DIGITAL CURRENCY: A CONCEPTUAL FRAMEWORK OF PERFORMANCE

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Abstract: This paper explores and elucidates the concept of Cryptocurrency. It contributes a framework of digital money and also provides an analysis of the price range, which influences Cryptocurrency volume and market capitalisation. Findings from the OLS analysis show that the low price genre influences the volume and market capitalization of Cryptocurreny. Based on the results, the paper develops a price, volume and market capitalization framework for Cryptocurrency. The findings provide a practical and conceptual contribution for investors and future researchers on the concept of digital currency.

Keywords: Cryptography, cryptocurrency, volume, market capitalization, price

1. INTRODUCTION

Crypto-currency is a computerised assemblage of binary data and propelled by block chain technology [1]; hence, crypto-currency is curated by information technology engineers to serve as a lighter and faster alternative means for facilitating transactions for the exchange of goods and services [2]. The 21st century information technology advancements have led to unprecedented innovation and the production of unparalleled rapid computer processing systems via miniaturised chips. Accordingly, industrial activities ranging from planning, production, and distribution receive boosts through modern digital information technology and robotics [3].

Needless to emphasize that digital technology has equally enhanced the mass production of goods and services and dissemination to consumers at the click of the computer mouse [4]. Aside from expediting industrial goods and services, digital technology has boosted the operations of money and stock markets around the world with associated increases in revenues [5]. Thus in addition to aiding the sales and purchases of goods and services through a quick transfer of physical money via electronic marketing, digital technology has now mutated positively to a new form of money referred variously to as digital money, crypto-currency, digital currency or electronic currency. Unlike the days of a trade by the batter and to the modern century of physical money for exchanges, digital money has come to the fore to break certain barriers and costs associated with paper money [6].

The implications of digital currency range from positive effects to challenges [7]. On the one hand, there are many advantages of digital money for the holder, for instance, the holder may now transfer money with little or no cost of transfers, such as the costs charged by the banks. On the other hand, digital money has some disadvantages mostly for monitoring agencies; for instance, digital money makes it somewhat difficult to keep audit trails for effective financial audits [8]. The difficulty with audit trails resonates with the difficulty in taxation tracing and collection. It also comes with heinous money laundering that may evade the monitoring

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apparatus of government agencies [8]. Albeit the inherent cons, digital money has arrived to exist in the money market with the likelihood to cause limitations in paper money circulation in the future [9]. Certainly, digital money has challenges, especially regarding the auditing profession, which requires some professional innovation to enhance improved auditing and assurance services for digitized corporate financial operations [10].

The implications of digital currency on auditing and accounting are vital given the attendant impact on global financial integrity. Recent research has identified key implications for accounting, auditing, taxation, and money laundering [11, 12].

The research problem that warrants this paper is the recognition by experts that the diverse developmental potential implicit in blockchains is still elusive given the knowledge gaps, which exist between computer and information technology research and other socio-economic research. Hence this paper inclines on a conceptual review, which decoupling the concept outside of the technical confines of computer and information technology engineering for the understanding of the wider money market players that drive the economic system.

Given the somewhat newness of the concept of digital money in the modern business and financial market environment, it becomes pertinent to formulate a simplified conceptualisation of digital money for the enlightenment of inquirers about digital money. Therefore, the objective of this paper is to provide a conceptual framework for Cryptocurrency and to analysis the price range, which influences the volume and market capitalisation of Cryptocurrey.

2. LITERATURE REVIEW

2.1. Crypto Currency Concept

The digital economy is altering the status quo where humans enjoy government money uncontested [13]. This is because, the current monetary status which is controlled by the governments of the world is gradually shifting and giving way to the contemporary transition towards a digital economy made possible by cryptographic engineering innovation, which has brought an assortment of digital currencies to the fore [13, 14]. Therefore the governments of many nations are gradually building state digital currencies which are mainly digitized versions of their current government money and these digital money projects are somewhat radical as government digital money projects look rather different from current fiat paper money for example the United States dollar [13].

Crypto-currency is a means of payment, which mostly applies in an online system of selling and purchasing goods and services. Hence, digital money or digital currencies form an integral part of the financial market software structure [15]. Crypto-currency functions on the platform of distributed ledger assemblage, which is referred to as block-chain. According to [15] there is no known authority, which controls or mediates in the usage of cryptocurrency, the reason being that the software design works on peer-to-peer operations. The crypto currency could hardly function without the support of a decentralised and distributed database technology – the blochchain [4]. In their proposal for an improved electronic method of payment, which bypasses a trusted third party, [16] argue that before the thought of digital money, electronic commercial transactions relied only on banks to facilitate electronic payments between two parties as the trusted third party.

