



Money as a Medium of Exchange: Then and Now: Can Technology be a Facilitator of Exchange?

By Amaresh Das

Southern University at New Orleans, United States

Abstract- This paper deals with the origin of money through its function as a medium of exchange. Barter can give rise to money through necessitating the use of a standard of value even before calling for the use of a medium of exchange. In a given society at any point in time money is defined in principle simply as the subset of total financial assets and commodities which are actually performing monetary functions. Three main functions are usually suggested. Money is thought to be that which serves as a medium of exchange, standard of value and store of value. Defining money in a particular context would simply involve a judgment as to which items currently possess these properties to a greater or lesser extent. The paper also ascertains whether money originated through its function as a medium of exchange, can explain the dynamics of monetary exchange of most recent days. The paper also ascertains if technological changes can improve the efficiency of the trading process.

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I. INTRODUCTION

Before attacking the complex monetary problems of a modern society it is best to arm oneself with a thorough understanding of the fundamental nature of money and its functions and the general framework of the monetary system. Only then one is equipped with the essential tools for attacking contemporary monetary problems. The assumption that money arose from the realization of the inconvenience of barter, popular as it is among economists, needs careful re-examination. This is what the paper principally proposes to do

a) *Money as a Medium of Exchange and as a Store of Value*

Money can act as the standard of value without actually becoming the medium of exchange. In primitive societies, for example, cattle was sometimes used as a standard of value but were not necessarily used as a medium of exchange. If the troublesome problem of 'double coincidence of wants' is to be avoided, some readily acceptable thing must be available as a go-between to bring about a smooth and effective exchange of goods. Some form of money, therefore, must be called into use to act as the intermediary or as

the 'medium of exchange'. It is not enough that there be a basis for comparing the value of things to be exchanged.

Keynes, being a leading exponent of the nominalist school which regards money primarily as a unit of account, attaches more importance to its standard of value function, stating that in itself the use of a mere medium of exchange would hardly have made us emerge from the phase of barter.¹ Although as a general rule the materialist school supports wholeheartedly the medium of exchange theory of the origin of money a few of its members endorsed the standard of value theory. Thus Laughlin, a leading monetary monetarist, stated that as soon as two or three articles entered the field of exchange, reference to a common denominator became imperative. As Laughlin says (1903, p7)

So natural is this operation of the human mind that the evolution of the standard concept must have preceded the concept of the medium of exchange. In fact, the whole history of money seems to show the existence of a tendency to use as a medium of exchange the article first chosen as a standard of value.

Another prominent member of the 'hard money school' Gregory takes a similar line.² According to the standard value theory of the origin of money, it is difficult to see how the medium of exchange could possibly have preceded in chronological order the standard of value, considering that the use of a medium of exchange necessarily implies the use of a standard of value. No nominalist could have put the case for the standard of value theory more forcefully.

There is almost an infinite variety of primitive monetary system, each obeying a particular set of values.

The economic system of the North American colonies in the early period was too primitive to make the use of coined money indispensable. The

¹ J. M. Keynes (1930

² As Gregory (1933, p 45) writes

The difficulties of pure barter were first overcome by the expression of values in terms of some common prized object before that object served as a medium of exchange and the qualities which fitted the commodity to serve as a common denominator of values would not necessarily fit it to serve as a given medium of exchange.

economy of the rural district was simple. Most settlers moved within a small radius and did not buy many things from outside. In the opinion of Nettels, early social arrangements were such as to make for the elimination of the use of modern money possible.

According to the standard of value theory of the origin of money, it is difficult to see how the medium of exchange could possibly have preceded in chronological order the standard of value, considering that the use of a medium of exchange necessarily implies the use of a standard of value. If an object comes to be used systematically as an intermediary in the exchange of goods and services, by its function its use implies consciously or otherwise the expression of prices in terms of the object concerned. It fulfills, therefore, the function of the standard of value. On the other hand, the use of a standard of value evidently does not necessarily imply the use of a medium of exchange. Indeed, as Gregory rightly pointed out, the need for a common denominator to facilitate barter must have been felt long before the increase in the volume and diversity of goods made the use of a medium of exchange imperative. So long as there were fixed exchange parities between the principal objects bartered against each other systematically, there were no imperative need for a standard of value with the diversification of products, services and requirements, however, the tariffs of fixed parties tended to become too involved, and the use of some common unit of account became increasingly necessary. There was a tendency to fix ratios in one particular unit or in several units convertible to each other on the basis of fixed parities,³

It seems probable that, in many instances, long before primitive man felt impelled to accept for his goods or services an object he did not require for his direct needs he must have come to be induced to value goods and services in terms of some fairly widely used object. This view is contested by Menger who believes that a primitive stage a common denominator was not necessary because early barter was not done for the sake of obtaining equal value, but for the sake of securing what was needed in return for what was in superfluity.⁴

³ In Iceland during the 14th century there existed an elaborate tariff of fixed parities expressed in terms of stock fish on the basis of which all barter transactions were effected. In communities where barter was based on free bargaining the need for a common denominator must have made itself felt at a relatively early stage.

