'Fiat money' or 'minimal set of rules'? What concept of money for a market economy?

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Abstract

During the last twenty years, money theoreticians have established the following important results[1]:

1. under some not too strong conditions, a monetary equilibrium exists with a money being an intermediary of exchange ([8], [10]); not only that money has a positive price at equilibrium but it circulates even if there exists a risk-free asset yielding a positive rate of return ([13]); such a proposition contrasts with that of OLG models obtained in the 80's

2. in general, monetary equilibria are better than non monetary equilibria in terms of welfare; money is *essential* ([16])

3. money remedies the no-commitment problem inherent in anonymity (in the case of a much populated society); money is equivalent to a social memory; it acts as a decentralized means of social control over individuals ([11], [1]).

Money theoreticians have followed a common approach: they add '*frictions*' to the Arrow-Debreu's model of competitive general equilibrium and show, under some precise conditions, that money remedies these '*frictions*'. As a consequence, money is used at equilibrium. Modern academic theory of money may be considered in a sense as the outcome of a critique of Arrow-Debreu's view of a market economy. In an Arrow-Debreu economy transactions are centralized. They take place multilaterally at no cost. Introducing *'frictions'* allows to modify that poor description and to suggest another one very different with stochastic bilateral meetings, specialisation, search costs, information problems, etc.. There is a strong link between modern theory of money (namely the search-theoretic approach to money) and a more or less implicit theory of a market

[1] A very authoritative survey is [14].

economy. Conceiving money as '*fiat money*' is in accordance with that 'friction' view of a market economy.

Is that view appropriate? Some reasons will be given below for answering 'no'. Let us content ourselves here to suggest the following test. The first step of that test is to select the minimal characteristics an economy must exhibit in order to be labelled 'market economy'. In order to avoid circularity as much as possible, the selection must be done under a 'veil of ignorance' of current economic theories. The list should be such that most people cannot disagree (and not following whatever special theory). The second step is to confront the economic theories of prices and money with the specifications selected in the first step. As it will be clear below, modern academic theory does not pass the test even if it performs far better than Arrow-Debreu's model. It may be criticized in turn for providing an inappropriate conception of money linked with a poor theory of a market economy. Instead of being thought of as 'fiat money', money should be accordingly described as a 'minimal set of rules' associate to the specifications of a market economy.

1 '*Fiat money*' and 'market economy' in academic theory

Before discussing the friction approach of money and market, a brief reminder about 'fiat money' is in order.

1.1 Money as a 'special commodity'

Contrary to a long tradition of mainstrean theory, modern theoreticians refuse to take money as granted. As they aim at explaining why money is used in exchange, they have to make it optional. Consequently they conceive a market economy in which money is not indispensable. A barter equilibrium exists under very general assumptions. The fact that money is not a necessary component of a market economy allows theoreticians to search for the conditions of its acceptance at equilibrium (in traditional terms, for a positive price of money at equilibrium). So they gives sense to their main claim: the so-called microfondation of money theory.

What are the necessary components of a market economy? Primitives are (i) individual endowments (ii) individual preferences (iii) production techniques and (iv) transactions techniques. Money, viewed specifically as an intermediary in exchange, enter the economy as an optional transaction technique. Primitives are expressed in terms of a *commodity-space*. That commodity-space is the primary assumption of any value theory, be that of Ricardo, Marx, Walras, Arrow-Debreu or search-theoretic approach. Initial endowments are vectors of that space, individual preference are functions defined on it and production and transactions techniques are described in terms of commodities. Commodity-space is the unique language available to value theoreticians and the unique

medium of communication between the economic agents described in their basic models.

Even if they pay lip services to the idea of money as an institution, theoreticians are led to introduce money as a commodity. That commodity has to be special since it must be distinguished from the others. Being specifically used in transactions, value theoreticians find convenient to exclude it from the preferences functions and from the techniques of production. Money is said to be without intrinsic utility and useless for production. That vision of money does not proceed from any 'realism'. It rests on a strong logical argument: an intermediary of exchange is not desired for itself. It provides a good rationale for search models, the first having exhibited monetary equilibria with a pure transaction money.

