Simple Macroeconomics of Crypto Currency and the Political Economy of Monetary Policy in a Democracy

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Abstract

The paper attempts to examine the macroeconomic implications of the coexistence of crypto currency with legal tender money in the context of a democratic country such as India. The paper shows that macroeconomic implications of crypto currency can be captured by a simple extension of the IS-LM model. The main potential political consequence emerges due to difficulty in implementation of monetary policy, especially prior to elections. The paper shows that if the share of crypto currency out of total money supply is high it is bound to impact on the efficacy of monetary policy. .The paper also examines the practical difficulties of legalizing crypto currency.

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1. Introduction

Crypto currency is a virtual currency which is generated on virtual platforms that does not require a central authority and its state is maintained through distributed consensus. The purpose of this paper is not about how crypto currencies are created or designed, rather the focus of this paper is on the fact that if crypto currencies are created how it affects monetary policies in simple macroeconomic terms, the political economy of crypto currency and also how it affects the macroeconomic issues of the Indian economy.

The notion of crypto currency is comprehensive encompassing all forms of payment instruments that are generated on virtual platforms in terms of independent digitized currency. There are many types of crypto currencies in the world and the most popular of them is Bitcoin.[1]. These currencies are issued virtually by a method of '*block chains*'. It is a continuously growing list of records, called blocks, which are linked and secured using cryptography. It can be considered as an open distributed ledger to record transactions between two parties in an efficient, verifiable and permanent way maintaining confidentiality through cryptography. We can explain how crypto currency works through block chain in terms of a flowchart in figure 1. From the flowchart we

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[1] The other forms of crypto currencies are Ripple, Litecoin, Bitshares, Zcash etc. China and many countries across the world have created virtual platforms to transact goods and services with "tokens" that look like currency and are not legal tenders of any country. It is to be noted that crypto currencies are different from virtual platforms like Amazon Pay or various types of virtual wallets such as Paytm. They are intermediaries; they compete in the market for payment systems and transactions, but do not have independent currency units. They transact in currencies that are legal tender of a country, dollar or Rupee or Euro etc. They do not issue their own independent currency or crypto currencies as issued virtually like Bitcoin. China and many countries across the world have created virtual platforms to transact goods and services with "tokens" that look like currency and are not legal tenders of any country