⁴ Menger may be right so far as the very early phases are concerned. But then at such early phases the medium of exchange was equally unnecessary. The turnover of goods consisted at that stage largely of exchanges of presents. See Einzig (1947). So, standards of value may have been employed by primitive communities before the adoption of a medium of exchange, though not for the requirements of trade. According to this view money may have been employed even before the development of barter, for the purpose of valuing wealth which required the use of a common denominator.

India had primitive currencies which were in use for many centuries B. C. even in those parts of the sub-continent which had reached in advanced civilization. Almost all economic transactions in many villages were carried out without the use of money. When they happen to be rich in money they hoard it in coins which serve as ornaments. Until recently the use of modern money in remote villages in Uttar Pradesh was rare, whether for effecting exchanges or remunerating services. (Hodkin (1931, p 17).

It would seem that the assumption that money necessarily arose from the realization of the inconveniences of barter, popular as is among economists, needs careful re-examination. The medium of exchange theory of the origin of money appears sometimes in an extreme form which suggests that at a certain moment a deliberate decision to adopt money was made, when the increase in the volume of trade made barter conditions intolerable. Economic historians rightly denounce the idea of a deliberate decision to change the system of commercial exchanges as being fully as unrealistic as Rousseau's conception of the conclusion of a *contract social*. The suggestion made by Crowther (1940) that currency must have been the invention of a 'lazy genius' who could not be bothered with the complications arising from barter appears to be equally divorced from reality, while it is just probable that some communities out of untold thousands may have adopted money through the deliberate invention of one person or the deliberate decision of the community, the chances are that in the overwhelmingly majority of instances the evolution of money was an unconscious and gradual process. It is important that economists writing on the subject should realize that institutions such as the division of labor, or private property, or money, are not invented by some genius, lazy or otherwise, on a Sunday afternoon.

It is equally important to bear in mind that money was not invented once for all for the entire globe. While in many instances the institutions may have been copied by various communities from others, very often each community worked out its own salvation independently in its own way, without knowing anything about identical or similar solutions arrived at in other parts of the world. It is impossible to accept the application to money of the different conception implied in Crowther's remarks...

It seems certain that, while in many communities barter without the use of any kind of money continued long after the system had become cumbersome owing to increase in the commercial turnover, in other circumstances some form of money was adopted long before this became absolutely necessary or particularly advantageous from the point of view of the interchange of goods. Apart from instances

in which money was first adopted for purposes other than trade, even its premature developments out of barter is conceivable at a stage when the community could well have retained the more primitive method of moneyless trading. Money tends to develop automatically out of barter, through the fact that favorite means of barter are apt to arise. A stage is usually reached when the use of one of the means of barter becomes so widespread that it may be said to have become a medium of exchange. This process was aptly described by Menger who realized the inadequacy of the conception under which pure barter is supposed to have continued until it reduced itself to absurdity through the expansion of turnover, and was then replaced by money⁵

Metallic money was not unknown in Japan in 700 A.D. In A.D. 713 tax was payable in copper. In the 10th century gold dust became a medium of exchange. At first it was put in a small bag of convenient size (ten ryo). But later it was realized that gold dust often dripped from the mouth of the bag, so it was melted into gold bars and used by weight, the bars being cut as required. The use of gold dust and gold bars continued even after the adoption of coinage, as there were not enough coins. (Takizawa (1927, p 95).

An intermediate stage in the progress from pure barter economy – under which goods are acquired for direct consumption only – to money economy is the employment of some favorite medium of exchange⁶. It seems probable that when money developed out of barter it did so not because barter had become intolerable through an increase in the commercial turnover, but because more and more people found convenient to use the same intermediate goods in their transactions. This may appear to be saying the same things in a different way. In reality there is an essential difference between the negative approach used by many generations of economists who attributed the origin of money to the intolerable inconvenience of barter that forced the community to adopt a reform, and the positive approach suggested here, according to which the method of exchange was improved upon

⁵ Turner (1929) ridiculed the assumption that primitive communities are necessarily gravely handicapped in trade by the difficulty in effecting direct exchanges between the original producer and the ultimate consumer. He pointed out that if the would-be buyer of certain goods are unable to find a seller to accept his goods, he could always improve his bargaining position by swapping his goods against other which were more easily exchangeable. If even these goods did not serve his purpose adequately he could swap them against other goods even more easily acceptable until he gained possession of the right kind of goods with the aid of which he could acquire the goods he really needed.