In their research in favor of digital currency, [16] argue further, that electronic payment via the banking system is fraught with the high cost of the transaction, hence high bank charges; there are also limitations on the size of payments via the bank's electronic systems. These, coupled with an inherent risk of the acceptable percentage of risk and fluidity of trust raise the cost of bank system electronic transactions. In addition, clients have ripped off their private information given the trust and fraud issues. Hence [16] initiated alternative electronic payment which uses cryptographic proof; thus instead of relying on a third party trust (the bank), two parties can use cryptographic means and engage in commercial transactions to sell, buy, pay and receive money without relying on a third party trust. Thus, the rooting of digital money is founded on convenience, low cost, third party trust issue avoidance and peer-to-peer direct dealing.

Cryptocurreny has enabled a flow of online digital monetary and other transactions, which represents economic or business interaction between two individuals, parties or organisations that are remotely located (Figure 1). Therefore, cryptocurrency transaction is an effective transfer of digital money by using cryptocurrcy between two authorised users of the block-chain network [17].

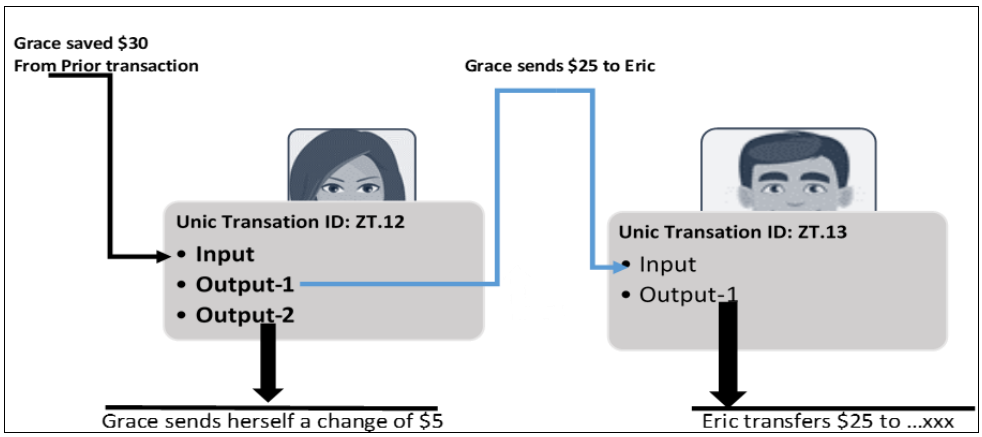

Fig. 1. Sample Demonstration of Crypto Currency Transaction.

2.2. The Block-Chain Concept and Configuration

Blockchain is the core technology, which underlies the existence and functioning of digital money. In digital commercial descriptions, blockchain refers to a digitalised transaction ledger, which is managed by an array of computer systems in a protected frame that insulates it from fraudulent alterations and/or criminal hacking. The system's technology makes it amenable for participants to engage in a one-on-one transaction, selling, buying, and payment without resorting to any authoritative third party control such as the government or the banking system. This means that the transactions keep growing and pile up into huge records, or blocks, and the computer array system keeps the records or blocks connected by means of cryptography [17, 18]. In their study, [17] expatiates the concept of blockchain further; they highlight that although blockchains are digital ledgers, they are tightly tamper protected and are stored in multiple computer systems devoid of repository and centralisation. Given its formation, blockchain enhances the ability of several participants to record their transactions simultaneously, and the encryptions remain unchangeable once the recorded transactions have been entered [17]. Accordingly, Bitcoin is the maiden amongst the currently diverse bourgeoning blockchain supported cryptocurrencies. The protective technique, which is cryptography remains a vital strategy to protect cryptocurrencies. Cryptography in the context of digital money and blockchain is a modern information technology technique, which protects and reserves the contents of an electronic message solely for the view of the sender and receiver without any third party accessibility. Hence, the concept derived its root from the Greek word Kryptos – a word used in Greek to describe a hidden object [19].

Although another genre might exist in the block-chain dynamics, the main architecture has two main categories for blockchain access namely the permissionless genre and permissioned genre. The permissionless genre of blockchain network allows anyone access to read and write in the blockchain platform without prior authorization for access. However, the permission genre of blockchain networks creates limitations for participation to specified individuals or organizations, which therefore a thoroughtmeasure for security controls. Accordingly, the understanding of the differences, which exist between the two main categorisation of block-chain permit organizations to know and be able to choose which genre of blockchain technologies may better serve the need of the organsation [17].