find that a person, say Ajay, wants to send an amount of crypto currency (say 100 Bitcoins) to Raadhika. It has been shown that this amount can be transferred through block chain technology, with encryption and decryption, virtually to Raadhika maintaining confidentiality. The flowchart shows the detailed steps involved in this virtual transaction which are self-explanatory.
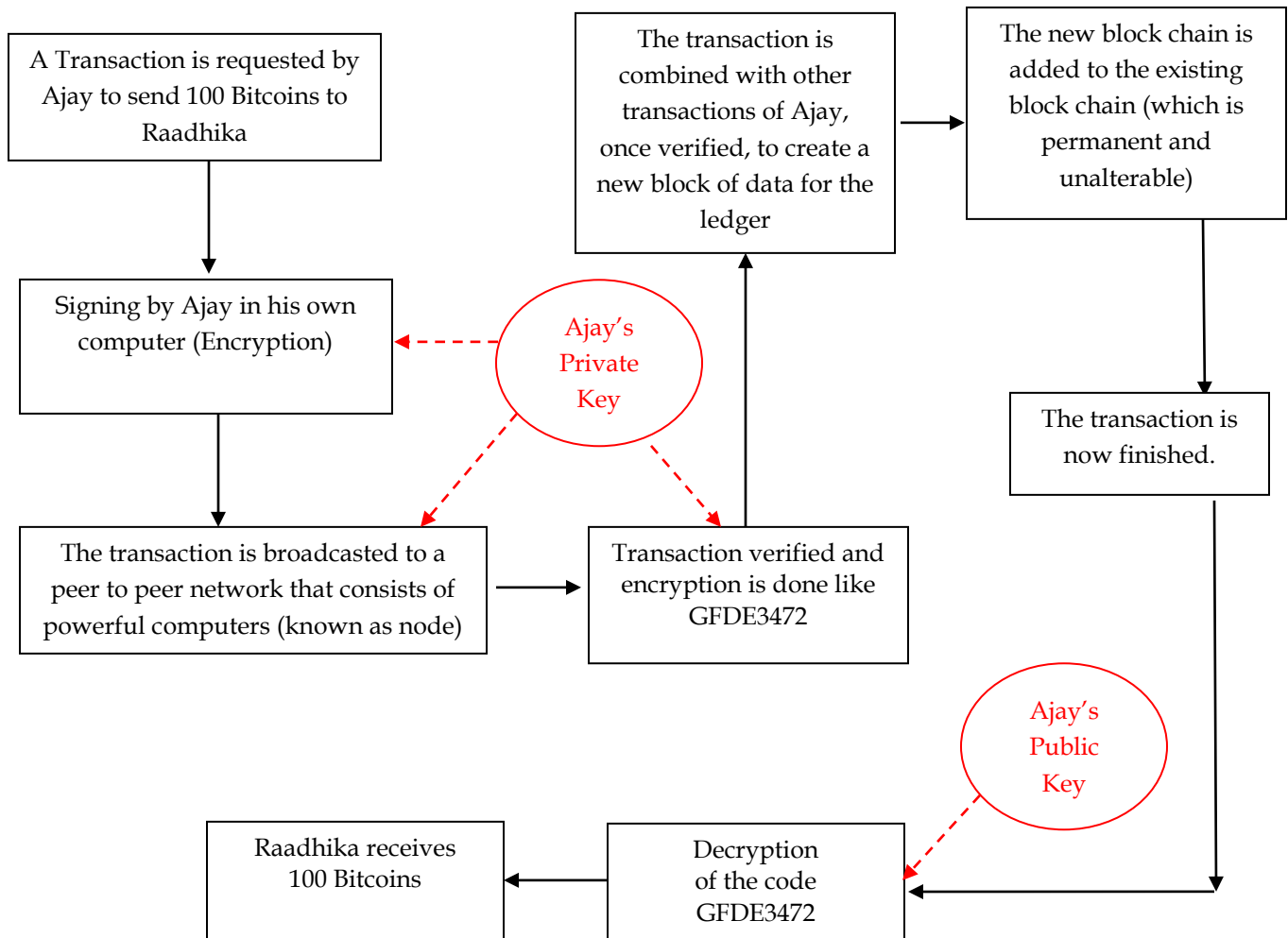

Figure 1 : Flowchart showing how crypto currency works through block chain

If we look at the literature we find that the work of Brunnermeier, James and Landau (2019) provides detailed information on various such platforms. The idea of competing currencies and payment systems independent of government backed or controlled

systems was originally raised by Hayek (1976). The literature on crypto currency is limited as the concept is new and not yet very popular in many countries. This might be one reason for lack of serious research on this issue. However, it cannot be denied that holding of crypto currency is becoming popular rapidly in both developed and developing countries and one cannot deny it as a potential threat to legal tender money with adverse consequences to different countries.[2] Some of the other important works in the area of crypto currency are by Alvarez, Argente and Patten (2023), Baboshkin, Mikhaylov and Shaikh (2022), Garcia-Corral, Cordero-Garcia, Pablo-Valenciano and Uribe-Toril (2022), Makarov and Schoar (2022), Memoria (2021), Sockin and Xiong (2020), Chiu and Koeppl (2019),Cheung, Roca, Su (2015) etc.[3] In the Indian context we find that there is lack of serious research work on crypto currency. Moreover the works that are available on crypto currency in the Indian context are more of journalistic in nature rather than serious research papers and have not considered any analytical structure to analyze the problem in the Indian context. The paper is motivated on this ground and in terms of a macroeconomic structure it attempts to address the issue and the potential policy measures to examine the implications of monetary policy in the presence of crypto currency.

The paper is organized in the following manner. Section 2 deals with a simple macroeconomic framework by incorporating crypto currency. Section 3 deals with a brief analysis of the linkage of crypto currency with politics of monetary policy in the Indian context. Section 4 concludes.

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[2] The Indian Government in its last budget also has expressed serious concern about the growing popularity of crypto currency and has stated in its budget for 2022-23 for controlling the rapid increase in crypto currency by bringing this currency under its apex bank, the Reserve Bank of India (RBI).