Money does not enter consumption and production. It is thus not possible to make it an output of private firms. As a consequence, its quantity cannot be endogenously determined. Money as a special commodity is assumed not being privately produced. Its quantity is exogenous. It is taken as a parameter of the models and not as the outcome of individual actions[2]. That fact leads theoreticians to inquire into the effects of a change in its quantity and to study the conditions of money neutrality. Such a question, considered as an outstanding one, is deprived of any sense when the means of payment are endogenously issued.

To be useless for consumption and production and to be non-privately produced are the basic properties of money defined as 'fiat money'. Those properties are neither realistic nor arbitrary: they are necessary for modern money theory to be consistent. They link together the two pillars of the modern approach to money: a quest for a logical genesis of money - why money is used instead any other transaction technique? - and value theory - how relative or money prices may be associate to commodities?

But, as we shall see, economic theoreticians do not stop there. They attribute to 'fiat money' an additional property: to be durable. The motivation for that assumption is to account for an additional function of money, not only to be an intermediary in exchange but also to be a store of value. Such idea is arbitrary since being a store of value does not derive from being an intermediary of exchange and is not specific to money. To be a store of value is virtually a property shared more or less by all durable commodites. Nothing prevents one to imagine a non-durable intermediary of exchange in an organized market (as in the strategic market games approach). As it will be clear below, the durability of money makes sense only in a very special view of a market economy where an agent cannot make more than one transaction at any point of time. Assuming a durable 'fiat money' is redondant in general and misleading in some cases.

To achieve to make the concept of 'fiat money' relative, note that it lacks a very important property considered by some authors as crucial, namely to be an unit of account[3].

[2] When that assumption is relaxed, the basic search model of Kiyotaki-Wright ([10]) ceases to support the idea of a bootstrap effect ([3]).

[3] 'Money of account (...) is the primary concept of a theory of money' ([9], p. 3).

1.2 Money as a remedy for 'frictions'

In an Arrow-Debreu economy transactions are implicitly multilateral and costless (centralized clearing). That feature of Arrow-Debreu's model is unanimously considered as inappropriate. It does not suit a market economy. It is responsible, theoreticians think, for the lag of money theory (or money prices theory) behind value theory (or relative prices theory). In order that money theory keeps up with value theory, Arrow-Debreu's view has to be amended. Here come the 'frictions'. Let consider the most significative.

Rightly or wrongly, multilateral transactions are considered as not suitable. Bilateral meetings (stochastic or not) are preferred to describe a market economy. Here is the first (and very important) 'friction'. That view is not neutral. It leaves no room for whatever organization of exchange. It is even not possible to speak of a market for a specified commodity and the so-called 'law of supply and demand' looses its ordinary meaning. More specifically, due to that lack of organization of markets, an agent cannot conclude more than one transaction at any point of time. Here, intermediation, by contrast with direct exchange, takes time. To take that into account, agents are supposed to have a given rate of depreciation of future.

In a centralized market (multilateral by construction), the *value* of initial endowments only matters, not their *material composition* (Walras equivalent distributions theorem). When agents bilaterally meet, it is their material composition (compared with the preferences) that matters. Equilibrium values depend on it. That property allows to deal with a basic point, the specialization of agents (in production and in consumption), omitted in Arrow-Debreu's model. Economic agents are now specialized. The direct consequence is that a problem of *double coincidence of wants* has to be solved. Here is a second 'friction'.The two 'frictions' above are those taken into account in models of Iwai ([8]) and Kiyotaki-Wright ([10]). They are sufficient for the demonstration of the existence of a monetary equilibrium. What money does in these models is easy to understand: *it remedies the double coincidence of wants problem.* Money is adopted as a means of carrying out transactions if the problem of double coincidence is severe enough compared to the common belief of agents on the degree of social acceptance of money. Iwai calls that condition a *bootstrap effect.* If not, a barter equilibrium prevails as an alternative bootstrap effect.

An assumption, common to Arrow-Debreu's model and Iwai or Kiyotaki-Wright basic models, is that quality of commodities is common knowledge. The absence of private information on the quality of commodities may be debatable when agents are specialized. Specialization seems to imply at least an unequal information. But to make the story clear, assume that the quality of commodities is imperfect even if there is no specialization and thus no problem of double coincidence of wants. Private information on the quality of commodities is another interesting 'friction' relative to the communication between agents. Such a 'friction' may be sufficient to demonstrate the existence of a monetary equilibrium([18]). 'Fiat money' being non privately produced is perfectly identified by all agents. If private information is severe enough, money will be preferred

to barter. *Money, in this case, remedies a problem of information.* Money here is the best common language for private agents.

