structure among the time series In addition, our daily data sets consist of 720 numbers of observations; large enough to be able to conduct the Recursive Johansen

cointegration test. Last but not the least, we choose specifically Recursive Johansen cointegration technique because our aim is to examine the dynamics of the cointegrating degree of our daily time series with respect to the period from 2017 to 2019.

From an investor perspective, this cointegration analysis is significant since these cryptocurrencies are used in their cryptocurrency exchanges for different operations especially for trading fees. Thus, traders who use these exchanges should hold these utility tokens in their wallets and use them which leads to an appreciation in these currencies' prices. Besides, currencies' performance also shows traders' confidence in these exchanges. In other words, analyzing these utility tokens' price with cointegration analysis demonstrate investors to these cryptocurrency exchanges performance in terms of their long run relationship. If they have a strong long run relationship then it means that you can invest in anyone of them. However, if any cryptocurrency is disassociated from others then it means that it gives a strong option to the investor for diversification of assets.

Binance is the central focus of this paper. Other chosen cryptocurrencies as a counterpart to Binance are Kucoin, Qash and Latoken. They are fundamentally very similar exchange platforms like Binance. However, they have slight differences. Kucoin is the most similar exchange to Binance and focuses on mostly cryptocurrency trading with a Binance-like interface and business model. However, Kucoin gives more incentives to newcomers and traders in order to increase their user count (Kucoin Whitepaper, 2017). The focus of Latoken is its attempt to be a tokenization platform, which "provides the issuance and trading of tokens and aim to establish infrastructure for tokenizing private and public equity, funds, real estate, and works of art." (Latoken Whitepaper, 2019). Besides cryptocurrency trading, QUOINE Liquid provides a crowdfunding platform and its utility token QASH is used in all QUOINE

services including ICO service, (QUOINE Liquid Whitepaper, 2017). Overall, even though these exchanges have different focuses, Binance attempts to provide all services in its platform.

The rest of the article is designed as follows. Section 2 explains Binance's inclusive policies and their management narratives. Section 3 elucidates functions and services of Binance that differentiate it to stand as a role model in the crypto exchange market. The following section presents the methodology, findings and the last section concludes.

2. The Environment When Binance Was Born

Before giving preliminary information about how Binance becomes a leading exchange in the crypto market, portraying the atmosphere where Binance was born will elucidate the conditions fostering its birth. Major problems have already existed in the crypto exchange world. Most particularly, exchange hacks and state regulations were the major challenges. Hereupon, the biggest cold wallet company Ledger claimed that nineteen crypto exchanges including MT. Gox, Poloniex, Bitstamp, and Bitfinex have been hacked. Indeed, the stolen value was equal to one billion dollars until Binance got on the stage in June 2017 (Ledger, 2019). Notably, MT. Gox hack attack was one of the most devastating and influential in the crypto market. MT. Gox was a crypto exchange, where 70% of the transactions were carried out before they had lost their credibility. Besides, the cost of the attack was equal to 850000 bitcoins, which amounted to 17 billion dollars at the time when Bitcoin was most valuable (Pollock, 2018). Furthermore, crypto exchanges had a series of problems with national governments. In September 2017, China decided to close the crypto exchange (Goh et. al. 2017) and banned Initial Coin Offerings known as ICO (Ghosh, 2017). In addition, there have been many controversies about Bitfinex's 1-to-1 US dollar-backed stable coin Tether (USDT), whether it is backed or not, since its announcement in 2015 (Bitfinex, 2015). This issue is still alive and investigated in detail by Hackett et al. (2019).

These kinds of issues led to a loss of confidence in crypto exchanges. However, many hassle-free exchanges like Coinbase have never been hacked. Coinbase is located in San Francisco and has insurance for its funds (Coinbase, 2019 and Clinch, 2015). Coinbase operates only in the US and some European countries, and they just have three cryptocurrencies included in the exchanges as Bitcoin, Ethereum, and Litecoin. Concisely, all of these deficiencies of systemic qualifications induced the investors to search for alternative trustable exchanges. Under this set up, Binance emerged as an alternative gateway for investors.

2.1. Functions of Binance

Crypto traders must choose one of the cryptocurrency exchanges to trade in the crypto world. Accordingly, there are more than 100 crypto exchanges, which have different in-depth technical competencies, such as security, liquidity, transaction speed, coin variety, low fees, deposit options, and mobile applications to attract investors. Binance has the highest volume among crypto exchanges according to coinmarketcap. Moreover, Binance is among the fastest exchanges due to its matching engine that can handle 1400000 orders per second (Binance whitepaper, 2017). Binance is also among the top three exchanges in terms of coin variety with around 500 trading pairs. Accordingly, its 0.1 percent trading fee is the least fee among big crypto exchanges. Besides, customers receive up to 50 percent discount if they pay the fees with Binance Coin, which is a utility token of Binance (Falk, 2019). Moreover, Binance whitepaper (2017) states that Binance is supported by "Web-based trading client, Android native client, iOS native client, Mobile HTML5 client (including WeChat H5 client), PC (Windows) native client, REST API" and it supports Visa and Mastercard as a deposit option (Russell, 2019).

