RESEARCH ARTICLE

The Impact of Cryptocurrencies on Developing Market Economies

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Abstract

Cryptocurrencies are electronic forms of money that are seen as credible investments; these currencies ranging from Bitcoin, Litecoin, and Etherium are increasingly viewed as a separate asset class with unique characteristics, driven by the distributed ledger technology (DLT) commonly referred to as Blockchain has increased trust in Bitcoin as a store of value and medium of exchange. This paper looks at the evolution of bitcoin and the challenges that have come to characterize the Nobel currency. From sound governance, tax compliance, data privacy and portability, cybersecurity, and fair competition; the currency in its current form exposes economies to grave economic and financial stability risks. Policymakers should regulate the functioning of bitcoin as they would a speculative asset class, by constraining risk-taking from banks by increasing requirements for deposits, whilst designing a mechanism that monitors and improve the functioning of markets that allow the proliferation of the currency.

Keywords: Cryptocurrencies, Competition, Distributed Ledger Technology, Financial Stability

1. Introduction

New cryptocurrencies are emerging daily, providing alternatives to traditional forms of payments and enabling new mediums of exchange such as cash. These currencies span Bitcoin[1], Litecoin and Etherium, designed to provide some characteristics of money as well as asset classes that enable the transfer and/store of value across societies. In less than a decade, bitcoin has gone from being an obscure curiosity to a household name. In recent times, bitcoin has risen – with ups and downs – from a few cents per coin to over $4,000. In the meantime, hundreds of other cryptocurrencies – equalling bitcoin in market value – have emerged (Graph 1, left-hand panel). While it seems unlikely that bitcoin or its sisters will displace sovereign currencies, they have demonstrated the viability of the underlying blockchain or distributed ledger technology (DLT) and its credible use and application across other sector such as manufacturing, health care, investment, cyber security and big data.

Venture capitalists and financial institutions are investing heavily in DLT projects that seek to provide new financial services as well as deliver old ones more efficiently. Bloggers, central bankers and academics are predicting transformative or disruptive implications for payments, banks and the financial system at large.

Findings from Andolfatto (2015, 2016), Broadbent (2016), Raskin and Yermack (2016) and Skingsley (2016) attest to this sea-change in mediums of exchange as consumers and transformative

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1. Bitcoin is an example of a non-central bank digital currency. It was invented by an unknown programmer who used the pseudonym Satoshi Nakamoto and was released as open-source software in 2009 along with a white paper describing the technical aspects of its design (see Box A for further details).

implications for economies, financial systems and consumer investment behavior is already changing reflecting a macroeconomic backdrop characterised by ultr-accomodative interest rates, low economic growth and a dearth of investment opportunities with over 20% of global debt yielding negative returns. The transformative changes likely embedded in the increased use and &adoption of cryptocurrencies across economies suggests a need to better understand the nature of cryptocurrencies.

Similarly, it is imperative to understand the implications of these novel sources of investment on macroeconomic outcomes, monetary policy and consumer behavior. This paper outlines the nature of crypto-currencies, outlines the inherent differences to cash and how best to leverage their investment characteristics without compromising financial stability.
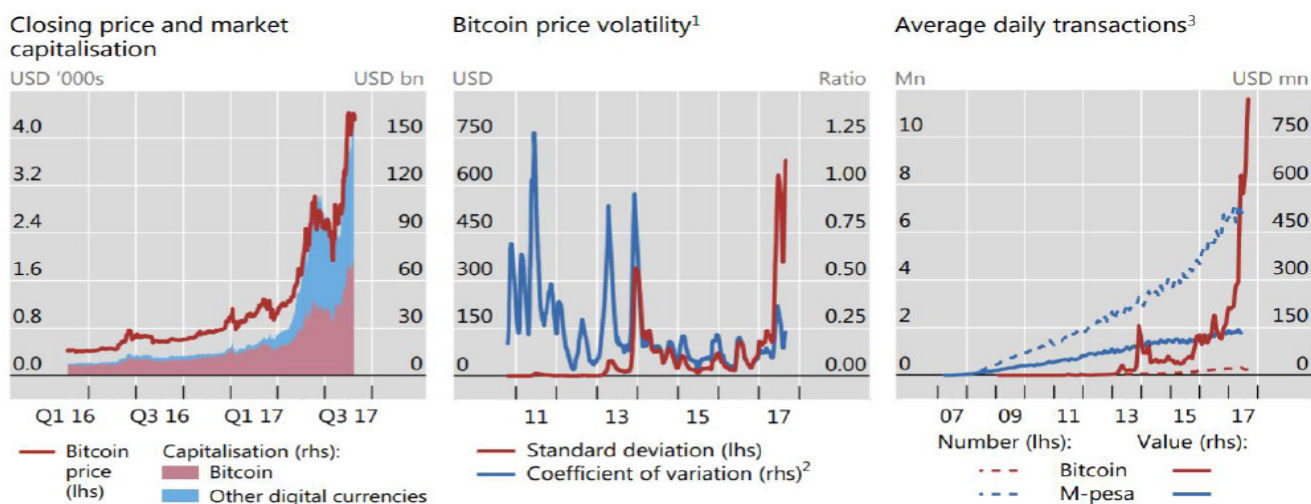