2.3. Role of Cryptography in Digital Currency Security

Since the advent of Bitcoin in 2009 [20], many other digital currencies have emerged in the Crypto currency market and put together, their market capitalisation is in the region of trillions of Dollars [21]. Currently, there are hundreds of different digital currencies trading in the digital money market [21]. However, leading digital currencies in terms of market capitalisation include Bitcoin, Ethereum, Binance Coin, Tether, Solana, Cardano, USD Coin, XRP etc.; these appear in Figure 2 their market capitalisation in Figure 3.

Cryptography is the bulwark that is pivotal to the emergence and bourgeoning of crypto-currency. This is because even in the world of physical money, the security system ingrained in a paper currency is the key that provides the credibility of the currency. Given that digital or crypto-currency involves an exchange between two parties, Cryptography provides desired trusted security between the two parties via the provision of digital encryption [22].

Accordingly, in the field of information technology engineering, crypto-currency security relies on the algorithms of encryption and attendant decryption techniques made possible by cryptography [23], hence the invention of crypto-currency would not have been easy without cryptographic technology. The security of cryptography works the algorithm encryption wherein texts are scrambled to produce ciphertext – which is an indecipherable text format, which the recipient can use in decoding (decrypting) the data when received.

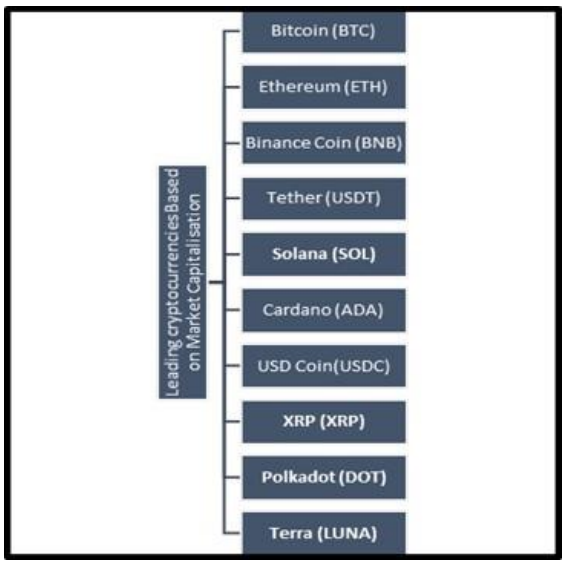

Fig. 2. Ten major types of Crypto currency: BTC –Ethereum –Binance –Tether –Solana –Cardano USD –XRP –Polkadot –Terra Source: author's chart, with data from [24].

Fig. 3. Market Capitalisation: ten leading Cryptocurrency [24].

[23] identifies three main techniques of cryptography namely authentication, asymmetric-key and symmetric-key. Authentication provides two main types of data security, which are integrity and source security. Integrity security ensures that the original data has not been modified along the channel of transmission. Source authentication assists in tracing the system or user who created the data.

Asymmetric-key, which is popularly referred to as public key is a system of cryptography that produces two keys – a public key and private key. Whilst data is sent with a public key, the recipient may only decrypt the data with a private key – thus enhancing protection to the sent data or information. The symmetric-key functions in stark opposite to asymmetric-key, in that one secret key is generated for both encryption and decryption of data; therefore under this method, only the holder of the secret key used in encrypting the data may have access to the information at the receiving end. Both methods of cryptography provide security to the operation of digital or crypto-currency.

The market performance for Bitcoin and other cryptocurrencies can be viewed at [21, 24] and other digital currency markets. Based on the foregoing, the author presents a digital money conceptual framework in Figure 4, which captures in brief the dynamics.

Cryptography provides the impetus to an important innovation orchestrated by digital money, which is the block-chain. Experts regard block-chain as the catalyst that enhances conceivable peer-to-peer digital currency exchange. Accordingly, block-chain is the umbrella that binds together all the Bitcoin transactions in a distributed database and with high-level security [25]. A combination of numberious government and private contracts with attendant transactions with multiple records of the multiple transactions constitute significant structures in every economic and political systems of all societies.

