

**Research Article**

**CRYPTOCURRENCIES IN THEORY OF MONEY AND CREDIT: AN AUSTRIAN PERSPECTIVE**

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**ABSTRACT**

Theories of money and credit can be divided into two general categories: commodity theory of money and credit theory of money. Both categories theoretically question the acceptance of cryptocurrencies as money. The present study aimed to provide a new interpretation of the Theory of Money and Credit in relation to both theories mentioned above. First, the functions of "public trust" was taken as a commodity, which is consistent with Karl Menger's views and the subjective theory of value. Based on this approach, the definitions of the credit theory of money will be acceptable with a new interpretation. This new interpretation also involves an extension of Hayek's definition of money, which is consistent with Mises' definition of money. Then, the concept of intertemporal preferences, with an emphasis on the barter root of money based on Mises' regression theorem, was used to show that cryptocurrencies can be accepted as money as far as they serve as private currency and suit the computability of dynamics of "Underlying Economic Realities" with intertemporal preferences. Therefore, the main criterion for defining money is how it affects intertemporal preferences.

**Keywords:** Cryptocurrency; Intertemporal preferences; Credit; Private currency; Fiat money; Regression theorem

**JEL Classification:** B53, E42, E47, E51, G15

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**INTRODUCTION**

From a macroeconomic perspective, cryptocurrencies are considered competitors for national currencies and may be able to transform the theories and policies of money and modern banking. However, the money supply is still monopolized by governments and the political economy is the most decisive factor affecting it. In addition, governments argue that they recognize the independence of central banks based on conventional economic theories and the public good. Assuming price flexibility- at least in the long run, some economists conclude that monetary policies merely affect the general level of prices and the real sector of the economy will go on disregarding the money supply and value. On the other hand, some others are optimistic about the effects of monetary policies at least in the short run. Nevertheless, while believing in the nonsuperneutrality of money supply increase or decrease, most economists continue to agree that central banks should have a monopoly on the money supply. It is widely believed that central banks should be able to control long-term economic growth fluctuations, maintain an acceptable rate of employment, and ensure the relative stability of prices by developing some policies, such as inflation rate targeting and interest rate targeting.

When Nakamura sent his article "Bitcoin: A Peer-to-Peer Electronic Cash System" to cypherpunks, it was probably difficult to predict that we would face this massive volume and variety of cryptocurrencies in less than ten years. The first economist who proposed the demonopolization of money in the 20<sup>th</sup> century was Friedrich von Hayek. Hayek's monetary system begins with a publisher's commitment to cash out of a basket of commodities (initial valuation) and is premised upon competition between publishers of private money. In fact, private currency publishers should always control the relative value of their money to the committed portfolio of commodities, as well as its relative value to other currencies. More than four decades after Hayek presented his views, the need for a reliable computing unit is still one of the reasons that justify the monopoly of central banks on the money supply. It is publicly assumed

that the market fails to provide stable money in the mainstream of the economy. The fluctuations in the value of cryptocurrencies have prompted the monetary authorities in many countries to officially declare that cryptocurrencies are not real money and cannot play the roles that are currently being played by national currencies. The present study aims to employ the Theory of Money and Credit (TMC) to evaluate the current and future status of cryptocurrencies with regard to conventional functions of money.

**METHODOLOGY:**

A complicated and abstract phenomenon may always be experienced from different perspectives. Since we are not epistemologically able to experience or perceive the whole of a phenomenon, we need a method to avoid analysis errors to the most possible extent. The present study used a theoretical model based on verbal formalism. This theoretical model was a conceptual image consisting of a set of events, logically deduced from the elements of human actions. It was referred to as the imaginary model by Ludwig von Mises. In this model, the formal logic applies to axioms referred to as "synthetic a priori proposition" in Immanuel Kant's literature. These statements may be considered either universal or non-universal. However, the present study deals with only universal statements. Conclusive results can be obtained by assuming every set of axioms through an accurate process of reasoning. It is obvious that any change in these axioms will lead to different results. This is what the critics of the accepted axioms of the present study can do.

Accordingly, the market can be defined as a mechanism for producing, transferring, and discovering information to coordinate the actions and achieve economic order. Unlike the definitions of the economic mainstream, the existence of information is not an assumption in this definition. In fact, this definition is basically based on the epistemological premise that we have a limited understanding of the surrounding world and the identifier is effective in the path of knowledge acquisition. This definition of the market will apply to money and other commodities.

Definitive statements only make sense for the past, and the future is something possible at best. In a treatise on probability, John Maynard Keynes argues that some ambiguities and uncertainties cannot be reduced or eliminated while some others can be managed. Frank Knight, in an article titled "Risk, Uncertainty, and Profit", distinguishes between calculable and non-calculable risks. Theories of Keynes and Knight paved the way for a separation between risk and uncertainty in the economic literature.

Uncertainty implies our ignorance of future events. Due to the nature of our knowledge of the world, we are unaware of the effects of today's choices and actions of humans, nature, and other factors on events happening tomorrow, next week, next month, and next year. However, risk has a different concept from limiting the investigation choices. It refers to our limited knowledge of phenomena and scenarios about imaginable future events. It is associated with the probability of a particular event occurring in the future. In fact, the scope of risk-related topics is restricted to what we imagine and know or what we can understand and guess.