⁶ The increasingly frequent use of one particular medium of barter tended to raise its status gradually and imperceptibly to that of a medium of exchange.

before the old method became intolerable and before an impelling need for the reforms had arisen.

b) *Money as a Store of Value*

When economists are engaged in a controversy on the question whether the function of money as a medium of exchange preceded its function of money as a standard of value, they are inclined to overlook or under-rate the claim of the store of value function. This is probably due to the fact that an object that is used as a store of value cannot, by that reason alone, be considered as money. It need not necessarily be suitable even subsequently to assume the role of money; many non-monetary objects which are capable of fulfilling the function as a store of value are precluded by their nature from assuming that role.

Jevons (1875) was among the few economists who realized the full significance of the store of value function of money and the possibility that chronologically it may have preceded the other monetary functions. As he writes:

The use of esteemed articles as a medium for conserving value may in some cases precede their employment as currency. Historically speaking, such a generally esteemed substance as gold seems to have served firstly as a commodity valuable for ornamental purposes; secondly, as a store of wealth; thirdly as medium of exchange, and finally as a measure of value. (p 16)

He quotes instances for the use of gold in the Homeric period as a store of value and points out that it was not until a later period that it replaced oxen as a common measure of value. His observation conveys the impression that he considered it essential for an article to be used for ornamental purposes before it could become a store of value.⁷

A detailed examination of the origin of money through its function as a store of value is provided by Rist ((1940) who copiously quotes from Keynes (1930). He famously quotes a remark by Keynes.

The importance of money essentially flows from its being a link between the present and the future. (Keynes, p 293).

Rist rightly points out that when money loses its capacity to serve as a store of value function – the day paper money begins to depreciate at a rapid pace – it becomes less suitable for acting as a medium of exchange even though it does not altogether lose its capacity of serving that purpose. After both World Wars people in various countries reverted largely to barter, or to the use of primitive money, because their paper money ceased to be suitable to fulfill the function of store of value. Holders of goods were reluctant to

⁷ This is by no means necessarily so. Goods such as wheat, oxen, smoked fibre mats, etc., were used as a store of value even though they could not be described as ornamental

accept notes even for a few hours and preferred to employ as a medium of exchange goods capable of playing the part of a store of value. Rist makes it quite clear that an object cannot satisfactorily fulfill the function of a medium of exchange unless the recipients are prepared to hold it temporarily at any rate in its capacity of a store of value.⁸

c) Gresham's Law

If two or more different kinds of currencies are legal tender, and have a fixed ratio in relation to each other, then the one which is over-valued compared to its free market price is apt to remain in circulation while the under-valued one is likely to disappear. This later came to be known as Gresham's Law. The principle that bad money drives out good money operates in another sense. During periods of debasement the debased currencies are apt to remain in circulation while the full-valued currencies are apt to disappear through hoarding, industrial use or export. There are many instances in the evidence on the behavior of primitive currencies to show that Gresham's Law applies to them in both senses. On the other hand, in many other instances primitive currencies have defied Gresham's Law. An instance of the operation of Gresham's Law is provided by India and Burma where until comparatively recently rice served as a medium of exchange, and only inferior rice remained in circulation. Yet, another instance of the same kind is that of tobacco currency in Virginia, the use of which led to a market determination of the quality of tobacco produced for the requirement of monetary circulation.⁹

The operation of Gresham's Law in primitive societies, however, at a more advanced data is at times apt to be handicapped by the lack of adequate export facilities. The use of some primitive currencies is confined to a particular community and cannot be exported at all. The dual character of many primitive currencies facilitates the operation of Gresham's Law. If one of several currencies in use becomes over-valued it is apt to become diverted to non-monetary use and the under-valued currencies remain in circulation.

⁸ This does not necessarily mean, however, that their function of store of value is always the origin of its other functions. Indeed, since a time lag must necessarily elapse between the acceptance of money in payment and its subsequent use in payment, be it only a few days, or a few hours or, even a few minutes. During the Second World War the depreciation of the Chinese paper money assumed such proportion that sellers of goods were unwilling to keep it as a store of value even for the briefest possible period.

