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A Theoretical Approach To Electronic Money

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Contents

Introduction

Electronic payments have been known for a long time. Electronic Fund Transfers (EFT) are nowadays widely used, in particular in inter-bank clearing and thanks to the general use of debit cards and Automated Teller Machines (ATMs).

The development of EFT has caused an important decrease in money balances held for transaction purposes. In addition, the need to increase the rate of return on current accounts has risen. So, one of the most important financial innovations in the United States has been the possibility to earn interest on highly liquid accounts. As a result, the distinction between monetary and financial assets has become more and more blurred[1]. Moreover, money appears to be vanishing in an existence confined to the instant. Yet, this has not caused the traditional definition of money to be challenged.

Economists who have gone into the question of the existence of money in electronic fund transfers, have come to the conclusion that money «suffers» from a simple physical disappearance. As Kurtzman puts it (1993: 1): *«Money has been transmogrified. It is no longer a thing, it is a system. Money is a network that comprises hundreds of thousands of computers of every type wired together in places as lofty as the Federal Reserve»*.

Hence, the definition of money has somehow taken on a poetic quality. To quote Henderson (1987: 15): *«This new money is like a shadow. Its cool-gray shape can be seen but not touched. It has no tactile dimension, no heft or weight [...] Money is a phantom from the past, an anachronism. In its place, traveling the world incessantly without rest and nearly at the speed of light, is an entirely new form of money based not on metal or paper but on technology, mathematics, and science».*

As a means of payment, money has come to be a *«money-flux»* (whose existence is confined to the instant), according to the terminology put forward by Henderson (1987).

Electronic payments are currently going through a further evolution. Besides *«access products»,* a new range of electronic payments, *«e-money products»,* has emerged. The most recent developments have immediately been qualified as a *«culmination in the process of the dematerialization of money»* (Meister, 1996). So, according to the *Congressional Budget Office* (1996), electronic money not only constitutes the overcoming of the physical concept of money, but also the overcoming of the notational concept of money: *«The new electronic payment methods take the concept of money beyond its physical and notational forms to intangible electronic forms that exists only on-line».*

Recently, we have witnessed a rise in the number of economists asking whether electronic money should be considered as money proper[2]. As pointed out by Bernkopf (1996), the first effect of the

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1 See Rattaggi (1994).

2 See for instance Bernkopf (1996): *«Is the balance on the photocopier card cash?»,* and England (1996): *«If American Express takes the balances it receives up front from college parents and invests those balances in loans to business, has American Express (a non-bank institution) created money? The college students certainly view the*

emergence of electronic money has been to force economists to turn again to fundamental questions *(«Long-established notions are being turned on their head»)*, such as *«When is an institution a bank? When is a prepaid card balance E[lectronic]-cash?[...] What is a bank? Is it an institution that lends money? That accepts deposits? That lends money and accepts deposits simultaneously? The commonly accepted definition of bank is fast becoming outmoded [...] What is electronic cash? When does the balance of a multipurpose card become electronic cash?»*.

As put forward by White (1996): *«Will changes in the way money is paid from one party to another bring about changes in the character of money itself?»*.

Answering these questions is even more difficult because monetary theory has not provided a satisfactory definition of money yet, nor has it provided a satisfactory explanation of how money is created. We should remember that mainstream theories refer to a non-monetary economy, where money is brought into the picture as a particular commodity only in a second step of the analysis.

Now, answering these questions is of primary importance, in particular in order to provide an analytical framework for analyzing issuers of electronic money and applicable regulations[3].

On the other hand, the nature of issuers' activity is still far from being fully understood. As pointed out by Froomkin (1996): *«Basic concepts, such as whether a Certification Authority's sale of a certificate is the sale of a good, a service, or a mixture of the two remain to be determined»*.

The analysis of the distinguishing features of electronic money raises an embarrassing question: is not the traditional theory of money inadequate for a full understanding of phenomena such as electronic money?

Indeed, an increasing number of economists (see, for instance, Philips (1996) and Anderson (1996)) put forward the idea that money ought to be considered as a flow of information.

Now, while the analysis of money as a means of payment shows money to be a flow of information, money in the theory and practice of finance requires being a remunerated asset. A question arises spontaneously: are we not talking about two different things? In our opinion, this subject is very important. The functional definition of money («money is what money does») seems to be inadequate.

The problem is well-known. Smithin (1984), despite his definition of the means of exchange as both an *«electronic impulse»* (1984: 29) and an *«interest bearing asset»* (1984: 33), maintains that the evolution of innovations does not require a reappraisal of the fundamentals of monetary theory: *«The precise form of the medium of exchange is not a serious monetary issue»* (1984: 36). Smithin's conclusion is not surprising for it confirms the traditional lack of interest of researchers towards payment systems, and bears out the fact that monetary theory and changes in the payment systems have commonly been studied almost

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balances on their debit card as «money». So does the business receiving the loan».

[3] To quote Bauer (1995): *«This leads to the question of who should be permitted to issue e-cash. In most cases, e-cash is the liability of the issuer. Thus, while it circulates in cyberspace, to what uses can consumer's funds be put? Also, if the issuer is a depository financial institution, should deposit insurance and reserve requirements extend to e-cash holdings? All of these questions deserve careful consideration»*.

independently one from the other (Berger, Handcock, Marquardt, 1996: 716).