Uncertainty is an integral part of economic propositions and analyses. The ultimate purpose of these analyses is to give us the cognition to choose more efficient ways to gain more satisfaction. Coping with uncertainty more efficiently is part of this process. "Living as members of society and dependent for the satisfaction of most of our needs on various forms of co-operation with others, we depend for the effective pursuit of our aims clearly on the correspondence of the expectations concerning the actions of others on which our plans are based with what they will really do. This matching of the intentions and expectations that determine the actions of different individuals is the form in which order manifests itself in social life; and it will be the question of how such an order does come about that will be our immediate concern"(Hayek, 1982a, p.36).

"...Classical Greek was more fortunate in possessing distinct single words for the two kinds of order, namely *taxis* for a made order, such as, for example, an order of battle, and *kosmos* for a grown order, meaning originally 'a right order in a state or a community'..."(Hayek, 1982a, p.28). The reason why the order not deliberately created by man is not easily accepted is that "The main reason is that such orders as that of the market do not obtrude themselves on our senses but have to be traced by our intellect. We cannot see, or otherwise intuitively perceive, this order of meaningful actions, but are only able mentally to reconstruct it by tracing the relations that exist between the elements. we shall describe this feature by saying that it is an abstract and not a concrete order"(Hayek, 1982a, p.38). "It would be no exaggeration to say that social theory begins with - and has an object only because of- the discovery that there exist orderly structures which are the product of the action of many men but are not the result of human design"(Hayek, 1982a, p.37). Since *cosmos* has been around for non-fiat money, the focus of this study is to investigate whether it also applies to cryptocurrencies.

### What is a commodity?

Everything is subject to the law of cause and effect or at least we understand the world that way. Those things that are causally related to the fulfillment of human needs are referred to as "useful things". For useful things to be transformed into commodities, they have to meet four primary conditions, known as commodity characters. These four conditions are as follows: human need, a thing whose characteristics can be causally linked to the satisfaction of this need, one's awareness of this causal relationship, and controlling and employing that thing to satisfy the need (Menger, 1976, p.52). If the monopolies, copyright, goodwill, friendships, etc. meet the commodity characters, they can be categorized as relationship commodities (Menger, 1976, p.54). When people find out that their need for a commodity is more than its inventory, they employ economizing measures in the quantitative relationship with that commodity. These are called economic commodities that can command a price when sold. Therefore, whenever a thing loses one of its commodity characters, it will no longer be a commodity. For example, if large quantities of a drug with

no use other than treating a specific disease are produced, it loses one of its commodity characters after the eradication of that disease, because that drug will no longer be needed.

### Subjective theory of value:

Scholastic Theologians argue that value is determined as a constant value over time based on the hierarchy of beings and the fair price should be always constant. This hierarchy is arranged in step by step and progressively order, reflecting the stages of creation. Based on this hierarchy, the latter stages rank higher than the former ones. Like his predecessors, Thomas Aquinas faced a "paradox of value". This means that a pearl was more expensive than a mouse, whereas a mouse ranked higher than a pearl in the hierarchy. According to Augustine of Hippo, he believed that things that are marketable do not match their natural order of value, but they are measured by their usefulness to man (Pribram, 1983, p. 13). However, this failed to resolve the "diamond-water paradox"; although water is, on the whole, more useful, in terms of survival, than diamonds, which have only decorative uses, it commands a lower price in the market. There is a misconception, even for Adam Smith, that the price of commodities directly should reflect the total amount of labour that spent on each one. The diamond-water paradox is often considered a criticism of the Labor Theory of Value (LTV), which argues that the economic value of a commodity or service is determined by the total amount of labor required to produce it. This concept is currently attributed to Marx's writings, although Adam Smith and David Ricardo have also discussed it in their works.

The subjective theory of value is one of the assumptions of this study. The subjective value indicates that the value of a commodity is determined based on the Subjective valuation of individuals who use it rather than the amount of labor necessary to produce it. People evaluate each commodity based on its power to reduce dissatisfaction. Accordingly, value refers to the importance of commodities or quantities of commodities, assuming that we should have the awareness of intended commodity or quantity in order to meet our needs (Menge, 1976, pp. 114-121).

"Just as a penetrating investigation of mental processes makes the cognition of external things appear to be merely our consciousness of the impressions made by the external things upon our persons, and thus, in the final analysis, merely the cognition of states of our own persons, so too, in the final analysis, is the importance that we attribute to things of the external world only an outflow of the importance to us of our continued existence and development"(Menge, 1976, p.116). Utility refers to a thing's ability to meet human needs. Like economic commodities, non-economic commodities have their own utility, because they can meet our needs. What distinguishes between economic and non-economic commodities is that the former commodities are worthy due to their scarcity (Menge, 1976, p.101).

Hence, there is no measure of economic value. Subjective valuation "arranges commodities in order of their significance; it does not measure its significance"(Mises, 1953, p.39). Transactions are not based on the measurement of value by a person, but it is on the basis of value comparison: more or less value "The judgement, Commodity A is worth more to me than commodity B, no more presupposes a measure of economic value than the judgement (A is dearer to me—more highly esteemed—than B) presupposes a measure of friendship"(Mises, 1953, pp. 44-45). This means that There is no such thing as abstract value (Mises, 1953, p.47). "... should have made sufficiently plain the unscientific nature of the practice of attributing to money the function of acting as a measure of price or even of value. Subjective value is not measured, but graded. The problem of the measurement of objective use-value is not an economic problem at all"(Mises, 1953, p.49). We have also faced a philosophical dilemma of subjective valuation over time: no one has a fixed subjective value scale to measure the changes in the subjective valuation scale over time. It is clearly incorrect to assume that value scales are constant over time because scales change over time and we forget how values were in the past and how intensively they were recorded by us.

