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The Theory of Money, Wealth and Efficient Currency Markets : Modeling M5 as Money Supply with Crypto-Currency[1]

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Abstract

The paper proposes setting up of M5 as Money Supply with Crypto-Currency along the lines of inclusion of other currency products developed in the last 50 years in order to promote efficiency in the money markets, transactional efficiency and generating wealth along with positive contributions to GDP and people at large. The paper also considers that Money as a valuable Resource and a Wealth of the Nation, having potential to generate/mobilize more wealth. The paper proposes that given the emergence of digital modes of money transactions, there is an urgent need for creation of legitimate Crypto-Currencies by National Governments to induce confidence and laissez faire through transactional efficiency in money market. Government Intervention (or Central Banks) to generate the Crypto-Currency is the need of the hour and critical for tomorrow's normal economic and business conditions in the economy when businesses and labour market source are global and looking for currency efficient sources.

I. Introduction

THE PAPER CRITICALLY evaluates various theories on Money and how/why M5 as a Money Supply indicator is needed for inducing Crypto-Currency in the basket of Currencies by Central Banks worldwide (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d). The paper proposes setting up of M5 as Money Supply with Crypto-Currency along the lines of inclusion of other currency products developed in the last 50 years in order to promote efficiency in the money markets, transactional efficiency and generating wealth along

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with positive contributions to GDP and people at large. The paper also considers that Money as a valuable Resource and a Wealth of the Nation, having potential to generate/mobilize more wealth. The paper proposes that given the emergence of digital modes of money transactions, there is an urgent need for creation of legitimate Crypto-Currencies by National Governments to induce confidence and laissez faire through transactional efficiency in money market. Government Intervention (or Central Banks) to generate the Crypto-Currency is the need of the hour and critical for tomorrow's normal economic and business conditions in the economy when businesses and labour market source are global and looking for currency efficient sources.

The proposed Model of creating efficient Money Market through modeling of M5 will facilitate an automatic way for transactional efficiency, generating wealth for the Nations, Firms and people-at-large, through easy access to currency and opportunities for jobs and growth (Agarwal, Agarwal and Agarwal, 2018). It would also help save currency costs in a Market Driven Economic System with Asymmetric Information (Agarwal, Penm, Wong and Martin, 2004; Agarwal, Penm and Agarwal, 2006). The "New Avtar" of Money in the form of Crypto would witness the change the way money (currency) has looked traditionally for centuries in the form of gold, silver, leather, wood, metal, paper, plastic, stone (Furness, 1910) and many others to a faceless virtual fully fractional form, but only when launched by Nations (via their Central Banks).

Given the emergence of Crypto-products in the informal sector with multiple players, it has become difficult for National Governments to regulate and calibrate the supply of money and its effects through Monetary Stabilization measures adopted by them, as these crypto-products allow billions/trillions of money be transacted globally without any checks and balances. More than the benefits, these products are emerging as threat to National Security; Individual's Wealth and Nations apart from the ills any speculative product brings with it to meet the needs of Greed of a specific group of people and rouge identities. Hence, the need for governments to act fast and consider to induce this financial innovation (crypto-currencies) as a currency of tomorrow into its basket of currencies, as done with various other monetary products in the last six decades.

II. Economics of Currency (Money)

Money (Currency) is a Medium of Exchange. It has emerged for ages to be a Unit of Accounts and Store of Value. Money's different functions are associated with different measures of the Money Supply. Till dates, the economists / market operators (including central bankers) have been unable to define the "correct" measure of the Money Supply. Hence we see several measures. These are classified along a spectrum or continuum between narrow and broad *monetary aggregates*. Narrow measures include only the most liquid assets, the ones most easily used to spend (currency, checkable deposits). Broader measures add less liquid types of assets (certificates of deposit, etc.). With the emergence of Crypto-Currency, it is expected that Money Supply will move into a "New Avtar" where we would witness the change the way money (currency) has looked traditionally for centuries in the form of gold, silver, leather, wood, metal, paper, plastic, stone (Furness, 1910) and many others to a faceless virtual fully fractional form.

Currency (Money) is a portion of the national money supply, consisting of bank notes and government-issued paper money and coins, which do not require endorsement in serving as a medium of exchange. Traditionally amongst less developed societies, currency encompasses a wide diversity of items (e.g., livestock, stone carvings, tobacco) used as exchange media as well as signs of value or wealth. In the developed nations, where checks drawn on demand deposits are an important means of transaction, currency may actually account for only a small portion of the total money supply in the system (Britannica, 2017).

This continuum corresponds to the way that different types of money are more or less controlled by monetary policy with narrow money measure include those more directly affected and controlled by monetary policy, whereas broader money measure are less closely related to monetary-policy actions (Wikipedia, 2017). It is a matter of perennial debate as to whether narrower or broader versions of the money supply have a more predictable link to the Nominal GDP. The different types of money are typically classified as "**M**"s. The "M"s usually range from M0 (narrowest) to M3 (broadest) but which "M"s are actually focused on in policy formulation depends on the country's central bank. Some of the more commonly used and well established M's representing different forms of Money Supply by Central Banks are M0; MB; M1; M2; M3; M4; MZM. The typical layout for each of the "M"s is as follows

Type of money	**M0**	**MB**	**M1**	**M2**	**M3**	**M4**	**MZM**	**M5**
Notes and Coins in Circulation (outside Central Banks & Vaults of Depository institutions) *(Currency)*	✓	✓	✓	✓	✓	✓	✓	✓
Notes and Coins in Bank Vaults *(Vault Cash)*		✓						
Central Bank Credit (Required reserve and Excess Reserve not physically present in Banks)		✓						
Traveler's Checks of Non-Bank issuers			✓	✓	✓	✓	✓	✓
Demand Deposits			✓	✓	✓	✓	✓	✓
Other Checkable Deposits (OCDs)(i.e. Negotiable Order of Withdrawal (NOW) accounts at Depository Institutions and Credit Union share draft accounts)			✓	✓	✓	✓	✓	✓
Savings Deposits				✓	✓	✓	✓	✓
Time Deposits and Money Market Deposit Accounts for individuals				✓	✓			
Large Time deposits, Institutional Money Market funds, Short-Term Repurchase and other Larger Liquid Assets					✓			
All money market funds						✓	✓	✓
Crypto Currency(Only when launched by a Central Bank)								✓

Over Periods, measures of the money supply have exhibited fairly close relationships with important economic variables such as nominal gross domestic product (GDP) and the price level. Based partly on these relationships, Milton Friedman and many others have argued that the money supply provides important information about the near-term course for the economy and determines the level of prices and inflation in the long run. Central banks, including the RBI, FRB, ECB and others have at times used measures of the money supply as an important guide in the conduct of monetary policy. Over recent decades, however, the relationships between various measures of the money supply and variables such as GDP growth and inflation have been quite unstable. This has been primarily due to the free flow of currency across borders with online means of movements of funds/savings. As a result, the importance of the money supply as a guide for the conduct of monetary policy has been reduced over time. The introduction of Crypto-Currency would make it completely out of place unless the Crypto-Currency is made part of the family at the earliest through introduction of M5 as a measure of Money Supply (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

The New Money Supply Measure as M5 is

M5 = M3 + Crypto Currency*

where, * proposed in our work to be launched by Central Bank

The good part of the money supply data is that it is recorded and published, usually by the Government or the Central Banks of the Country. Public and Private sector analysts have long monitored changes in the money supply because of the belief that it affects the price levels, inflation, exchange rate and business cycles in an economy. The relation between money and prices has been historically associated with the quantity theory of money and expectations built there upon. There has been strong empirical evidence of a direct relation between money-supply growth and long-term price inflation, at least for rapid increases in the amount of money in the economy. If we take the example of Zimbabwe which saw extremely rapid increases in its money supply also saw extremely rapid increases in prices (hyper-inflation). This is why almost all central banks keep money supply as a key critical factor for means of controlling inflation and ultimately plan equitable stable economic growth / development. Given the emergence of Crypto products in the informal sector with multiple players, it has become difficult for National Governments to regulate and calibrate the supply of money and its effects through Monetary Stabilization measures adopted by them, as these crypto products allow billions/trillions of money be transacted globally without any checks and balances. More than the benefits, these products are emerging as threat to National Security and Nations apart from the ills any speculative product brings with it to meet the needs of Greed of a specific group of people and rouge identities. Hence, the need for governments to act fast and consider to induce this financial innovation (crypto-currencies) as a currency of tomorrow into its basket of currencies, as done with various other products in the last 6 decades.

Though some heterodox economists argue that the money supply is endogenous which is determined by the workings of the economy and not by the central bank. Hence the sources of inflation must be found in the distributional structure of the economy (Wikipedi, 2017). In addition, they feel that the central bank's control over the money supply is feeble and that there is weak link between the growth of the money supply and the inflation rate. First, in the aftermath of a recession, when many resources are underutilized, an increase in the money supply can cause a sustained increase in real production instead of inflation. Second, if the velocity of money (i.e. the ratio between nominal GDP and money supply) changes, an increase in the money supply could have either no effect, an exaggerated effect, or an unpredictable effect on the growth of nominal GDP. This further enforces the very existence and need for Central Banks to consider inducing M5 and Crypto-Currencies to induce efficiency in money markets eradicating the ills the variants of crypto products in the informal segment have already spread.

Common sense tells us that a Central bank creating new money out of thin air depreciates the value of each Unit (Rupee/Dollar/Euro) in circulation. However the modern Monetary Theory disagrees, as it believes that money creation in a free-floating "fiat currency" regime such as the one seen in USA which will not lead to significant inflation unless the economy is approaching full employment and full capacity, given that the currency floating outside the central banking regulatory regime is large than the one inside. This scenario was restricted to a few economies for now, however with virtual currencies in place, it would be a natural outfall given source of income and wealth today stands to be across globe moving on with the wave of globalization, liberalization and lowering of tariff barriers (via FTAs; WTO structures and trade blocks). Today we live in a global village which is on a lookout for its own new efficient currency and money markets. It is now for Nation's to decide to allow free play creating mess with irreparable damage to social and economic fabric or to embrace the financially engineered crypto-currency as the currency of tomorrow within its framework benefiting all by launching National Crypto-Currencies and M5 (as money supply measure) (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

Currently we find that the Money Multiplier is the ratio between M1/MB or M2/M1 or M2/M0 (see Section III). However it is expected to shift change to M5/M1 or M5/M2, given the way crypto-currency are expected to move into the economics of currency.

2.1 *The Quantitative Theory of Money*

The quantity theory descends from Nicolaus Copernicus (1517), Martín de Azpilicueta, Jean Bodin (1568), Henry Thornton (Hetzel, 1987) and various others who noted the increase in prices following the import of gold and silver, used in the coinage of money, from the New World. The "equation of exchange" relating the supply of money to the value of money transactions was stated by John Stuart Mill (1848) who expanded on the ideas of David

Hume (1748). The quantity theory was developed by Simon Newcomb (1885), Alfred de Foville (1907), Irving Fisher (1911) and Ludwig von Mises in the late 19th and early 20th century.

Henry Thornton introduced the idea of a central bank after the financial panic of 1793, although, the concept of a modern central bank wasn't given much importance until Keynes published "*A Tract on Monetary Reform*" in 1923. In 1802, Thornton published "*An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*" in which he gave an account of his theory regarding the central bank's ability to control price level. According to his theory, the central bank could control the currency in circulation through book keeping. This control could allow the central bank to gain a command of the money supply of the country. This ultimately would lead to the central bank's ability to control the price level. His introduction of the central bank's ability to influence the price level was a major contribution to the development of the quantity theory of money (Hetzel, 1987).

Karl Marx modified it by arguing that the Labor Theory of Value requires that prices, under equilibrium conditions, are determined by socially necessary labor time needed to produce the commodity and that quantity of money was a function of the quantity of commodities, the prices of commodities, and the velocity (Agarwal, 2008; Agarwal, Agarwal, Agarwal, Agarwal, 2017b). Marx did not reject the basic concept of the Quantity Theory of Money, but rejected the notion that each of the four elements were equal, and instead argued that the quantity of commodities and the price of commodities are the determinative elements and that the volume of money follows from them. He argued that the law, that the quantity of the circulating medium is determined by the sum of the prices of the commodities circulating, and the average velocity of currency may also be stated as follows : *given the sum of the values of commodities, and the average rapidity of their metamorphoses, the quantity of precious metal current as money depends on the value of that precious metal*. The erroneous opinion that it is, on the contrary, prices that are determined by the quantity of the circulating medium, and that the latter depends on the quantity of the precious metals in a country; this opinion was based by those who first held it, on the hypothesis that commodities are without a price, and money without a value, when they first enter into circulation, and that, once in the circulation, an aliquot part of the medley of commodities is exchanged for an aliquot part of the heap of precious metals.

John Maynard Keynes, like Marx, accepted the theory in general and wrote this Theory as fundamental. Its correspondence with fact is not open to question. Also like Marx he believed that the theory was misrepresented. Where Marx argues that the amount of money in circulation is determined by the quantity of goods times the prices of goods, Keynes argued the amount of money was determined by the purchasing power or aggregate demand. He wrote "*Thus the number of notes which the public ordinarily have on hand is determined by the purchasing power which it suits them to hold or to carry about, and by nothing else*".

In the Tract on Monetary Reform (1924), Keynes developed his own quantity equation

$$n = p(k + rk')$$

where n is the number of "currency notes or other forms of cash in circulation with the public"
p is "the index number of the cost of living", and
r is "the proportion of the bank's potential liabilities (k') held in the form of cash".