By contrast, this paper proposes an analysis of money which starts from payment systems. It focuses on payment systems which require the emission of electronic money (*e-money, e-cash*), issued mainly under two different forms: *prepaid*[4] *cards* (also referred to as *electronic purses, card money, balanced based, card based*) and *prepaid software products* (*digital cash, net money, note based, network based*). After indicating the distinguishing properties of electronic money (which derive entirely from its technical features), this paper outlines their consequences on the principles of monetary theory. It will be argued that recognition of the fact that electronic money is nominal money issued in an operation of monetary intermediation, provides an analytical framework for a better understanding of electronic money issuance, as well as of the meaning of issuing money.

Our analysis will reject Smithin's conclusions. The main point is to show that only a deep analysis into the very nature of bank money can provide a better understanding of phenomena such as electronic money, which is consistent with the evolution of financial and banking innovations, in particular with the rise of interest bearing mediums of exchange. In support of our analysis, we will draw from the pioneering works of Bernard Schmitt (1966, 1975 and 1984) on the nature of money, banking and capital.

[4] As we will see later, the use of the term «prepaid» is somewhat inadequate.

Part I. The Working of Electronic Money Payments

1. The Distinctive Characteristics of Electronic Money

Since our analysis is entirely based on the distinctive properties of electronic money, properties which derive from its technical features, we should first describe the working of electronic money payments by using the useful device of the T-accounts, before proceeding with the argument.

Flow of funds

Payments are made through an issuer who represents a sort of «digital branch» of the bank. Agents must therefore open an account at a bank which provides this service. Transfers of funds from the payer's bank (bank *Bq*) to the issuing bank (bank *Be*) are made according to current regulations. If agent A is the payer and agent B is the payee, *Be*'s balance sheet is as follows:

Δ assets	BANK Be	Δ liabilities
Credit on bank Bq + 100 mu	Deposits due A + 100 mu	

Fig. 1. Be's balance sheet. (mu: monetary units)

Funds at bank *Be* are insured by the Federal Deposits Insurance Corporation (FDIC). Wishing to pay agent B, agent A orders the transfer of the amount requested to the scheme operator (the issuer of electronic money). This operation is necessary because, from that moment on, funds are no longer covered by FDIC's insurance. Bank *Be* will simply deduct the amount from its demand deposits liabilities and increase equally its liability to the issuer.

Δ assets	BANK Be	Δ liabilities
	Deposits due A - 100 mu	
	Debt towards issuer + 100 mu	
Credit on Bq 100 mu	Debt towards issuer 100 mu	**Result**

Δ assets	ISSUER	Δ liabilities
Credit on Be + 100 mu		Deposits due A + 100 mu

Fig. 2. Transfer of funds to the issuer.

Agent A can then ask the issuer to issue electronic money. Emission of electronic money gives rise to a substitution of deposits liabilities with e-money liabilities (which can be either a general liability account or a cardholder's account). Hence, funds are moved only within the issuer.

Δ assets		ISSUER		Δ liabilities
		Deposits due A E-money (A)	- 100 mu + 100 mu	
Credit on Be	100 mu	E-money (A)	100 mu	**Result**

Fig. 3. Issuer's balance sheet in an e-money emission.

It is worth noting the difference between a traditional withdrawal of bank-notes and an emission of e-money. Even though the two operations are perceived as similar by users, for a bank its properties are somewhat different (Laster and Wenninger, 1995b). While in ATM withdrawals, banks see a decrease of both assets and liabilities (vault cash and demand deposits), in an e-money emission, issuers see a simple substitution of liabilities.

Emission of electronic money (in closed circulation systems)

Simultaneously to the inscription of e-money liabilities on the issuer's balance sheet, the issuer proceeds to the emission of electronic money. Emission of electronic money is recorded in an emission account (*record*, or *database*) which has no financial signification[5] and whose purpose is to ensure a correct management of the electronic payment: an entry on that account is simple numerical information about the emission and the destruction of the payment device[6].

Electronic money schemes are designed to feature characteristics which give the user the impression that electronic money is an electronic analogue to paper money. So, in the eyes of users, payments with electronic money are similar to withdrawals of paper money. However, this similarity is just an illusion voluntarily created by the use of a graphical interface. For banks, e-money properties are different.

In fact, electronic money requires the intervention of a third party for each flow of electronic money: *«unlike cash, when a customer pays another customer an electronic bank will play an unobtrusive but essential role»* (Digicash, 1996). Indeed, while paper money is emitted in an *open circulation system* (in which notes freely circulate among agents), all electronic money schemes currently available (largely because of the lack of security forwarded by *open circulation systems*) work as *closed circulation systems*[7] (CPSS, 1996: 34n), in which multiple transactions among agents are not allowed. Consequently, after

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[5] See figure 5 below.

[6] The main purpose of this record is to prevent double spending of the same unit of electronic money.

[7] Terminology employed by Pauli & Koponen (1997). Since the terminology employed can be confusing, it is of absolute importance to point out that *closed circulation systems* are not to be confused with what has become known as *closed systems*. By *closed systems* are meant systems in which the use of electronic money is restricted to one purpose (photocopier cards are a typical example of *closed systems*). Similarly, *open circulation systems* are not to be confused with *open systems*.

every payment, recipients of electronic money must surrender electronic money to the issuer for destruction; this fact prevents electronic money forgery. Describing e-money as *«digital banknotes that travel around the electronic economy»* (The Economist, 1996: 68) is deeply misleading. As Browne & Cronin (1996) put it: *«one of the basic features of electronic money is that it does not circulate»*.