**Intertemporal preferences:**

Individual preferences and choices are the most fundamental concepts of economics. Every person uses a variety of commodities and services to meet their needs. The combination of these commodities and services depends on many factors and is considered to be related to a purely mental process; it is obvious that every person's choices only make sense in the range of options available to them. One of the major innovations of mankind is the exchange of commodities and services by members of society for greater satisfaction. Each of the parties will be willing to participate in any exchange only if it can increase their satisfaction subjectively. The complexity of communities and expansion of the division of labor have fundamentally changed individual actions; individuals who had to be self-sufficient to meet their present and future needs planned their lives based on the production of a finer number of commodities and expected more satisfaction with the exchange of these commodities with others.

In a society where most commodities and services are produced by individuals themselves, this choice and preference are reflected in the productions. For instance, a household may cultivate more forage, in addition to the required quantities of a large number of commodities, to produce more meat and another household may plant more wheat to bake more bread. However, in a society where free trade is more common, the same individuals or households will no longer produce the required quantities of a large number of commodities but they will strive to produce more quantities of one or more products, hoping to obtain more quantities of commodities and services through the exchange.

Although individual preferences can only be attributed to consumption, it should be noted that a static description does not help much with economic analyses. Assuming a set of commodities and services that a person will consume throughout their lifetime as the basket of choice, we can make propositions about individual preferences in a community, excluding time from the analysis. We need to evaluate the rules of individual choices over time so that we can carry out economic analysis. Since every person's choices at any given moment consider both the current and the future requirements, we have preferences that are closely interwoven with time. As a result, intertemporal preferences should be taken into account instead of individual preferences. We can replace "intertemporal preferences" with "time preferences", but the former is more appropriate because different economic activities often yield in a more or less predictable period of time. For example, farming includes a one-year period, extraction and production of one ton of steel ingot from the ore will take a certain amount of time, and the repayment time of a loan is specified from the beginning.

We can describe consumption over a period of time and define saving as the deliberate postponement of present consumption aiming at further consumption in the future. When it comes to saving versus consumption, intertemporal preferences indicate the extent to which individual preferences are present-oriented or future-oriented. "Period" here does not refer to a specified length of time, such as one year, one month or one week, but it implies the time during which someone forbears from consuming something or the time during which consumption is expected to be increased, in exchange for past savings. The concept of "intertemporal" outweighs the concept of "period"; "intertemporal" here means to postpone "consumption" from "present" to "future" through saving or bring forward "consumption" from "future" to "present" through borrowing.

When people apply their mental preferences to exchange commodities, a system of relative prices is formed over time based on the law of one price. Based on this system, the marginal rate of substitution of commodities and services is equal to their relative price. This determines the price of different commodities relative to each other. If there is a commodity at the fee price of the corresponding currency, that commodity serves as a counter that determines the price of all other commodities. This is, in fact, the objective expression of intertemporal preferences in determining the prices of present commodities and services. However, to exchange commodities and services over time, it should be taken into account that people consider

consumption in the present more pleasant than consumption in the future and expect rewards for it.

Based on the above-mentioned, the interest rate reflects the systematic discounting of future values. However, the best way to describe the interest rate is to take the market interest rate in relation to the following three components: underlying time discount, inflation premium, and risk premium. Underlying time discount is one of the components of the interest rate that is understood based on the concepts of intertemporal preferences. If the other two components are equal to zero, the interest rate will be equal to underlying time discount and economic analyses should be based on intertemporal preferences. If we consider inflation a monetary phenomenon and regard risk as a phenomenon caused by governmental interventions, the interest rate will be only a reflection of intertemporal preferences in the market economy, where not only fiat money does not exist but also governmental interventions do not work (Garrison, 2001, p.108).

**FUNCTION AND DEFINITION OF MONEY:**

According to the economic literature, money has three primary functions. It is a medium of exchange, a unit of account, and a store of value. Why was money invented? Which property makes money valuable? The intrinsic relevance of these three functions of money will be described here.

**Store of value:**

Money serves as a transporter of value over time, because it is a specific commodity that plays the role of a medium of exchange. The question here is why this specific commodity plays such a role. The answer is "the special suitability of goods for hoarding" (Mises, 1953, p.35). This economic function of money also involves the transport of value through space. What makes money valuable is not merely its ability to pass from hand to hand. The crucial element that makes money play the role of a medium of exchange is its storability and its role as a cash balance. In other words "all money must be regarded at rest in the cash reserve of some individual or other" (North, 2012, p.17). "What is called storing money is a way of using wealth. The uncertainty of the future makes it seem advisable to hold a larger or smaller part of one's possessions in a form that will facilitate a change from one way of using wealth to another, or transition from the ownership of one good to that of another, in order to preserve the opportunity of being able without difficulty to satisfy urgent demands that may possibly arise in the future" (Mises, 1953, p.147). We hold the money, as the most marketable commodity, because we have no idea of our uncertain future. Since money is the most marketable commodity, it provides us with maximum options no matter what will happen in the future. If we had a broader knowledge of the future, we would keep the commodities we thought we would need more under the new circumstances in order to maximize our benefits. When we store money, we will earn little return but we can better safeguard the value of the exchange.

It should be noted that the storability of money applies to both the function of any commodity money and "public trust" in the future acceptance of money, based on an intersubjective perception. This "trust" underpins the foundations of the credit theory of money.