Figure 1. Bitcoin appears to be a volatile investment, but not a credible store of value

Sources[1]: Central Bank of Kenya; CoinDance; CoinDesk; www.blockchain.info.

1. Ninety-day moving averages. 2 Ratio of standard deviation to mean. 3 Monthly averages. For bitcoin, estimated transaction value in USD; for M-pesa™, transaction value in KES converted into USD.

2. Can Bitcoin Serve as a Medium of Exchange?

It is not clear that bitcoin can ever replace cash as it operates via democratic consensus, supported by the distributed ledger technology and has a limited number of users. This paper defines a cryptocurrencies as an electronic form of central bank money that can be exchanged in a decentralised manner known as peer-to-peer, meaning that transactions occur directly between the payer and the payee without the need for a central intermediary[1]. Unlike cash issued by the central bank, Bitcoin is supported by the distributed ledger technology that serves as a medium of exchange between its users.

Furthermore, it does not have the characteristics inherent in "cash" issued by a central authority as it is not recognised by governments as a legitimate

store of value and the democratic consensus which underpins the crypto currency is limited to its users. Secondly, cryptocurrencies are not accessible to individuals who do not participate in the purchase of sale of bitcoin, litecoin, etherium etc.

In this spirit, Bjerg (2017) includes the universality of accessible currencies as central to the legitimacy of central-bank issued currencies. It is important to note that central banks across the world are issuing digital currencies to leverage the technological advances latent in the distributed ledger technology; it is, therefore, imperative to make a distinction between cryptocurrencies and central bank digital currencies (CBDCs).

This taxonomy reflects what appears to be emerging in practice and distinguishes between two potential types of CBCC, both of which are electronic: central bank-issued and peer-to-peer. One is accessible to the general public (retail CBCC) and the other is available only to financial institutions (wholesale CBCC).

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1. The purest form of peer-to-peer transaction is a cash exchange. On a computer network, the peer-to-peer concept means that transactions can be processed without the need for a central server.

In principle, there are four different kinds of electronic central bank money: two kinds of CBCCs (the shaded area) and two kinds of central bank deposits. The most familiar forms of central bank deposits are those held by commercial banks – often referred to as settlement accounts or reserves.

The other form is, at least in theory, deposits held by the general public. Tobin (1987) refers to this form as deposited currency accounts (DCAs).[2] So far, central