Thus electronic money issued in *closed circulation systems* is issued in favor of agent A *(Fig. 4, flow 1)* exclusively in order to make a payment. After having received e-money *(flow 2*), the recipient (agent B) must surrender it to the issuer *(flow 3)*. Only after having surrendered it to the issuer, and having been credited with a deposit *(flow 4),* is agent B finally paid. Consequently, new electronic money is issued in every payment[8]. Hence, the creation «on A» and the destruction «on B» of electronic money define a payment of A to B. Every payment is made up of three flows involving A, B and the issuer. This constitutes the «tripolar» structure of each payment, which describes a *closed circulation system* (Tanaka, 1996; Pauli & Koponen, 1997).

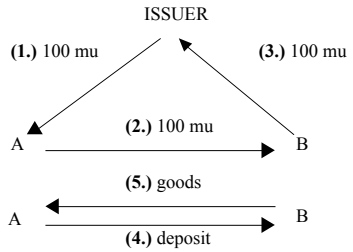

Fig. 4 . Electronic money payment.

Before analyzing their implications, it is worth summarizing the distinguishing features of electronic money issued in *closed circulation systems*:

1. **It is issued only to make payments:** electronic money is issued only in order to proceed to a payment.
2. **It requires a «tripolar» structure**: every payment is a relation between three agents (the payer, the payee and the issuer).
3. **It exists only within the payment:** in order to be finally paid, the recipient of electronic money must surrender it to the bank. E-money is then destroyed, which implies that it has an existence confined to the payment.
4. **It cannot circulate**: electronic money cannot survive the payment. Hence, it cannot circulate among agents[9].
5. **E-moneys are not homogeneous**: each issuer emits a different electronic money (CPSS, 1996: 37). Moneys therefore are not homogenous.

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[8] Note that the same applies when agent A and agent B are clients of two different banks. Emission in a *circuit system (closed circulation system)* requires electronic money to be surrendered (for authentication) to the issuer. So, for security reasons payments through electronic money require an immediate clearing.

[9] Our analysis is strictly limited to *closed circulation systems*.

This paper is solely concerned with *closed circulation systems*. As we shall see, emission of electronic money in *closed circulation systems* has important consequences for the analysis. For the sake of the analysis we will refer to *closed circulation systems* as *circuit systems*. By *circulation systems* we will refer to *open circulation systems*, where multiple transactions among agents are permitted.

A rigorous analysis of the nature of electronic money is essential, especially in order to provide an analytical framework for applicable regulations. Because most schemes involve the emission of e-money by non-bank institutions, it is of primary importance to clarify the nature of this activity: are issuers banking intermediaries or simply service providers?

Issuers respond to the need of security. However, as pointed out by Froomkin (1996), issuers are not simply agents charged with the security of payment systems, they are *«new entities»,* whose activities are not limited to cryptography, and which demand *«new relationships».* As Froomkin puts it: *«These partly cryptographic, partly social, protocols require new entities, or new relationships with existing entities, but the duties and liabilities of those entities are uncertain [...]».*

Part II. Theoretical Analysis of Electronic Money

1. Current Interpretations of Electronic Money

Electronic money, means of exchange and means of payment

Electronic money is quite often assimilated to notes withdrawn from ATMs, used in a payment and then deposited (Caskey & Sellon, 1994). This view implies that flow 2 (see above Fig. 4) constitutes a direct transfer of funds. However, as pointed out by the majority of authors, the reality is different: funds are not stored onto the card but kept in a suspense account by the issuer. As we have mentioned, emission of e-money gives rise to a simple substitution of banking liabilities: *«a prepaid card liability for a demand deposit liability»* (Laster & Wenninger, 1995b). Therefore, there is no direct transfer of funds (Stuber, 1996); funds are kept at the bank, which even admits the possibility of paying an interest on these funds (Browne & Cronin, 1996; White, 1996). Hence, even if the terminology employed can be misleading, smart cards are not loaded with purchasing power (FDIC, 1996a): *«The use of the phrase «load value onto a card», «electronic value», or any similar terms used in this opinion, is not meant to imply that the information loaded on stored value cards is legal tender or anything similar to legal tender. Rather, such information is more in the nature of a right to be paid a sum of money»*.

More commonly, it is argued that the main difference between money and e-money lies in the fact that e-money is not issued by a central bank; it is just a *«representation of the issuer's promise to pay»* (Congressional Budget Office, 1996).

Electronic money is thus commonly compared to travelers' checks (White, 1996; Congressional Budget Office, 1996). According to Ely (1996), e-money is no different than other means of payment: *«Fundamentally, electronic money is no different than all other forms of money that exist today [...]. All forms of money that circulate in the United States today are forms of credit that also serve as media of exchange»*. This opinion is shared by Kelley (1996a).

This view is supported by Goodhart's analysis (1989) on the difference between means of payment and means of exchange, which is based on the distinction between credit and final payment. While final payment *«leaves the seller with no further claim on the buyer»* (1989: 26), the use of means of exchange needs a further final payment to occur: *«A medium of exchange includes those assets, or claims, whose transfer to the seller will commonly allow a sale to proceed. The distinction is that when the seller receives a medium of exchange, which is not a means of payment, in return for his sale, he will feel that he still has a valid claim for future payment against the buyer, or even more generally against some other group on whom the buyer has provided him with a claim»* (ibidem).