Binance's winning strategy not only depends on to be a leading exchange with the aforementioned functions. In addition, Binance is eagerly adding innovative functions into its

system. In this direction, Binance launched fiat-to-crypto exchanges in Jersey and Uganda. According to Changpeng Zhao, “Binance plans to grow to ten fiat exchanges in 2019, with ‘ideally two per continent” (Russell, 2019**).** Furthermore, Binance launched its own *Blockchain Binance Chain* which is seen as “one of the most important crypto events of the year" by Kyle Samani, Co-Founder of Multicoin Capital Management. Binance plays a fundraising role from initial coin offerings through their Launchpad, which enables startups to raise funds in the platform. As it stands, Binance Chain is the basis of Binance DEX, which is a decentralized crypto exchange of Binance (Kharif, 2019). In addition to these novelties, Binance launched Binance Labs to invest in more than twenty projects. Binance Academy, on the other hand, aims to educate people in more than fifteen languages with articles and videos. Besides these innovative functions, BNB, a token of Binance, has a significant role in Binance’s success. As He-Yi, the co-founder of Binance mentioned: “It's only through BNB that we've built such a strong community, and this is the secret of Binance's growth.” BNB, native utility token is used in the Binance platform for Binance Launchpad, to reduce fees, to vote for community coin of the month, and so on (Pollock, 2018). With the help of these innovations and meeting various needs of crypto traders on a single platform, Binance increased its customers to more than ten million (Wang, 2018) and achieved to retain them. Hence, Rizzo (2019) stated “cryptocurrency exchanges, some of the largest and most profitable businesses in the industry have a big problem of retaining users for which they’re willing to consider any and all manner of solutions for, but Binance already has a solution.”

2.2.Other Cryptocurrency Exchanges With A Utility Token

Although Binance’s innovative and inclusive model brings success, as Rizzo (2019) claims in the most known crypto news platform Coindesk that “competitors could easily replicate their strategy of offering many cryptocurrencies”, and “with incentives so well aligned, other

exchanges have been rushing to replicate the model". Kucoin, QUOINE Liquid, and LATOKEN are prominent examples of these replicated models. Kucoin gives a trading discount for KCS, its utility token. It gives "awards for new-user invaders" and "promise to keep the fee rate low" like Binance. QUOINE Liquid has a utility token called QASH that can be used for fee discounts and in all QUOINE services including ICO service, which is similar to Binance Launchpad (QUOINE Liquid whitepaper). LATOKEN also has a utility token called LA and it is used for support transactions, paying fees, and using the LATOKEN platform's services (LATOKEN Whitepaper, 2019).

These exchange tokens increased their values in ate 2017 and early 2018 and had eminently high correlations in this period. However, Binance positively disassociated itself from others when it moved to Malta in March 2018. One year after this move, prices of KCS, QASH, LA, and Bitcoin decline significantly while the value of Binance stays strong and stable. Hence, Binance's significant move to Malta is discussed in the next part.

2.3. Heading To Malta

As we discussed in the first part, regulators from China to the U.S. had been cracking down on cryptocurrency exchanges. Japan, where Binance had an office, followed them and the Financial Services Agency of Japan issued a warning to the seven crypto exchanges for operating without approval, (Nakamura, 2018). Within twenty-four hours, Binance announced its new home as Malta, "The Blockchain Island". Prime Minister of Malta's welcome tweet followed it: *"Welcome to #Malta@binance. We aim to be the global trailblazers in the regulation of blockchain-based businesses and the jurisdiction of quality and choice for world-class FinTech companies."*. Apart from the positive impact of the crypto-friendly atmosphere of the European Union member Malta on Binance's operations, solving the paramount crisis in

a very short period and Binance CEO's successful and transparent crisis management increased the confidence in Binance.

Investors like to invest in the assets with better fundamentals. Given that, the managers of the Binance have acted on time in moving to Malta, this act also gives information about the similar proactive responses that are likely to take place in the future and thereby increases the credibility on Binance. This recursive information just by itself is valuable from the investors' perspective to manage their investment portfolio. For the traders and investors, it was a positive development due to several reasons. These reasons include blockchain-friendly bills and the business ecosystem of Malta and the opportunity to expand operations to bigger European and Middle Eastern markets. As the prime minister of Malta mentioned, the Maltese government planned to become "Blockchain Island" by passing bills like The Malta Digital Innovation Authority Act or The Virtual Financial Asset Act and attracting the attention of investors and companies operating in the Blockchain and cryptocurrency field (Aitken, 2018 and Visram, 2018). This act also signals to the traders and investors that Binance moves to a less risky country that does not shut down its operations unlike its previous headquarters in China and Japan. In this way, moving to Malta gave confidence to investors and traders. In addition, Binance was one of the first companies that move to Malta's blockchain ecosystem. Hence, Binance has acted proactively like a leader of the crypto exchanges. In a short span of time, as Roger Aitken (2018) claimed "crypto investors flocking to 'Blockchain Island' Malta in droves" and Binance expands its operation in Malta like becoming a partner of Malta Stock Exchange".

Another positive expectation from investors and traders after Binance's move to Malta is Binance's expansion to Europe and other markets. After the move, Binance expected to open 10 new local cryptocurrency exchanges in five different continents like in the US, Uganda, or

Turkey apart from its global exchange (Rizzo, 2019). Hence, moving to Malta was the first step for Binance's path to become a global exchange given that ex-ante before this move, it was considered as an East Asian exchange. This expansion is significant from traders' perspective because in this way Binance gains new customers and increases its trading volume and number of projects that want to go public by using the Binance ICO platform Launchpad expected to boost due to expansion into other continents. Hence, because BNB should be used in these operations by traders as explained in the Functions of Binance section, investors would expect BNB price to rise.

2.4. Hacking Attacks

Hacking attacks are one of the main concerns shaking the trustworthiness in exchanges. Nevertheless, in July 2018, Binance became the victim of these attacks. Hackers collected the API keys of some users to suddenly increase and sell their SYS Coins. However, Binance's advanced AI fraud detection timely suspended trading and withdrawals to protect their customers against hackers.

After this event, to protect and insure the funds of customers from any further attacks, Binance created an insurance fund as Secure Asset Fund for Users (SAFU), which consists of 10 percent of its trading fees (Changpeng, 2018). Eventually, Binance became a survival of the fittest in the market by overcoming these hack attacks.