2. In a 1987 speech, Nobel laureate James Tobin argued that, in order to avoid relying too heavily on deposit insurance to protect the payment system, central banks should "make available to the public a medium with the convenience of deposits and the safety of currency, essentially currency on deposit, transferable in any amount by check or other order" (Tobin (1987, p 6); see also Tobin (1985)). That is, people should be able to store value without being subject
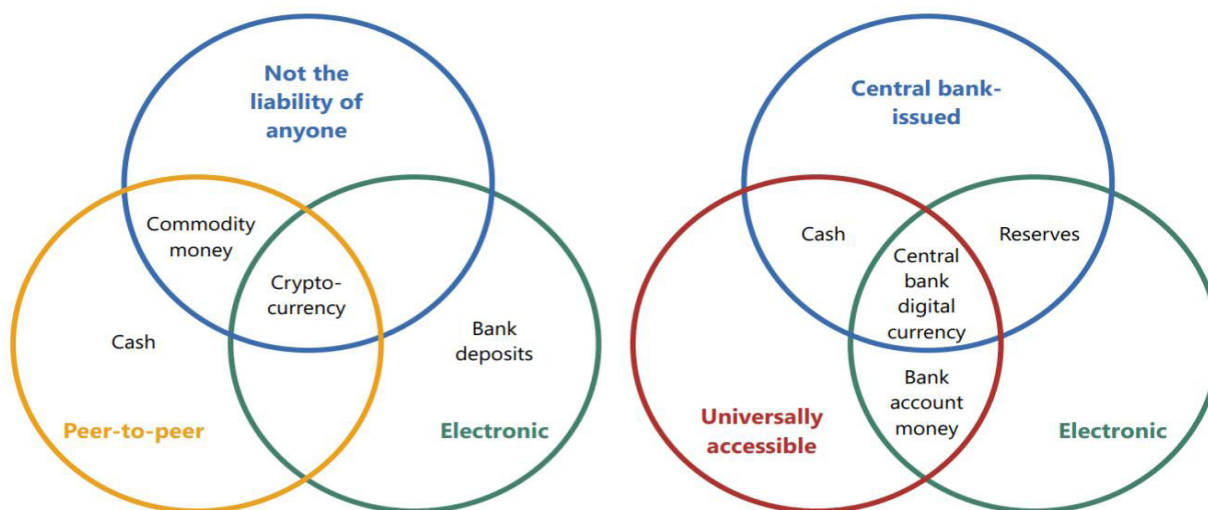

Figure 2. Two taxonomies of new forms of currency

This distinguishes CBCCs from other existing forms of electronic central bank money, such as reserves, which are exchanged in a centralised fashion across accounts at the central bank. Moreover, the taxonomy distinguishes between two possible forms of CBCC: a widely available, consumer-facing payment instrument targeted at retail transactions; and a restricted-access, digital settlement token for wholesale payment applications. As illustrated in the chart above, cryptocurrencies are not backed by a central issuer, as such, they are not the liability of any one party and operate based on a distributed ledger technology (see chart below).

Distributed ledger technology (DLT) refers to the protocols and supporting infrastructure that allow computers in different locations to propose and validate transactions and update records in a synchronised way across a network. The idea of a distributed ledger – a common record of activity that is shared across computers in different locations – is not new. Such ledgers are used by organisations (e.g. supermarket chains) that have branches or offices across a given country or across countries. However, in a traditional distributed database, a system administrator typically performs the key functions that are necessary to

maintain consistency across the multiple copies of the ledger. The simplest way to do this is for the system administrator to maintain a master copy of the ledger which is periodically updated and shared with all network participants (Bech and Garrat 2017).

By contrast, the new systems based on DLT, most notably Bitcoin and Ethereum, are designed to function without a trusted authority. Bitcoin maintains a distributed database in a decentralised way by using a consensus-based validation procedure and cryptographic signatures. In such systems, transactions are conducted in a peer-to-peer fashion and broadcast to the entire set of participants who work to validate them in batches known as "blocks". Since the ledger of activity is organised into separate but connected blocks, this type of DLT is often referred to as "blockchain technology".

The blockchain version of DLT has successfully powered Bitcoin for several years. However, the system is not without drawbacks: it is costly to operate (preventing double-spending without the use of a trusted authority requires transaction validators (miners) to employ large amounts of computing power to complete "proof-of-work" computations);

banks have generally chosen not to provide DCAs.

there is only probabilistic finality of settlement; and all transactions are public. These features are not suitable for many financial market applications. Current wholesale DLT payment applications have therefore abandoned the standard blockchain technology in favour of protocols that modify the consensus process in order to allow enhanced confidentiality and scalability. Examples of protocols currently being tested by central banks include Corda to the risk of bank failure.

and Hyperledger Fabric. Corda replaces blockchain with a "notary" architecture. The notary design utilises a trusted authority and allows consensus to be reached on an individual transaction basis, rather than in blocks, with limited information-sharing.