A check is therefore not considered as a means of payment: *«A check merely represents an order to a third party, the banker, to complete the final payment to the creditor»* (Goodhart, 1989: 40). Payment is final only when the seller has in his possession a risk-free monetary asset (most commonly, central bank

issued money)[10]. In accordance with Goodhart's analysis, the need for the recipient to give e-money back to the bank in order to finally be paid (which gives the traditional «tripolar» structure of e-money payments) is explained by the fact that electronic money is not a risk-free asset.

2. Critical Assessment of Current Interpretations

Deposits always belong to a holder

According to the traditional interpretation, e-money is issued simply by selling it (Hayes et al., 1996; Roberds, 1997). As the Office of the Comptroller of the Currency (1996) puts it: *«it is essentially selling bank liabilities to its customers. The issuer takes the proceeds from the sale of electronic cash and invests or holds the proceeds until the electronic cash is presented to the issuer for redemption»*. The word *«selling»* can be misleading. In fact, issuers do not own funds. A purchase of a claim is indeed a loan. Funds are therefore just lent to the issuer by agent A. As pointed out by White (1996), during the operation of payment, funds are deposited in the bank, i.e. they are lent to the bank: *«The incentive for banks to offer digital currency is clear: float. If digital currency balances pay zero interest, as analog currency traditionally has, the bank receives an interest-free loan from customers holding its currency balances»*. Thus, as argued by the Working Group (1994) issuers act as deposit institutions: *«In economic terms, it is clear that the money received by the issuer of an electronic purse is a bank deposit. It is indeed a claim which the cardholder (or account holder) has on a third party»*. Funds underlying smart cards are therefore to be considered as deposits.

However, interpretations on this matter differ. Indeed, the holding of funds onto general liability accounts rather than onto cardholders' accounts has induced the Federal Deposit Insurance Corporation to judge deposit insurance as inapplicable (FDIC, 1996a).

Admittedly, positive time lapses from the creation to the destruction of electronic money. Between the time e-money is created and the time e-money is destroyed, funds are held in a suspense account. Nevertheless, as already noted, e-money being issued in a *circuit system*, needs to be surrendered to the issuer by the recipient. Thus, from an analytical standpoint, deposits at bank *Be* are general liabilities which will immediately find a new holder. In fact, as it is sure that e-money will be given back to its issuer, this time can even be considered as analytically instantaneous. Given the impossibility for e-money to

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[10] Goodhard's analysis is most interesting: a payment is final only when no claims against the buyer or other institutions subsist. However, if carried to its logical end, this view should conclude that central bank issued money is not to be considered as a final means of payment. The problem is well-known. We should remember a fundamental question raised by Peel while discussing the *Bullion Report*: *«What is the significance of that word, a 'Pound', with which we are all familiar? What is the engagement to pay a 'Pound'?»* (quoted in Hawtrey, 1919: 366). Even if this issue is not directly addressed in this paper, the definition of final payment remains a crucial issue.

circulate, we are indeed faced with the alternative: either the deposit belongs to B, or it belongs to A. If it does not belong to B yet, it means that the pretended general liability is actually A's deposit. Hence, analytically the deposit always belongs to a holder.

Consequently, from an analytical viewpoint (and as an additional consequence of e-money being issued in a *circuit system*) general liabilities accounts are reduced to cardholder's accounts. The whole payment operation takes place as if it were truly instantaneous.

As emission of e-money is considered as a sale of issuer's liabilities, current interpretations of electronic money suggest that the payer realizes a loan to the issuer. Still, issuance of e-money does not in itself represent an act of borrowing.

It should be noted that the emission of electronic money and the loan to the issuer are not necessarily a single operation. Most systems under development require the payer (agent A) to hold an account by the issuer. By moving funds to the issuer, agent A realizes a loan to it. In what sense would the emission of e-money represent a further loan? By issuing e-money, the issuer does not act as a borrower. Issuance of e-money is a further action which ought to be kept analytically separated from that of moving funds to the issuer.

The paradox of central bank issued electronic money

As the first part of this paper has shown, one of the distinguishing features of electronic money - which arises because of the need of protecting the flow of electronic money from counterfeiting *(«man-in-the-middle attack»)* - resides in the intervention of the issuer at each transaction. This causes the subdivision of payments into three flows, followed by a transfer of funds. An interpretation of these three flows is fundamental. Traditional interpretations consider these flows as logically separated and corresponding to three separate flows of electronic money. This view considers electronic money as being intangible money, and an object of three separate actions: emission, payment, and destruction. Accordingly, and complying to the traditional conception of money, the circuit described by e-money is understood as a (closed) circulation. If this were the case, e-money would not require a rethinking of the fundamentals of monetary theory such as the definition of money. We will provide evidence that challenges this view. It will be argued that the circuit described by e-money cannot logically be satisfactorily explained by considering e-money as a risky asset. Instead, what follows (drawing from Schmitt's work) will suggest that emission in a circuit corresponds to a precise monetary phenomena. For that purpose, we will analyze in this section emission of e-money by a central bank[11]. As central bank issued e-money is *«a risk free liability of the state»* (Good, 1997: 21) , the question of the uncertainty and the unsoundness of e-money issuers will be superfluous from the analysis. No one doubts that central bank issued e-money is to be considered as a

[11] Emission of electronic money by central banks is hypothesized by the Bank of International Settlements (BIS, 1996).

final means of payment.