Keynes also assumes "*...the public, (k') including the business world, finds it convenient to keep the equivalent of k consumption in cash and of a further available k' at their banks against cheques……*" So long as k, k', and r do not change, changes in n cause proportional changes in p. Keynes however notes.....that the error often made by careless adherents of the Quantity Theory, which may partly explain why it is not universally accepted is as follows. The Theory has often been expounded on the further assumption that a mere change in the quantity of the currency cannot affect k, r, and k', – that is to say, in mathematical parlance, that n is an independent variable in relation to these quantities. It would follow from this that an arbitrary doubling of n, since this in itself is assumed not to affect k, r, and k', must have the effect of raising p to double what it would have been otherwise. The Quantity Theory is often stated in this, or a similar, form.

Now "in the long run" this is probably true. If, after the American Civil War, that US Dollar had been stabilized and defined by law at 10 per cent below its present value, it would be safe to assume that n and p would now be just 10% greater than they actually are and that the present values of k, r, and k' would be entirely unaffected. But this long run is a mis-leading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is long past the ocean will be flat again.

In actual scenario experience, a change in n is liable to have a reaction both on k and k' and on r. It will be enough to give a few typical instances. Before the war (and indeed since) there was a considerable element of what was conventional and arbitrary in the reserve policy of the banks, but especially in the policy of the National Central Banks towards their reserves in Gold. These reserves were kept for show rather than for use, and their amount was not the result of close reasoning. There was a decided tendency on the part of these banks between 1900 and 1914 to bottle up gold when it flowed towards them and to part with them reluctantly when the tide was flowing the other way. Consequently, when gold became relatively abundant they tended to hoard what came their way and to raise the proportion of the reserves, with the result that the increased output of South African gold was absorbed with less effect on the price level than would have been the case if an increase of n had been totally without reaction on the value of r. Thus in these and other ways the terms of our equation tend in their movements to favor the stability of p, and there is a certain friction which prevents a

moderate change in *v* from exercising its full proportionate effect on *p*. On the other hand, a large change in *n*, which rubs away the initial frictions, and especially a change in *n* due to causes which set up a general expectation of a further change in the same direction, may produce a more than proportionate effect on *p*.

Keynes thus accepts the Quantity Theory as accurate over the long-term but not over the short term. Keynes remarks that contrary to contemporaneous thinking, velocity and output were not stable but highly variable and as such, the quantity of money was of little importance in driving prices (Friedman, 1970). The theory was influentially restated by Milton Friedman in response to the work of John Maynard Keynes and Keynesianism (Friedman, 1956). Friedman understood that Keynes was like Friedman, a "quantity theorist" and that Keynes Revolution "*was from, as it were, within the governing body*", i.e. consistent with previous Quantity Theory (Friedman, 1970). Friedman notes the similarities between his views and those of Keynes when he wrote that "*A counter-revolution, whether in politics or in science, never restores the initial situation. It always produces a situation that has some similarity to the initial one but is also strongly influenced by the intervening revolution. That is certainly true of monetarism which has benefited much from Keynes's work. Indeed I may say, as have so many others since there is no way of contradicting it, that if Keynes were alive today he would, no doubt, be at the forefront of the counter-revolution*". Friedman also notes that Keynes shifted the focus away from the quantity of money (Fisher's *M* and Keynes' *n*) and put the focus on price and output. Friedman writes "*What matters, said Keynes, is not the quantity of money. What matters is the part of total spending which is independent of current income, what has come to be called autonomous spending and to be identified in practice largely with investment by business and expenditures by government*". This is where the strong presence of variants of crypto-currencies defying all fundamentals of an asset class have come into emergence in the form of Bitcoins (and others) globally in the last few years influencing spending patterns beyond controls of any Nation / Central Bank.

The Monetarist counter-position was that contrary to Keynes, velocity was not a passive function of the quantity of money but it can be an independent variable. Friedman wrote "*Perhaps the simplest way for me to suggest why this was relevant is to recall that an essential element of the Keynesian doctrine was the passivity of velocity. If money rose, velocity would decline. Empirically, however, it turns out that the movements of velocity tend to reinforce those of money instead of to offset them. When the quantity of money declined, by a third from 1929 to 1933 in the United States, velocity declined also. When the quantity of money rises rapidly in almost any country, velocity also rises rapidly. Far from velocity offsetting the movements of the quantity of money, it reinforces them*". These trends are re-enforcing in current times, which demand a corrective action by Central Banks and National Economies to protect the sovereignty of currencies and re-adjust with the dynamic evolution of economics of currencies.

Thus while Marx, Keynes, and Friedman all accepted the Quantity Theory, they each placed different emphasis as to which variable was the driver in changing prices. Marx emphasized production, Keynes income and demand, and Friedman the quantity of money. Academic discussion remains over the degree to which different figures developed the theory (Volckart, 1997). Bieda (1973) further argues that Copernicus's observation on Money can lose its value through excessive abundance, if so much silver is coined as to heighten people's demand for silver bullion. For in this way, the coinage's estimation vanishes when it cannot buy as much silver as the money itself contains. The solution is to mint no more coinage until it recovers its par value (Friedman, 1970) amounts to a statement of the theory (Bieda, 1973), while other economic historians date the discovery later, to figures such as Jean Bodin, David Hume, and John Stuart Mill (Volckart, 1997; Wennerlind, 2005).

The quantity theory of money preserved its importance even in the decades after Friedmanian monetarism had occurred. In new classical macroeconomics that the quantity theory of money is still a doctrine of fundamental importance, but Robert E. Lucas and other leading new classicals made serious efforts to specify and refine its theoretical meaning. For new classicals, following David Hume's famous essay "Of Money", money was not neutral in the short-run, so the quantity theory was assumed to hold only in the long-run. These theoretical considerations involved serious changes as to the scope of countercyclical economic policy (Galbacs, 2015). Historically, the main rival of the quantity theory was the real bills doctrine, which says that the issue of money does not raise prices, as long as the new money is issued in exchange for assets of sufficient value (Roy, 1987). Taking form Roy and others it is clearly event that the value of money/currency is inherently locked with the assets of the nation (privately/publicly held). Hence the Crypto-Currency which is to be launched by Central Banks as Money (M) has to be locked against National Assets (private / publically held) generating its intrinsic value to qualify as a tenable asset class crypto-product/currency (see Section 4.1) (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

III. Money supply

The *money supply* (or *money stock*) is the total amount of assets available in an Economy at a specific time. There are several ways to define "money", but standard measures usually include currency in circulation and deposits. The money supply also commonly defined to be a group of safe assets that households and businesses can use to make payments or to hold as short-term investments (Agarwal, 1988; Agarwal, Agarwal and Agarwal, 2016, 2017; Agarwal and Agarwal, 2017). For example, the currency and balances held in current (checking) accounts and savings accounts are included in many measures of the money supply. There are several standard measures of the money supply, including the monetary base, M1 (commonly known as narrow money), and M2. The monetary base is defined as the sum of currency in circulation and reserve balances (deposits held by banks and other depository institutions in their accounts at the Central Banks).

The Global View (based on over 10 Central Banks) defining monetary aggregates are as follows:

M0: Total of all Physical Currency (including coinage).

M0 = Central Bank Currency Notes + Government Notes + Coins.

It is not relevant whether the currency is held inside or outside of the banking system as reserves. This includes bank reserves

Referred as the Monetary base, or Narrow money

MB: Total of all Physical Currency (M0) + Central Bank Deposits (special deposits that only Banks can have at the Central Bank).

Referred as Monetary Base (or total currency)

This is base from which other forms of money (like checking deposits and others listed below) are created. It is one of the most liquid measure of money supply.

M1: M0 + Demand Deposits + Traveller Checks + Other Checkable Deposits

Bank reserves are not included in M1.

M1 is defined as the sum of currency held by the public and transaction deposits at depository institutions (which are financial institutions that obtain their funds mainly through deposits from the public, such as commercial banks, savings and loan associations, savings banks and cooperative / credit unions)

M2: M1 + Savings Accounts + Money Market Accounts + Retail Money Market Mutual Funds + Small Denomination Term Deposits

Represents M1 and "close substitutes" for M2.

M2 is defined as M1 plus savings deposits, small-denomination time deposits and retail money market mutual fund shares.

M3: M2 + Large & Long Term deposits + Institutional Money Market Mutual Fund Balances (in some cases Repurchase Agreements and Debt Securities as with Central Bank)

Referred to as Broad Money

MZM: Money with zero maturity.

It measures the supply of financial assets redeemable at par on demand. The velocity of MZM is considered to be a relatively better predictor of inflation.

M4: M3 + Commercial Paper + Treasury Bills

The Reserve Bank of India (Central Bank) defines the monetary aggregates as:

M0: Currency in Circulation + Bankers' deposits with the RBI + 'Other' deposits with the RBI = Net RBI credit to the Government + RBI credit to the commercial sector + RBI's claims on banks + RBI's net foreign assets + Government's currency liabilities to the public – RBI's net non-monetary liabilities.

Referred as Reserve Money.

M0 outstanding was [1] 14.75 trillion in August 2017.

M1: Currency with the Public + Deposit Money of the public (Demand deposits with the Banking system + 'Other' deposits with the RBI).

M1 was 184 % of M0 in August 2017.

M2: M1 + Savings deposits with Post office Savings Banks.

M2 was 879 % of M0 in August 2017.

M3: M1+ Time deposits with the banking system = Net bank credit to the Government + Bank credit to the commercial sector + Net foreign exchange assets of the banking sector + Government's currency liabilities to the public – Net non-monetary liabilities of the banking sector (Other than Time Deposits).

(Broad concept of money supply)

M3 was 880 per cent of M0 in August 2017.

M4: M3 + All deposits with Post Office Savings Banks (excluding National Savings Certificates)

The Section IV outlines as to why Crypto-Currencies are the future currency, however ONLY and ONLY when introduced by Central Banks all over the world in their own denominated Currency Tags backed by National Assets as done for all Real Currencies today. These will replace part of the Real Currency and may be all in due course bring in desired currency efficiency within the regulated framework. Hence the need for Central Bank denominated Crypto Currencies for being part of Money Supply for an appropriate money supply system in the virtual currency reign as M5 (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

M5: M3 + Crypto Currency (*proposed to be launched by Central Bank*)

IV. Virtual Community; Virtual Products(VPs) and Virtual Currency (VCs): Emergence of Bitcoins as mode for Illicit (Hawala) Transactional ***(as Bitcoins defy all principals for being recognized as a Virtual Currency or a tenable asset class* (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d)*)***

The increased use of internet and advancement in technology has given rise to the Virtual Communities. A virtual community is to be understood as a place within cyberspace where individuals interact and follow mutual

interests or goals. Social networking is probably the most omnipresent type of virtual community (e.g. Facebook, MySpace, Twitter, Linkedin and others). There are other prominent knowledge sharing communities like (e.g. Wikipedia).These communities create a virtual world (e.g. Second Life) including those that aim to create an online environment for gambling (e.g. Online Vegas Casino). Sometimes these communities have created and circulated their own currencies for exchanging goods and services. The currency is acceptable within that specific community as a medium of exchange, unit of account and store of value. These today offer alternative modes of payment acceptable in the virtual community.

A virtual products (VPs) as on date can be defined as a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community (ECB, 2012)[1]. Virtual Products (VPs) refers to any type of digital unit that is used as a medium of exchange or a form of digitally stored value created by agreement within the community of VP users. VPs are not issued nor guaranteed by any jurisdiction and do not have legal tender status. VPs shall be broadly construed to include digital units of exchange that (a) has a centralized repository or administrator; (b) has decentralized distribution network; or (c) Can be created or obtained by computing or manufacturing efforts Only when introduced by a Central Bank (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

The Virtual Product Schemes as classified based on their interaction with the real money (ECB, 2012; EBA, 2014) as

i. *Closed Virtual Product Schemes basically used in Online Gaming*
ii. *Virtual Product Scheme with Unidirectional Flows*[2]
iii. *Virtual Product Scheme with Bidirectional Flows*[3]

The Virtual Product (so called Virtual Currencies) Schemes differ from Electronic Money Schemes (ECB, 2012; EBA, 2014; Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d) as

i. Virtual Products (VPs) do NOT have physical counterparts with legal tender status.
ii. Virtual Products do NOT have Legal Sanctity, given that they are NOT launched by Central Banks.
iii. Virtual Products Scheme currently floated under the Bitcoins structure DEFY all principals for being a tenable asset class (see Section 4.1).
iv. Traditional Financial actors like the central banks are NOT involved in issuing virtual currencies but they are issued by virtual communities which are often non-financial private companies. Hence financial sector regulations and supervisions do not guide the flow of virtual currencies.
v. Exchange of real currency and virtual currency is NOT regulated by any law
vi. The supply of the virtual products currently are governed by issuer which do NOT have a Legal standing

	Electronic money schemes	Virtual Currency Schemes
Money Format	Digital	Digital
Unit of account	Traditional Currency (Euro, US Dollars, pounds, etc) with legal tender status	Invesnted Currency (Linden Dollars, Bitcoins etc.) without legal tender status
Acceptance	By undertakings othar than the issuer	Usually within a specific virtual community
Legal status	Regulated	Unregulated
Issuer	Legally established electronic money institution	Non-financial private company
Supply of Money	Fixed	Not Guaranteed
Possibility of redeeming funds	Guaranteed (ant at par value)	Not guaranteed
Supervisision	Yes	No
Type(s) of Risk	Manily Operational	Legal, credit, liquidity and operational

Note : Virtual Currency Schemes = Virtual Product Schemes
Source : ECB

Figure 1
Difference between Electronic Money Schemes and Virtual Currency Schemes (ECB, 2012)

In assessment of Virtual Product / Currency Schemes it is believed that they presently

i. will lead to Asset bubbles or Price instability due their being a flawed Asset Class product (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).
ii. they have limited interaction with the real world currencies and their ability to purchase real good and services, they can cause instability in global financial markets given their emergence as *Hawala* and medium of transaction for illicit activities (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; Goldberg, 2017; HT, 2018;).
iii. they are inherently unstable and volatile; hence attract speculators to make financial gains. However, since they have not been legally accepted as a tender by financial actors, they are unlikely to de-stablise National Economies (Bloomberg-ET, 2018b).
iv. the countries, government and central banks are keeping a close watch on these virtual products (so called virtual currencies) and are initiating action to protect the gullible investors from burning their hands. Many countries have also declared these VPs or VCs as a Non-Legal Tender (product).
v. are not supervised or overseen by any public authority globally or nationally. The ability of these currencies to purchase virtual and sometimes real currencies exposes users to credit, liquidity, operational and legal risks (Agarwal, 2017ab; Bloomberg, 2017c; Archana, 2018).

vi. the anonymity of issuers and transfers make them attractive for criminals, fraudsters and money launderers to perform illegal activities (Agarwal and Agarwal, 2004, 2006; Bloomberg-ET, 2018a; Reuters, 2018b).
vii. many regulatory bodies believe that the circulation of these currencies create parallel payment gateways which either need to be regulated or made illegal to protect the Sovereign currencies and legalized business environment (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; Pillai, 2018b).