Furthermore, cryptocurrencies could enhance sanctions busting, which has outsized implications for the global world order. It can be seen a credible tool for money laundering across the globe. This holds grave implications for tax shifting, more so
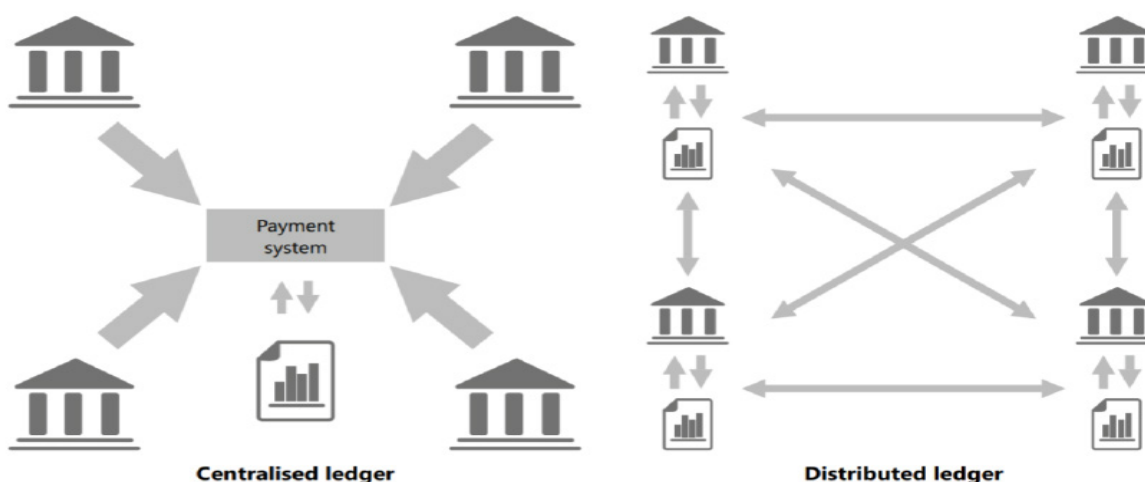

Figure 3. Distributed ledger system

Source: Santander InnoVentures [1](2015).

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1. See also Chapman et al (2017), CPMI (2015) and Benos et al (2017). The amount of energy currently being used by Bitcoin miners is equal to the energy consumption of Lebanon and Cuba (see http://digiconomist.net/bitcoin-energy-consumption). For a detailed description of proof-of-work, see https://en.bitcoin.it/wiki/Proof_of_work.

Admittedly, this prompted caution from the G20 and Kouam (2019), who illustrate the implications to financial stability and disintermediation in the financial system. It is important to note that cryptocurrencies do hold characteristics that are inconsistent with financial stability in the absence of intentional and targeted regulation. Bitcoin is an example of a non-central bank digital currency. It was invented by an unknown programmer who used the pseudonym Satoshi Nakamoto and was released as open-source software in 2009 along with a white paper describing the technical aspects of its design

(see Box A for further details).

3. What are the Risks Associated to Cryptocurrencies?

Legal Certainty and Sound Governance: One of the drawbacks of cryptocurrencies is the uncertainty surrounding claims amongst participants. The likes

of bitcoin and litecoin are not based on any asset or reserves at a central bank, which prevents the creators from incurring any loss and significantly exposes the users of said currencies. The absence of legal certainty over the convertibility of cryptocurrencies for cash or any other asset are symptomatic of a lack of governance that could prove futile over the long-run for developing economies that are already prone to capital outflows, courtesy of political uncertainty.

Money Laundering – Terrorist Activities and Illicit Activities: Cryptocurrencies operate via democratic consensus but distributed ledger technologies that prevent regulators from performing a vital function. This is particularly salient for law enforcement and counterterrorism activity that is salient for both advanced and developing market economies. Safety, Integrity and Efficiency of payment systems: Payment systems are a way for consumers and institutions to execute transaction across borders and within economies.

for developing economies that currently see over 2 billion in tax evasion.

The emergence of new cryptocurencies will create new forms of clearing that can compromise the legitimacy, not least efficiency, of such systems. The integrity of payment systems are central to democratic underpinnings of cash and the functioning of financial systems. New currencies that are disconnected from the financial system can create systemic risk and impose significant pressure on payment systems in the event of a run or a sudden loss of monetary value.