2.5. Binance's Cross-Continental Projects

Binance's white paper (2017) states that crypto exchanges require a universalization mentality and diverse language support due to the blockchain's borderless nature. Indeed, Binance invested in more than 190 countries by supporting 15 different languages to foster its own community. Another vibrant instance for Binance's worldwide operations is that it launched

Binance Jersey and Binance Uganda for fiat to crypto trading and Binance planned to expand them to 10 exchanges (Rizzo, 2019). Besides, it is important to note that Binance's activities around the world are not only business-oriented but also community building oriented as well. In 2018, Binance organized more than a hundred meet-ups, with an average of two to five per week around the world. Finally, Binance's move to Malta has an impact on the globalization of Binance. Binance only had four Non-Asian out of twenty-seven team members. While 3 months after moving to Malta, Binance has started to have employees from 39 different countries (Changpeng, 2018). In conjunction with this, Binance appears to have created a global crypto community by implementing a nomadic, inclusive, and innovative strategy for its investors.

3. Data Collection and Methodology

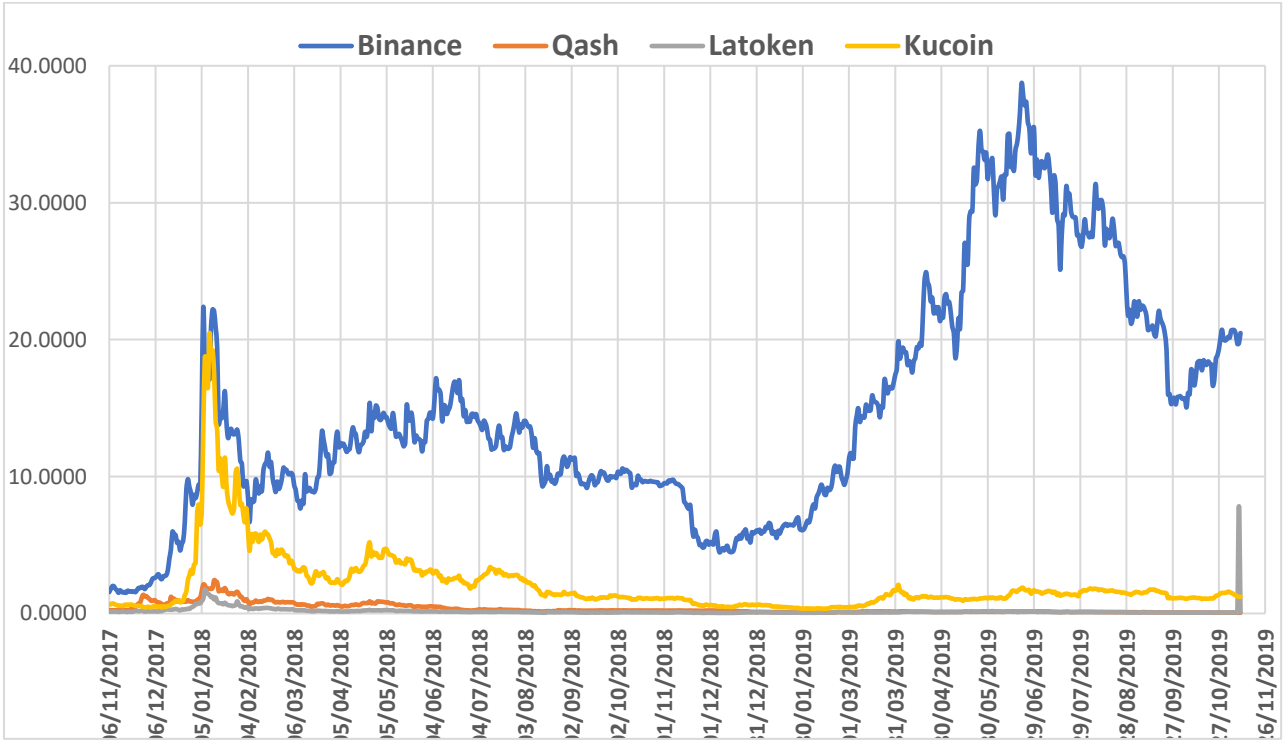
We use daily prices of four cryptocurrencies Binance, Qash, Latoken, and Kucoin because they have their own crypto exchanges. Descriptions of these coins are provided in Table 1. The data set covers the period of November 6, 2017 to November 10, 2019. Database of historical cryptocurrency prices was accessed through an API that was initially given at the Coinmarket.cap website (Daily prices are fixed in U.S dollars). Before applying the empirical model, we explore the general trends of the variables over time. It is apparent in Figure 1 that Binance disassociated itself from other variables when they moved to Malta (March 2018) considering the four-time series in Figure 1.

Table 1: Descriptions of Variables

Abbreviation	Variable	Market Cap.	Volume (24h)	Circulating Supply
BNB	Binance Coin	$4,524,287,676USD	$231,386,508 USD	155,536,713 BNB
LA	Latoken	$35,597,531 USD	$59,172 USD	380,104,462LA
KCS	Kucoin	$123,303,383 USD	$14,745,305 USD	89,079,790 KCS
QASH	Qash	$40,432,243 USD	$268,968 USD	350,000,000QASH

Source: Coinmarket.cap

Figure 1: Daily Prices of Kucoin, Binance, Qash, and Latoken



3.1. Stationarity and Unit Root Tests

Stationary and non-stationary variables are treated differently. Before conducting our empirical model, we identify variables as stationary and non-stationarity with constant and trend models. The stationarity of each time series means that it has a constant mean, constant variance, and constant autocovariance. On the contrary, non-stationarity characterizes an independent time series that can engender spurious regressions. In other words, non-stationary or unit-roots (a

random walk) means that when there is a shock during time t in time series, this shock is not going to die away in the following periods, (Brooks, 2014).

One of the most critical issues in time series analysis is spurious regressions. In that situation, results would be meaningless (Granger and Newbold, 1974). In order to deal with nonsense regressions and to have meaningful results, it is required to test for possible unit roots of time series before starting a time series analysis (Harris and Sollis, 2003). Hence, we first start checking the unit root tests of each variable separately. We employ three different unit root tests; Augmented-Dickey Fuller unit root (1979), Phillips-Perron (1988), and DF-GLS Elliot, Rothenbeng, and Stock (1992) unit root tests with and without a trend. We divided data sets into two subgroups, which are categorized as before and after the experiment to test the differences among the time intervals.