Transaction in the Virtual Economy System basically settle two components with regards to payment systems (a) Delivery of Virtual or Real goods and services and (b) Transfer of Funds. Hence the payment system of the VPs works similar to the Real currencies except for the fact that financial intermediaries are not involved. The process involves

i. authorisation and submission of a payment instrument
ii. processing and clearing involves a payment instruction exchanged between the creditor and debtor
iii. debits and credits are settled in the user's account

4.1 *Crypto-Currency as a Tenable Asset Class*

An asset is anything of value that can be converted into cash or equivalence in trade backed by a depository securing the value. Assets are owned by individuals, businesses and governments and can be in any shape or form, whether tangible or intangible. Examples being Cash and cash equivalents (certificates of deposit, checking and savings accounts, money market accounts, physical cash, Treasury bills); Real Property (land, building, machinery, goodwill and any structure that is attached to it); Personal property (anything/everything that one own that is not real property such as boats, collectibles, household furnishings, jewelry, vehicles, even one's life (as labour hours Agarwal, Agarwal, Agarwal, Agarwal, 2017b); Investments (annuities, bonds, cash value of life insurance policies, mutual funds, pensions, retirement plans stocks and other investments) (Agarwal, 1969, 1988; Agarwal, 1988; Agarwal, Iyer and Yadav, 2012). Assets are often grouped into a few broad categories: (a) liquid assets and illiquid assets from finance perspective; (b) as tangible assets and in-tangible assets (virtual) from accounting perspective; (c) real assets and virtual assets from derivative perspective of underlying variable and others (Agarwal, Agarwal and Agarwal, 2017). Your net worth is calculated by subtracting your liabilities from your assets. Essentially, your assets are everything you own, and your liabilities are everything you owe. A positive net worth indicates that your assets are greater than your liabilities; a negative net worth signifies that your liabilities exceed your assets. Most financial products existing in the markets today (including money market) are based on these three broad categories identifying asset class (Agarwal and Agarwal, 2007).

Now when we talk of Currency, how do we go about generating the value a currency possesses and how do we know a single bill [Rs (INR); US$; Euro; or any other] is really worth. Is it just because the government says so or some

exchange lists it so. NO, any currency is worth its projected value only as long as the government is willing, and able to defend its value. The value of a currency is traditionally decided by the size of the economy or the consolidated assets of the said country (in public or private domain) (Furness, 1910; Fisher, 1911; Green, 1987; Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d). In-accordance the amount to circulate is channeled by the central bank in order to ensure stable growth, trade and financial discipline. This is done by most central Banks by managing the Money Supply [M0; MB; M1; M2; M3; M4; MZM; M5 (*when proposed crypto-currency is introduced by Central Bank Only as Central Bank Digital Currency (CBDC)*) and a few others] (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d). Basically, currency value fluctuates relative to the size of the economy, and the supply and demand of currency is dependent on which direction the economy is taking. We are able to get a market perspective on this from the foreign exchange market. Exchange rates fluctuate every second because market participants expect a different value for currency A relative to another currency B. For example, the GDP of India for the year 2017-18 is equivalent to US$ 2.53 trillion, and if the India's economy is expected to grow relative to the world economy (Agarwal, Agawral and Agarwal, 2018), INR (Rs) will appreciate relative to major tradable currencies, given the supply of INR (Rs) stays the same and it remains to be a floating currency (or managed float as in most developed economies like, India, USA, UK, Japan, Europe (EURO) and others).

There is a clear evidence that a Currency as an Asset class is only tenable when an economy's assets (privately held or by public) are there to back the valuation (Agarwal, 2004b; ET, 2018). In recent case of Greece, when the currency was not holding value as there was extensive debt burden, the only way Greece could resolve the situation was by sale of its national assets (both in public and private domain). However Greece adopted an intermediate step of converting deposits (debt from depositors) into equity/convertible debt to resolve the currency crunch created due to extensive devaluation and global default on debt payments. This is where the Virtual Products (so called crypto-currencies) launched by various agencies, scientists, industrialists, entrepreneurs and trading speculators lack – that they are not a Tenable Asset Class (Ali, Barrdear, Clews and Southgate, 2014; FATF, 2014; Bloomberg, 2017b, 2017c; Christopher, 2017; IMF, 2017b; Rangan, 2017; Reuters, 2017b; TNN, 2017).

The concept and framework of Virtual Currencies (crypto-currencies), whether launched through Mining or by logical creation by a Central Bank (as Central Bank Digital Currency (CBDC)) would remove this deficiency of it being a tenable asset class (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d). We have tried to present different frameworks in which VPs (so called crypto-currencies) exists and the kind of fallies/erosion of hard earned wealth they subject everyone of us to on a day to day basis, especially because they are NOT launched by a Central Bank as a medium of transaction.

4.2 *Virtual Products (like Bitcoins…) Framework as Virtual Transactional System*

Virtual Products (like Bitcoins & others) are kind of so called crypto-currency in the sense of these being conceptual. They are manufactured

using software, by solving complex mathematical problem and cryptology having market values; by solving one such problem nearly 12 and a half bitcoins are generated. The idea of bitcoin emerged in October 2008 from a research paper by the name of Satoshi Nakamoto. The purchase process using Bitcoin is considered to be so secure that it isn't possible to hack the system. Only a money transfer can be seen, but nothing can be known about the sender and the recipient. This type of anonymity with its strong crypto-logical security is ensured by those dealing with Bitcoins, though in the last 6 months we have seen that this myth is proven wrong by hackers and thieves (Kharif, 2018).

We see an extensive support for such privately managed VCs mostly in US and Japan, apart from a select few other nations globally. According to the US treasury, the bitcoin is a "decentralized virtual currency". There are some exchanges (Agarwal, 2018), which may be treated as mints or a central bank, which are mainly located in China, Hong Kong and Russia. There are various companies called "miners"' under each exchange. The bitcoin ecosystem uses a function called the "hash function". A hash' is given for every transaction, along with a "public key" and a "private key". Each of these keys is inverse to each other, but it is never easy to derive one from the other. The public keys' are openly available in the public domain. The details of each transaction report are available in a ledger called "blockchain". From this open source, anybody can tell how many bitcoins are traded at some specified public key. But nobody can know the owner of those, cannot be easily broken, making the system's character of anonymity and privacy also its drawback (TNN, 2017; Sas and Khairuddin, 2017; TNN, 2018b)

On August 30th, 2017, one Bitcoin was considered to be worth ₹ 2,91,822/- its value skyrocketing since Donald Trump's election as the US President in November 2016 and spawning an industry of auxiliary services for people rushing into find gold in these virtual products so called crypto-currency (Bloomberg, 2017b, 2017d). As we all know, Bitcoin is a decentralized, paperless crypto-product not produced by a central authority like a bank or a consortium. It is a mathematical formula. Virtual Product is produced by massively souped-up-computers, called "mining rigs" that solve complex math problems to obtain these virtual products. A Ledger records all the transactions. Mining-rigs runs round the clock, its performance depending on the high end graphic cards and cooling system used not an inexperience proposition at an average ₹ 3 Lakh a machine. Several online vendors as well as individuals are investing in those machines to mine crypto-products (so called crypto-currencies).

The framework/system working of these crypto-products is explained in Figure 2.

Bitcoin was launched as the first so called crypto-currency (crypto-products) to exist. All digital products created since then are called Altcoins, or alternative coins. Litecoin, Peercoin, Feathercoin, Ethereum and hundreds of other coins are all Altcoins because they are not Bitcoin. Given that they

fulfill the payment system functionality. However they still do not fulfill; the basic condition for being a Currency which is MUST for any Currency is being a valid Asset Class (see Section 4.1) given no fiduciary / legal sanctity backing the virtual framework of Bitcoins (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

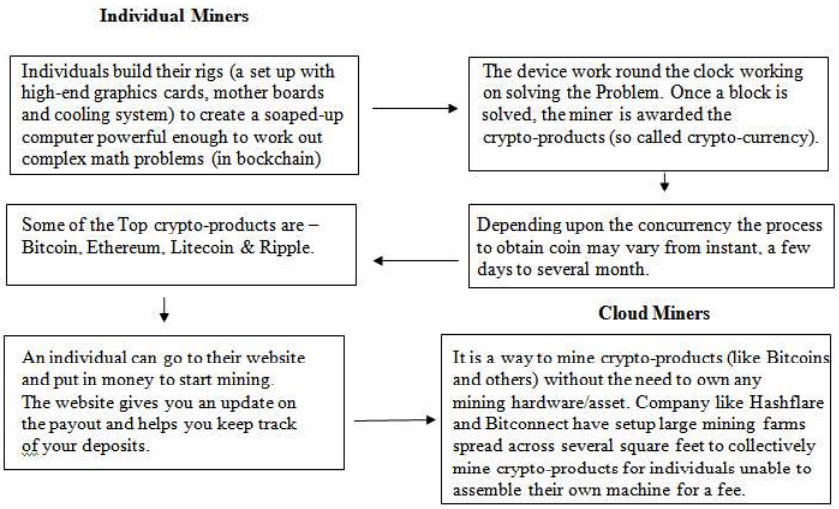


Figure 2
Crypto-Product Minning Framework establishing Virtual Transactional System

Bitcoins saw explosive growth after De-monetisation in India. The rise in popularity of such crypto-products has enabled techies like Saket Nalegaonkar to build services around it. The 28 year old Internet of things engineer spends his spare time travelling around the country helping enthusiasts set up rigs for mining. Badgujar, 26 year old management graduate, rewired five computers in his college lab, making them work in tandem to mine ethereum. Some companies- Hashflare, Genesis and Bitconnect among them have even set up so called farms to collectively mine so called crypto-currencies (crypto-products) for individuals unable to assemble their own machine, for a fee. Cloud–mining is now a new thing new where one can now run a bitcoin support website with bitcoin support 24*7 without any legal sanctions or approvals, given the location of such clouds is un-known and spread cross borders. Individuals can now spend as low as US$ 2 to start with for mining, and these companies assure fixed returns every month, however have no back-up secure depository backing their VCs (Bloomberg, 2017d, 2018b). The speculation in the crypto-products works much like it would with gold or equity or real currencies i.e. buy, wait for value to appreciate and henceforth sell, with complete speculative framework having NO default security like an illegitimate Gamble (Bloomberg, 2017c, 2018a; Das and Menon, 2017).

In India, one can buy bitcoins through a Bitcoin exchange or directly from an individual. Saurabh Agarwal (41, co-founder and CEO of Indian Bitcoin Exchange Zebpay) said that there are a very few of them for goods and services in the physical world. There are some who make money buying bitcoin off one exchange. The founder of exchange Coinsecure said he had seen people indulge in this arbitrage quite frequently in recent times. This works because different exchanges have different prices (Christopher, 2017). Given the high value, one can deal in fractions of Bitcoin (if the exchange is a virtual/online exchange allowing fractional trade). One can trade for as low as 0.01 BTC on Coinsecure (exchange started in 2014). What makes this crypto-product attractive is that it can be used to move money across the globe quickly and anonymously and that it is free of control of any central bank / government. Crypto-currency has understandable appeal to millennial who have came of age during the 2008 financial crisis and are now watching the rise of anti-globalist populism threaten the stability of economy. Ron Ginn, 35, founder of a private photo-sharing service called text event pics had been taken out all his money out of stock market and put it into Ripple and real estate. There is low cost for entry, one does not pay a lot of fees and millennial are the most tech-savy to move towards these without understanding the fundamentals or the nuisances like a child getting charmed by glitters. Unlike previous generations, this new young generation don't have pension are mis-trustful of stocking money away in mutual funds and are full accustomed to owning digital assets that have no concrete properties. As traditional paths to upper middle class stability are being blocked by direct exorbitant housing costs and a shaky job market, these investors view these innovative crypto-products not only as a hedge against another share market crash but also as the most rational and even utopian-means of investing their money.