Cyber Security and Operational Resilience

Admittedly, the distributed ledger technology can be termed "highly secure" but by no means does this mean the technology underpinning cryptocurrencies is unassailable. However, its mode of operation is decentralised, reducing the probability of targeted attacks against a centralised server or location at any given time. Meanwhile, it should be noted that such operational risks are symptomatic of any digitized systems that rely on a complex network of electronic systems. It should, however, be noted that while credit card fraud can be mitigated by a range of novel tools such as multi-factor authentication, biometric log-in processes and geo-location instant messaging tools confirming the users' identity and passwords. This has been increasingly employed by banks across the globe in a bid to lessen cyber security risks and bolster resilience.

The cyber security risks of a cryptocurrency that relies on democratic consensus and a decentralised *mundus operandi* are evident, but these are much less prominent that traditional electronic transactions. However, bitcoin has been targeted by hackers on September 26th, confirmed by KuCoin Global CEO Johnny Lyu (Kucoin, 2020). The breach affected the Kukoin's Bitcoin (BTC), Ether (ETH), and ERC20 hot wallets, after private keys were leaked. Reports estimate the breach to have affected $150 million in user funds. This suggest the fallibility inherent in digital systems and the exposure as well as the transfer of risk to consumers cannot be understated.

Similarly, Sub-Saharan African countries such as Nigeria and Kenya have equally been prone to bank fraud, including but not limited to identity theft, beneficial owners, financial inclusion, discrimination and blacklisted consumers etc. Esoimeme (2015) finds that a Bank Verification Number (BVN) could bolster cyber resilience if properly implemented. While this does not eradicate the propensity for fraud, it bolsters cyber resilience across the system. Meanwhile, there are other issues that accrue to centralised information systems, the majority of whom will form the basis of electronic currencies and central bank issued digital currencies.

In Kenya, consumers challenged the legitimacy of its National Integrated Information Management System (NIIMS) as amended by the Statute Law Miscellaneous (Amendment Act) 2018. One of the petitioners' grounds of contention, which will form a central part of this discussion, was that there are no adequate and/or proper safeguards for protection of the data and/or personal information intended for collection under the NIIMS system, hence there is a violation and/or threat of violation of the right to privacy guaranteed under Article 31 of the Constitution (Kimani, 2019). If the distributed ledger technology fails to protect consumer data implicitly, such concerns are likely to emerge much more strongly for cryptocurrencies such as bitcoin, etherium and litecoin. There is ample space for regulator to begin designing legislation designed to protect consumer's interest if cryptocurrencies are to become operational in developing market economies.

Market Integrity and Bitcoin

Concerns regarding the integrity of cryptocurrency markets are a hurdle to mainstream and institutional adoption of digital assets, in addition to being a key concern for regulators. To improve market integrity and provide consumers the confidence they deserve, policy makers may need to enact legislation to support the orderly and secure functioning of crypto markets. Such legislation will comprise banking authorities such as COBAC for CEMAC member countries as well as domestic regulatory bodies that are designed to support market functioning and lessen the spillovers from cryptocurrnecies into the real economy. The amount of bitcoin that can be issued at any given time and there are no regulators or market makers to ensure smooth functioning of peer-to-peer exchanges.

Data Privacy and Portability: Privacy concerns are little associated with blockchain technology as unique identification numbers and a fool-proof system protects consumer data and users of its peer-to-peer lending. As outlined above, the distributed ledger technology is not unassailable as there have bitcoin has been subject to hacks. One of the features of peer-to-peer exchange facilitated by the distributed ledger technology is the feature of anonymity.

Unlike traditional modes of exchange such as cash or other electronic payments, cryptocurrencies promise anonymity, enabling their users to exercise their right to purchase without any legislative impediments from governments; the anonymity is symptomatic of cash but the risks inherent with digital forms of payment are consumers' data that are stored online. The information risks associated to cash are muted, but regulators must ensure that consumer data is protected in a rigorous manner.

Consumer and Investor Protection: there are no clear definition for investor and consumer protection as the distributed ledger technology does not provide any way to trade the founders of cryptocurrencies. Furthermore, cryptocurrencies operated via democratic consensus, which absolves anyone party of counterparty risks. For example, an event-triggered sell-off could have adverse implications for financial stability, but unlike the financial crisis where blame was attributed to banks; the value of the currency is contingent on demand and scarcity. It is, therefore, challenging to design legislation protecting investors over the longrun, but it is indispensable that regulators explicitly prohibit banks and financial institutions from using consumer deposits to invest in cryptocurrencies.