3.2. Johansen Cointegration Test

Johansen, (1988) and Johansen and Juselius, (1990) proposed the Johansen Cointegration model, which is the most frequently used model for the analysis of more than one co-integrating relationships. The Johansen model is based on the number of independent linear combinations. This Johansen cointegration model is suitable for our empirical analysis because we have multivariate time series to test cointegration among them. In addition, the Johansen procedure is superior to all other cointegration techniques (Engle Granger (1987), (Phillips & Ouliaris, 1990), (Pesaran et al., 2001) on more than one fronts, as it does not need the pre-direction of causality and it can test for more than one cointegrating relationships. However, the Johansen test needs sufficiently large time series in order to produce optimum results (Khan & Zaman, 2017) and (Mariel, 1996) and we have sufficiently large time series at our hand. Johansen model's main aim is to determine the order of cointegration among time series. This model takes its first step in VAR of order k given by:

$$y_t = b_1 y_{t-1} + b_2 y_{t-2} + ... + b_k y_{k-2} + m_t \quad (1)$$

Where m is the vector of residuals, b_k denotes the coefficient matrices for each lag. If we use the Johansen Cointegration model, the above equation must be converted into a Vector Error Correction Model (VECM) of the form by adding error correction components:

$$\Delta y_t = \Pi y_{t-k} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + ... + \Gamma_{k-1} \Delta y_{t-(k-1)} + \mu_t \quad (2)$$

Where, $\Delta y_t = y_t - y_{t-1}$ represents differencing equation and k is the number of lags, $\Pi = (\sum_{i=1}^{k} B_i) - I_g$ and $\Gamma_i = (\sum_{j=1}^{i} B_j) - I_g$ that contains two matrices. Albeit Π represents long-run coefficient matrix, Γ includes short-run dynamics. There are g number of time series, which can be equal or more than 2. Johansen technique concentrates on the long-run coefficient matrix Π. Two different test statistics exist under the Johansen cointegration approach. It can be denoted as:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1 - \hat{\lambda}_i) \quad (3)$$

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (4)$$

Where r represents the number of cointegrating vectors under the null hypothesis. Beside this $\hat{\lambda}_i$ denotes forecasted *i*th ordered eigenvalue from the matrix Π (Brooks 2014). The matrix can have maximum g-1 ranks. Therefore, if we have two time series, there would be a maximum one cointegrated relationship among them. The Johansen has a set of null and alternative hypotheses, which are tested sequentially

H_0: r= 0 versus H_1 :0<$r \leq g$

H_0: r= 1 versus H_1 :1<$r \leq g$

H_0:r =2 versus H_1 :2<$r \leq g$

H_0:r= $g-1$ versus H_1:r= g

where r is symbolized as the number of cointegrating vectors under the null hypothesis. Accordingly, if the first null hypothesis is rejected such as $H_{0:\ r=\ 1}$ and the second H_0: r= 1 can't be rejected then we can conclude that there is one cointegrating vector. The same goes for more than one cointegrating vectors.

Importantly Johansen considers five possible VECMs, which cover all of the possible specifications of deterministic component for financial and economic time series:

Model 1 (VECM1): No Intercept or Trend in Cointegrating Equation (vector) and in test VAR

Model 2 (VECM2): Intercept (No Trend) in Cointegrating Equation and No intercept or trend in test VAR

Model 3 (VECM3): Intercept (no Trend) in Cointegrating Equation and in test VAR

Model 4 (VECM4): Intercept and trend in Cointegrating Equation and intercept or trend in test VAR

Model 5 (VECM5): Intercept and Trend in Cointegrating Equation and only intercept in test VAR

VECM1 and VECM2 assume that there is no linear deterministic time trend in the time series assessed for cointegration. Whereas, VECM3 and VECM4 assume that there is a linear

deterministic time trend in time series and VECM5 assumes that there is a quadratic deterministic time trend in the time series.

3.3. Recursive Johansen Cointegration Test

Considering the same time series y_t of total length T. Let T_1 be some initial observations of T such that $T_1 \leq T$, then a Recursive Johansen Cointegration test will be carried out by following the steps:

1. Carry out the Johansen Cointegration test for first T_1 observations (t=1,2,-----, T_1) and estimate $\lambda_{trace}(r)$ and $\lambda_{\max}(r, r+1)$. Denote these states as $\lambda^1_{trace}(r)$ and $\lambda^1_{\max}(r, r+1)$
2. Again carry out the Johansen cointegration test for first T_1+1 observations (i.e. for the sample t=1,2,--------T_1+1) and estimate $\lambda^2_{trace}(r)$ and $\lambda^2_{\max}(r, r+1)$
3. Again carry out the Johansen cointegration test for first T_1+2 observations (i.e. for the sample t=1,2,--------T_1+2) and estimate $\lambda^3_{trace}(r)$ and $\lambda^3_{\max}(r, r+1)$. In the same manner, carry out step2 for remaining all T-T_1 observations after T_1. Thus, having estimated T-T_1+1 trace and Max-Eigen value states i.e.

   $\lambda^1_{trace}(r)$, $\lambda^2_{trace}(r)$,----------, $\lambda^{T-T_1+1}_{trace}(r)$ and

   $\lambda^1_{\max}(r, r+1)$, $\lambda^2_{\max}(r, r+1)$,---------- $\lambda^{T-T_1+1}_{\max}(r, r+1)$

The simple Johansen Cointegration test assesses the existence of cointegration for the whole period as a whole and assumes that the cointegrating vector and the dynamics of VECM remain the same for the whole period. However, Recursive Johansen Cointegration test gives flexibility by relaxing the assumptions of constant cointegrating vector and the same dynamics of VECM. It can evaluate the evolution of the long-run relationship with respect to time.