Let us imagine that central bank issued e-money is emitted in favor of agent A. E-money issuance gives rise to a substitution of e-money liabilities for demand deposit liabilities. It is interesting to note that the withdrawal of notes gives rise to similar book entries: liabilities to the carrier simply replace demand deposit liabilities. After the payment, deposit of notes received by B (the payee) and restitution of e-money by the recipient, results in similar book entries: demand deposit liabilities substitute liabilities to the carrier. At first sight, one might conclude that e-money (as issued by central banks) is to be considered as an analogue to paper money. If so, *circuit systems* have to be understood as fundamentally equivalent to *open circulation systems* with a subsequent redeposit of funds.

On the contrary, we will argue that *circuit systems* and *open circulation systems* are not at all equivalent. As we will see, a distinction between these two systems has far-reaching consequences in respect to monetary theory.

Indeed, while the redeposit of notes for the amount received is made on a voluntary basis and does not change the fact that B has finally been paid, the recipient of e-money must obligatorily surrender it to the issuer (for validation and destruction) in order to be paid. This means that after having received e-money from the payer, the payee has not yet been finally paid. No one doubts that after having received e-money, the payment is not yet completed: payment has just been somewhat «announced». Put differently, payments with central bank issued notes are final, while payments with central bank issued e-money are not final. In the words of Goodhart, the recipient of e-money still has a valid claim against a third party (the central bank, as in our example).

Admittedly, this characteristic of e-money is entirely due to its technical features. Nonetheless, those features have important analytical consequences, namely, that a payment with central bank (electronic) money is not final. Carried to its logical conclusion, the traditional analysis must come to the rather curious conclusion that while notes are means of payment, central bank e-money is just a means of exchange.

Clearly, one possible interpretation is to assert that the risk[12] of a fraudulent use of e-money (which causes e-money to be emitted in *circuit systems*) is to be assimilated to uncertainty about the third party. This could, in itself, save the position for conventional theory. Still, central bank issued e-money could not be considered as a final means of payment.

Electronic money is defined in a circuit

An even more relevant interpretation is possible: e-money is not to be dissected into the three flows which define it; the three flows should be considered as a unique operation. Accordingly, the three flows: creation of e-money on A, transfer to B, destruction on B are taken simultaneously (although the whole operation still takes a positive time) and together define what is called e-money. Only under this condition can central bank's issued e-money again be considered as a means of payment. According to this

[12] *«Technical risk»* (Good, 1997: 21).

interpretation, electronic money issued in a *circuit system* is to be considered as a set of flows which describes a circuit. This conception is congruent with the fact that e-money does not circulate.

E-money, consistently with its technical features, is defined by its existing on three poles: the payer, the payee and the issuer (by contrast, paper money needs only two poles: the payer and the payee). So, e-money is not an object which *circulates within a circuit*, but rather an object which is *defined in a circuit*.

3. An Alternative Analysis of Electronic Money

Electronic money as an asset-liability

In order to clarify our point, it is useful to analyze the case of a payment from A to B by overdraft. E-money is issued in favor of A. Still, A does not own it.

The issuer emits e-money in favor of A and in this respect A is credited with e-money. On the other hand, e-money is to be given back to the issuer (either by the recipient after the payment, or by A in case A does not proceed with the payment) in order to be verified and destroyed. Thus, A owes e-money to the issuer. The same applies for agent B: on the one hand he holds a claim against the issuer, and on the other hand, as long as B has to give it back, B owes it to the issuer.

Issuers thus are always simultaneously debtors and creditors for the same amount in respect to the same agent. So, once e-money is issued in favor of A, can it be claimed that A holds an active? Surely not. Issuance of e-money does not increase A's wealth. A striking conclusion has to be drawn: e-money is not an asset (nor, of course, is it a liability), but rather it is an asset-liability, whose existence is defined in a circuit.

Admittedly, emission of an asset-liability, where agents are simultaneously debtors and creditors for the same amount, seems to be a circular operation, devoid of any economical meaning. Yet, emission of an asset-liability does have a meaning. If it remains true that emission in favor of A has no particular meaning in and of itself (because A is simultaneously a debtor and a creditor for the same amount), when emission is extended in a payment (i.e. as soon as it involves a third agent, B), the whole operation acquires a precise economical meaning, which is: that a payment has been made. Striking as it may seem, the reality is that emission of an asset-liability in favor of A and destruction of an asset-liability on B defines a payment from A to B. B is thus credited with a deposit. That is how a (*circuit system*) e-money payment works.

Issuers as monetary intermediaries

Previous analysis led us to consider e-money payments as analytically instantaneous. Money (as a means of payment) and money (as a reserve of value) thus become two distinct analytical objects: money (as a means of payment) - defined as an asset-liability - has in fact an instantaneous existence (an existence

limited to the instant where reserve of value function shifts from A to B); on the other hand, money (as a reserve of value) - which continues to be defined as a liability of a deposit institution - must be logically conceived as *the object of payment*. Thus, money as a means of payment has no reserve of value function, that is, it is purely nominal. For the sake of clarity, we will refer to money as a mean of payment as M* (or *nominal money*) and to money as a reserve of value as M.