[3]. Most of these works have focused on Bitcoin value and Bitcoin prices as it is the most popular crypto currency. Cheung, Roca, Su (2015) in addition have considered the crypto currency bubbles. Baboshkin, Mikhaylov and Shaikh (2022) have argued that sustainable crypto currency growth is impossible.

2. A Simple Macroeconomic Framework with Crypto Currency

To illustrate matters we consider a simple IS-LM type framework where the price level is assumed to be given.[4] We consider that in this otherwise closed economy simple IS-LM type framework crypto currencies enter into the picture. So there are two currencies M_g and M_b, the first one is generated by the government or legal tender money and the other one, the second one, is generated virtually. The product market equilibrium condition is given by

$$S(Y) = I(R) \tag{1}$$

where $0 < S^{/}(Y) < 1$ and $I^{/}(R) < 0$

Equation (1) implies savings, given by $S(Y)$ is a function of income or output, Y, and investment, $I(R)$, is inversely related to the rate of interest, R.

The money market equilibrium condition in the presence of crypto currency is given by

$$M = M_g + M_b = kPY + L(R) \tag{2}$$

$L^{/} < 0$.

We assume here that the expected conversion rate or expected exchange rate of legal tender money to crypto currency to be given. In equation (2), kPY is the transaction demand for money and L implies the level of speculative demand for money. From equations (1) and (2) we can easily determine Y and R, which we used to do in case of usual IS-LM model.

So far it seems that there is no independent role of legal tender and crypto in terms of determining the extent of transactions and speculative demand. It is just the reflection of exogenous increase in money supply. While at this stage we leave the distinction in speculative demand unattended, we devise a method which will identify the extent of

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[4] Large body of economists in the world believe that price does not vary much in short run and firms are stuck with unsold goods and hold excess of desired inventories.

the division of aggregate transaction demand. We interpret the transaction demand in terms of the transaction costs of holding the money. This is given as follows.

Suppose we consider Y_g as the level of output that is transacted by M_g and Y_b as the level of output that is generated by M_b. For simplicity we assume that Y is a single good and its price is given by P and we have

$$Y = Y_g + Y_b \tag{3}$$

In equation (3) once Y is known, the interesting question is, how to allocate this Y between Y_g and Y_b. As both types of money are available, people will try to minimize the transaction costs, T, associated with it. It is given by

$$T = T_g(Y_g = Y - Y_b) + T_b(Y_b) \tag{4}$$

$$T_g' > 0, T_b' > 0, T_g'' > 0, T_b'' > 0$$

It is assumed that T_g and T_b increase with Y_g and Y_b respectively. We can assume the marginal transaction cost increases with more one transacts via physical or virtual platform. The levels of Y_g and Y_b are chosen in such a way so that

$$MC_b(Y_b) = MC_g(Y_g) \tag{5}$$

Equation (5) shows the allocation rule of output, Y, between Y_g and Y_b. It is done by equating the marginal cost of transaction from crypto currency is equal to marginal cost of transaction from legal tender money. This is shown in figure 2.
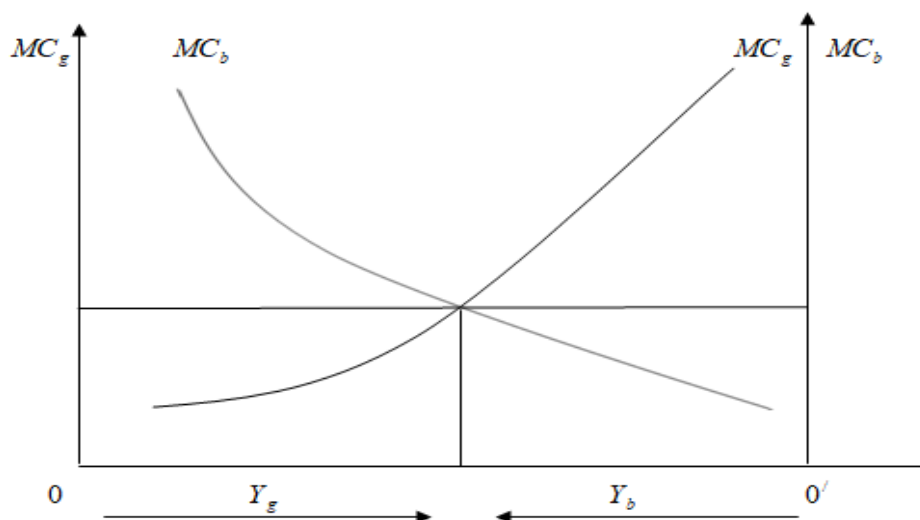
Figure 2 : Optimal allocation of Output level between Legal
Tender Money and Crypto Currency

Figure 2 shows the optimum allocation of Y_g and Y_b which depends on the level of the level of Y and it is given by $00'$ in the figure.