Therefore, it can be shortly stated that we do not consume part of our current commodities to deal with future uncertainties rather than to increase future consumption. This is different from saving, investing or borrowing. In fact, the emergence of money is the result of storing commodities for dealing with future uncertainties. The commodities for which we consider subjective value have the capacity to transport value over time and space if they are highly accepted by the public for exchange.

A review of commodities that have historically played the role of money indicates that most of them have more or less shared features such as homogeneity, incorruptibility, portability, divisibility, and scarcity. The consumption value of commodities gradually lost its importance to be perceived as money. Finally, money included the commodities that were subject to a particular type of public trust.

The functions resulting from this type of "trust" can be regarded as a product of our collective action. This type of trust is spontaneously formed by members of society or the public may be forced to treat a phenomenon (i.e. to accept something in exchange for commodities) as if they had to trust it. When exchanging through the commodities that can store value, people expect to be able to meet their needs in the face of future uncertainties. However, the value of these commodities that are now equated to money is still determined in the same way as that of any other commodity. As a result, the value they transport over time and space is also subject to the same rule. If the supply of the commodities we store to deal with future uncertainties increases for any reason, we will transport less value to the future than expected. This increased supply may be due to the exploration of gold and silver mines in a standard gold system or the result of the central bank's expansionary monetary policy in a modern monetary system.

World population growth and complexity of economic relations can increase conservatism in the dynamics of this trust, because every person is more likely to fail to find another person to exchange their needed commodities, on the one hand, and the entry of money into some relations and transactions can raise the cost of breaching the initial contract for each person, on the other hand. Nevertheless, the continuity of this level of trust will still depend on its functioning to meet the needs of individuals in the community. The possibility of the gradual decline of trust or replacement of the commodities that used to play the role of money by other commodities that offer more satisfying features cannot be completely ruled out.

#### Medium of exchange:

If there is no exchange in a society, there will be no need for money there. Money is also not needed in theory in a pure socialist commonwealth (Mises, 1953, p.29). However, in a system based on private ownership "the function of money is to facilitate the business of the market by acting as a common medium of exchange" (Mises, 1953, p.29). "Participants expect to consume whatever it is that they receive in exchange. But in a more developed system of indirect exchange, participants exchange their goods and services for goods that can be exchanged for additional goods and services" (North, 2012, p.15). "Now all goods are not equally marketable. While there is only a limited and occasional demand for certain goods, that for others is more general and constant. Consequently, those who bring goods of the first kind to market in order to exchange them for goods that they need themselves have as a rule a smaller prospect of success than those who offer goods of the second kind. If, however, they exchange their relatively unmarketable goods for such as are more marketable, they will get a step nearer to their goal and may hope to reach it more surely and economically than if they had restricted themselves to direct exchange. It was in this way that those goods that were originally the most marketable became common media of exchange; that is, goods into which all sellers of other goods first converted their wares and which it paid every would-be buyer of any other commodity to acquire first. And as soon as those commodities that were relatively most marketable had become common media of exchange, there was an increase in the difference between their marketability and that of all other commodities, and this in its turn further strengthened and broadened their position as media of exchange" (Mises, 1953, p.32).

Which historical events caused the paper money and then national currency to replace precious metals is of little importance for this study. However, it is clear that this replacement aimed to conquer the position of the money created over time for specific purposes. The coercive power of governments made people accept and use fiat money as a substitute for money. Money also facilitates credit transactions. "Credit transactions are in fact nothing but the exchange of present goods against future goods" (Mises, 1953, p.35). Therefore, it is considered the most marketable commodity, and credit is referred to as the exchange of current commodities with future contingent commodities. Although credit is often granted by money, other types are also conceivable in this regard. Therefore, the two different banking services that are less separated should be discussed

separately. These two services are money storage and transfer to facilitate the transactions and opening savings deposit account and loan granting. In today's banking, especially from the perspective of central banking, these two services are so intertwined in liquidity expansion and contraction- including money and near money- that it will be difficult for any banker to separate the decision on each of them.

#### Unit of account:

We have heard such statements over and over "There is nothing more important that the government can provide individual producers than a reliable standard of value, a unit of account that retains its constancy as a measuring device" (North, 2012, p.21).

Suppose there are  $n$  commodities in the economy and the  $n^{\text{th}}$  commodity is the most marketable one. In this case, it is nonsense to speak of the stability of the value of the  $n^{\text{th}}$  commodity. When the value of all other commodities is changing, only one counting feature remains for the  $n^{\text{th}}$  commodity that exists anyway. The value of the  $n^{\text{th}}$  commodity relative to any other commodity does not differ from the value of the first commodity relative to any other commodity. As a result, the  $n^{\text{th}}$  commodity can store value like any other commodity but it is more liquid than any other commodity. A commodity that cannot be exchanged with other commodities in the future has the minimum capacity to store value. However, this liquidity does not mean at all that it is a benchmark for subjective value, and objective price measurement naturally depends on changes in subjective value.

We should note that valuation is only done based on particular and non-public actions and it is money that measures objective prices or, in other words, ratios of exchange. "If in this sense we wish to attribute to money the function of being a measure of prices, there is no reason why we should not do so" (Mises, 1953, p.49). "Admitting that money measures objective prices is not the same as saying that money is a measure of value, which is subjective" (North, 2012, p.21). The adoption of money as a measure of objective prices does not mean that it is also a measure of value, because the value is something subjective and objective prices are naturally subject to changes in our subjective values. The measure of objective prices should not be confused with the measure of value. Additionally, there is no need to ask the government to do so, because the government cannot provide us a stable measure of value, neither. Since money (even fiat money) is necessarily considered an economic commodity, it is valued according to its own merits and benefits.