Far from being sterile, a distinction between M* and M will provide us with some precious insights into the nature of electronic money. Indeed, we will argue that electronic money - issued in a *circuit system* - is a pure means of payment (M*, nominal money) whose existence, confined in a circuit, is limited to the instant of payment. We will define emission of M* as monetary intermediation.

As already noted above, electronic money (M*) is not in itself a deposit, but rather, as the FDIC puts it, is a right to be paid a deposit. The deposit (M) is the real object of payment. Every payment involves the following simultaneous operations:

- Agent A acquires a commodity;
- Agent B sells a commodity and acquires a financial asset (deposit);
- Agent A sells a financial asset (deposit).

Electronic money, whose creation-destruction, by virtue of its asset-liability nature, is purely nominal, conveys a deposit which constitutes the real content of the payment. And so, the payment is final.

The e-money issuance balance sheet (*database*) records the following operations:

assets		Issuer - Emission account		liabilities
		A 100 mu		**1. Emission on A**
A	100 mu	B 100 mu		**2. Payment of B**
B	100 mu			**3. Destruction on B**

Fig. 5. Emission account (off-balance-sheet).

We should add that the e-money's emission account is not, with reason, considered as having a financial meaning. The creation and the destruction of e-money are not recorded on the issuer's balance sheet, rather in a «database». Developers of e-money schemes consider information recorded on such accounts as computer related information whose purpose is to prevent e-money double-spending. In our opinion, information concerning the creation and the destruction of e-money is to be considered as having a monetary nature, for it describes issuance of e-money as an asset-liability, that is, it describes monetary intermediation. Issuers act as monetary intermediaries between A and B.

Our analysis is supported by Schmitt's work on the nature of bank money (1966, 1975 and 1984). Bank money is a liability of a particular kind*: «this liability is somewhat fictive, indeed issuers owe nothing to anybody»* (Schmitt, 1975: 10). Schmitt suggests basing payment analysis on the distinction between debts issued by purchasers of commodities (which gives rise to the need to proceed to a payment) and debts which are not issued by purchasers. Intermediaries in payment operations do not act as purchasers. Indeed,

if issuers of money were to act as purchasers, banking debts would themselves be debts which give rise to the need to proceed to a payment. As Schmitt puts it: *«by issuing money, issuers do not buy anything: neither goods, nor services, nor claims»* (1975: 23).

The identification of issuers (and therefore of monetary intermediaries) is straightforward: financial intermediaries act as purchasers (of claims) but monetary intermediaries act as non-purchasers. As monetary intermediaries, issuers do not buy anything. Indeed, how is it that banks can issue claims against themselves without ever honoring them? Such an issuance is possible because, acting as non-purchasers, issuers are simultaneously debtors and creditors for the same amount in respect to the same agent.

Monetary intermediaries thus issue nominal money (M*, an asset-liability) in an operation which involves three poles (the intermediary, the payer and the payee). As the previous section has shown, payments are not limited to a creation-destruction of nominal money, M*, but instead, payments have a real content represented by deposit M (which is the *object* of payment).

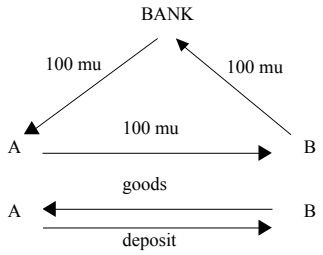

Fig. 6. Monetary intermediation through emission of nominal money (M).*

Note that monetary intermediation (which is explicit in the case of electronic money) is implicit to every payment. A deep analysis into the very nature of money (as put forward by Schmitt and Cencini) leads to identifing the presence of an implicit (but nonetheless crucial) monetary intermediation (creation-destruction of M*) in every payment operation.

As Cencini puts it (1988: 69): *«The payment of [B] is made using a vehicle (nominal money) which disappears immediately after the transaction, leaving its charge (income) as a deposit of [B]».*

«The logical succession of events is the following:

1. Money is created by banks as a pure vehicle

2. The vehicle is used by the economy to carry out monetary transactions

3. Money is destroyed by the same bank by which it was created

The result of monetary transactions is the transfer of bank deposits and not of nominal money which disappears immediately after the transfer has been carried out» (Cencini, 1988: 73).

Nominal money and banking innovations

The distinction between M* and M throws a new light on Smithin's paradox (1984), where the means of payment was simultaneously defined as an electronic impulse and as a remunerated asset. So, the

existence of interest bearing deposits that are made through the use of electronic debit cards acquires a new dimension.

As already noted above, the instantaneous existence of money as a means of payment has been put forward by a number of authors. Its existence in positive time is considered as being the result of friction. Indeed, as clearly pointed out by Berger, Hancock & Marquardt (1996: 718): *«In the limit, if there were no payment system friction and no cost of converting other assets into or out of money, the transactions demand for money may approach zero. Payers could costlessly, risklessly, and instantaneously convert other assets into money and transfer the money to payees, who could instantly convert the money back into higher yielding assets»*. It can be argued that this is tantamount to saying that from an analytical standpoint, money as a means of payment has to be considered as instantaneous, created and destroyed in every payment (an activity that we have defined as «monetary intermediation»). Instantaneous existence of money as a means of payment can be logically conceived only by defining it as an asset-liability[13], which implies that it acquires a separate existence from money as a store of value (which is an asset).