'Frictions' above design a certain image of a market economy: more or less impatient and specialized individuals, endowed with a common language (commodities or 'fiat money'), bilaterally meet and conclude transactions following their own interest only. Transactions take place only at equilibrium, that is a situation from which no agent has an interest to deviate if no other agent deviates.

In such an economy, there is no visible organization or institution besides a common language. The refusal of Debreu's central clearing is tantamount to assuming anonymity[4]. How to make sure that egoist agents will respect their budgetary constraints and their commitments in a such a environment? Here, modern money theoreticians suggest their most significative statement.

1.3 'Fiat money' as a decentralized social control

Equivalence in exchange or budgetary constraints are two possible expressions of the more general principle of reciprocity. Anonymity challenges that principle. Nothing can force anonymous agents to respect the rules of exchange, unless they are incited to do so. Consequently, no credible commitment seems possible without some external constraint. Rightly or wrongly, economic theoreticians seem to consider that the no-commitment problem is relevant only for sequential transactions but not for spot transactions. Note that sequential transactions here mean money transactions since (i) any agent can realize only one transaction at any point of time (ii) money is assumed durable. By contrast, barter does not raise any problem of commitment. Quite naturally, following Kocherlakota([11]), modern money theoreticians analyse money as a substitute to a social memory.

Let consider a market economy in which specialization is such that no double coincidence of wants occurs when agents meet bilaterally. At best, only simple coincidences are possible: an agent can produce the commodity the other desires but not the other way round. No economic activity can take place unless the virtual consumer convinces the virtual producer to effectively produce for her. She could not promise him to do so later: such a commitment is not credible due to anonymity. In that economy, the best strategy for anonymous egoist agents is: 'not produce for others without a *quid pro quo*'. The economy has a unique (degenerate) equilibrium: autarky.

How is it possible to remedy the no-commitment problem (which is more than a friction')? How to incite people to adopt another strategy, namely to produce each time it is worth for another agent? How to make the economy adopt a better equilibrium (in fact the best possible)? Two different solutions are possible.

A first one is what Kocherlakota calls a *gift economy.* Agents have a strategy better than autarky: to produce in case of a simple coïncidence meeting without

[4] Debreu clearing requires a central accounting, not compatible with anonymity.

asking for a counterpart *if and only if the beneficiary has not violated that rule in the past*. In that case, it is possible to show that the economy experiences its best position (that a benevolent social planner would have chosen). It would be a *gift economy* instead of an exchange economy but the general principle of reciprocity would be respected.

A necessary condition, however, for the existence of that gift economy is the possibility to check at any point of time whether an agent has or has not respected the rule. If there is a free access to a social memory (think of a huge social accounting with a free access to the data), nobody has an interest to violate the rule since he will be punished for sure in the future (in fact condemned to an eternal autarky). An equilibrium other than autarky exists thus at which people enter in gift relations with each other.

A second solution is a *monetary exchange economy*. Assume that half of agents of each type of specialization hold a unit of fiat money. The rule to be followed is now: in each single coïncidence meeting produce a unit of commodity *if and only if there is a counterpart of one unit of money*. The idea is very simple: someone with a unit of money has never violated the rule: either she holds money as an initial endowment or she has produced in the past for another holder of money. Money makes a social memory useless. There is no need for a central accounting to check that agents have respected their commitments to follow the rule.

In modern societies, the story goes on, with a great number of individuals the cost of a social memory would be incredibly high. Money is preferred since it performs the same technological role as social memory. Costs of transaction associate to money are negligible in comparison of those associate to a social memory. Anonymity makes the problem of no-commitment very hard to overcome. Money fortunately remedies that difficulty (see [1]).

2 Validity of academic money theory is 'tenuous'

Money is often paralleled with language and sometimes considered as memory (see [7]). But authors maintening that last view are not economists but rather anthropologists or political philosophers. More significantly, they do not offer any demonstration in favor of that interpretation[5]. Here we have not only a strict economic point of view but also a rigorous demonstration using a formal model presented as very general (not limited to search models). In other words, Kocherlakota provides for us a very deep interpretation of money backed by an impressive formal apparatus.