Money is primarily a market-born phenomenon that aims to deal with future uncertainties and facilitate exchanges due to its capacity to store value. The use of money in accounting or as a unit of account is anyway considered its secondary and implicit function because money measures and records objective prices. It is not true that we have made something to handle multiple tasks at the same time, but it is our conventional classification and effort to describe its functions.

The fact that money is used as a unit of account in its secondary functions is another manifestation of the transfer of value over time and space. Subjective values of complicated human phenomena are compared by calculating objective prices. As a reflection of the subjective valuation of a large body of individuals, objective prices are determined by applying the law of one price in a time-consumer collective action. We face predetermined prices in the market that our subjective preferences cannot be applied to them. However, it should be noted that the law of one price determines prices over time.

Future uncertainties are often caused by changes in the value of commodities that are expected to transfer value over time and space. These uncertainties have more to do with investment and entrepreneurship rather than consumption. The tendency to have a stable unit of account to reduce these uncertainties has promoted the false belief that it is possible to achieve such stability. Such stability can be achieved only when changes in subjective values of the public are not manifested in objective prices and the supply and demand of commodity continues at those objectively stable prices during the period of stability. This actually means the stability of subjective values. If the public subjective valuation of commodities changes and a

coercive force prevent changes in objective prices, individuals apply changes in their preferences through supply and demand.

In terms of the feasibility of having a fully stable unit of account, it has been almost a misleading fact that coins and different types of fiat money were homogeneous and considerable and it was easier to perform their calculations in a system of relative prices with  $n$  commodities at the unit price ( $P=1$ ). However, the value of any commodity chosen to transport value through time and space will ultimately be influenced by subjective valuation. Even if a fixed subjective value is assumed for a given commodity, the relative value of that commodity changes as the subjective value of other commodities changes.

The limited and gradual fluctuation of the exchange rate of a currency can also partly trigger such misguidance. Additionally, the increased relative price of a currency sometimes not only satisfies the tendency for the stability of currency value but also brings more satisfaction.

Compared to inflationary spirals, hyperinflations, and chronic double-digit inflation rates, a small rate of positive inflation is not often controversial and can somewhat satisfy the tendency for the stability of currency value. This is actually one of the options that seem to be available and probably the best one. Theoretically, this does not at all mean the feasibility of a completely stable unit of account. A 2.5 inflation rate over a period of 30 years, assuming the stability of subjective values for a given commodity, doubles the objective price of that commodity or, in other words, the purchasing power of the same amount of money will be halved.

#### Definition of money:

According to Carl Menger, money is defined as a publicly accepted medium of exchange. Concepts such as "the most marketable commodity" or "common medium of exchange" are contrary to the concept of "fiat money". According to medieval concepts, fiat money was considered valuable. Vissering states that the ancient Chinese used a term to refer to the concept of money literally meaning "common commodity" (Hayek, 1990, p.35). The definition proposed by Carlile – money is the most liquid asset – is more widely used today and is very close to the concept used by the ancient Chinese (Hayek, 1990, p.55). Mises defines money as the most marketable commodity (Mises, 1949, 398). An object needs to be widely accepted as a medium of exchange to be eligible for being used as money because it is a commodity means of transporting value. As previously mentioned, there are at least three essential roles for money (a store of value, a medium of exchange, and a unit of account). The first one both fundamentally causes the other two roles and is underpinned by them. However, these three roles are interwoven and this inherently unnecessary separation is made only to clarify our view of money. Defining money as a medium of exchange does not necessarily mean inattention to two other roles, because it implies both of them. It also means emphasizing the need for the intrinsic value of a commodity, because the functions caused by public trust can be considered a commodity. However, this emphasis does not necessarily include the direct consumption value similar to what found in relation to commodities such as gold, salt, and the like.

"The definition of money as the generally acceptable medium of exchange does not, of course, necessarily mean that even within one national territory there must be a single kind of money which is more acceptable than all others; there may be several equally acceptable kinds of money (which we may more conveniently call currencies), particularly if one kind can be quickly exchanged into the others at a known, though not fixed, rate" (Hayek, 1990, p.55). "By referring to different kinds of money we have in mind units of different denomination whose relative values may fluctuate against one another. These fluctuating values must be emphasised because they are not the only way in which media of exchange may differ from one another. They may also, even when expressed in terms of the same unit, differ widely in their degree of acceptability (or liquidity, i.e. in the very quality which makes them money), or the groups of people that readily accept them. This means that different kinds of money can differ from one another in more than one dimension" (Hayek, 1990, pp.55-56).

Therefore, there is no clear distinction between money and non-money (Hayek, 1990, p.56). Accordingly, we can define the most marketable commodities in a single spectrum. "It also means that, although we usually assume there is a sharp line of distinction between what is money and what is not and the law generally tries to make such a distinction so far as the causal effects of monetary events are concerned there is no such clear difference. What we find is rather a continuum in which objects of various degrees of liquidity, or with values which can fluctuate independently of each other, shade into each other in the degree to which they function as money" (Hicks, 1935, p.35). "I have always found it useful to explain to students that it has been rather a misfortune that we describe money by a noun, and that it would be more helpful for the explanation of monetary phenomena if 'money' were an adjective describing a property which different things could possess to varying degrees. 'Currency' is, for this reason, more appropriate, since objects can 'have currency' to varying degrees and through different regions or sectors of the population" (Hayek, 1990, p.56).