Monetary theory must account for the distinction between nominal money (M*) and real money (M). It might be argued that such a distinction has no practical utility whatsoever. On the contrary, a distinction between M* and M accounts for the current evolution in practice.

Indeed, instantaneous existence of M* as a pure means of payment is consistent with possible future evolution such as demand of money as a non remunerated asset approaching zero and velocity of circulation approaching infinity. As noted by Jordan & Stevens (1996): *«The kernel of the money question beginning to emerge on the 21st century horizon is not just about the predictability of changes in velocity, or even the instability induced by ever higher velocity. Rather, what may be new and different about the 21st century is the possibility that the velocity of central bank money might approach infinity».*

In our framework, evolution in practice simply realizes what theory already permits. Due to the fact that it is logically conceivable to proceed to payments through the instantaneous (implicit) emission of an asset-liability (which is less costly than paying through an asset), non remunerated assets (which correspond to the traditional definition of money) are bound to vanish. Objects of payment are, therefore, remunerated assets (M).

4. Practical Consequences

Besides universally accepted smart cards *(«open systems»)*[14], a variety of reloadable single-purpose and multipurpose cards *(«closed systems»)* has been developed. A typical example of these are photocopier

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[13] On the contrary, traditional monetary theory, which does not distinguish between M* and M, simply explains current evolution by the uncertainty about the soundness of issuers. Our approach explains instantaneous existence of money of payment by putting into evidence its asset-liability nature.

[14] *Closed* and *open systems* ought not to be confused with *closed* and *open circulation systems*. See note 7 above.

cards. However, the analytical distinction between *open systems* and *closed systems* remains somewhat blurred; this is related to the difficulty of identifying money. As England (1996) puts it: *«If American Express takes the balances it receives up front from college parents and invests those balances in loans to businesses, has American Express (a non-bank institution) created money? The college students certainly view the balances on their debit card as «money». So does the business receiving the loan»*.

Traditional analysis proves to be unable of identifying the presence (or absence) of banking intermediation in the two cases; the unique discrimination criteria being that of universal acceptability of electronic money. As we will see, application of the theoretical framework developed in the previous section will prove useful for identifying the presence (or absence) of banking intermediation.

As we have already established, the charging of universally accepted cards represents two distinct actions: on the one hand, agent A deposits an amount (M) at the issuer, and on the other hand, emission on A of electronic money (M*) sets up the payment operation. Funds underlying e-money are, therefore, deposited at the issuer. Emission of e-money represents a monetary intermediation made by the issuer. Should we conclude as a consequence of the approach put forward in this paper, that every issuer (even of single-purpose cards) acts as a monetary intermediary? Surely not.

Reloadable single-purpose cards

Among the most common single-purpose cards are photocopier cards, which are widely used on universities' campuses. In the following example we will first consider systems where cards are issued by merchants («merchant-issuer model»), in our case, universities. By analogy, the following analysis applies to electronic money issued on intranet systems. As we will see, because transactions are prepaid in the strict sense of the word, single-purpose cards are truly prepaid cards.

Purchase of a commodity originates a debt of the purchaser, A, towards the seller, B. We will call this debt a «debt of purchase». The particular feature of single-purpose cards is that the purchase of photocopies *does not* result in a debt of purchase. Actual purchase is made by charging the card, which implies that debt of purchase is remitted *in advance* by the amount charged on the card. Therefore, charging the card implies purchasing photocopies; agent A is already the virtual owner of the photocopies. From an analytical viewpoint those photocopies are to be intended as goods sold before their actual printing. The use of the card will not give rise to any flow of information of a monetary nature, but rather to a simple exchange of information about the number of photocopies that agent A has the right to make.

As a consequence, funds paid out belong to the university, which can put them into whatever use it desires. If the university loans the funds, it does not act as a financial intermediary.

The relation between agent A and the payee (the university, which in this case coincides with the issuer of the single-purpose card), is a simple *bipolar relation.* The creation-destruction (Fig. 7) of the «payment» device *(«electronic scrip»)* - which is devoid of any monetary meaning - requires just two poles (the payer and the payee) rather than three poles (the payer, the payee and the issuer) as in the case of universally

accepted cards. A tripolar relation would show the presence of a monetary intermediation.

The only implicit *tripolar relation* is when charging the card (which is the moment of final payment of photocopies), but in this case monetary intermediation is implicitly carried out by a bank. Hence, universities never act as monetary intermediaries.

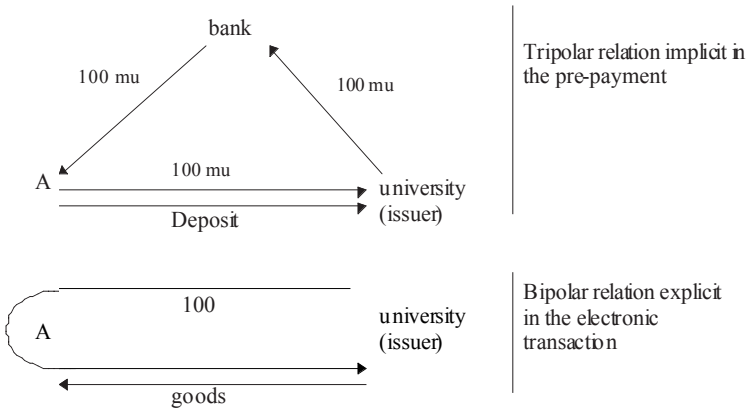

Fig. 7. Payment by single-purpose cards.