[5] It seems there is some trade-off between the confidence we may have in demonstrated but arid statements - they are common in economic theory - and the feeling of understanding we may get from deep intuitions not easy to control - as it is often the case with political philosophy and anthropology. The reader may choose his/her preferred linear combination.of both.

But, a more careful examination shows that his case is relevant only for a very special type of monetary system in which money cannot be distinguished from capital. Kocherlakota's thesis has only a 'tenuous' validity due to a very restrictive image of a market economy, precisely that one associate with the current conception of 'fiat money'.

2.1 A confusion between money and capital

The environment allowing to establish that money is memory makes clear that capital rather than money is analysed and that bilateral relations rather than market are considered.

Money is taken as a *durable* 'fiat money'. This a condition for money holdings to be equivalent to a summary of past transactions in Kocherlakota's model as in the basic model of Kiyotaki-Wright. The summary is unambiguous. Money is durable and its quantity is given: as a consequence individual money holdings cannot change but as an effect of transactions. Money here is the only durable commodity.

But, as noted above, durability is not a necessary condition for being an intermediary in exchange. Even if it seems convenient to prove that a monetary equilibrium exists in which money is not only an intermediary of exchange but also a store of value, theoreticians should apply Occam's principle. They should be true to the idea that money is specifically an intermediary in exchange and not a store of value. Let try that strict assumption and assume that money is perishable as are all other commodities. What would be the consequences?

At each point of time, a fraction of agents would have to receive exogenously a unit of money. According to what rule? If the rule is to give a unit of perishable money to all agents having produced and sold a commodity, Kocherlakota's demonstration is valid. But any other rule would make Kocherlakota's thesis invalid. Money would cease to be equivalent with a (perfect) memory[6]. The link between past transactions and present money holdings would be broken.

Is there any reason to think that Kocherlakota's rule is relevant although very special? Certainly not. In any monetary system, the pure metallic one included, the quantity of money is at least partially endogenous. It is the result of individual demands for money facing some determinate behaviour of a monetary authority. In a pure gold standard, Kocherlakota's rule applies if and only if the monetary authority (the Mint) does not change the rules of coinage[7]. In any monetary system, money holdings do not evolve as a mere consequence of transactions. They are generally influenced by agents expectations and by the

[6] Kocherlakota's thesis is that '*money is no better than memory*'. Such an assertion is as true as 'market is no better than *Pareo optimum*'. Both are interesting when there is an equivalence (Kocherlakota's *money is memory* and first welfare theorem respectively).

[7] In that system gold is not money. Only legal gold coins are an intermediary of exchange. Money appears to be durable but this is true only to the extent that legal definition of the unit of account does not change and that the same type of gold coins are accepted as means of payment. In a pure metallic system money is perissable as subject to possibly changing legal rules of issuance. It is not possible, even in this case, to negate the sovereignty aspect of money.

degree of accommodation of the monetary authority. *Money holdings evolution is generally not equivalent to the memory of past transactions.*

What information is conveyed by the observation of money holdings? Basically, that some agents have some purchasing power (to be determined by bargaining or by the market). How have they got that power? Is it thanks to their past transactions only (sales *minus* purchases *plus* initial endowment)? It is the special case adopted by Kocherlakota: money is equivalent to memory. Is it because a bank has accepted to finance a seemingly profitable future project? It is the special case advocated by Schumpeter: money is completely severed from the past transactions; it has nothing to do with memory. Of course, all mixed cases are conceivable and, as otten, the truth is in between.

To assume that money is durable makes it an item of capital. When all other commodities are assumed to be perishable money is the unique capital. *Capital* and *money* are two different names for one thing. That money be memory is no surprise when capital (or money) is considered as an inalterable and indestructible commodity.

Despite its apparent generality, Kochelakota's demonstration is relevant only for a very special case, when money cannot be distinguished from an exogenous capital used as a means of payment. The confusion between money and capital is not legitimate from the mere point of view of academic theory since money is defined as a pure intermediary of exchange. It is not legitimate from a more general point of view either, as it will be clear below. In Kocherlakota's special case money is severed from any element of sovereignty. This reflects more a normative proposition than an objective one.