Probably influenced by German lawyers, economists in the second half of the 19<sup>th</sup> century focused on the wrong notion that one of the main features of a complete currency is that it should be the common currency, that is to say, the government's monopoly on the money supply. This view was not generally accepted by economists in the second half of the 19<sup>th</sup> century. It is a myth that there is something called money that is clearly defined and can be distinguished precisely from other things. This is to justify the lawyers' and judges' actions because the things referred to as money have always affected phenomena other than money. This myth is still hurting as it leads to the notion that fiat money can be used only for certain purposes, whereas there should always be only one thing that can be called the currency of a country. It is hence better to talk about "currencies" rather than "money" because the term "currency" emphasizes the flow of a medium of exchange. It also includes bank balances and checkable exchange media (Hayek, 1990, p.58).

Although the definitions proposed by Mises and Hayek seem different at first, both of them are against the concept of fiat money with an emphasis on the capacity to store value and Subjective theory of value. In terms of the fact that whether a piece of the bill or anything else can be considered money, it can be stated that it depends on where that piece of the bill or any other thing is in this spectrum. This piece of paper has no value or function per se, but its use determines its position in this spectrum. If we get stuck in an inflation crisis just like what happened in Hungary in the 1940s, a waste collector will sweep the bills of our national currency off the streets. Are the bonds considered money? Is our checkbook money? Is what is released by the central bank to be considered money? To answer these questions, it is necessary to determine the extent to which each of these items is the most marketable commodity and where their position is in the above-mentioned spectrum.

#### CRYPTOCURRENCIES AND THEORY OF MONEY AND CREDIT:

We defined money as a spectrum that should be considered an "attribute" rather than a "noun". We also discussed the reasons for focusing on terms such as "being money" and "being near money". Bearing in mind the functions of "trust" as a commodity, this definition of money primarily includes the neoclassical definitions based on the commodity theory of money. According to Walras, our measure of value must be a specific quantity of a given commodity (Walras, 1954, p.188). Hicks also states that each of the other  $N-1$  commodities could be considered a counter (money) (Hicks, 1967, p.3). Based on these definitions, there is no difference between money and other commodities. Fisher argues that any commodity called money must be generally accepted in exchanges and any commodity generally accepted in exchanges must be called money (Fisher, 1931, p.2). Emphasizing the distinction between money and the objectivity (money stuff) that the monetary function is based on as a key point, the credit theory of money indicates that money must be interpreted as completely separate from the secondary characteristics that make it

superior to other commodities as far as the pure truth of money is concerned (Simmel, 1978, p.124). The proponents of this theory argue that although the money stuff better helps it to perform its function among other commodities, the essence of money is not made of tangible physical materials. Michael Innes states that the eyes have never seen a dollar and hands have never touched it (Innes, 1914). In fact, the credit theory of money has a greater emphasis on the social function of money, something which is referred to as "trust" in the definition proposed in the present study. In terms of the commodity theory of money, the proponents of the credit theory of money have been more focused on the importance of the money stuff. This misunderstanding, along with the medieval state theory of money that was revived by George Friedrich Knapp in the early 20<sup>th</sup> century, is the theoretical focus of the credit theory of money that has been introduced to the political economy literature since the second half of the 20<sup>th</sup> century. The political economy paradigm theorized the role of the welfare state from different dimensions to compensate for market failure and drive development after World War II. "For more than 2,000 years the government prerogative or exclusive right of supplying money amounted in practice merely to the monopoly of minting coins of gold, silver or copper. It was during this period that this prerogative came to be accepted without question as an essential attribute of sovereignty-clothed with all the mystery which the sacred powers of the prince used to inspire. Perhaps this conception goes back to even before King Croesus of Lydia struck the first coins in the sixth century BC, to the time when it was usual merely to punch marks on the bars of metal to certify its fineness" (Hayek, 1990, p.28).

Geoffrey Ingham insists that money is a social relation. In terms of the nature of money, he states that money must be understood as a claim or a credit (claim and credit are two sides of a coin, each of which can be viewed by the parties of a money exchange) that comes to existence by certain social relations independent of the production of commodities and services and is essentially nothing more than a "promise to pay" between people. Considering the "trust" understandable form the exchange of money, the proponents of the credit theory of money conclude that the states can establish such an entity to value money. That is why Ingham states, "money is value in itself" (Ingham, 2004, p. 61).

A review of the history of monetary developments shows that the use of fiat money began in Europe after World War I when the European central banks persuaded governments to allow them to keep the borrowed golds and not declare commercial banks bankrupt. The same model was implemented by Franklin Roosevelt in the US in 1933. Therefore, such understanding that is now presented by the credit theory of money with an emphasis on its "volar impositus" was not generally accepted by either communities or governments until less than a century ago. As Gary North states, "All over the world during the twentieth century, the State, in conjunction with State-created central banks, deliberately stole the public's gold" (North, 2012, p.127).