3.4.Empirical Results

Unit Roots

The results show that the variables are not stationary. However, it is observed that variables are stationary after taking first differentiation for all categories for the whole time series, before and after the experiment. It is important to note when measuring Latoken's stationarity degree after the experiment, we detect some outliers for the last 6 days. To solve this situation, we conduct the averaging method by taking an average of the last 15 days to be able to check unit root tests by considering with and without a trend. Hence, as demonstrated in Tables 2 and Table 3 that cointegration analysis can be applicable for the next step.

Table 2: Results of Dickey-Fuller, Phillips-Perron and DF-GLS Unit Root Test before the Experiment

Date: 6 November 2017-22 March 2018						
	Augmented Dickey-Fuller Test (ADF)		**Phillips Perron (PP)**		**DF-GLS**	
Variables	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
Binance	-1.648	-1.719	-1.667	-1.768	-1.899(1)	-1.899(1)
Kucoin	-1.489	-1.319	-1.730	-1.606	-1.559(1)	-1.559(1)
Latoken	-1.673	-1.575	-1.818	-1.718	-1.460(1)	-1.460(1)
Qash	-2.046	-1.914	-2.119	-1.974	-1.590(1)	-1.590(1)

Note: *,** and * refer to the rejection of the null hypothesis at 1, 5, and 10 percent significant levels, respectively. H0: The series have a unit root. Ha: The series are stationary.**

First Difference

Date: 6 November 2017-22 March 2018						
	Augmented Dickey-Fuller Test (ADF)		**Phillips Perron (PP)**		**DF-GLS**	
Variables	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
Binance	-10.012***	-9.981***	-9.896***	-9.859***	-7.799***(1)	-7.799***(1)
Kucoin	-9.764***	-9.761***	-9.790***	-9.783***	-7.767***(1)	-7.767***(1)
Latoken	-11.440***	-11.451***	-11.465***	-11.472***	-6.874***(1)	-6.874***(1)
Qash	-10.637***	-10.671***	-10.603***	-10.634***	-7.803***(1)	-7.803***(1)

Note: *,** and * refer to the rejection of the null hypothesis at 1, 5, and 10 percent significant levels, respectively. H0: The series have a unit root. Ha: The series are stationary.**

Table 3: Results of Dickey-Fuller, Phillips-Perron and DF-GLS Unit Root Test After the Experiment

Date: 23 March 2018-10 November 2019						
	Augmented DickeyFuller Test (ADF)		**Phillips Perron (PP)**		**DF-GLS**	
Variables	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
Binance	-1.227	-1.507	-1.183	-1.457	-1.314(1)	-1.314(1)
Kucoin	-1.836	-1.781	-1.888	1.864	-1.549(1)	-1.549(1)
Latoken	-1.496	-0.769	-1.392	-0.606	-1.260(1)	-1.260(1)
Qash	-2.732	-2.603	-2.786	-2.491	-1.401(7)	-1.401(7)

Note: *,** And * refer to the rejection of the null hypothesis at 1, 5, and 10 percent significant levels, respectively. H0: The series have a unit root. Ha: The series are stationary.**

First Difference						
Date: 23 March 2018-10 November 2019						
	Augmented Dickey-Fuller Test (ADF)		**Phillips Perron (PP)**		**DF-GLS**	
Variables	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
Binance	-26.151***	-26.129***	-26.122***	-26.100***	-2.997**(7)	-2.997**(7)
Kucoin	-25.259***	-25.255***	-25.256***	-25.251***	-16.650***(1)	-16.650***(1)
Latoken	-8.402***	-8.460 ***	-8.491***	-8.487***	-1.332***(3)	-1.332***(3)
Qash	-29.062***	29.161***	-28.882***	-29.002***	-13.363***(1)	-3.881***(6)

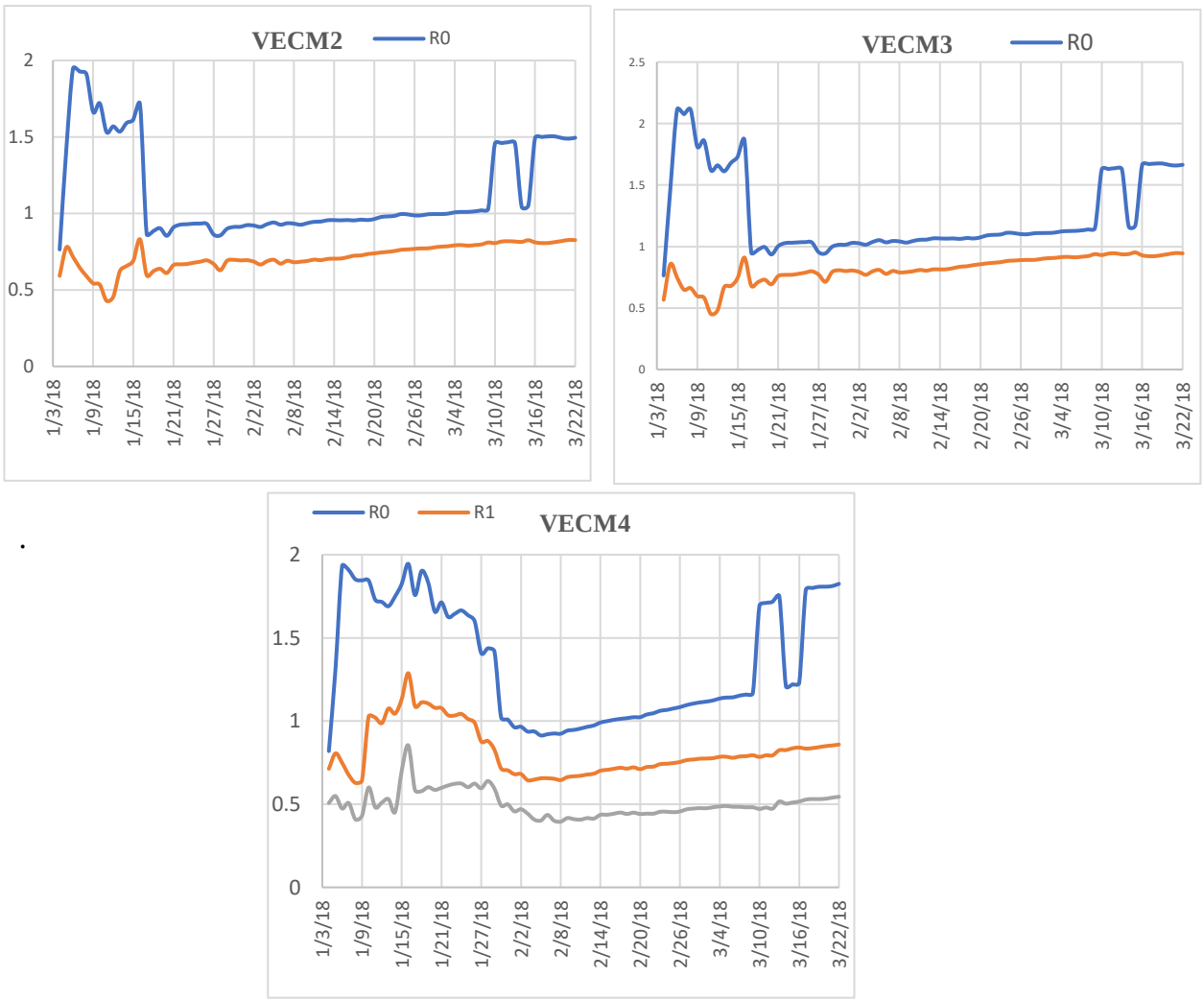
Note: *,** And * refer to the rejection of the null hypothesis at 1, 5, and 10 percent significant levels, respectively. H0: The series have a unit root. Ha: The series are stationary.**