2.2 Money, commitment and organization of markets

That individuals cannot credibly commit to future actions is necessary to Kocherlakota's demonstration. The no-commitment problem is less a question of memory than an *information* problem. A positive money holding signals that the agent has followed the rules in the past (counterfeiting money put aside) so that it is right to produce for her (that is to incur some desutility) in exchange of a unit of money (without any intrinsic utility). But to settle the problem in that way makes sense only if any agent cannot realize more than one transaction at any point of time. That environment is very restrictive and other views of a market economy are possibe and available.

in the strategic market games approach, where transactions are explicitly considered, agents determine at each point of time their desired transactions (purchases and sales are simultaneous). Compliance with the rules, that is the respect of budgetary constraints, is guaranteed by *physical constraints*. Agents must effectively put their commodities or their money bets at each trading post. Effective quantities only are taken into account by Shapley-Shubik rule determining prices on the different decentralized markets (each market is centralized but each market is independant from each other)[8]. Shapley-Shubik rule ensures

[8] See [12].

that budgetary constraints are respected *ex post*.

To describe a (decentralized) market economy needs to overcome the no-commitment problem. In any case, an institutional hypothesis is necessary. A durable 'fiat money' does the job in the special environment adopted by Kocherlakota. A minimal organization of markets does the job when markets are considered instead of bilateral meetings. It is misleading to define money as a remedy to the no-commitment problem since this is true only in a special case. Questions raised by the existence of money are too important to consider they are solved when the environment is so special that money is the sole capital and that agents cannot realize more than one transaction at each point of time.

What money does in an economy largely depends on the assumed characteristics of that economy. The 'friction' theory of money makes that point very clear. Economic theory deals with a market economy. Money theory cannot be independent of market theory.

Kocherlakota's thesis and, beyond, modern academic approach to money are not really convincing even if they show great advances in monetary theory. What makes problem is their special view of a market economy which is more or less implicit in the different models they propose. The high degree of sophistication of the analysis should not make us forget that money theory is an essential part of the larger theory of a market economy. The relevance of the former is subject to that of the latter. The discussion about modern money theory should not be limited to technical (and difficult). It should bear also on the legitimacy of the environments adopted in the models. Do they give a right picture of a market economy? Do they capture the essential characteristics of a market economy?

In order to answer these questions, the basic features of a market economy have to be listed, on which most people (not only academic theoreticians!) could agree. It will be suggested that academic theory of money, despite its recent advances, may be criticized as grounded on an inappropriate market theory. For that reason, an alternative theory of money has to be coupled with another view of a market economy.

3 Money and market economy: an alternative view

Rather than to consider different transactions arrangements (bilateral meetings, organized markets, intermediaries, etc.), it seems necessary to establish the minimal properties that an economy must exhibit in order to be called a market economy. It does not make much sense to inquire into what money is and what money does without knowing the exact specification of a market economy[9].

[9] The temptation of a general theory of money being valid for any type of society must be resisted. It would lead to abusive generalizations (see [4])

3.1 A market economy: the specification

Under the 'veil of ignorance' of any precise economic theory, three characteristics appear necessary and sufficient to define a market economy: (i) individual actions in the market are decentralized, *(ii)* coordination between individuals is *a posteriori* and (iii) equivalence in exchange is the rule.

3.1.1 Market individual actions are decentralized

That each individual is free to decide about his/her actions in the market is fundamental and beyond contest. Consequently the most obvious requirement for any market theory is to allow for decentralization. Decentralization contrasts market economies with centrally planned ones or with economies ruled by custom or tradition. Individuals freely determine what, how, why and how much they produce or consume subject to technical and budgetary constraints. Those actions are not mere intentions, they are effective. As nobody is supposed to be able to enter into others's mind, individuals have to make their actions known by other. Since no central authority knows individuals's intentions, individuals have no other means than to effectively act in some way: posting a price (for a seller), sending a purchase order backed by a means of payment (for a buyer), being present and exposing commodities in a trading post, etc. As freedom of thinking significantly exists only associated with freedom of expression, freedom of choice in the market implies some means to express it.