Based on the methodology of this study, there was a need for a theoretical model to evaluate the TMC and show that the dynamics of "Underlying Economic Realities" suit intertemporal preferences. There is hence a need for analysis based on the dynamics of "Underlying Economic Realities". "Underlying Economic Realities" are access to resources, technology, and capital structure and consumer preferences include intertemporal preferences. The market process facilitates the translation of these basic facts into production decisions, mainly guided by the expectations of entrepreneurs. Intertemporal preferences refer to the subjective preferences of individuals based on subjective evaluation and naturally involve the data on the scarcity, usefulness, and dynamics of resources, technology, capital structure, and the like. Disclosure of intertemporal preferences means to set subjective prices. Therefore, it is necessary to investigate the relationship between the TMC and intertemporal preferences.

Our inference primarily comes from market definitions, which explains how spontaneous order was formed and expresses the basic epistemological views about our inability to access sufficient information. According to this definition, the market is a mechanism of providing a collective interaction within the division of labor by

revealing individual subjective valuations. The establishment of such a mechanism necessarily means organizing and facilitating the production, transmission, and discovery of information about public preferences, which are referred to as the "market". It is clear that this information says something about people's preferences that are based on people's desires and needs and are presented as objective prices. It is interesting that when preferences are revealed under the freedom of exchange, they actually reflect the concrete decisions of individuals. This means that individuals reveal these preferences by their economic actions, which are the actual exchange of commodities and services. It should not be assumed that the disclosure of preferences means making comments at no cost, but it is based on the payment of costs (actually forbearing the commodities, leisure time, and any valuable thing) and is influenced by "Underlying Economic Realities".

However, objective prices may not reflect individual preferences. When a government coercively intervenes in the pricing of commodities and services, it actually disrupts a pre-established order. For example, if the objective price of a commodity is lower than the result of people's preferences, people's action will change and there will be more demand for that commodity. The supply of this surplus demand is not in line with the preferences of the suppliers of that product and the government will have no choice but to initiate further interventions to settle this disorganized situation. These interventions will gradually involve a wide range of economic affairs. In fact, we face an organization instead of a complicated order. These interventions eventually deprive society of an efficient mechanism of information flow and establishment of spontaneous order. This also applies to currency value, interest rate, exchange rate, and all other objective prices.

As explained earlier, the "capacity to store value" is the most fundamental concept in defining money as a medium of exchange. This feature of money is of special importance when it causes further satisfaction in the face of future uncertainties. This further satisfaction is achieved when we store part of the commodities to meet future needs or forbear from consuming some commodities so that we can consume more of them in the future. When we talk about the "capacity to store value", we are actually referring to intertemporal preferences. When we provide a commodity for others in exchange for receiving the same quality or more of that quantity, it is an exchange between a commodity and money. The money here is evidence of some sort of debt with no due date. This means that there are the equivalent commodities and services in the economy when a debt is running up. Assuming such a condition, the definition proposed by Simmel- money is a credit of society .... money is a remittance without a debtor's name-(Simmel, 1978) and Schumpeter- the money holder is a creditor of a commodity and money is a demand for social production-(Ingham, 2004,) can be acceptable. However, it is very difficult to accept that the debtor is unknown. If individuals refuse to submit their commodities and services in return for receiving them in the future, the money issuer should take such a commitment unless every recipient of money considers subjective value for it without knowing the final debtor based on "trust", which was formerly regarded as a commodity. This will be a form of confrontation with future uncertainties by each of the participants.

Here, there is a need to separate the definitions of money and credit. Money refers to the most marketable commodity whereas credit implies the exchange of current commodities with future commodities. Current commodities are delivered in cash while future commodities are received as a debt document. On the due date, the debt document is voided and the money stuff equivalent to the value contained in the debt document will be received. In case of default, a court will decide the case based on legal evidence. However, credit-granting means that one side of the exchange forbears from consuming current commodities. Money, as a commodity, also suits the computability of dynamics of "Underlying Economic Realities" with intertemporal preferences.

It is now necessary to review the question raised by Karl Helfferich in 1903, which subsequently became known as "the problem of the Austrian Circle". Mises tried to solve this problem by using his

regression theorem and including “time” in the mechanism of money value determination. It is not possible to describe the application of the law of diminishing marginal utility in the money value determination, whose value seems to be the reason for its demand, without considering the fact that the current money price– and thereby its demand– is determined based on both today’s subjective valuations of market activists and the yesterday’s purchasing power of money in order to achieve a useful non-monetary commodity through a backward movement in time. Therefore, money can be analyzed like any other commodity whose system of supply and demand is based on intertemporal preferences. In fact, money suits the computability of dynamics of “Underlying Economic Realities” with intertemporal preferences as far as it is away from a state-borne monopoly and its value dynamics are determined within the market. Now it is the time to investigate the potential functions of cryptocurrencies to coordinate intertemporal preferences.

Since cryptocurrencies are widely used for multiple purposes, there is no doubt that cryptocurrencies are a commodity as long as we can use them to satisfy our needs while aware of their benefits. Based on Menger’s literature, some may refer to cryptocurrencies as “false commodities”. However, we are discussing the cryptocurrencies that have many applications in exchanges, asset transfer, and the like. About the question that whether cryptocurrencies are money, we can refer to the definition of money. In addition, we should find the position of cryptocurrencies in the spectrum of money. If the cryptocurrencies attract more public acceptance and are used in a wider range of exchanges– in terms of geographical distribution and daily circulation, they will deserve to be titled the most marketable commodity.