Given the massive surge in the value of so called crypto-currencies (crypto-products), real estate developers, too, are seeking a piece of the action. Bengaluru base Nalegaonka helped set up rigs for mining, had been contracted by real estate developers to convert entire floors into mining farms. Bitcoin growth Fund (BGF), a blockchain based start up fund, closed its first fund raising with US$ 14.5 million (approx ₹ 95 crore) as part of its initial coin offering (ICO) in August 2017. Founded in January 2017 in Dubai, the founding team includes Phil McCauley, Nagaraj Konda and Mattiaas Frost. BGF focus on Asian markets, primarily India and China. BGF is a blockchain-based venture capital fund where regular or small investors can invest by buying a token named "MCAPS" via ICO. An ICO works like an initial public offering. In an ICO, (retail) investors get tokens instead of shares in a company. However, there are some key differences between IPO and ICO. While IPOs are regulated and issue shares in operational companies, ICOs are not regulated and issue digital coins for projects that have yet to be developed (Murphy, Murphy and Seitzinger, 2015; Reuters, 2018a; Pillai, 2018a; IMF, 2018).

As per BGF, the minimum investment amount required is US$ 5 and there are close to 6 lakh investors from India who have subscribed to MCAP

via ICO by mid of 2017. Most of the retail investors are from the tech and finance background, feel that they usually understand this kind of new crypto-product as an asset class investment, is a myth. The second-largest retail subscribers were from China (30% and the rest were from South Korea and other countries. Here the (retail) investors are not buying bitcoin or any crypto-products, rather they are buying a currency mining fund that would invest in various crypto-products like Dash, Ethereum, Monero, Litecoin, Z-coin and Bitcoin, amongst others. Mining is a farming process. The process is distributed as either dividend or profit. During the mining process, miners try to get the crypto-products as much as possible and as quickly as possible, as 90% of all crypto-products' total output is pre-determined, which is contrary to any farming where outputs cannot be determined, however have an inherent security of the land and labour wealth (Agarwal, Agarwal, Agarwal, Agarwal, 2017b).

In February 2017, Bitcoin startups Zebpay, Unocoin, Coinsecure and Search Trade had come together to form the Digital Asset and Blockchain Foundation of India (DABFI) to bring in transparency and growth in the virtual currency market as well as create awareness on the so called crypto-currencies (crypto-products), to liaison with regulators to bring in clarification in taxation (Agarwal,1988; Sikarwar, 2017; ET, 2017). In the US, companies have raised US$ 180 million via ICOs so far in 2017, compared to US$ 101 million last year, according to Smith & Crown, a blockchain research, data and consulting group.

Trading in bitcoins is gaining traction, especially among those aged 18-35 years and seeking to harness volatility for extra-ordinary returns (Bloomberg, 2017b; Christopher and Bansal, 2018). As Sandeep Goenka, cofounder and chief operating officer at Zebpay, an app-based bitcoin exchange says that "the increasing awareness of bitcoins worldwide, particularly about its revolutionary technology, has triggered a rally in the bitcoin market". Japan has now added itself to the list of countries that have regulations for bitcoins. Due to these positive factors, bitcoin prices have shown tremendous strength. Since April 2017, Japan's legalization of the digital currency has contributed to the rally in bitcoins (JT, 2018; Bloomberg-ET, 2018b; Pillai, 2018b; Kumar, 2018). After Tokyo's move, many vendors have started accepting these crypto-products as virtual currency. Peach Aviation, for instance, is going to be the first Japanese airline to accept bitcoins as payment for plane tickets. With an expert committee in India now seeking to regulate domestic trading of bitcoins, prices are expected to leapfrog in the next one year (Bloomberg, 2017d, 2018b).

IIF Professors have been proponent of the fact that virtual products (so called virtual currencies or crypto currencies) as a concept is very innovative and must be considered by Central Banks (including RBI) and National Governments, however the current form of these Virtual Products (VPs) or Virtual Currencies (VCs) mushrooming in the markets have a destabilizing impact (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; ET, 2017; Reuters, 2017b; Goldberg, 2017; Reuters, 2018a).

We also find that trading volumes and prices have risen in lockstep with increasing interest in India in bitcoins. In June 2015, the prices were about ₹ 20,000 per bitcoin which have surged to ₹ 2,25,000 recently. In the past few days, it has pared gains partially, and how trades about Rs. 1,83,000 per unit in the round-the-clock market. Sahil Shah, a final-year BBA student of Nirma University, has sold four bitcoins at roughly ₹ 2.20 lakh a piece against ₹ 70,000, the average price at which he acquired those. This rally is almost a bubble, but it gave a solid profit-booking opportunity for people who bought bitcoins two-three years ago. There are several reasons for its recent spurt in growth, from politics in the US and Brazil to the WannaCry ransom ware attacks and other such global viral cyber-attacks. Whatever be the reasons for this newfound love for these crypto-products, people dealing with bitcoins are aware; it is a risky, unregulated and uninsured crypto-product. These are like skating on thin ice, behind the excitement and thrill there is the fear of un-warranted death (Bloomberg, 2017d; Goldberg, 2017; Rangan, 2017; Dev, 2018).

The lack of regulations, though has cast a shadow over the bitcoin universe. Over the last six months, the RBI has being issuing several statements repeatedly warning consumers about financial and regularity risks associated with these so called virtual currencies (Yermack, 2013; TNN, 2017; Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; Archana, 2018; Reuters, 2018a; TNN, 2018b; Shetty and Pillai, 2018). However a firm stand is still warranted both by Reserve Bank of India (RBI) and the Government (Nappinai, 2018). Recent research has unearthed the achilles' heel of bitcoin technology. Sas and Khairuddin (2017) have found that the very design features that make bitcoin technology appealing to its users has weaknesses, which are being exploited by hackers and thefts of these crypto-products (Kharif, 2018; Bloomberg, 2017c; Dev, 2018). They warn that these flaws can lead to drastic theft and fraud which are beyond recovery or trace (Kharif, 2018; Mizrahi, 2018). An easy quick erosion of hard earned wealth of individuals beyond recourse. The research has serious implications for the technology that has enjoyed several re-births in the last decade. Already huge amounts of "cash" are stored in the form of bitcoins (and its VP variants), which go by the name of "digital gold". The latest findings put the question mark on its recoverability and ownership as well. The transparent design features that are supposed to promote trust in the bitcoin have come to haunt its investors.

The blockchain is the main technological innovation of the bitcoin. It is decentralized, pseudo-anonymous and unregulated and, therefore, attractive to many of its users. Blockchain maintains a continuously growing list of records "blocks" that are said to be free from tampering and revision. Each block contains times-tamp-encoded information of the time when a transaction has taken place and a link to a previous block. It allows a transaction to take place between two parties anonymously, if one ignores the digital signature, without a mediator: In the case of traditional currencies, a bank or a financial institution acts as a trusted' mediator: blockchain, with its open ledger design, is seen by some investors as a low cost-intensive (no paying of fees to a mediator), fast and transparent technology.

According to the researchers, the problematic bitcoin design features include "*… the risk of losing a password- a lost or forgotten password cannot be recovered, so all bitcoins from an electronic wallet could be rendered unrecoverable*". Insecure passwords can lead to bitcoins being stolen – for instance, through phishing attacks (Gibbs, 2017). The irreversible nature of transactions for bitcoins can lead to bitcoins that are stolen or diverted to another wallet due to hacking (Gibbs, 2017), or dishonest trading partners cannot be reversed and recovered. The anonymous nature of the crypto-product VC users, and their un-kown reputations, opens up opportunities for dishonest traders to scam during transactions. The fear of fraud is real as bitcoin are popular among many dark web users, and many of them are not ethical hackers. A 2015 Coindesk report indicated that bitcoin has been the defacto currency of the dark web (the hidden' Internet, accessible any by to, the free software that allows anonymous surfing – *birth of the Hawala*), since the pioneering marketplace Silk Road, the "eBay of drugs", arrived in 2001. In fact, an FBI report claimed that Silk Road made US$ 1.2 billion in 2012-13, and a large part of it was paid in currencies such as bitcoins. According to Sas and Khairuddin (2017) the challenge that bitcoin users face is the risk of "insecure transactions and in particular that of dealing with dishonest traders". Unregulated systems attract people with its freedom. Bitcoin technology is one such example. Considering the rise in usage of such crypto-products across the world and in India, the governments should look at putting a policy framework in place immediately. In July 2017, China's central bank said initial coin offerings are illegal and asked all related fundraising activity to be halted immediately, issuing the strongest regulatory challenges so far to the burgeoning market for digital token sales. The People's Bank of China said to its website that it had completed investigations into ICOs, and will strictly punish offerings in the future while penalizing legal violations in ones already completed. The regulator said that those who have already raised money must provide refunds; though it didn't specify how the money would be paid back to investors. It also said digital token financing and trading platforms are prohibited from doing conversions of coins with fiat currencies. Digital tokens can't be used as currency on the market and banks are forbidden from offering services to initial coin offerings (TOI, 2018).

A recurring challenge for bitcoin and other such so called crypto-currencies (crypto-products) is how to make them work in the real world. A Singapore-based startup says the answer is its VISA card. Henceforth we saw that TenX is pitching its debit card as an instant converter of multiple digital currencies into fiat money: the Rupee, Dollars, Yen and Euros. Company takes a 2% cut from each transaction and had received orders for more than 10,000 cards. While transactions are capped at US$ 2,000 a year, users can apply to increase the limit if they undergo identify verification procedures. Bitcoin, the most popular, slumped after reaching a record in June 2017 amid concerns about a split in two, only to recover as fears faded. The company has built an app that serves as a digital wallet connected to the VISA card so that when it's swiped at a café or restaurant, the merchant is paid in local currency and the users' crypto account is debited. Co-founder Julian Hosp said transactions are processed immediately and it doesn't

impose any charges on top of the conversion fee that is set by so called crypto-currency exchanges, which typically is 0.15 to 0.2% (Agarwal, 2017). The card now supports eight digital currencies, including the lesser-known dash and augur, and aims to offer about 11 of them by the end of the 2017. TenX currently processes about US$ 100,000 of transactions a month. By the end of 2018, it's targeting US$ 100 million in monthly transactions and a million users. We wonder what regulators globally have to say if such play cards are allowed to swam the markets and take over transactions. Would there be any sense to calibrate inflation using CPI, WPI, CPE Deflator or any other such statistical means, when no trade or transaction is within the purview off any reporting system, like we see in Black Money transactions commonly called Hawala in India (or Asia) (Bloomberg, 2017).

Badev and Chen (2014) wrote that Bitcoins is a scheme designed to facilitate transfer of value. Unlike the traditional payment system which use sovereign currencies or fiat currencies, the bitcoin has its own metric called the Bitcoin with a small letter "*b*" or abbreviated as *BTC*. The scheme implementation involves the use of cyptography, distributive algorithm and incentive driven behaviour. Bitcoins is considered to be one of the most successful so called virtual currency scheme designed and implemented by software developer Santoshi Nakamoto in 2008. His idea was to produce a virtual currency independent of any central authority, transferable electronically, more or less instantly, with very low transaction fees. It has a bi-directional flow, real currency that can be exchanged for bitcoins and vice-versa. It is expected to grow to be used as a currency at the global level to buy and sell virtual and real goods, however it is still not achieved in the last 10 years (decade) of its existence, as it is limited a select few players. Bitcoins are divisible to eight decimal points enabling their use in any kind of transaction regardless of the value. Bitcoins are not pegged to any currency or commodity.

This software driven virtual product (namely Bitcoins) can be mined by anyone with a strong computing skills. They are made through a self limiting system called crypto-currency mining and the people who mine these coins are called miners. It is projected that 21 million Bitcoins can be mined wherein approximately 11 million have already been mined and are in circulation. Bitcoin VCs is completely unregulated and decentralized. There is NO central bank that issues it, there is NO National mint, there is NO Depositor Insurance coverage and there is NO asset backing the so called crypto-currency (crypto-products). These crypto-products are self-contained and un-collateralised, which means that there is no precious metal that creates the so called crypto-currency (bitcoins). According to Nakmoto, the value of each Bitcoin resides within each bitcoin itself, which is totally flawed concept and defies the basic principal of a tenable asset class (See Section 4.1).

Given that the supply and demand of Bitcoins is market determined and the fact that these are based on decentralized, peer to peer network; they have attained immense speculative value (Bloomberg, 2017), however

fall apart when it comes to be quantified as money/currency. This financial engineered innovation is an open-source (its controlling computer code is open to public view); peer-to-peer where transactions do not require a third-party intermediary such as PayPal or Visa and works on a digital platform which is completely electronic with no physical presence. This makes it to have the potential to emerge as a strong basis for a crypto-product to be used as transaction means by a select few, as one sees the use of Casino Coins/Casino Playcards. For any product to emerge as money/currency, there has to be a central controlling agency that control the supply of the currency which is pegged to real assets inducing and securing the value, however with Bitcoins the network is completely decentralized, with all parts of transactions performed by the users of the system only beyond control of any government / central banking agency. In this market of Bitcoins the buyer and seller interact directly (peer to peer), however the identities are encrypted which means NO personal information is transferred from one to the other. On one side governments have identifications going beyond Passport systems like the AADHAR Cards; Social Security Numbers and others and on the other hand we see such crypto-products undermining the importance of such secure gateways in the name of Privacy and illegitimate transactional efficiencies. It is usually said that a public ledger[4] maintains the full transaction record of every Bitcoin exchanged and generated. However with the emergence of so many varieties of crypto-products mirroring Bitcoins, one is puzzled as to who manages this public ledger and how many of such ledgers are there (see Figure 3 and Figure 4). Not-withstanding the test of time these cryto-products (like Bitcoins...) lacks the possibility of natural transferability to the Heirs or holder of the Asset, as done when any asset/currency goes to the heirs of the individual/institution having the rights to use the benefits from the said currency/asset.