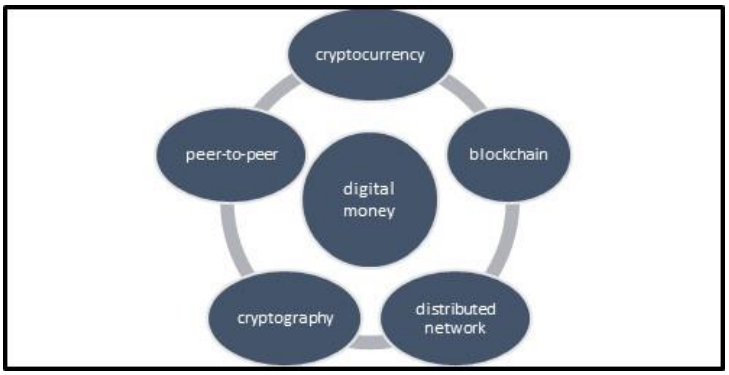

Fig. 4. Digital Money Conceptual Framework: cryptocurrency –blockchain distributed network –cryptography – peer-to-peer.

These organised economic structures protect business and assets and set boundaries of operations, ownership and rights, of individuals, organisations and nations [26]. However, experts are worried that these important structures along with the bureaucratic management have not been able to adjust the system structure with the digital transformation of the economic system. Hence the block-chain emergence steps in to ameliorate this problem. This is why [26] expresses the sentiment that blockchain provides a solution to this problem.

3. ANALYSIS METHOD CRYPTOCURRENCY PRICE, VOLUME AND CAPITALISATION

The preceding sections have reviewed relevant concepts and literature. This section proceeds to make a new contribution by applying a quantitative method to analyse the effect of Cryptocurrency prices on the volume and market capitalization of Cryptocurrency. Based on the results from the analysis in the next section, the paper presents a model for forecasting volume and market capitalization and a Cryptocurrency price, volume and market capitalization framework for TrueUSD Cryptocurrency.

The researcher randomly chose the historical exchange data for a US Cryptocurrency, namely the TrueUSD from the online Cryptocurrency trading platform for Coinmarketcap. Trading data namely, opening price, high price, low price, closing price, the volume of currency sold, and market capitalization of currency were collected for the period 2022/07/03-2022/09/02, which gave a total of sixty two (26) observations. Using the Gretl software, the OLS regression was applied to analyse the effect of different Cryptocurrency prices on volume and market capitalization respectively.

4. RESULTS AND DISCUSSION

Table 1 presents the OLS results for the effect of Cryptocurrency prices on the volume of Cryptocurrency traded. At an alpha level of 0.05, results show that low price has a significant effect on the volume of TrueUSD Cryptocurrency traded at a p-value of 0.00004. In addition, Table 2 shows that low price has a significant positive effect on the market capitalization of TrueUSD Cryptocurrency.

Furthermore, the Q–Q plot in Figure 5 and Figure 6 demonstrates that the variable distributions have a good linear relationship, as the points in the Q–Q plot shows that the variables are approximately laying on the linear line, although not essentially on the core line where y = x. Accordingly, this accentuates how the low price is significantly related to the volume of cryptocurrency sales.

Table 1. OLS, using observations 2022/07/03-2022/09/02 (T = 62).

Dependent variable: Volume

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	21,5659	5,25035	4,1075	0,00013	***
Open_	-2,26592	1,52986	-1,4811	0,14398	
Low	2,07046	0,462825	4,4735	0,00004	***
Close__	0,156517	1,72798	0,0906	0,92814	

Mean dependent var	31,50000	S.D. dependent var	18,04162
Sum squared resid	14479,82	S.E. of regression	15,80038
R-squared	0,270740	Adjusted R-squared	0,233020
F(3, 58)	7,177557	P-value(F)	0,000353
Log-likelihood	-257,0289	Akaike criterion	522,0578
Schwarz criterion	530,5663	Hannan-Quinn	525,3984
rho	0,758860	Durbin-Watson	0,511750

^Volume = 21,6 - 2,27*Open_ + 2,07*Low + 0,157*Close ……..Model (1)
(5,25) (1,53) (0,463) (1,73)

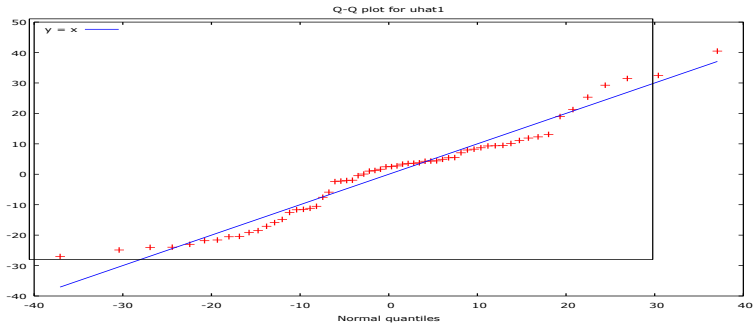

Fig. 5. Q-Q Plot for Low Price and Volume of Cryptocurrency.