3.1.2 Market coordination is *a posteriori*

A consequence of decentralization is that agents take their decisions without knowing for sure what other people do at the same time. Of course, every agent tries to guess others' actions but decentralization is not compatible with a perfect knowledge of the effective actions of others. To bring to the market a given quantity of commodity may be the result of a very sophisticated calculus taking into account past history and expectations. It cannot however proceed from such a direct knowledge. When he/she posts a price, for instance, a seller does not know the prices other sellers have posted (or the purchase orders). Bilateral bargaining seems an exception to that rule since agents come together to a common decision about price and quantities. But even in this case, they ignore what other people do at the same time which may change the effects of their common decision. Nobody knows the result of what he/she is doing at the very moment of the decision. In other terms, coordination *a posteriori* is compatible with a great diversity of meetings between agents (bargaining, markets, etc.) provided that no particular agent or no institution be able to master the entire process of coordination. If it were the case we could not distinguish between a market economy and a centrally planned one.

The very idea of individual freedom makes sense only at the cost of a lack of transparency of society to its members. Such a transparency would contradict decentralization. The latter implies that coordination between agents take place once all agents have taken their decisions. A spontaneous mutual compatibility

of actions decided independently by a huge number of individuals is very improbable. Coordination in the market takes the form of a confrontation between *a priori* non compatible individual actions. *Market is the general name for the process through which agents adapt their own actions to that of others.*

3.1.3 Equivalence is imposed *a posteriori*

Equivalence in exchange is a straight consequence of assuming free individuals having the same rights and the same condition [10]. No agent can impose a transaction to another. Identical *conditions* (individual *positions* may differ due to unequal endowments) and freedom make sure that transactions take place according to an equivalence principle.

Equivalence does not preclude gains in exchange. All agents may be better off after the market from the point of view of their personal utility. Some of them may be worse off as well. Equivalence does not concern utility but prices or exchange values. Prices imply at least two agents. Prices are objective be they expressed as ratios between quantities of exchanged commodities or as quantities of monetary unit. Equivalence means that all agents accept *a priori* that the exchange value of what they buy should not exceed the value of what they sell (including intertemporal transactions). It means that actions in the market (sale or buy orders, posting prices, etc.) are subject to a *budgetary constraint*.

Although all agents *a priori* respect their budgetary constraint, differences between sales and purchases may arise for some individuals (at least for two of them) due to decentralization of actions. Coordination *a posteriori* is responsible for the existence of individual deficits or surplus. These deviations from equivalence cannot be corrected but (logically) *a posteriori*. Deficits must be settled in a way or in another in order to restore equivalence. If not, agents go bankrupt. Once deficits are settled, agents' wealth (at market prices) is known. Some gain some loose. In the special case of spontaneous equality between purchases and sales for all agents, wealth structure does not change. In the general case, there are some 'market sanctions' (impoverishment or enrichment, bankruptcies, LBO, etc.). Market determines individuals's wealth and their variations through those 'sanctions', another name for *a posteriori* imposition of equivalence.

3.1.4 The case for an alternative theory

The three features above - decentralization, *a posteriori* coordination and equivalence - may be largely accepted as being three basic characteristics of a market economy by contrast to other forms of social organization (traditional, feudal,

[10] Whether wage-earners are or are not in the same position as other agents (entrepreneurs, rentiers, landlords, etc.) is not discussed here. Mainstream economics basically maintains that equivalence rules all exchanges (labour included) whereas Classics, Marx and Keynes do not consider wage-earners as being on the same footing.

centrally planned economy, etc.). These features should be present in any economic theory pretending giving an account of the working of a market economy. They are a specification which has to be respected. It is certainly such specification that competitive general equilibrium theoreticians had in mind before the 70's when they tried to solve the three basic problems: existence, uniqueness and global stability of equilibrium. They have renounced to the third one. The failure to demonstrate global stability, well-recognized by the profession (see [6]), has driven academic theory probably too far from its traditional path. Nowadays, there is no room left for any study in a disequilibrium dynamics. Only equilibrium positions can be accounted for.

The restriction of academic theory to equilibrum situations is not the effect of an opinion but the consequence of a theoretical failure. Economic theory used to be centered on the self-regulatory properties of the market (either to defend or to contest them). It is no longer the case. The baby has been thrown away with the bath water. The very principle of market has been disposed of along with the *a posteriori* coordination. At equilibrium it is impossible to make a difference between a centrally planned and a market economy. In both economies any agent cannot act but with the agreement of all the others. Decentralization does not make sense any longer. The two first specifications are not met. However interesting academic theory may be, it cannot be recognized as a relevant theory for a market economy. Its main results concern an economy without sanctions, without bankruptcies, without crisis: Hamlet without the Prince.