3. Politics of Monetary Policy

In the macroeconomic framework that we have mentioned in the last section we can state that an increase in money supply reduces the rate of interest and the fall in the rate of interest stimulates investment and hence output in the economy. One can argue that this might be the main reason why the Central Government in India asks RBI to increase supply of money or liquidity in the system i.e. announces a drop in the rate at which RBI lends money to banks nearer to elections. The politicians in our economy are always in favour of reducing interest rate to stimulate investment.[5] It has been proved time and again all across the globe, and India is not an exception, that lower interest rate does not stimulate aggregate investment. It is actually expectations about future

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[5] See Subbarao (2016) in this context to know about the actual story of India regarding reduction in interest rate.

that is essential for determining the level of aggregate investment. But bad economics is used by clever politics to influence the minds of not so informed population. [6]

Suppose we consider separately the money market equilibrium conditions with government legal tender money and crypto currencies and also have introduced the division of total demand for money to transaction demand and speculative demand for each type of currency. They are given as follows

$$M_g = kPY_g + L_g(R) \tag{6}$$

$$M_b = kPY_b + L_b(R) \tag{7}$$

where $L'_g < 0, L'_b < 0$

In equations (6) and (7) we know that R denotes the market rate of interest. Here g stands for legal tender (Government) money and b stands for crypto currency. Again L_j, Y_j and M_j shows speculative demand for money, level of output and money supply for each type of currency $\forall j = g, b$.

Combining equations (6) and (7) we can write

$$M = M_g + M_b = kPY + L_g(R) + L_b(R) \tag{8}$$

We now consider a simple illustration to examine under what conditions an increase in supply of high powered money causes an insignificant increase in the rate of growth of GDP. Suppose we assume that the amount of crypto currencies in the economy remains constant and its share in total money supply to be high. Then an increase in total money supply, M, due to an increase in legal tender money, M_g, without any change in M_b, can be expressed from equation (8) as

$$\hat{M} = m_g \hat{M}_g = l_y \hat{Y} - (l_g e_g)\hat{R} - (l_b e_b)\hat{R} \tag{9}$$

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[6] See the works of Lee and Werner (2022), Liu, Mian and Sufi (2020), Borio and Hofmann (2017), Guttmann, Lawson and Rickards (2020) , Schnabi (2017), Sharpe and Suarez (2014) etc for the insignificant impact of interest rate on investment and growth.

In equation (9) , m_g is the share of legal tender or government money supply in total money supply, l_y and l_b are respectively the shares of transaction and demand for money, for government money and crypto currency in total money demand. Here e_g and e_b are the elasticities of speculative demand for government money and speculative demand for crypto currency respectively with respect to rate of interest. Thus $e_i = (-R\dfrac{L_i'}{L_i})\forall i = g,b$ and $\hat{x} = \dfrac{dx}{x}\forall x = M, M_g, Y, R$

From equation (1) we find that

$$s_y\hat{Y} = -e_I\hat{R} \quad \Rightarrow \hat{R} = (-\dfrac{s_y}{e_I})\hat{Y} \tag{10}$$

where s_y and e_I are respectively the elasticities of saving with respect to income and investment with respect to rate of interest. Substituting for $\hat{R}$ in equation (9) we get

$$\hat{Y} = \dfrac{m_g}{[l_y + (l_g e_g + l_b e_b)\dfrac{s_y}{e_I}]}\hat{M}_g \tag{11}$$

From equation (11) we find that if the share of crypto currency is high so that m_b is high, then m_g is low, as $m_g + m_b = 1$, and we find that the rate of growth of Y is low due to an increase in supply of legal tender money. Higher l_g or l_b has the same effect. If people already hold a significant share of asset demand for money in crypto currency or in government currency, excess supply of money does not induce one to hold it even more.