Table 2. OLS, using observations 2022/07/03-2022/09/02 (T = 62).

Dependent variable: MarketCap

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
Const	21,5659	5,25035	4,1075	0,00013	***
Low	2,07046	0,462825	4,4735	0,00004	***
Close__	0,156517	1,72798	0,0906	0,92814	
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rho	0,758860	Durbin-Watson	0,511750

^MarketCap = 21,6 + 2,07*Low + 0,157*Close__ - 2,27*Open_.....Model (2)
(5,25) (0,463) (1,73) (1,53)

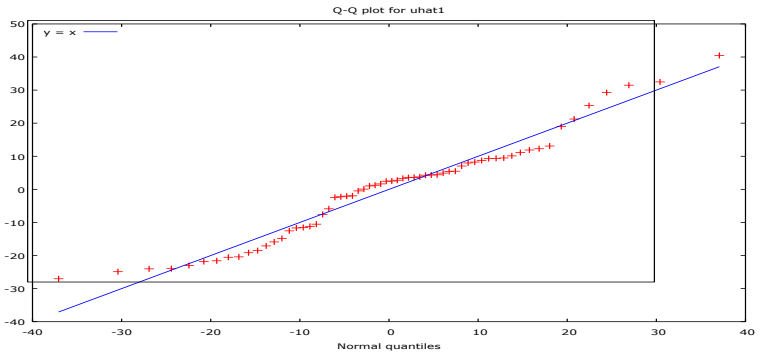

Fig. 6. Q-Q Plot for Low Price and Market Capitalisation of Cryptocurrency.

4. CONCLUSIONS

One internet-driven revolution of the 21st century is the emergence of digital money, also called digital currency or cryptocurrency in the modern money and financial market environment. The forgoing sections have reviewed and discussed the concept of Cryptocurrency and exemplified the transaction process with a diagram (Figure 1).

Majority of existing cryptocurrency articles appear technical, making it difficult for non-technical specialists to decode this important concept. Accordingly, this paper's preceding sections presented a simplified digital money conceptualization to enlighten potential investors, students and academia regarding the currently bourgeoning digital currency.

The paper has made a conceptual and practical contribution to the literature in three strands. Firstly, it has provided a highlight of basic description of digital currency, the block-chain, cryptography concept, and the leading types of digital money, and provided formulation of digital money conceptual framework for further researchers.

The second contribution of the paper is that it provides the first analysis of the Cryptocurrency price range, which influences the movement of Cryptocurreny volume and market capitalization by applying the OLS regression analysis. Amongst the four major Cryptocurrency prices (opening, highest, low and closing), the results provide the first demonstration and contribution to the literature, which shows that Cryptocurrency volume and market capitalization is influenced by the lowest price.

The third contribution of this paper is the derivation of a Price, volume and market capitalization framework for TrueUSD Cryptocurrency (Figure 7), a model for price, volume and market capitalization (Equation 1 and Equation 2), this is the first price, volume and market capitalisation framework in the Crytocurrency literature.

The above findings and contribution provides important practical and policy information for Cryptocurrency owners and investors for planning, speculation and investment. This paper’s contribution provides an avenue for further research to explore this relationship by using other types of Cryptocurrencies in the market.

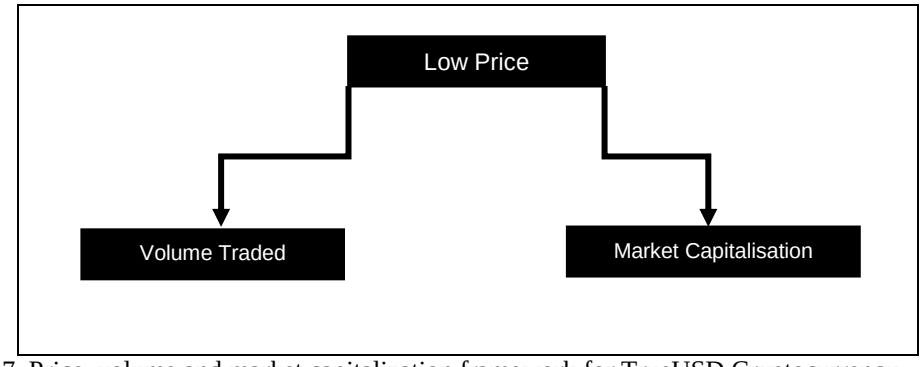

Fig. 7. Price, volume and market capitalization framework for TrueUSD Cryptocurrency.

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