⁹ This is also true of other commodities serving as currencies in the old American colonies. There was also a tendency for inferior, badly strung or faked wampum to remain in circulation among the colonies, for the simple reason that in trade with the Indians only perfect specimens were accepted. The working of the cigarette standard in prisoner's camps during the Second World War also illustrated the functioning of Gresham's Law. Usually the cigarettes of favorite brands disappeared; they were either consumed or hoarded. Only less popular brands of hand-filled cigarettes remained in circulation. See Bagehot (1915).

II. MONEY AND THE MEDIUM OF EXCHANGE

The standard of view of money, that is primarily a technical device for overcoming the inefficiency of barter, led on naturally to the characteristic dual perspective on the relationship between money and real economic activity, which is found in most mainstream monetary and macroeconomic theory. Although the existence of money is accepted (seemingly grudgingly) as part of the background of economic institutions, monetary changes *within* a given framework are still regarded as essentially neutral.

a) *Is Money Neutral? the Role of Technology*

The 'invention' of money must at one time have had some sort of impact in moving the economy away from the original state of barter; but there is no further ongoing relationship between money and real economic activity. Money is, therefore, at once very important and yet unimportant, Trautwe in (1993) puts this nicely when discussing 'the standard view of money as a requisite but essentially neutral lubricant of economic activity. The reason for this shift is not difficult to find. The orthodox economic theory of the latter part of the twentieth century is essentially *Walrasian* in the sense that a framework is adopted in which the coordination of exchange activities in a general equilibrium setting is seen as unproblematic. Models based explicitly or implicitly on Walrasian 'microfoundations' therefore have no real role for money to play. ((Laidler (1990), Hahn (1983)). The Walrasian auctioneer provides a (fictitious) method of coordinating activities in a market economy without the need for any other agency, and it is hardly surprising that models that easily solve problems of information and coordination in this way can find no role for money (Bell (2001)..

Another way of putting the point would be to say that technological advances can be assumed to make the Walrasian vision of the economy a potential reality instead of just a convenient theoretical fiction. With the advance of technology. most recent modelling efforts involving search, storage cost, 'shopping time' and so on, obviously do intend to remedy this particular defect but again fit awkwardly into a structure which originally presumed to solve all such problems *a p r i o r i s* relative price signals. In the primitive communities, exchange of goods would have required barter between agents with coincident endowment and wants. However in modern day at an advanced level of division of labor, one may trade by getting something one does already possess but which, as judged from past history, one will be able to sell later easily to others. For a suitable range of the number of units per trader and the number of differentiated products available, traders have enough holes in their inventories to barter, but, after sometime trades involving money play an important role; and sometimes no trade at all is possible in an encounter of two randomly selected traders. Which product evolves

as the most desired 'money' thus depends on the random dynamics of the market, without outside interference and without any special property of that product at the beginning.

This result conforms to statistics where 'everything' can be described by randomness, whether it is Boltzmann statistics for thermodynamics, the build-up of social hierarchies or the value of the European currency. Economists might regard this view as oversimplified. For a recent model, the time dependence could be quantified: a stationary state is reached if every trader has several chances to trade with every other possible trader., the distribution of times for which one currency stays on top then appears to follow a stretched exponential. Other models of statistical mechanics of money' are discussed in Stauffer (2001).

Looking up contributions such as the work by Jones ((1976) or the seminal paper by Kiyotaki and Wright ((1985), one finds almost the same structure of analysis. Following then the prevalent style of reasoning in their subject they were theoretical investigations into the nature of equilibria in an economy with a large number of goods rather than a truly dynamic model of the emergence of money. The question pursued is under what conditions one would find a 'monetary equilibrium' in which one of the available goods emerges as a medium of exchange and under what conditions the economy remains stuck in a situation of barter trade. Like in many other areas in economics, the demonstration of the existence of multiple equilibria (barter vs monetary equilibrium as well as different monetary equilibria) pointed to the necessity of investigating out-of equilibrium dynamics.

To give the reader a feeling of the typical approach pursued in economics in modern days we give a short sketch of the basic ingredients of the seminal Kiyotaki and Wright model that has stimulated a whole branch of recent economic literature. The setup is, in fact, more of an example than that of a general model of a multi-good economy. In particular, it is assumed that there are three commodities in the economy which are called goods 1,2,3. there is also an infinite number of individuals who specialize in both production and consumption: type i . [$i = 1, 2, 3$] agents derive pleasure (utility) only from the consumption of good i and are able to produce only good $i \mp j$.