Tax Compliance: Tax evasion nd avoidance is endemic in developing market economies, due to an inability to coordinate global surveillance and the ability of multinationals to shift profits to tax havens. From the stand point of cryptocurrencies, they will provide a credible vehicle for global companies to evade taxes as retained earning can be otherwise termed investments that are subject to different tax regimes across different jurisdictions. According to the IMF, developing economies loose over 2trillion on average, which constrains government spending and exacerbates the impact of weaker external balances.

It is, therefore, imperative for policy makers to ensure that such cryptocurrencies are not used as a means to evade taxation that have grave socio-economic costs to nations, not least developing economies with structural economic imbalances facilitated by free trade policies that have not sufficiently accounted for tax loopholes.

Whilst such unfortunate economic effects are endemic in cryptocurrencies, it is important to consider the tax implications of cryptocurrencies prior to legislating their operation in developing market economies. The

economic fallout can be seen from two stand points;

1). The cost of hedging against macroeconomic risks such as inflation or risk-adjusted returns on developing economies can exacerbate liquidity and banking crisis. For example, if consumers seek to insulate their portfolios and investments from inflation, they can increasingly rotate their assets into cryptocurrencies, which can further reduce the value of the exchange rate and precipitate a currency crisis. This imposes a costs on the fiscal balances of developing economies, as their governments have to spend more to attenuate the costs of banking or currency crisis. Meanwhile, the cost of borrowing for banks and governments equally rise following periods of macroeconomic stress, more so as one in three countries are at risk of debt distress.

2). The second costs that accrue from non-compliance or tax evasion are lower government revenues. This particularly endemic of developing market economies, which are prone to tax evasion s domestic regulation is not sufficiently harmonised with global standards to prevent tax shifting across jurisdictions. This constrains spending on vital infrastructure such as roads, schools and energy that are necessary for economic development. More worrying is the fact that developing economies are commodity exporters, whose revenues are exposed to the global business cycle as well as economic activity prone to different tax countries. Tax avoidance and hedging impose grave costs on policy makers' ability to spend, thereby slowing economic development. The issue of tax compliance can, therefore, not be overstated.

Monetary and Financial - Hedging and Monetary Policy Transmission: Cryptocurrencies are a credible vehicle of investment for some, as they are a store of value in some regards and can be converted to cash based on the given amount of sellers at any one time. However, they impose grave cots to the financial system, not least financial stability, as individuals can use cryptocurrencies to hedge against inflation or other macroeconomic outcomes such as low growth or weaker returns on investments.

The disintermediation caused by cryptocurencies can enable investors to store their assets in cryptocurrencies and cause the currency to depreciate. A weaker currency not only causes prices to rise, it equally depresses economic growth (REF, REF and REF).

As such, the economy is prone to hedging and inflation overshoots if individuals park their assets

in cryptocurrencies. This obviously has implications for monetary policy, where by central banks will have to raise policy rates to keep a lid on inflation even as the economy slows. As a result, such pro-cyclical monetary policy outcomes could amplify the shock from uncontrolled investments in cryptocurrencis. Over time, the inverse relationship between the performance of cryptocurrencies and the exchange rate will induce pressures for monetary policy that will have to contend with episodes of financial instability and lower economic growth. More worrying are the transmission mechanisms from monetary policy that could assuaged by renewed investments in cryptocurrencies as the purchasing power of cash remains impeded by the uncertainty created by the linkage between cryptocurrencies and traditional exchange rates. Admittedly, limits could be set on the amount of deposits that can be credibly invested in cryptocurrencies and enhanced convertibility can result in greater financial stability over the longrun. However, such an outcome is only likely if crypto companies own deposits at the central bank to ensure convertibility.

The International Trading System: Capital flows form the backbone of the modern day economy, with liquidity and foreign direct investment necessary for the functioning of the modern day economy. Cryptocureencies will discourage investment in traditional assets that have a positive impact on the real economy via employment the employment channel and networks effects that eventually spillovers into the informal sector in developing market economies. Should cryptocurrencies become ubiquitous, it is not unlikely that huge swathes of capital will be transferred from traditional asset classes like stock, bonds, real estate and commodities to cryptomoney. This is even more likely as over 20% of global debt is negative yielding and investors will be looking for other means to generate higher returns. Not only are the development implications of cryptocurrencies dire, they can equally serve as an anchor for a new type of investment, which do not particularly related to the modern-day economy.