As discussed earlier, Johansen assumes five possible specifications of VECM. For the problem at hand three VECMs i.e. VECM2, VECM3 and VECM4 are theoretically supported by cryptocurrency exchange market theory, as there is a quite rare chance that these four (Binance, Kucoin, Latoken, and Qash) would have either no intercept (VECM1) or quadratic deterministic trend (VECM5) at all. There are different information criteria available for lag order selection of VAR, i.e. Akaike information criterion (AIC), Schwarz information criterion

(SIC), Hannan-Quinn information criterion (HQC), and many more. However, SIC performs better than the rest as stated by Khan and Khan (2018), Khan et al., (2019), Haug (1996). Therefore, in this study for plausible lag order selection, SIC is used. Different maximum lags are tried ranging maximum to five. However, a maximum of lag 2 is selected by SIC. Hence, in order to save degrees of freedom, maxlags=2 is set out throughout the cointegration testing process.

The Johansen Trace statistics are estimated assuming three VECMs (VECM2, VECM3, and VECM4) for "before the experiment" (sample ranging from 06 November 2017 to 22 March 2018). Similarly, the Johansen tests for the same three VECMs are carried out "after the experiment" (sample ranging from 23 March 2018 to 10 November 2019). The results of the cointegration test over the period of 06 November 2017 to 22 March 2018 (before the experiment) show that there are at most two vectors of cointegration among Binance and other cryptocurrency exchanges. Whereas the results are showing zero cointegrating vector at a 5 percent level of significance after the experiment where the sample ranges from 23 March 2018 to 10 November 2019. The Recursive Johansen cointegration test is carried out for the "before the experiment" sample and the ratios of trace statistics to their respective critical values are plotted against time in Figure 2 and Figure 3, considering 1% and 5% level of significance respectively. The first sub-sample is taken as T1=60. Figure 2 clearly portrays that for VECM2, the ratios are gradually increasing with respect to time. If the ratio is greater than one, this implies that the null is rejected, and if the ratio is lesser than one, it implies that the null cannot be rejected. For all of the three VECMs i.e. VECM2, VECM3, and VECM4, the ratio under the null hypothesis depicted as R0, is increasing with time and it gets greater than one with time indicating that there is stronger evidence of the long-run relationship in time.