3.2 Money in a market economy: the minimal components

The concept of money ought to be consistent with the three features admitted above as inescapable. Its properties are more or less parallel with that of the society.

3.2.1 The nominal unit of account

A nominal unit of account is a necessary condition for letting known individual actions. This nominal unit may or not be defined in a material way but it must be kept distinct from commodities. A dollar may be defined as a certain weight of gold but that quantity of gold is not a dollar *per se*. Alternatively a dollar may be tautologically defined as a dollar. The essential point is that people in the market refer to dollars and not to gold or to whatever commodity.

Presupposing a unit if account does not mean that its existence is unconditional or that theory has nothing to explain here. One thing is to assume the existence of the dollar as unit of account, another to understand the conditions under which such a unit may last over time. History teaches that monies are mortal. Theory has to make explicit why some still exist[11].

[11] Viability theory seems well-suited to that task (see [2]). Some work is in progress on that point.

3.2.2 The minting process

Money is defined also by *a minting process*, i. e. by some rules determining the amount of means of payment made available to agents in order to make effective their actions in the market. Think of an economy where specialized producers must buy their inputs in order to be able to bring commodities in the markets. Purchases (expected profits included) *logically* precede sales (even if both are necessarily simultaneous) in the sense that only expenditures can be decided whereas receipts come as their consequence. *No individual agent can decide how much other people will spend to him. But all agents may decide how much to spend conditional to the obtention of the required means of payment.* They have to do so in order to be able to sell something to others. Irreversibility of the market process is a feature of market economy derived from coordination *a posteriori*. Getting means of payment is a necessary condition for a market specialization of activities. Decentralization implies that agents could spend independently of what other people do. In other words, *the means of payment used to buy are not those obtained through sales*.

The process by which they get means of payment may be various (from the minting of gold to pure credit) but it must exist. *Minting process* is a generic term to denote the various ways along which people get money independently of their sales. In its more general acception, the minting process is a relation between wealth (which is a stock) and agent's ability to intervene in the market (which is a flow).

Expenditures of agents are receipts for others. For the whole economy during a given period total expenditures are identically equal to total receipts. But for each individual in particular, a difference between receipts and expenditures generally arise. Flow of payments form the very structure of economic relations. Table below shows such a payment matrix:

flows of payment	1	2	...	n	expenditures	balances
1	-	d_{12}	...	d_{1n}	d_1	s_1
2	d_{21}	-	...	d_{2n}	d_2	s_2
...	...	...	...	...	...	...
n	d_{n1}	d_{n2}	...	-	d_n	s_n
receipts	d^1	d^2	...	d^n	μ	0

Individual actions appear as interdependent according to a *matrix of payment*. Money is the name of that specific interdependence associate to decentralization. The matrix of payment is the quantitative and synthetical expression of what is individual freedom in a market economy. Money is the (economic) name of that structure. Simmel advocates the same idea in philosophical terms (see [15], chapter 4).

Non-zero balances show that equivalence principle is not spontaneously respected. A third component must enter the picture.

3.2.3 The settlement of balances

Money is the name for that typical interdependence between individuals as represented by the matrix of payment. It is only at this level (and not for each particular transaction) that equivalence principle applies. Although aggregate decentralized expenditures are identical to aggregate receipts, there is no reason for such an equality to hold for each agent. In general, individual agents experience non-zero balances, either monetary deficits or surpluses. Equivalence principle does not hold unless some procedure of *settlement of balances is built-in as part of 'money institution'*. Balance settlements restore the principle of equivalence in case of disequilibrium. Without that constraint a deficit agent would have acquired too much wealth (valued in units of account) than allowed by equivalence. Balance settlement is the means of filling this gap. The deficit agent uses part of his wealth to discharge his debt. Let us call this the *monetary constraint*. This constraint works according to the rules of the payment system (gold currency or pure credit circulation). *The settlement of balances makes the monetary constraint effective and determines individual wealth after the market (which generally differ of wealth before the market) validating disequilibria of sales and purchases observed in the markets.*

In a pure gold currency system, where the minting process rests only on gold, the settlement of balances changes the structure of gold initial endowments. In a pure credit system, where the minting process rests on the monetization of capital, the settlement of balances is more complex (bankruptcies, LBO, financial operations, etc.) but ends up in a modification of the distribution of capital over individuals. Note that in both systems (and potentially in all monetary systems of a market economy), social wealth (by contrast with private wealth about which nothing can be said) is made of the basis of the minting process (gold or capital). Market changes the structure, and possibly its global amount, through the settlement of balances. Academic theory being restricted to zero balances situations cannot grasp that essential feature of a market economy.