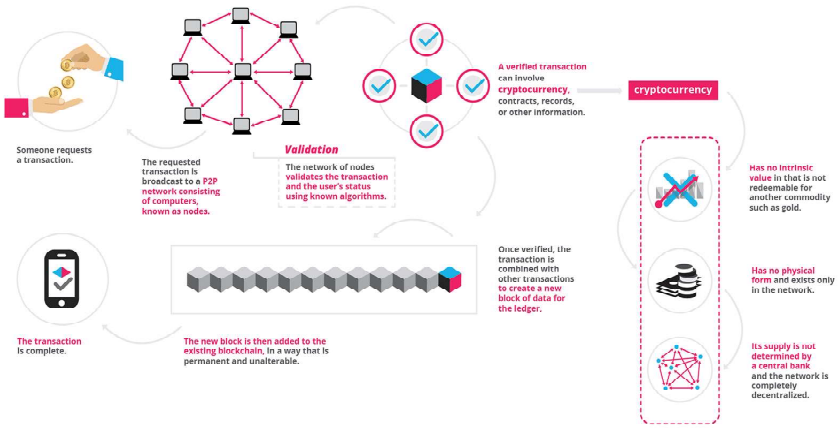
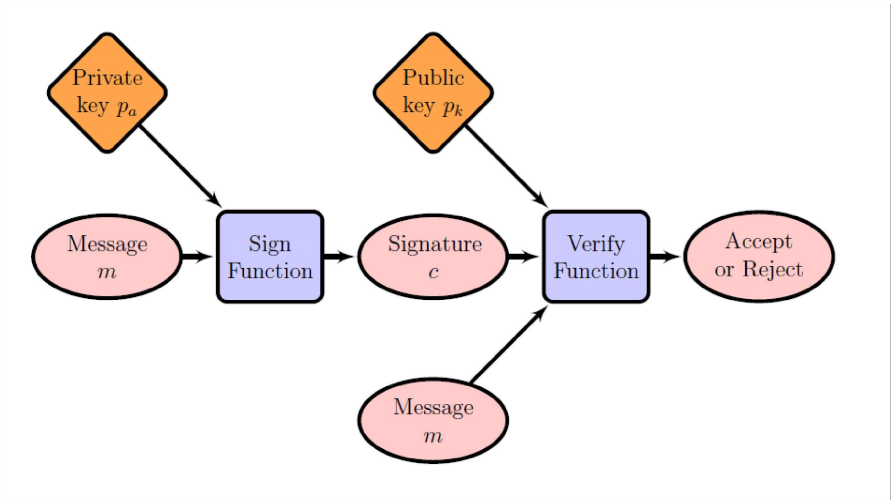


Figure 3
Virtual Product (Bitcoin) Framework as Virtual Transactional System[5]



Source: Badev and Chen (2014)

Figure 4
Digital Signatures permit exchange of accurate payment instructions[6]

Some of the features built in the Virtual Products (like Bitcoins…) Framework as Virtual Transactional System that set it apart from government-backed currencies are

i. *Decentralized* : Bitcoin network which is not controlled by a central authority. Machines work together such on every machine a bitcoin can be mined.
ii. *Easy to set up* : A bitcoin address in seconds, no questions asked, and with no fees payable, for Now. Historically, as soon as a product gets established and margins sqeeze, charge on transactions are expected to setin or even in case where Monopoly situations arise.
iii. *Anonymous as user information is Encryted* : Users can hold multiple Bitcoin addresses which are not linked to names, addresses, or other personally identifying information, which is also expected to change as more reforms and finer forms are expected forthcoming with emergence of regulations or frauds being surfaced (TNN, 2018b).
iv. *Transparent yet Opaque*: Bitcoin stores details of every single transaction that ever happened in the network in a huge version of a general ledger, called the blockchain. However no one individual or even the regulator can access the information without prior approval from the Exchange / the transactional operator, which brings the socio-economic setup at risk inducing National Security Threats and use by illegitimate illegal unorganized market operators (Reuters, 2018b).
v. *Transaction fees are miniscule :* Bank Charges are higher for international transfers whereas Bitcoin transfer charges are very small, which is expected to change as well. The reduction in Banks and Monopoly

situations existing in Banking Industry due to Financial Inclusion drives has driven Bank Charges to go sky rocketing globally both in developed and emerging markets (Agarwal, 2016; Agarwal 2017)

vi. *Speed of Transfer :* Money can be sent anywhere and it will arrive minutes later, as soon as the Bitcoin network processes the payment. All Virtual transactions have this efficiency factor as seen since mid 1990s after the emergence of Online Banks. The world has not forgotten the ill-effects of Online Banks and Stock Markets in USA being used by Osama Bil-a-din to finance its operations and transfer proceeds through Online Banks across over 6 Nations in few minutes, taking full advantage of efficient online-transfer NEFT/SWIFT mechanism. In India recently we also saw the rise of NPA to over ₹ 13,000 crores by a single firm of Mr. Nirva Modi, having sought bank clearances (LOUs) for funds transferred through bank branches using these Systems not tagged with the mainframe banking software, leading to creation of huge NPAs in consortium of Banks by a single firm.

vii. *Non-reputable* : Once the Bitcoins are transferred they cannot be returned back under the other user intends to send them back to you. As long as markets are there to accept the product, this is not a critical factor. However the fact that such virtual currencies defy tenable asset class classification, hence the world will observe more frauds by fake Operators, with no legal recourse. This will be seen more in developing, under-developed and emerging markets than developed economies around the world, given weak legal frameworks and huge cash economies (including black money presence).

These strong features outline the efficiency of the crypto-products (so called crypto-currency) market scenarios existing today for over a decade now. It is pertinent to note that whenever the Crypto-Currencies are introduced by Governments through Central Banks backed by National Assets (both public & Private) as the Virtual Currencies of the Future being a tenable asset class money/currency, then the M5 Money Supply framework will help give it the legal sanctity and remove the anomalies which exist with the VPs (like Bitcoins….) framework making it one of the more innovative financial engineered true currency of tomorrow.

4.2.1 *Recent Developments in Bitcoins (Crypto-Product) : Why; How and for What*

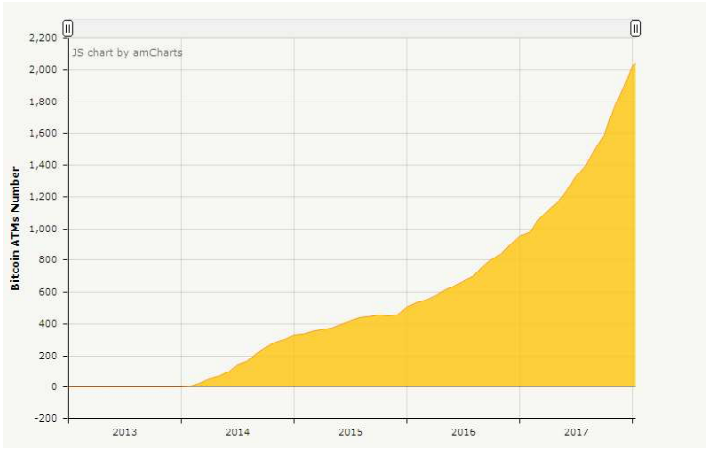
As outlined earlier, one can buy Bitcoin (a crypto product) from exchanges or directly from people via crypto-miner marketplaces (Upadhyay and Vishwanathan, 2018; Jatley, 2018; Dave and Shukla, 2018). Payment for such purchase of Bitcoins can be made through coins, debit cards, credit cards, wire transfers or by using other crypto-products via banks in the countries where it has still not been made illegal/illegitimate (TNN, 2017; Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; TOI, 2018; Shetty, 2018; Reuters, 2018b). However it is found that more than 72 countries (namely Argentina, Australia, Bangladesh, Belgium, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Canada, Colombia, Chile, China (Mainland), China (Hong Kong SAR), Croatia, Cyprus, Czech Republic, Denmark,

Ecuador, Euro Zone – ECB(Reuters, 2017b), Estonia, Finland, France, Germany, Greece, Iceland, India, Indonesia, Ireland, Italy, Israel, Jamaica, Jordan, Kyrgyzstan, Korea (South), Lebanon, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Macedonia, Namibia, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Philippines, Poland, Portugal, Romania, Russia, Saudi Arabia, Singapore, Slovakia, Slovenia, South, Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, Ukraine, United Kingdom, United States (some states), Vietnam and Zimbabwe) have already declared this as illegal/illegitimate means of crypto-product either completely banning it by declaring it a illicit and/or restrained by warming people NOT to trade or transact in such crypto-products till further clarification comes from regulators (Wikipedia, 2018; Dave and Shukla, 2018; Archana, 2018; Reuters, 2018a; Nappinai, 2018; Bloomberg-ET, 2018b). It has been found that many make payment via cash in place of credit cards/ bank transfers to keep these transactions outside the purview of regulators. In the USA, Coinbase, and Circle offer purchases with credit cards, however buyers still prefer to do cash transactions. Bittylicious, CoinCorner and Coinbase offer this service in the UK, accepting 3D Secure-enabled credit and debit cards on the VISA and MasterCard networks.

To store Bitcoins that are purchased, one can purchase wallets/valuts. A wallet can be (a) A software wallet stored on the hard drive of the computer; (b) an online web based service (c) a 'vault' service that keeps your Bitcoins protected offline or multi-signature wallet that uses a number of keys to protect the account. Technically one does not store Bitcoins, what one stores is secure digital keys used to access your public bitcoin addresses and sign transactions. This information is stored in a Bitcoin wallet. Though it seems secure, however we would witness large number of thefts, hackers and frauds in due course with other regulatory sanctions by governments in trying to keep the financial ecosystem secure and healthy for people (Bloomberg, 2017c; Kharif, 2018). In last few years we have seen the emergence of six main types of wallets: desktop, mobile, online/web, paper, cloud and hardware : (a) Desktop Wallet[7]; (b) Mobile Wallet[8] ; (c) Online or Web Wallet[9] ; (d) Paper Wallet[10] ; (e) Cloud Wallet[11] ; (f) Hardware Wallet[12]. The means to secure a Bitcoin Wallet is to Encrypt it, back it up, use multi-signature transactions and lastly to take it offline. So far the Exchanges and wallets have emerged as the best option to engage in regular trade of Bitcoins. The largest full trading exchanges by volume are Bitfinex (Hong Kong), Bitstamp (US), BTC-e (unknown), Kraken (US), Huobi (China and Hong Kong), OKCoin (China) and BTCC (China). Once a user has set up his or her exchange account then they need to link an existing bank account and arrange to move funds between it and user's new exchange account via wire transfer for purchasing or selling Bitcoins. Unlike the usual security exchanges these exchanges are not regulated and if they go out of business the user is likely to lose all their hard earned money (Upadhyay and Vishwanathan, 2018). Bitcoins in most countries do not a have a legal status and hence their recoveries cannot be challenged in any court within the

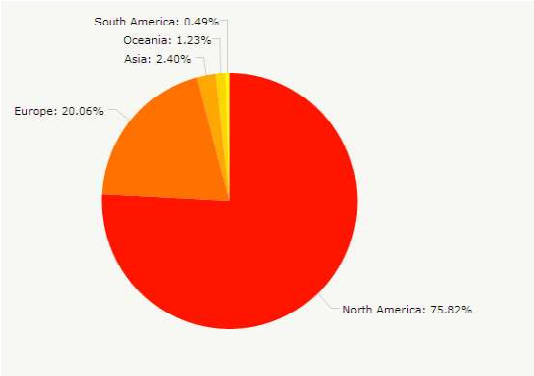
country or internationally. Also given the fact that the source of production, hosting the wallet and transactions is unknown, hence which rules to apply and which not is unknown. The regulators are also at a standstill (in a myst) on what to do with such transactions/trades (Schmidt, 2018). This growth in this fashion is a key threat to Central Banks, Monetary Systems, Individual Wealth and to the National Security (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

News reports indicate that the purchase of Bitcoins face to face without the hassle of linking the bank accounts with local traders has raised concerns for use for Money Laundering Black/Illegal Money (Agarwal and Agarwal, 2004, 2006; TNN, 2017; Rangan, 2017; Upadhyay and Vishwanathan, 2018; HT, 2018; Bloomberg-ET, 2018; Reuters, 2018b). Interestingly, *LocalBitcoins* as emerged as the primary site where such transactions are arranged and prices are negotiated. The site also provides an escrow service as an added layer of protection for both parties. In case the user is meeting face to face then they need to have a wallet and internet connection to verify the transaction. Another such site is the *Meetup.com* which arranges for meeting in groups to exchange Bitcoins. A 5-10% premium over the exchange prices is found in face to face transactions, however they are all confidential and beyond reach of any regulator. The underlying current for such illicit transactions ends up doing more damage than good to the society, as seen with various such products grown and in-existence worldwide in the last 200 years. Another vent for purchase of bitcoins has been the Bitcoin ATMs which when a user inserts cash and either scan the mobile wallet QR code or receive a paper receipt with the codes necessary to load the bitcoins onto the user's wallet. There are presently 2034 Bitcoin ATMs that on an average charge 9.44% (See Figure 5; Figure 6; Figure 7; Figure 8).