Fair Competition: Cross Border Effectiveness

The last decade has exposed the frailties and vulnerabilities of an increasingly interconnected and interlinked global economy, with centralised clearing and free-flowing capital across borders. It is important for cryptocurrencis to regulate sufficiently in advance, imposing restrictions on the amounts of deposits that can be used to invest in these assets, ensuring smooth market functioning and creating the right incentive for market participants and platform owners to effectively transact.

The rationale for forward-looking regulation and legislation is imminent, but this should champion fairness for a rudderless currency with significant domestic ramifications.

4. Recommendations

- Policy makers should ensure that a group of public sector staff are ware and knowledgeable about blockchain technogies. They should ensure that the security concerns that could arise as well as the financing issues and hedging that is implicit in bitcoin can be spotted. Admittedly, this can equally enable the formation of tech units that seek to better understand the distributed ledger technology and can implement this across other sectors such as manufacturing, retail and health care. A complete and up-to date understanding of block chain is indispensable to assuaging security concerns should they arise, whilst ensuring that consumer data and interactions are shielded from techbandits or other forms of assailants.

- Secondly, policy makers should discourage hedging by ensuring that any electronic currencies hold large liquid deposits at a central bank to ensure convertibility. This will reduce sudden spikes in the value of the currency as investors or citizens seek to flee episodes of risk such as a sudden plunge in the value of the currency caused by an exogenous or endogenous shock such as COVID-19. This will equally lessen financial stability risks as commercial banks will be sufficiently liquid to and improve the transmission mechanism from monetary policy. Liquid deposits will improve financial stability; not least guarantee it over the long run.

- An effective tax mechanism should be set to ensure that cryptocurrencies are contributing to the societies were each trade occurs. For example, policy makers could design a tax based on each trade and a certain sum to reflect the creation of economic activity on the financial side of the economy; the proceeds from such taxes can be used, explicitly, to up skill and digitize the workforce. An example includes the creation of job transition.

5. Conclusion

cryptocurrencies as an electronic form of central

bank money that can be exchanged in a decentralised manner known as peer-to-peer, meaning that transactions occur directly between the payer and the payee without the need for a central intermediary[3]. Unlike cash issued by the central bank, Bitcoin is supported by the distributed ledger technology that serves as a medium of exchange between its users. The currency is driven by technological advances and has come to firm a credible mode of exchange for market participants across advanced, emerging and developing market economies.

This paper finds that Bitcoin does not possess unique characteristics that can enable it function as money. While it operates via democratic consensus, supported by the distributed ledger technology (DLT), its ability to replace cash is very unlikely. However, it can credibly serve as a medium of exchange and enables consumption and non-monitored economic activity that are inherently absent from traditional forms of payment such as notes and coins. Even as cash can be used to in the absence of a digital trail, bitcoin serves as an anchor for the digital age, characterised by online payments and a electronic forms of engagement.

This finds that Bitcoin is a salient form of investment, albeit speculative and prone to wild Swings (See Fig. 1). There are a number of issues spanning governance, money laundering, tax evasion and data privacy that suggest a more cautious approach to adopting it across the countries. This is, particularly, the case for developing market economies that do not have sufficiently advanced data regulation. The paper advocates cautious optimism and mechanisms to prevent speculative behaviour on the part of banks and private investors to prevent a proliferation of financial stability risks. They should equally place limits on the amount of savings and deposits that can be invested in Bitcoin, if at all. Finally, credible monitoring mechanisms should be designed by law makers to understand block chain technology and reduce the probability of data breaches. These recommendations, amongst others should equally be accompanied by effective tax legislation that reflects

21st century needs of domestic economies; this is particularly salient for developing economies that are prone to tax evasion and global tax haemorrhaging.

This article posits the challenges associated with cryopto-currncies in the context of developing, emerging and advanced economies. While its does not explicitly advocate the ban of cryptocurrencies, their functioning in economy should be accompanied by a set of measures that address data, privacy, security, economic and financial issues.

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