Figure 2: Before the Experiment assuming 1 percent level of significance



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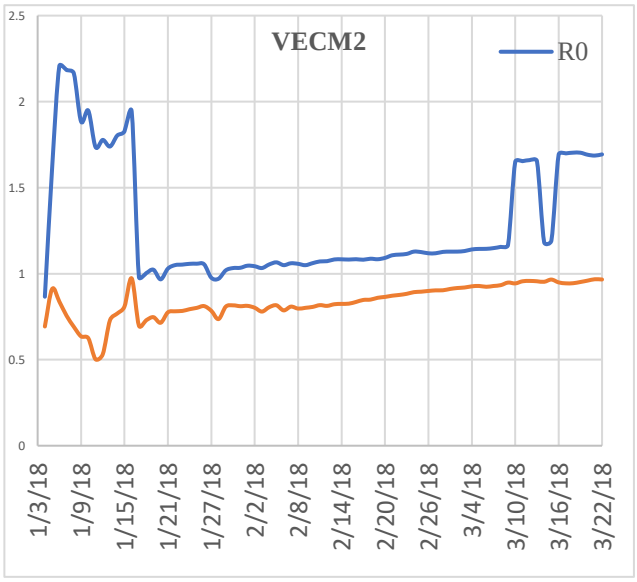
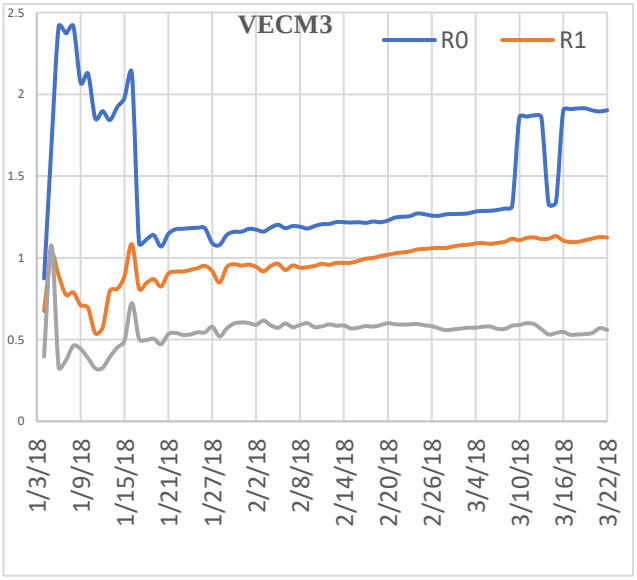
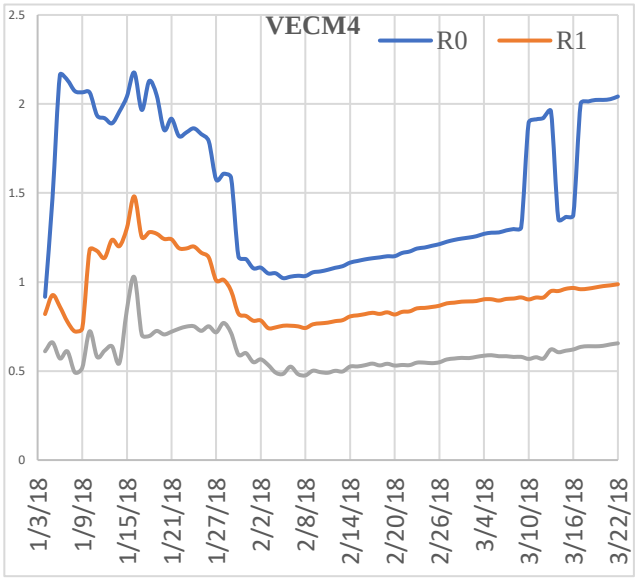
The same is the case for Figure 3, where the ratios are plotted against time assuming a 5% level of significance. Now the evidence of stronger cointegration between the four crypto exchanges is much more convincing as compared to Figure 2. Again, the evidence of cointegration gets stronger and stronger in time, and even in some cases, there are two cointegrating vectors.

Figure 3: Before the Experiment assuming a 5 percent level of significance

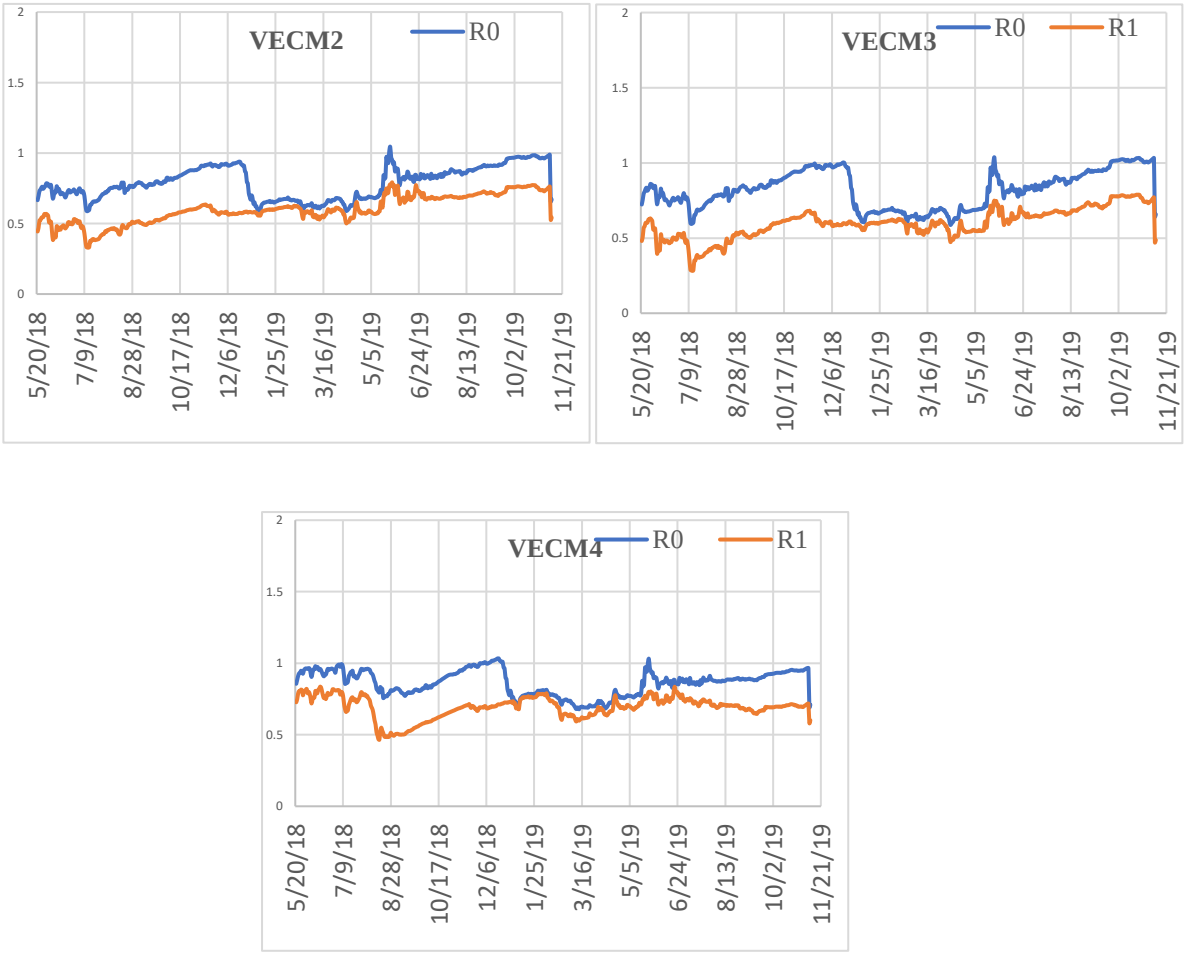






For the sample “after experiment”, the recursive Johansen test is carried out considering an initial sample of 60. The ratios of trace statistics to their respective critical values are plotted against time in Figure 4 and Figure 5, assuming 1% and 5% level of significance respectively.