A typical example used in many of the pertinent contribution has the following structure of consumption and production:

i	1	2	3
i'	2	3	1

This implies that there is no 'double coincidence of wants' in the economy. Therefore, intermediate

trading of goods by agents who do not desire them as consumption goods is required for the satisfaction of the need of these agents. It is furthermore assumed that in every period there is a random matching process that assigns every agent to a pair with one other agent within the economy. Pairs of agents then have the chance to trade with each other (exchange their goods).

In the theoretical papers on this subject, the focus is on the detection and characterization of steady state Nash equilibria.: sets of trading strategies of each type of agents together with the steady state distribution of goods resulting from these strategies, so that each individual maximizes its expected utility under full information (rational expectations) about the strategies pursued by other individuals. There are also storage costs per period for goods that are not consumed by their owners. The distribution of both the instantaneous utilities derived from consumption and the storage costs are crucial for the types of Nash equilibria that exist in the model. These goods with lower storage costs are, then, more likely to emerge as 'moneys' due to their more convenient properties. A particular interesting situation is the coexistence of the so-called 'fundamental' and 'speculative' equilibria. In the former, only goods with lower storage costs are accepted by the agents, while in the latter case some low-storage costs are also traded against high-storage commodities. The second case¹⁰ is the most interesting one as it corresponds to the 'emergence of money'; certain goods are not traded not because of their intrinsic values but purely because they are accepted by other agents.

¹⁰ To solve the steady state equilibria requires us to consider the development of expected lifetime utility for each group of agents:

$$E \sum_{t=0}^{\infty} \beta^t [I_i^u(t) U_i - I_t^D(t) D_t - I_{ij}^C(t) C_{ij}]$$

Where U_t is the instantaneous utility from consumption, D_t the instantaneous disutility, C_{ij} the storage costs of goods j for types i , $\beta < 1$ is the discount factor and I_i^u , I_t^D , I_{ij}^C are indicator functions assuming the value 1 at any period t in which consumption, production or exchange take place and 0 otherwise. Bellman's approach in dynamic programming allows us to express this problem in terms of value function of certain states. For example,

$$V_i(j) = -C_{ij} + \max \beta E [V_i(j)' | j]$$

could be used to denote the value for an individual of group i to currently own one unit good j . The value $V_i(j)$ of this scenario consists of an instantaneous disutility, $-C_{ij}$ the negative storage costs incurred by this agent plus the discounted value of the expected change in its situation in the next period, $E [V_i(j)' | j]$.

III. CONCLUDING REMARKS

It seems to be a mistake to assume that barter became reduced to absurdity at an early phase of economic progress. The chances are that in the majority of communities it survived long after its replacement by some form of monetary system became possible through technical and, of course, intellectual progress. Notwithstanding the limitations of the store of value theory, it undoubtedly contains a large part of the truth, and it is indispensable for an understanding of the evolution of money. Although recent direction toward a dynamic monetary exchange further facilitate our understanding of money, any rigorous derivation of the type of Nash equilibria outlined above is still a combinatorial nightmare. A fact that is liable to impress one more than anything else as a result of a study of the background to primitive money is the possibility of a wide variety of causes leading to the same solution, and of the same cause leading to a wide variety of solutions.

A comprehensive approach to the basic nature and functions of money, then, suggests that the origin of money lie, not so much in the need to eliminate the inefficiency of barter in an exchange economy but in social practice. There is an evolutionary aspect to the relationship between the monetary and credit systems as first suggested by Moore's distinction between commodity money, fiat money and credit money and Chik's identification of five stylized 'stages of banking' in the evolution of the modern financial system.

Advocates of technology-based 'free banking' which refers to the elimination of what is seen as government 'interference' in currency and banking affairs, have stressed the medium of exchange function and hence criticized the recent monetary economics (NME) on these grounds, even though sharing with the latter group a preference for *laissez-faire* in the financial services industry. For example, many monetarists assert the relevance of Menger's (1892) approach even in the present day Menger's theory attempts to explain the convergence of a market system on a common monetary standard purely in terms of the self-interest of traders in the system, and without the need to invoke any form of legal or social restrictions. An 'invisible hand' argument is used to suggest that trader's interest in reducing transactions costs will prompt eventual convergence on a single commodity as the standard. Technological changes can certainly improve the efficiency of both the trading and accounting process and also change the external form of the various assets into which the necessary 'trust and confidence' may be reposed. It is doubtful, however, that technology alone will succeed in eliminating the basic features of a modern day monetary problem.

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