Cryptocurrencies have the capacity to store value. If the dynamics of cryptocurrencies value is taken into account since their emergence, it will be revealed that a number of people have attributed a subjective value to a cryptocurrency based on their expectations about the future functions of that cryptocurrency and attempted to take its ownership. As a reflection of the public Subjective valuations, the market sometimes does not allocate resources. Fluctuations of cryptocurrencies in the market should be interpreted based on subjective values. Sharp fluctuations in the nominal price of cryptocurrencies do not negate the subjective value attached to them by participants in their supply and demand. Even these changes in objective prices should be attributed to changes in the public Subjective valuations. It is noteworthy that the market functions cannot be denied in today’s complex world full of uncertainties exacerbated by state interventions. This subjective value may have been based on the function of a cryptocurrency or an entrepreneurial judgment (there will be also pure entrepreneurial errors). During this process, one may overlook the consumption of some commodities and reveal their intertemporal preferences in order to take ownership of a cryptocurrency. Therefore, it can be stated that cryptocurrencies have the capacity to store value if they ensure the existence and continuity of their subjective value and their exchange requires to forbear from consuming some current commodities. Even if the volatility of this value exceeds that of other commodities, it should be emphasized that individuals have consciously chosen this method in the face of future uncertainties. Individuals have the ability to substitute and evaluate. If some commodities are manufactured with less effort but sold at a higher market price, it means that the manufacture of those commodities is highly profitable. Then, more people may begin manufacturing those commodities as long as the gap between the manufacturing profit of different commodities is bridged. In the early stages of the emergence of a new phenomenon, there may be more opportunities to use information and creativities that are not usually used to manufacture a more satisfying commodity and, naturally, changes in Subjective valuations of individuals will be commensurate with changes in the production, transfer, and discovery of this information.

The matter of whether cryptocurrencies can be a unit of account can be evaluated from different aspects. First of all, it should be noted that there is not much difference between cryptocurrencies and other

common fiat currencies in terms of features such as homogeneity, divisibility, and availability.

The next point is the relative value stability of cryptocurrencies. Objective prices– expressed in units of money– reflect our intertemporal preferences. We tend to include objective prices in the value determination in order to add more precision to our own knowledge and recognition. To deal with future uncertainties more satisfactorily, we try to achieve this more precision by quantifying objective prices– as a representative of subjective values– and stabilizing the comparison between them over time. It should be noted that these fluctuations contain the information we always seek. These fluctuations themselves are not controversial; rather, the real events of our world must be taken into account as the source of these fluctuations. Therefore, a level of fluctuations that do not impair this “greater precision” is acceptable. Since we are trying to choose the best option from among the options available to store value through time and space, we need the relative value stability of any cryptocurrency compared to others (rather than the absolute value stability of a cryptocurrency) to choose one of them as a unit of account. Unfortunately, the fact that the relative prices of currencies in the world of fiat currencies is usually determined based on one or more inclusive currencies. It is usually out of the question that the relative value of these currencies is fluctuating relative to commodities and services. In fact, users of each currency only care about its relative value compared to that of some other currencies. This importance is due to the need for the exchange of commodities and services. If cryptocurrencies find new and different applications, there is no reason for not determining the value of national currencies based on cryptocurrencies. In fact, the more widely the cryptocurrencies are used and the greater public trust they attract, the more they will be exchanged and the more capacity they will have to store value. As a result, cryptocurrencies will be considered a more reliable and stable unit of account.

Today, there are cryptocurrencies that have managed to largely maintain their relative value stability against commodities and services, especially when their relative value fluctuations against commodities and services are compared with those of fiat currencies such as the dollar. Compared to the national currencies tackling a double-digit inflation rate, cryptocurrencies have functioned better as a unit of account.

#### CONCLUSION:

The fact that cryptocurrencies are not still commonly used by families and enterprises as a unit of account for economic computations and decision-making can convince the majority of society that cryptocurrencies are not money. Even the value of cryptocurrencies is determined based on national currencies. On the other hand, cryptocurrencies are not still widely used for pricing commodities and services. There are a few commodities traded with cryptocurrencies, that is, a few commodities that are traded in exchange for both national currencies and cryptocurrencies. The present study aimed to show that none of these observations is a good criterion for rejecting the categorization of cryptocurrencies as money. In fact, the only appropriate criterion is the effects of cryptocurrencies on the computability of dynamics of “Underlying Economic Realities” with intertemporal preferences. Different types of money find such a function basically through the capacity to store value, and the other two typical roles of money (a unit of account and a medium of exchange) make sense only after they have the capacity to store value and they gradually expand it.

In addition, this study described the mechanism of value storage in the face of future uncertainties by explaining the subjective theory of value and the function of “trust”.

Cryptocurrencies are influenced by “Underlying Economic Realities” as long as they are part of the process of disclosing intertemporal preferences. Obviously, disclosure of people’s intertemporal preferences means that they pay the whole cost of exchanges. When

people decide to exchange some of their commodities and services with cryptocurrencies, they adopt some sort of dealing with future uncertainties that may be based on functions of the intended cryptocurrency or an entrepreneurial judgment, which is naturally accompanied by pure entrepreneurial errors, similar to what that may occur in investment in hybrid cars and so on.

Therefore, it can be fundamentally admitted that cryptocurrencies can store value in compliance with "Underlying Economic Realities" and "intertemporal preferences", whereas such a function cannot be justified for fiat currencies. Expansion of the other two roles and more efficient storage of value can improve the position of cryptocurrencies in the money spectrum. It seems that technological advances and changes in legal and political relations of societies can ensure the relative value stability of cryptocurrencies and promote their position in the money spectrum.

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