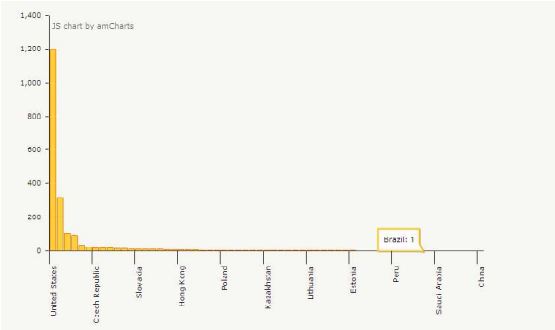
Source: https://coinatmradar.com/charts/#growth

Figure 5
Emergence of Number of Bitcoin ATMs over the 4 Years



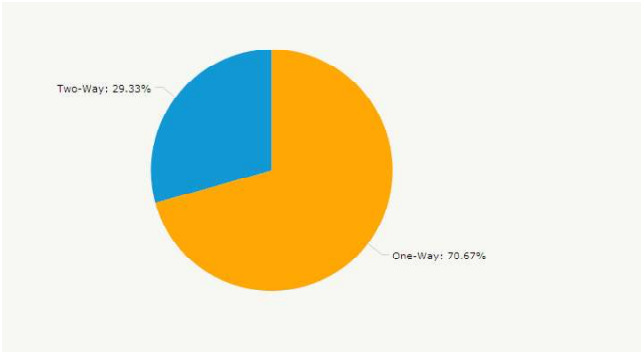
Source: https://coinatmradar.com/charts/#growth

Figure 6
Bitcoin ATMs Regions Wise over the 4 Years



Source: https://coinatmradar.com/charts/#growth

Figure 7
Bitcoin ATMs Countrywise over the 4 Years

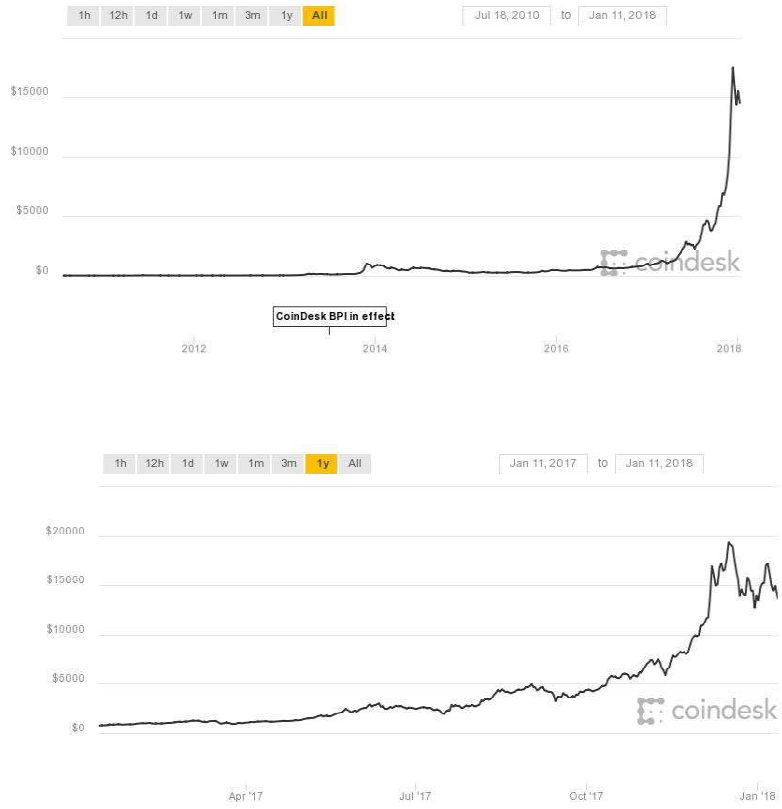


Source: https://coinatmradar.com/charts/#growth

Figure 8
Bitcoin ATMs One Way versus Two Way System

Smith and Rosevear (2017) have outlined that the benefits of using crypto-products like bitcoins or digital transactional framework include (a) the reduction of transactional frictions; (b) the ability to transact across borders; (c) the elimination of counterparty risk assessment; (d) regulatory and monetary policy freedom; (e) access to money for the "unbanked," user anonymity and ledger transparency. The future of money as digital (VCs and crypto-products such as Bitcoin) is generally seen as the first early stage of that broad, however as this financial innovation defy the basic principal of an tenable asset class, hence till crypto-currencies are launched by Central Banks, these benefits come bundled with illusionary high risk bringing forth loss of wealth, distortion in economic eco-system and threat to National Security.

The key parameters one must assess as the potential before investing in Virtual Products (like Bitcoins) are



Source : Coindesk 2018

Figure 9
Bitcoin Trading Value between 2010-18 and January 2017-18

i. *Value Basis* (does asset have value? what forces determine its price? will such forces endure over time?)
ii. *Stability* (is volatility reasonably low and steady? is there some predictability of how wide price swings could be? does the asset show wild swings in value?).
iii. *Liquidity* (is the market large enough such that bids to buy are easily met with offers to sell & vice-versa? what happens when the base/operator disappears? what is the sanctity of transaction)
iv. *Informational Efficiency* (are VCs like bitcoin resemble assets class? Will it respond to new information in a predictable way, or is it random? what is the source of information and is it legitimate)
v.. *Accessibility* (can you invest and how? can it be purchased and traded? are products such as ETFs available that offer divisible investment through the standard channels such as a brokerage?)
vi. *Regulator* (who regulates?; who controls?; is there a recourse?; incase of dispute where would one go?; is there legal sanctity? what is the taxable liability?)
vii. *Transferability and Ownership* (can its ownership be transferred? Can heir(s) gain access to its rightful ownership after the dealth (natural/ accidental) of the primary holder? Can any holder of the crypto product claim ownership, even if he is not the primary hodler? Who is the writeful owner a thief, a hacker, a miner or the purchaser?

Given that the price for a Bitcoin is not driven by any intrinsic value but by the trust and faith buyer and sellers have in exchanging the digital currency, it is a pure gamble (Das and Menon, 2017; Kumar, 2018). In many countries including India, the tax authorities (ET, 2017; Sikarwar, 2017; ET Wealth, 2018) are treating the revenue gains from bitcoins to be taxed under capital gains from speculative trade/markets/products (like gambling; casino; betting; horse race and others) (Agarwal, 1988; Jatley, 2018; Dave and Shukla, 2018; TNN, 2018c; Dave, 2018). The market value is linked to the digital economy and digital crypto-product which at any moment can vanish in thin air (this has been observed to happen in many cases worldwide in the last 4-5 years). Given the growth in the market and more people seeking sudden revenue gains, Bitcoin are increasingly becoming more stable and liquid, however they are still by far the highest risky product, given there being NO legal sanctity. However we see some exchanges in US and other parts of the world where Bitcoin bid and ask spreads as quoted on dealer exchange sites is approximately 0.7% approximately one tenth of what it was in 2013. Bitcoin ATMs have also emerged in the world from a handful in 2014 to 900 in 2018 (see Figure 5-8). Bitcoins average monthly trade is over past three years is US$ 740 million (1.8 million bitcoin units). Market Capitalisation across major US exchanges is US$ 16 billion. These figures seem alarmingly fascinating (see Figure 9), however it is quite like the showrooms/ shops/business operations which are fly by night operators as seen in cities like New York, London, Paris, Delhi and many other major cities around the World having a life span of a week or two. The world has seen success stories of business of Gambling; Flesh Trading; Drugs; Killing; Thefts; Smuggling; Arms; Cartels and many others showing extremely high revenue streams. It is also well

known that many small economies have adopted some of these as a prime source of income and sustainability given no other meaningful factor of production. Wonder if revenues or profits outside the legal framework leading for threats to erosion of wealth; socio-economic frameworks and National security are to be judged and allowed on such basis. We have tried to present these figures about crypto-products (like Bitcoins…) to enlighten and highlight the fact that profits/ revenue streams in short run beyond the legal frameworks can cause more harm then benefits (like does Corruption; Black Money and Illicit transactions).

Ali, Barrdear, Clews and Southgate (2014) indicate that the valuation of a digital currency that is, at least in principle, to be able to be used as a medium of exchange ought to take a wide variety of factors into sconsiderations like :

i. The expected real return of holding the digital currency (that is, the nominal interest rate minus expected price inflation), relative to other options (Agarwal and Agarwal, 2005; Agarwal, 2017a; Agarwal, Agarwal and Agarwal, 2016, 2017; Agarwal, Agarwal and Agarwal, 2018).
ii. Any risks associated with holding the digital currency relative to other currencies, including risks of theft or fraud, rigging, artificial valuation and price volatility (Bloomberg, 2017c, 2018a; Kharif, 2018; ET, 2018).
iii. The relative benefits of using the digital currency as a medium of exchange when compared to traditional systems, including availability, transaction fees and degrees of anonymity (Agarwal, 2017b, 2017c).
iv. Any time constraints or costs associated with switching wealth between the digital currency and more traditional assets (like Rs; US$; Euro; Gold; Silver or any other asset class).
v. Any non-monetary concerns, such as an ideological preference for one particular currency.
vi. A view on how much other people value the currency (based on the above factors) and how this is expected to change in the future.
vii. Regulatory prudence and legal sanctity (TNN, 2017; Rangan, 2017).

A number of funds have emerged offering Bitcoin investment (Sikarwar, 2017; Christopher and Bansal, 2018; Pillai, 2018a) like (a) Bitcoin Investment Trust ; (b) Bitcoin Capital; (c) Global Advisors Bitcoin Investment; (d) Pantera Capital; (e) Gemini Trading and others. With increased payment options crypto-products can offer a multitude of benefits. In the recent past, several retail giants in a couple of countries have begun accepting crypto-products. While many are making large fortunes in crypto-products, it is important to remember that due to the massive variability in prices and short term growth, there is still a large amount of risk. Therefore, proper caution is advised and the need for Modelling M5 in the Money Supply basket for Central Banks to launch their own currency denominated crypto-currencies.

On August 8th, 2017 the website Coinmarketcap listed 1037 different types of so called crypto-currencies (crypto-products), 626 of which have listed market. Some listed are Litecoin (LTC)[13] ; Ethereum[14]; Peercoin[15]; Z

cash[16]; Dash coin[17]; Ripple[18]; Monero[19] ; Dogcoin[20]; Potcoin[21] . This clearly highlights the extensive growth in various forms of VPs launched in the informal markets.

An interesting case of Vanuatua South Pacific archipelago of some 80 island which recently surfaced, now let outsiders use the volatile crypto-products to apply for so called investment citizenship (Bloomberg, 2017a), which is a clear reflection of threat to the Securities of Nations worldwide. News outlined that Fork over the equivalent of about US$ 280,000, and their family of up to four can receive passports from what the New Economics Foundation, a UK based think tank, calls the fourth-happiest country in the world. Vanuatu isn't the only island that offers citizenship for price (the list includes Antigusa, Grenada, Malta and St. Kittis and Nevis), but it's the first to allow payments via bitcoin. Vanuatu citizenship offers several advantages given that the country has the 34th most powerful passport in the world, providing visa-free visits to 116 other countries. It falls right below Panama and Paraguay and above Dominica; the UK is a tie at third place, the US at fourth, Russia at 40th. The country also has no income, inheritance, or corporate tax (Agarwal, 1988). It's not even customary to tip there, according to the Vanuatu Tourism Office. The archipelago is relatively accessible: about a three and a half hour flight from Sydney to Port Vila, the capital. There are many regions and countries in the world which have harbored on illicit trade and commodities. These would also welcome such crypto-products (so called cryoto-currencies) as a medium of safe haven transaction.

If we look at the case of New York, Virtual Products are considered a commodity and individuals can open an online Bitcoin account. The New York State requires businesses engaged in virtual products activities that have a place of business or provide services to persons located in New York, to obtain a license for digital currency activities known as BitLicense. The BitLicense was introduced in 2015 by the New York State Department of Financial Services (NYDFS). It is expensive to apply for a licence with non refundable fee of US$ 5,000 and other legal paper work requirement which may cost further between US$ 5,000-100,000. The BitLicense includes several obligations including hiring a compliance officer, consumer protection, anti-money laundering (AML), cyber security, business continuity, disaster recovery, and capital requirements. The first license was received by Circle in 2015 followed by Ripple and Coinbase in 2016 and 2017. Many companies like Genesis-Mining, Kraken, ShapeShift and Bitfinex moved out of New York as they did not want to comply with the requirements. Also on January 9th, 2018, a new bill was submitted to Arizona Senate to allow people to pay their taxes in Bitcoins which was moved by Senator Warren Petersen and co-sponsored by three other lawmakers. American states Idaho and Alaska have issued warning on investment in Bitcoins. On December 27th, 2017, Poloneix, U.S. based exchange revealed that it would require all its accounts to maintain Know Your Customer (Agarwal and Agarwal, 2004) details in order. A reverse trend has begun in USA as well to restrict or bar such crypto-products given global response from central banks and economies.

However, in 2016, Bank of England in its working paper identified these currencies and blockchain technology as both an opportunity and challenge for the central banks. It also recognised that Bitcoins or any other digital currencies (crypto-products) are less likely to be accepted as common forms of money and give rise to any banking systems based on virtual currencies hence it may be a far cry before these currencies can affect the macro-economic stability of any economy.

IIF Professors since May 2017 has been vocal in speaking at various forums, through their research works and in interviews at TV Channels – Lok Sabha TV; Rajya Sabha TV, Delhi Doordarshan TV (DD India TV; DD News TV; DD National TV) and Radio Channels urging Government of India; Reserve Bank of India (RBI) and in meeting with Governors of Central Banks of different regions of the worlds to come forward to make formal statement on virtual products (like Bitcoins) and such virtual transactional platforms being "Not Legal Tenders" as they defy the basic concept of tenable asset class given their not being launched by any Central Bank / Regulatory Body and their leading to erosion of wealth of the common man causing serious turbulence in the Economy.