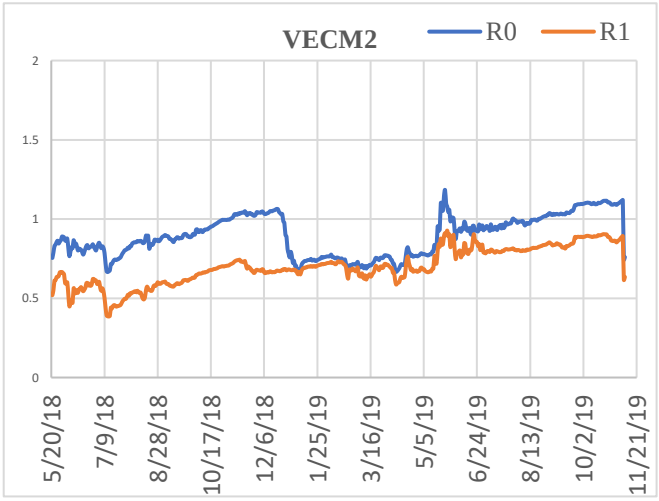
Figure 4: After the Experiment assuming 1 percent level of significance

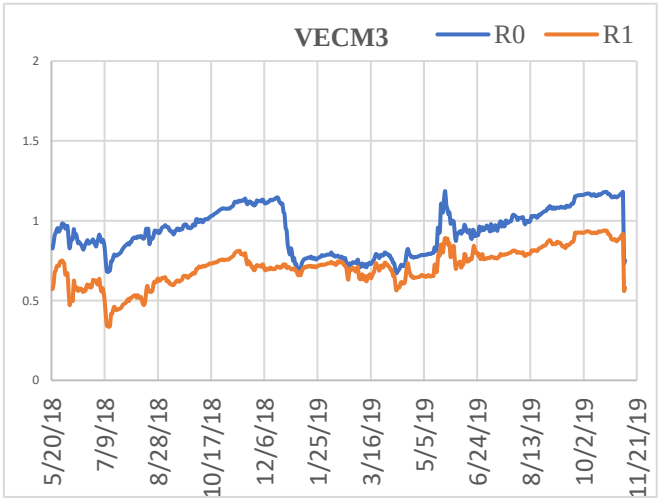


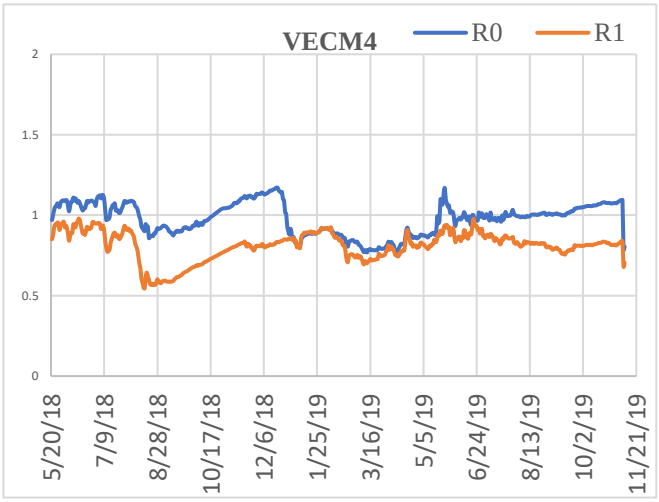
It is clearly portrayed from Figure 4 that for all three VECMs i.e. VECM2, VECM3, and VECM4, there is no evidence of cointegration among our variables.

In Figure 5, one can also see that for most of the times, there is no evidence of cointegration assuming a 5 percent level of significance.

Figure 5: After Experiment assuming 5 percent level of significance







These empirical results show that Binance positively disassociates itself from other crypto exchange currencies like Kucoin, Latoken, and Qash when it moved to Malta after cryptocurrency exchanges banned from operation in Japan. The fundamental reason for this disassociation is Binance's strength to overcome struggles with rapid and influential responses. It proved to investors and traders that its operation, business strategy, and team are the fittest to be a survival. As it is shown in the results, Binance continues to increase the gap with other crypto exchanges after it went to Europe from East Asia with its globalization strategy. Hence,

with its dominant lead in the crypto exchange market and expansion to all continents, the idea of a universal single crypto exchange is started to prevail.

4. Conclusion

This paper aims to provide new empirical evidence on the possibility of a universal stock market in the crypto world. There has been already discussion about the possibility of stock market universality in the traditional financial world because of its regulative, parochial, and central structure. Accordingly, in this paper, we broaden this discussion while assessing the applicability of the universal cryptocurrency exchange by analyzing Binance, Kucoin, Latoken, and Qash. Moreover, we conduct a recursive Johansen cointegration model to check the movement of the cointegration of our multivariable in the long term. The empirical results from the daily prices of Binance, Kucoin, Qash, and Latoken show that Binance prominently disassociates itself from others after it moved to Malta on 23 March 2018. According to these findings, Binance crypto exchange could be considered as the survival of the fittest with its universalistic approach, inclusive and innovative policies, and their well-equipped security capacity against the hackers and state regulations.

To that end, Binance's move to Malta shows that market participants respond to innovative business practices positively. The tendency of decentralization and new initiatives of the borderless stock market in the blockchain-based financial system exposes that investors have negative attitudes and experiences towards regulatory threats of the nation-states. In the midst of such new financial challenges, Binance appears to have successfully satisfied the needs of the investors. Hence, a natural experiment in the crypto exchanges reveals the Binance as the survival of the fittest among the crypto exchanges. In this line, this result also indicates that if the functioning of the stock exchanges across the globe are left alone to the market without the

regulations of the nation-states, only the very few competitive exchanges are likely to survive due to the increasing competition and efficiency in the exchange market.

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