So if people do not wish to hold that much of bond and rate of interest does not fall that much, investment and income do not rise that much. Thus ability of the government to manipulate rate of interest will be limited. It is political suffering that is at the core of the problem. Even if the RBI Governor is a friend of the government, rate of interest will not drop near about elections or when the government wants it to happen. Hence it is the power of regulatory control that is at stake.

We now consider a special case to examine the implications of monetary policy in the sense that an increase in supply of crypto currency may have insignificant effect on GDP. Suppose we consider a case where people hoard any excess supply of crypto currency for speculative purpose only and hold government currency only for transaction demand. We have already mentioned earlier that the expected conversion rate or exchange rate of legal tender money to crypto currency to be given. An increase in supply of crypto currency, when it is used for speculative purposes only, will not only increase the supply of crypto but also shifts the demand curve for crypto currency to the right due to an increase in expected exchange rate of crypto if expectation is such. The reason is that people holding crypto currency will expect for some reason that in future crypto would be legalized by the government and then it would be exchanged at a lucrative rate vis a vis the legal tender. Then there should not be any impact on rate of interest as excess supply of crypto will be matched by excess demand due to this effect. It is a separate kind of speculative demand because the holders of crypto currency will treat holding of legal tender as an asset.

Crypto currency or virtual currency is like currency of another country being allowed to be transacted within the country when it is not officially linked with local currency by any fixed rule. Hence, volatility of crypto currency will be of concern. Movement of crypto currency in and out of the country can hurt financial interest of the locals. Government of different countries cannot control such movement or cannot control if crypto currency is unnecessarily held in excessive amount by local people because of wrong perception in its value. When crisis hits, the government may be forced to undertake costly bailout strategies (by increasing money supply). Crypto currency is like a globally floating currency which no one can control. That is really scary.

4. Concluding Remarks

The paper shows that in the presence of crypto currency monetary policy may fail to increase real GDP. Movement of crypto currency in and out of the economy can affect the domestic economy adversely as the domestic central bank has no control over this currency. In the end we examine the possibilities of legalizing crypto currency in an economy as proposed by India's Finance Minister Nirmala Sitharaman in her 2022-23 and 2023-24 Financial Years' Central Budgets. The Budget of 2022-23 has announced that Reserve Bank of India (RBI) is going to issue crypto currency in the market in near future. It means that RBI controlled Crypto Currency will be treated as legal tender. The proposal is no doubt unique, given that China, UK and USA are moving cautiously and have not yet considered crypto currency as legal tender. In case of private virtual currency it is difficult to locate the seller and the buyer. It is expected when it will be controlled by RBI, such a problem will not arise. It is also expected that RBI will regulate crypto currency through *block chain* method. So if Reserve Bank of Digital Currency in India (RBDCI) is introduced by RBI crypto currency can be controlled.[7] As a result of this in near future the citizens of India will have three sources of transactions like liquid cash, private virtual currency and RBDCI. We can thus have a possibility of decline in the supply of liquidity cash in the economy and there is always a chance to have a situation of black memories of demonetization of the year 2016-2017. As the Government of India in its budget for the year 2022-23 has legalized crypto currency in terms of its issuance by RBI, the question that naturally arises is, how this huge government initiative will be financed. Apart from an increase in the income tax rate, though in the budget for 2022-23 no such provision has been mentioned, [8] and increase

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[7] This part of the paper is partially draws from the work of Basu (2022). However, the present paper includes original comments of the authors which are different from the work of Basu (2022). See also Marjit (2022).

[8] Given the trends of Union budgets over the last few years it appears to be a remote possibility in near future as well.

in loan financed increase in government expenditure by big industrial houses,[9] one major source of financing this initiative is deficit financing or increase in net RBI credit to the government. Thus there will be printing of new money in the economy and it will create inflationary pressures in the economy. If RBDCI and private crypto currency exist simultaneously, it will reduce the currency control capability of RBI. Virtual currency is good as long as RBI has full control over it, though it cannot be denied such a control is difficult to implement on part of RBI.

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[9] One can check that in this case there will be an increase in rate of interest by shifting the IS curve to the right and also an increase in aggregate demand which creates inflationary pressures in the economy in terms of increase in prices.

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