Welcomingly on January 13th, 2018 Bank of Indonesia published a press release that the payment made in crypto-products (so called crypto-currencies) are not legitimate as they do not comply with 2011 Currency Act. Bank Indonesia also warned "all parties" that buying, selling or trading crypto-currencies come with "high risks," as they are "highly volatile" and do not have backing from an authority, or underlying assets to support prices. Countries including the U.K., India, Russia and more have recently cautioned investors and traders over the perceived risks involved in crypto-currencies (Shetty and Pillai, 2018). On February 1st, 2018, The Finance Minister Mr. Arun Jaitley said while presenting the Union Budget 2018-19 in the Lok Sabha that Bitcoins are Not Legal Tenders stating that "*The government does not consider crypto currencies as legal tender or coin and (will) take all measures to eliminate the use of crypto assets...*" (Jatley, 2018; Dave and Shukla, 2018; Nappinai, 2018). It is heartening to note that many of the central banks are now talking about creating their own National crypto-currencies (including US, India and Ukaraine).

4.3 *Digital Money BITCOIN - The New Hawala*

A Hawala is a system of transferring money and property in a parallel arrangement avoiding the traditional banking system. It is a simple way of money laundering (Agarwal and Agarwal, 2004, 2006; Agarwal, Solojentsev and Agarwal, 2008; Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; FATF, 2014l Bloomberg-ET, 2018; HT, 2018) and is banned in India. But a new hi-tech form of hawala, has appeared as the digital currency - Bitcoin. Bitcoin, the digital coin, dominates the crypto-product markets amongst all. It has gained notice both because of its skyrocketing value (from less than a cent in early 2010 to around coming close to US$ 20,000, bitcoins value crashed to around US$ 13,600 in the end of December 2017) and because it is frequently

a key player in hacking and black market-related stories (TNN, 2017), from the looting of nearly half a billion dollars in coins from the exchange in 2014 to the early 2017 demand for payment in Bitcoin in "Wannacry ransom ware attack" and others in the last 5 years.

The digital economy may well be the future. Transactions through bitcoins have been allowed in the US, the EU, Japan and Singapore, but there is enough effort being made to control the bitcoin economy (Reuters, 2018). In this context, there is no law yet in India. The bitcoin's shadow was evident in the supply of money for the 2015 Paris terrorist attacks; UK Healthcare System Attack in 2017; Worldwide Hacking Attack in 2017; UK Bitcoin Robbery 2017 (TOI, 2018) and many others. The EU is keen to bring the bitcoin under control (Reuters, 2018). The inter-governmental Financial Action Task Force in Paris reported in 2015 that some terrorist websites encouraged sympathizers to donate in bitcoins. US anti-terrorism officials are also reportedly anxious about the way how the Islamic State is accumulating millions of dollars through bitcoins. Though there were legal provisions to enable organizations dealing in crypto-products getting registered in New York, however the New York State Government has already passed a Bill prohibiting Bitcoin. Countries like Canada and Australia have brought anti-money laundering and anti-terrorism laws to restrain such Virtual Products/Crypto-Products (so called crypto-currencies) within the pool of more than 72 countries listed above.

New regulations may soon come up in India and globally (TNN, 2017). In the last decade we saw that the rising global acceptance of the blockchain technology by global financial institutes and government agencies had helped gain investor confidence, however is a reversing trend now. Vijay Kumar (CEO at Belfrics Global) said that "Several government agencies are working on the evolution of block chain and crypto-currencies. Investments in the digital currency have been rewarding for investors, although the valuation slipped recently after Beijing regulators forced the closure of BTC China, one of the world's biggest exchanges for the Bitcoins. Otherwise, returns have quadrupled in 2017. The bitcoin rupee swap rate is now trading around ₹ 2.51 lakh, about four times higher than the December-end level of ₹ 64,000 in 2016."

Controlling terrorist funding has been one major reason for Government of India's Demonetization initiative. If India fails to regulate Bitcoin (and its variants), this new Hawala, may ironically become the easy way of funding terrorism. The government should have proper control over such crypto-products (like bitcoin…) in the interest of the economy and the security of the country. Investments in crypto-currency have come under the radar of tax authorities and investigation agencies amid concern that they could have become conduits for illicit flows (Sikarwar, 2017; ET, 2017; TNN, 2018c; HT, 2018), money laundering (Agarwal and Agarwal, 2004, 2006; Agarwal, Solojentsev and Agarwal, 2008; Bloomberg-ET, 2018) and the movement of black money. A Special Investigation Team (SIT) on black money has been

appointed by the Supreme Court, which has expressed worries about the so called crypto-currency (crypto-products) and suggested curbs on their trading in its draft report. "*There is concern on the way it operates… Some unaccounted money could be flowing into these*." said a government official aware of the matter. Policy makers are now looking at the issue closely. Income-tax authorities and the Enforcement Directorate are also examining investments in crypto-currency after the Indian government demonetized Rs. 500 and Rs. 1,000 notes in November 2016, "*There are issues with large investments flowing into this currency*" said a senior tax department official. India has not yet taken a call on how it wants to treat crypto-products (so called crypto-currencies), but the Reserve Bank of India has cautioned against them time and again repeatedly (Sikarwar, 2017; Rangan, 2017; Nappinai, 2018).

V. Conclusion

The paper proposes setting up of "**M5**" as Money Supply measure with Crypto-Currency along the lines of inclusion of other currency products developed in the last 50 years in order to promote efficiency in the money markets, transactional efficiency and generating wealth along with positive contributions to GDP and people at large. The paper also considers "**Money (Currency)**" as a valuable Resource and a Wealth of the Nation, having potential to generate/mobilize more wealth. The paper proposes that given the emergence of digital modes of money transactions, there is an urgent need for creation of legitimate Crypto-Currencies by National Governments to induce confidence and laissez faire through transactional efficiency in money markets. Government Intervention (or Central Banks) to generate the Crypto-Currency is the need of the hour and critical for tomorrow's normal economic and business conditions in an economy when businesses and labour market source are global and are looking for currency efficient enriched sources. This paper critically evaluates various theories on Money and how/why M5 as a Money Supply indicator is needed for inducing Crypto-Currency in the basket of Currencies by Central Banks worldwide (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d).

There is a deep interlock between Financial Inclusion, Banking and Digital Dividends (Agarwal, 2017ab; Agarwal, Agarwal and Agarwal, 2016, 2017; Agarwal, Agarwal and Agarwal, 2018) which foster creation of social security facilities; employment growth and a social equilibrium in the society reducing in-equalities of income and socio-economic gender gaps. Global Dis-equilibrium and interdependence (Agarwal, 2007a); unemployment (Agarwal, Agarwal, Agarwal and Agarwal, 2017b); establishing balance between need for survival (Agarwal, 2007), socio-economic growth (Agarwal, 1969, 1988a; Agarwal, 1988b; Agarwal, 2004a; Agarwal, 2013a, 2013b; Agarwal, 2017aa; Agarwal, Agarwal and Agarwal, 2018); and environment discipline (Agarwal and Agarwal, 2007); focus on issues to build sustainable future in an interlocked global economic environment; digital revolution, dividends and security are major concerns and global challenges before the economies in Asia and the World today.

Digital revolution has fostered more than 40% of world population to have access to internet and over 20% of the poorest poor in the world to gain access to mobile phones. Digital revolution has also empowered women participation and the common man on streets. Even the poor (BPL families in India), disabled and downtrodden are the key beneficiary of this revolution. Digital technologies today are accessible by a population of over 7.4 Billion globally with around 1.1 billion having high speed internet, within Asia & the Pacific having the highest growing portfolio (Stiglitz, 2001; Agarwal, Agarwal and Agarwal, 2016; UN 2017; Agarwal, Agarwal and Agarwal, 2018).

The increased interplay of digital frameworks within our social fabric have induced key concerns before governments, regulatory bodies and the common man on street in the global village today. This interplay raises issues of privacy; social fabric being destroyed; cyber security threats; funds flow controls; money laundering (Agarwal and Agarwal, 2004, 2006; Bloomberg-ET, 2018) and terrorist threats through speedy access to internet, digital wallets, crypto-products and banking facilities today. Contrary to the belief we see that banking facilities, which ought to have become cheaper using digital platforms (having more efficient and swifter means of transfer of money), are becoming more and more expensive with rise in bank charges (Agarwal, 2017a; 2017b). There are a large number of efforts placed by Governments (including PM Narendra Modi's programs like jan-dhan yojna; swatch bharat abhiyan; awas yojna, make in india program; beti bachao program; garib kalian yojna; krishi sinchai yogjna and others by almost all governments around the world) focusing to uplift the poorest of the poor and improve the standard of living for all (Agarwal and Agarwal, 2017; 2018). However even today most economies are suffering from serious problems such as unemployment; abject poverty; illiteracy; poor or weak infrastructure; food security; vulnerable diseases, sanitation and hygiene (healthcare concerns); clean air and water; high mortality rate of children and women; income disparities furthering gender disparities; increased violence terror attacks flourishing due to swift transfer of illicit money via digital frameworks etc. World Bank, ADB, UN and other international agencies have been fostering their energies and finances to tackle some of these soars through financing various economies. They have also tried to facilitate and empower the vulnerable sections of the society including Women to contribute in Sustainable Growth and development. While government efforts with the assistance of these international agencies are bearing fruits yet a lot more is required to be done. According to ILO world employment and social outlook report released recently that many of the jobs created in Asia Pacific region are of poor quality. In India, despite strong economic growth hovering between 6.5% to 7.5% (on year to year basis) in the last 4 years with strong FDI flows making our reserves cross US$ 430 billion, about 77% of the workforce will still have vulnerable employment in 2018-19 (IMF, 2017a, 2017b, 2018; Agarwal, Agarwal and Agarwal, 2018; WB, 2018). A large part of jobs created in the region remain poor in quality. Vulnerable employment affects almost half workers in Asia

Pacific or more than one (1) billion men and women. Projections indicate that 72% of workers in Southern Asia, 46% in South-eastern will have vulnerable employment by 2019 showing very little change from 2017 as per ILO report. Poor quality of job and high informality is the way for high number of working poor or those living on incomes of less than US$ 3 per day (ILO, 2016, 2017; Agarwal, Agarwal, Agarwal, Agarwal, 2017; WB, 2018).

There is an urgent need to reverse this process by adopting strategies through financing Social Infrastructure such as Education, Healthcare, Skill development with a view to increase the incomes of the poor, vulnerable and downtrodden. The Focus needs to be on food, shelter and good health for all. Hence one needs to adopt both financial and non-financial approach to involve people in their economies for inclusive development. In the past the Government in India has introduced several schemes such as NREGA and Aganwadi workers. The government is focusing on doubling the incomes of farmers so as to reduce poverty of agricultural and people in several sectors of the economy. The creation of Kisan Credit Cards (IIF Studies, 1997, 1998) and "Mobile Mandi's and Mandi's on Wheel" ensuring farmers welfare and income growth along with establishment of food security (Agarwal, 2008; Agarwal, 2018e; Agarwal, 2018f; Agarwal, Agarwal and Agarwal, 2018) are steps governments can initiate. There existed in Ancient India when food for work was adopted whenever people suffered from famines, floods or droughts and other natural calamities. Civil society and crowd funding besides the formal sources of funding allocated by the respective governments from their budget and by schemes introduced by World Bank, ADB, UN and other international agencies may help in the mission of reducing poverty. Most of the Churches and Temples around the world are extremely rich because of the voluntary donations which in our opinion can be used by the management of such religious organizations for social welfare, imparting education, setting up charitable hospitals, uplift girl status in society through removal of gender disparities thought education and to contribute in poverty reduction.

The emergence of BITCOINs (and others as an informal / illegal virtual crypto-product) has raised serious concerns for governments; erroneous erosion of wealth of people and deviation from the focus of development by governments, institutions and individuals from the key concerns of the society to speculative gains (Agarwal, 2017a, 2018a, 2018b, 2018c, 2018d; ET, 2017; Reuters, 2017b; Goldberg, 2017; Reuters, 2018a). The Crypto-Currency launched by Central Banks backed by tenable asset class of the Nation's Wealth (both publicly / privately held) are expected to emerge as a new mode of funds transfer and currency fostering financial inclusion, empowering Women and inducing Social Security Benefits. Governments all over the world and international agencies like United Nations, IMF, World Bank, ADB, and ILO, OECD, AfricanDB etc. are seriously concerned about generating employment and reducing the prevailing unemployment and removing poverty through newer digitally fostered mechanism. The

current form of crypto-products (like Bitcoins and others) will create the divide further and increase the depth and reach of the problems and ills most governments and National economies are perplexed with. For most governments as well as international agencies, generating employment is one of the most pressing and serious issues. It is also observed that there is a mismatch between the demand and supply of appropriate labour due to asymmetric information, i.e. jobs available but not in the knowledge of Labour and suitable labour available but not in the knowledge of employers. This is where creating frameworks along the lines of the National Labour Exchange to induce full and transparent employment would serve as a key role player (Agarwal, Agarwal, Agarwal, Agarwal, 2017).

Crypto-products **(**like Bitcoins….) today are used to regulate the encryption techniques of so called crypto-currency and verify the transfer of funds, operating independently of a central bank. No one controls them. They are not printed like Rupee, Dollars or Euros. Such decentralized crypto-products provide an outlet for personal wealth to move beyond restrictions and confiscation because of its security feature. Ending up with creation of more income disparities; gender dispersion; un-employment; illusionary illegitimate speculative gains and large number of ills moving into the financial systems through money laundering (Agarwal and Agarwal, 2004, 2006) using these crypto-products (like Bitcoins…). Some key forms of crypto-products which have emerged as so called Crypto-currency are currently functioning in a Non-Legal and Non-Regulated Framework subjecting economies to National Treats; monetary system failures; growth in Money Laundering mean and steep secure mechanism for all illicit trade/commerce cross borders without controls of any National Economies (Agarwal and Agarwal, 2004, 2006; Agarwal, Solojentsev and Agarwal, 2008).