Money is not the name of a special commodity called 'fiat money', as it is conceived of by academic theory. It is neither what a short-minded induction or a naïve observation of empirical evidence could suggest, as it is describd in most text-books. *Money is nothing but the set of rules which makes possible the working of that special combination of decentralization of individual actions and a priori imposed equivalence.*

Settlements of balances may take place smoothly without putting in question the basic rules of the system. But it could be also the case that the viability of the system is at stake. In the alternative theory sketched here monetary regulation is part of the concept of money[12]. That regulation may affect the minting process (making more or less difficult the process of monetization of wealth), the settlement of balances (bankruptcy laws, accounting norms, etc.) and also, in extreme cases, the unit of account. Sovereignty is an integral part of money but not as a general and indifferencied power, not even as the power of the State but as a specific one, entirely designed by the specific features of

[12] A formal presentation is proposed in [5]

market economy (think for instance of the so-called ìndependence of central banks or to the ECB). The alternative theory of money sketched here may be credited for its capacity to conceive of money and sovereignty as specifically and precisely related. But this reveals at the same time its limits defined by the set of its presuppositions: market economy, quantitative categories, etc.. It is a special economic theory for a special society and not a general one.

References

[1] Araujo, Luis, (2004), 'Social Norms and Money', *Journal of Monetary Economics*, 51, 2, 241-256.

[2] Aubin, Jean-Pierre, (1997), *Dynamic Economic Theory, A Viability Approach*, Berlin, Springer Verlag.

[3] Cartelier, Jean, (2003), 'Endogenous money in an elementary search model: intrinsic properties *versus* bootstrap', Working paper, FORUM.

[4] Cartelier, Jean, (2007), 'The hypostasis of money: an economic point of view', *Cambridge Journal of Economics*, (31)2, 217-33.

[5] Cartelier, Jean, (forthcoming), *Monnaie et marché, Pour une théorie alternative*

[6] Fisher, Franklin, (1983), *Disequilibrium Foundations of Equilibrium Economics*, Cambridge University Press.

[7] Hart, Keith, *The Memory Bank*, (Keith Hart website)

[8] Iwai, Katsuhito, (1988), 'The Evolution of Money: A Search-Theoretic Foundationof Monetary Economics', University of Pennsylvania CARESS Working Paper N° 88-03.

[9] Keynes, John Maynard, (1930), *A Treatise on Money*, vol. V et VI de *The Collected Writings of John Maynard Keynes*, MacMillan, 1971.

[10] Kiyotaki, Nobuhiro & Wright, Randall, (1993), 'A Search-Theoretic Approach to Monetary Economics', *The American Review*, (83), 1, 63-77.

[11] Kocherlakota, Narayama, R., (1998), 'Money is Memory', *Journal of Economic Theory*, **81**, 232-251.

[12] Shapley, L., S. & Shubik, M., (1977), 'Trade using one commodity as a means of payment', *Journal of Political Economy*, 85, pp. 937-968.

[13] Shi, Shouyong, (1996), 'Credit and money in a search model with divisible commodities', *Review of Economic Studies*, 67, 627-652.

[14] Shi, Shouyong, (2006), 'Viewpoint: A microfoundation of monetary economics', *Canadian Journal of Economics*, 39, 3, 643-688.

[15] Simmel, Georg, (1978), *The Philosophy of Money*, Routledge, [1900].

[16] Wallace, Neil, (2001), 'Whither monetary economics?', *International Economic Review*, 42, 4, 847-869.

[17] Walras, Léon (1900), *Eléments d'économie politique pure*, tome VIII des *Oeuvres économiques complètes d'Auguste et Léon Walras*, Economica, Paris, 1988).

[18] Willamson, Steve & Wright, Randall, (1994), 'Barter and Monetary Exchange Under Private Information', *American Economic Review*, 84, 104-123).