Nevertheless, it is important to analyze the case where merchant and issuer do not coincide. The answer is straightforward and confirms our conclusions.

As already established, single-purpose cards are truly prepaid cards. Funds received by the issuer from agent A (the payer) belong to the merchant (in our example, the university). As a consequence, those funds should immediately be paid to the university, which would probably use them to cover photocopying costs. Admittedly, the university could leave those funds in an account at the issuer, thus realizing a loan to the issuer. However, because the debt of purchase has already been remitted by pre-payment, the information stored on cards does not represent money nor any other monetary related information. Rather, it represents, as every student knows, photocopies. It follows that, even in this case, issuers do not act as monetary intermediaries, but only as providers of a service.

Multipurpose cards

A more interesting case is the evolution of single-purpose cards towards multipurpose cards. The problem has been raised by Bernkopf (1996): *«Let us assume that all photocopiers in a university library require the use of the university-issued prepaid card. We would consider this card arrangement a «closed system». What if vending machines at the university library are retrofitted to accept our photocopier card? Our closed system has gotten a tad more open. [...] Now, what if the five colleges and universities in the metropolitan area accept each other's photocopier cards? What if, soon thereafter, off-campus laundromats, restaurants, and newsstands at each of these institutions accept photocopier card? Is the balance on the photocopier card cash?»*. Bernkopf answers negatively: *«it is not cash yet, because it is not universally accepted»*.

Conforming to the traditional view, Bernkopf suggests that only universally accepted means of payment are to be considered as money. Now, in our opinion, this criteria is not satisfactory. In order to clarify our point, let us briefly go back to single-purpose cards.

Single-purpose cards are not universally accepted. Yet, there is an important reason for this: «value stored» on such cards is not universally accepted because it does not represent monetary value - and not the other way round. As we have already established, information recorded on such cards has no monetary significance, for those cards are *prepaid cards*. Goods (photocopies) have already been purchased by charging the card. In short, since goods have already been sold off, it is certain that the corresponding purchasing power cannot be used to purchase other goods (whether they be photocopies or other goods sold outside the campus).

In the case of multipurpose cards issued in a *closed system* our conclusions will be different. Let us imagine a multipurpose card which can be used to buy both good x_1 sold by company α and good x_2 sold by company β.

Because it is a multipurpose card, it is not possible to consider the amount charged on it as prepaid. Indeed, by charging the card, agent A buys nothing. In fact, as for universally accepted cards, at the moment of charging the card the «debt of purchase» towards sellers is still to occur. It is only by purchasing good x_1 from company α (or good x_2 from company β) that a debt of purchase arises; a debt which is immediately remitted by the payment.

Hence, this situation seems to be similar to that of *open systems*: the charging of the card represents the first of the three flows which constitute electronic money (M*). Issuers of multipurpose cards (even in *closed systems*) act as monetary intermediaries.

Our conclusions challenge current interpretations. Admittedly, money issued in closed systems is not universally accepted. How is it then possible to argue that issuers act as monetary intermediaries? The answer to that question is clear. As it is certain that the amount deposited by agent A at the issuer will be used to purchase either good x_1 or good x_2, this amount will be used just for extinguishing debts of purchase towards companies α or β. In this respect, even if not truly prepaid, the amount is, in a sense, «reserved». Being somewhat «allocated», this amount cannot be employed for extinguishing debts of purchase towards other companies. That is the reason why multipurpose cards, even though charged with monetary related information, are not universally accepted.

We are now in the possibility to answer the questions raised by Bernkopf (1996): *«When is a prepaid card balance E-cash? What is electronic cash? When does the balance of a multipurpose card become electronic cash?».* Issuers of multipurpose cards act as monetary intermediaries. If the system is considered as *closed*, it is simply because the amount of national income deposited at the issuer is allocated to the purchase of either good x_1 or good x_2. Multipurpose cards are, therefore, simply particular cases of universally accepted cards. The only difference between the two consists in the fact that universally accepted cards are allocated to purchase goods x_i (i.e. all goods produced in a country). Hence, multipurpose cards move to universally accepted cards by simply extending the number of goods which

can be purchased with the card.

Conclusion

In open contradiction to the traditional approach, characterized by a general lack of interest by theoreticians towards payment system issues, this paper has argued that analysis of the distinctive characteristics of electronic money is bound to contribute to received monetary theory.

In consideration of current developments in finance and the payment system, we believe this lack of interest is not justified. In the words of Greenspan (1996b: 695): *«I would like to emphasize the need for greater research efforts involving payment systems. I hope these efforts will include the development of new ideas that reflect the broad monetary, banking and infrastructure aspects of payment systems. I urge persistence. Payment systems are critical to the functioning of a modern monetary economy. Payment systems also raise interesting and important issues that challenge our ability to draw on ideas from many different fields of economic research».*

It is of our conviction that the monetary object (currently doubly defined as a flow and as a remunerated asset) deserves, without any doubt, further theoretical investigations which must account for the evolution in practice.

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