It is pertinent to mention that the valuation of crypto-products (like Bitcoin…) has been at an all time high ever since Japan passed a law to accept Bitcoin as a legal payment method (JT, 2018). However, over 72 Nations ban/restrictions on operations of such crypto-products and China's recent decision to ban Initial Coin Offerings (ICO) by some crypto-products miners have triggered a massive crash of almost 31-78 % in just two weeks in the early 2018. The Reserve Bank of India has not yet legally banned crypto-products but had issued notifications towards call for caution to people against the use of such virtual products (claiming to be virtual currencies). RBI has also advised commercial banks not to indulge in sale proceeds and restrict transactions related to VPs (TNN, 2017). Also the SIT created by Supreme Court of India has barred trading in such crypto-products. The main reason is that there is NO regulation on crypto-currencies and fluctuations (volatility) in prices are huge. Swings are as big as 25-85% percent up or down on a daily basis (Popper and Hsu, 2017; Rangan, 2017). The world in the last decade has seen several hacking, thefts and cyber attacks incidents where people lost thousands of dollars; pounds; rupees and the depositors were unable to go through any course of action for recovering these losses (Bloomberg, 2017c; Kharif, 2018; Dev, 2018). Digital currencies stored on one's personal devices like your mobile phone or laptop or cloud vaults/wallets are leading to series of newer risks

and issues. If the device is lost, stolen (Gibbs, 2017; Bhardwaj, 2018) or its operating system crashes, the investor would end up losing his funds completely without recourse. Buying crypto-products in India had been relatively easier given delayed legal re-course and large cash economy framework. However, India has most banks which are now restricted by RBI to indulge in such trades/transactions. There are strong KYC requirements which need to verify ID by through one's PAN card and AADHAR Card for most financial transactions in India, which are being completely bypassed with these financially innovative crypto-products (leading them to have emerged as the "New Hawala"). Government needs to be concerned as the number of companies dealing in crypto-products (so called crypto-currency) in India has grown from 4 in 2013 to over 20 by 2017 end (Christopher, 2017).

In the last two (2) decades we have seen that online banking; mobile banking; virtual banking; developmental banking; retail banking; corporate banking and cooperative (unions) banking besides digital wallets play a major areas of thrust in the banking sector and financial inclusion today. It is expected that this would further reduce cost, unless banks take to profiteering as done by some banks as observed in last 20 months post demonetisations in India (Agarwal, 2016; Agarwal 2017). The move by the Indian Government to induce/expand Post office Banking (as proposed by IIF Professors for last 8 years at various National Channels – DD, Lok Sabha TV, AIR, other TV Channels & print medias) would have far reaching impact of Financial Inclusion especially to the masses and rural India, Asia & the Pacific (Agarwal and Agarwal, 2017).

Given the emergence of Crypto-products in the informal sector with multiple players, it has become difficult for National Governments to regulate and calibrate the supply of money and its effects through Monetary Stabilization measures adopted by them, as these crypto-products allow billions/trillions of money be transacted globally without any checks and balances. More than the benefits, these products are emerging as threat to National Security; Individual's Wealth and Nations apart from the ills any speculative product brings with it to meet the needs of Greed of a specific group of people and rouge identities. Hence, the need for governments to act fast and consider to induce this financial innovation (crypto-currencies) as a currency of tomorrow into its basket of currencies, as done with various other monetary products in the last 6 decades is pertinent and in-evitable.

The proposed Model of creating efficient Money Market through modeling of M5 will facilitate an automatic way for transactional efficiency, generating wealth for the Nations, firms and people-at-large, through easy access to currency and opportunities for jobs and growth (Agarwal, Agarwal and Agarwal, 2018). It would also help save currency costs in a Market Driven Economic System with Asymmetric Information. (Agarwal, Penm, Wong and Martin, 2004; Agrawal, Penm and Agarwal, 2006). The "New Avtar" of Money in the form of Crypto would witness the change the way money (currency) has looked traditionally for centuries in the form of gold, silver, leather, wood, metal, paper, plastic and many others to a faceless virtual fully fractional form, but only when launched by Nations (via their Central Banks).

Jai Hind.

Notes

1. Virtual Currency Schemes, October 2012, A Report by European Central Bank
2. These currently are being purchased with real money with a specific conversion rate and then one can buy virtual goods and services or sometimes even real goods and services. For Example the virtual currency scheme set up by Nintendo, called Nintendo Points, can be redeemed in Nintendo's shops and in their games. Consumers can purchase points online by using a credit card or in retail stores by purchasing a Nintendo Points Card. The Points cannot be converted back to real money
3. These work with any convertible currency and have buying and selling rates and can buy virtual goods and services and real goods and services. For example Linden Dollars (L$) is the virtual currency issued in Second Life, a virtual world where users create "avatars", i.e. digital characters that can be customised. Second Life has its own economy where users can buy and sell goods and services from and to each other. In order to do so, they need Linden Dollars, which can be purchased with US dollars and other currencies according to the exchange rates established in the currency trading market. A credit card or PayPal account is needed. Users can sell their spare Linden Dollars in return for US dollars.
4 Public ledger is also called a distributed ledger or a blockchain that is visible to all computers on the network but does not reveal any personal information about the involved parties.
5 The Bitcoin system is so private that it has NO traditional financial institutions involved in transactions. Bitcoin is also referred as so called crypto-currency for its communication being secure from view of third parties. The simplest means to acquire Bitcoins is to use the exchange real money like rupee, dollar, yen, euros for bitcoins on an online exchange (e.g. Okcoin, Coinbase and Kraken). Anyone can obtain Bitcoins in exchange for the sale of goods or services, where the merchant can accept Bitcoin as a means of payment for the good and services supplied by him. Thirdly to acquire new Bitcoins, one can serve as a miner and mine Bitcoins by using one's knowledge of computer processing power to successfully verifying the validity of new network transactions. Purchased or mined Bitcoins can be stored in a digital wallet on the personal computer offline (known as cold storage) or at an online wallet service (hot storage). A wallet is a small personal database that one can store on one's computer drive (i.e cold storage), on one's smart phone, tablet, or somewhere in the cloud (hot storage).When the currency is stored online there are high chances of it being lost. The Bitcoin transaction uses cryptography to verify transactions, process payments and control the supply of Bitcoins. It uses two cryptographic schemes which is digital signatures and cypto-graphic hashes. Digital Signatures permit exchange of accurate payment instructions between the parties of a transaction. Cryptographic hashes are used for recording transactions in the public ledgers.
6 Digital signatures ensure the authenticity of the transaction between the sender and receiver by ensuring authentication, non-repudiation and integrity of the message. Digital signatures involve public key encryption which involves creation of a public and private key. Badev and Chen (2014) explain the process of digital signatures as a process where the sign function combines the message with the private key of the sender to produce signature c as indicated in Figure 4 above. The signature c carries the id entity of the sender with his/her private key. The receiver then receives the message and verifies that the message come from the sender with the help of a public key. The sign and verify functions are publicly accessible. The members of the Bitcoin system can verify the transaction with the message m, signature c and public key pk In cryto-graphic hash function converts the input string into an output string. Each message is converted into hash. As the message changes so would the output. Small changes in the message would also change the hash significantly. The output of hash function is random but deterministic. Bitcoins reside in bitcoin system as bitcoin address. The capability of Bitcoins one can send from the Bitcoin address is dependent on digital signatures that involve pairs of public and private keys. Each Bitcoin address is indexed by a unique public id

which is an alphanumeric number that corresponds to the public key. The private key is the counterpart of the public key. Any payment message has to be signed with a proper private key to be valid.

7 Original Bitcoin Client like Bitcoin Core can be installed on your computer and enables you to create a bitcoin address for sending and receiving the virtual currency, and to store the private key for it. Other Desktop wallet include MultiBit that runs on Windows, Mac OSX, and Linux. Hive is an OS X-based wallet with some unique features. An extra security enabled tailored desktop wallet is Armory. Others that focus on anonymity include Darkwallet.

8 These wallet come handy when one is travelling on the street and wishes to purchase something. Running as an application on the smart phone, the wallet can store the private keys for user's bitcoin addresses, and enable the user to pay for things directly with his or her phone. Mobile wallets include the Android-based Bitcoin wallet, Mycelium, Xapo and Blockchain. You also have browser based wallets like the CoinPunk and the Aegis Bitcoin Wallet, which supports Android smart watches.

9 The biggest advantage of a web based wallet is that it can be used from anywhere anytime through any access device. The biggest disadvantage is that it give the private keys to the web wallet provider which takes the control away from the user's hand. Coinbase, an integrated wallet/bitcoin exchange operates its online wallet worldwide. Users in the US and Europe can buy bitcoin through its exchange services. Circle offers users worldwide the chance to store, send, receive and buy bitcoins. Currently only US citizens are able to link bank accounts to deposit funds, but credit and debit cards are also an option for users in other countries (Shetty, 2018) . Blockchain also hosts a popular web-based wallet, and Strongcoin offers a hybrid wallet, which lets the user encrypt the private address keys before sending them to its servers – encryption is carried out in the browser. Xapo aims to provide the convenience of an simple bitcoin wallet with the added security of a cold-storage vault.

10 There are many sites that are offering paper wallets. Paper Wallets will generate a bitcoin address for the user and create an image containing two QR codes: one is the public address that user can use to receive bitcoins; the other is the private key, which user can use to spend bitcoins stored at that address. These wallets are safe from standard cyber attacks.

11 The whole system works via a Cloud setup, which is accessable to the select few wanting to use the service. The advantage of a cloud based wallet is that it can be used from anywhere anytime through any device. The advantage over Online/Web Wallet is that the private keys to the wallet remains confidential and less prone to hackers keeping the control in the user's hand.

12 Limited in number these are devices that can hold private keys electronically and facilitate payments like Trezor hardware wallet and Ledger USB wallet. Mycelium, Cryptolabs and BitStash currently have a hardware wallets in development. Nymi sports wristband from Boinym, which is likely to act as a bitcoin wallet and uses the heart rhythm as a security key.

13 Litecoin, launched in the year 2011, was among the initial crypto-currencies following bitcoin and was often referred to as 'Silver to Bitcoins gold". It is a peer to peer crypto-product and open source software project released under the MIT / XII license, creation and transfer of coins is based on an open source of cryptographic protocol and is not managed by any central authority. It can be sent globally around the world almost instantly, for very low fee. Bitcoin Vs Litecoin: One of the main differences between Bitcoin and Litecoin concerns the total number of coins which each crypto-product can produce. Infact, the minimum quantity of transferable bitcoin is one hundred millionth of a bitcoin (0.0000000 1, bitcoins) known colloquially as one "Satoshi".

14 Ethereum is a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference. Ethereum Wallet is a desktop Ethereum Wallet. Ethereum Wallet has integrated with shapeshift, which makes it easy to accept Bitcoin and other altcoin payments directly to your Ethereum Wallet as either.

15 Peercoin also known as PP coin or PPC, is a peer to peer crypto-products utilizing both proof of stake and proof of work systems. Peercoin is based on 12th august 2012 paper which listed the authors as Scott Nadal and Sunny king. Sunnyking, who also created Primecoin, is a pseudonym, Peercoin is the third most capitalized crypto-product at around 120mn dollars Peercoin seeks to be the most secure cryptocoin at the lowest cost, by rewarding all users for strengthening the network.

16 Z cash was launched on 28th October, 2016 and had remarkable achievements. More than just anything the assessment of Z cash is just as strong as the trust that the Z cash utilized a precise proof do secure the network called ZK- smark– or evidence of development. It offers privacy and selective transparency.

17 Dash (formerly known as Darkcoin and xcoin) is an open source peer to peer crypto-currency that offers instant transactions, private transaction and taken fungibility. It was rebranded from "Darkcoin" to "Dash" on March 25, 2015 a portmanteau of "digital cash". Dashcoin (Dash) is an automatically mutating anonymous crypto-product. Dashcoin is a next generation anonymous crypto-currency and the first automatically mutating crypto-product created with cryptonote technology.

18 Ripple is a real-time gross settlement system (RTGS) currency exchange and remittance network by Ripple. Also called Ripple Transaction Protocol (RTXP) or Ripple protocol, it is built upon a distributed open source internet protocol, consensus ledger and native currency called XRP (ripples). "XRP" is the 2nd largest market cap coin. Eobot has cloud mining of BTC that can automatically be converted into XRP. Ripple or XRP is a payment protocol that functions as a payment system, currency exchange and a remittance network and works with fiat currencies, crypto-products and commodities.

19 Monero is a secure, private untraceable currency. It is open source and freely available to all. With Monero, you are your own bank. Only you control and are responsible for your frauds; your accounts and transactions are kept private from prying eyes. Monero(XMR) is created on 18th April 2014 that focused on privacy decentralization and scalability. Unlike many crypto-currencies that are derivatives of Bitcoin, monero is based on Cryptonote protocol and possesses significant algorithmic differences relatin g to blockchain obfuscation Monero experienced rapi growth in market capitalization and transaction volume during the year 2016, partly due to adoption in 2016 by major darknet market AlphaBay (closed July, 2017 by law enforcement.)

20 A dog or a black dog carribean of Queen arm of Great Britain, made of pewter or copper, typically worth 1 half pence or 1/12 of a dollar. A dog and a stamp were not necessarily of equal value.

21 Potcoin was developed to remove the need for cash transaction between marijuana consumers and dispensaries. It was released on January 21, 2014 by entrepreneurs from Montreal, Canada who hoped the crypto-currency would be used by the legal Cannabis industry the world over. Three months after it took off, the Potcoin development team finally revealed their identities. In April, 2014 co-founders and developers Joel Vaffe and Nick Iversen delivered a talk about Potcoin at the New York crypto-currency convention. As of November 2014, there are 44 merchants accepting Potcoin as a payment method for products or services. Marijuana is still illegal in most countries.

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