A Primer on Endogenous Credit-money*

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When students enter a post-Keynesian class in monetary economics, their minds have been so much distorted by the neoclassical fallacy of an exogenous supplied stock of money that they find difficult to understand even the simplest story about demand-led endogenous money. The purpose of this chapter is to help teachers in presenting the main features of a modern financial system.

To do so, the T-accounts of banks and central banks, where assets must by necessity balance with liabilities, will be presented in a systematic way, starting from the simplest pure credit economy, with a single bank and without central banks and outside currency. Complications will be gradually introduced, such as competing private banks, a central bank and its reserve requirements, and then, at a later stage, the State with its financial requirements and its issues of government bonds. Recent developments in banking, such as capital adequacy ratios, zero-reserve requirements, repos, securitisation, and electronic money will also be discussed within the framework of the T-accounts.

1. A pure credit economy, with a single bank

Let us start out with a pure credit economy, in which there is a single bank engaged in credit and debit operations, and where firms are forbidden to issue bonds or commercial paper. This single bank may be a private bank, set up by some private entrepreneurs, or it may be an institution set up by the State. Whatever the case may be, we assume that the State has no budget, and hence that it spends nothing and taxes nothing. The fact that this enterprise acts as a bank may either have been acquired

through the spontaneous act of the markets or through some law imposed by the authority of the State. In any case, there is no currency money, no reserve requirements, no financial markets, and no central bank. The economy is also a closed one: there are no foreign transactions, no foreign reserves, and no exchange rates. Finally, neither gold nor silver are considered as reserve assets.

Within such a financial system, all financial transactions would have to transit through this single bank. There could be no leaks, and no inflows, besides the new credits granted by the bank. Every one would have an account at the single bank. That account could be either a debit, in which case the bank would make a loan L to the individual household or firm, or it could be a credit, in which case the individual household or firm would be holding a bank deposit, which is usually called money. Because there are no leaks, whatever amount of credit has to be equal to the amount of debit, i.e., $L = D$.

Table 1

Let us now assume that some agents, most likely firms, but perhaps also household consumers, wish to increase the amounts they borrow. Where are these loans going to come from? In the mainstream story, starting from fully loaned banks, new credits can only be granted when banks are the recipients of new deposits, a situation which occurs when the central bank purchases government bonds (from banks or from the general public) on the open market, thus giving rise to the creation of excess reserves. But in the present model, there are neither government bonds nor a central bank. How can the banks create new loans?

The post-Keynesian answer to this query is rather simple. Loans are created *ex nihilo*, at the stroke of a pen, or by punching a key on the computer, *as long as the borrower is credit-worthy*. The only limit to this process is given by the amounts of loans which can be granted to credit-worthy borrowers. This depends on the willingness of borrowers to borrow, and on the willingness of banks to grant credit-worthy status to their customers (Rochon 2000, ch. 8). The latter may be influenced by the degree of liquidity of the banks, to be defined in a latter section.

The simplest arrangement for banks and their customers is to set up credit lines, or overdrafts, which Keynes (1930, p. 41) defined as "an arrangement with the bank that an account may be in

debit at any time up to an amount not exceeding an agreed figure, interest being paid not on the agreed maximum debit, but on the actual average debit". When the credit line is being pulled upon, the additional loan which is awarded to the borrower has an immediate counterpart in the liabilities of the bank, by the creation of an equivalent additional deposit. This additional deposit then changes hands, as the borrower uses the new credit-money to pay for some services.

In our modern world, just as in Keynes's time, it is not necessary to have money deposits to be able to spend. "A customer of a bank may draw a cheque against his deposits, thus diminishing his *credit* with the bank; but he may, equally well, draw a cheque against his overdraft, thus increasing his *debit* with the bank" (Keynes 1930, p. 41). Similarly, recipients of cheques may use the funds to increase their credit balances at the bank, i.e., their deposits, or they may use the funds to reduce their debit balances, i.e., the used portion of their credit line.

This is what currently occurs with the use of debit cards. For instance, when customers use their debit cards to purchase goods, they may have no bank deposits, and hence the used portion of their credit line will be increased as the transaction occurs. Similarly, some sellers may also be in a debit position vis-à-vis the bank, and hence the payments received will be automatically applied to reduce the amounts due, as shown in Table 2. Under these circumstances, no change whatsoever will occur in the amount of deposits held by each transactor. This is a clear example of the reflux principle.

Table 2

Agents who desire to spend can thus do it in two possible ways. Either they spend by depleting their money balances (the bank deposits), or they keep still their money balances while increasing their debit at the bank. As Keynes pointed out, the potential for purchasing goods and services, or what he calls the cash facilities, is made up of two components, the money deposits being held and the *unused* overdraft, i.e., the portion of the credit line which has not yet be drawn upon. "Properly speaking, unused overdraft facilities – since they represent a liability of the bank – ought ... to appear on both sides of the account" (Keynes 1930, p. 42). If we were to keep track of these unused overdraft facilities, then the bank accounting would look as shown in Table 3.

Table 3

Although unused overdraft facilities are still considered as off-balance sheet loan commitments, some countries, namely the United States, do have some statistical data on these (Moore 1988, p. 25). Unused credit lines represent approximately one-half of the narrowly defined money stock, and twice the amount of used overdraft facilities. It is thus clear that those who have credit line arrangements do have access to an endogenous source of credit-money. Indeed, the Bank for International Settlements (BIS) considers that formal standby facilities and credit lines of banks ought to be taken into consideration when assessing capital adequacy ratios (BIS 1988, p. 24).

Some post-Keynesian authors, mainly associated with the Dijon circuitiste school, sometimes make the controversial statement that the monetary circuit starts with the savings of the workers. This paradoxical statement by Keynesians is however easy to understand, within the framework of the T-accounts. Assume that new loans are demanded by producers to pay their workers. The deposits created in the process of drawing on the credit line are transferred to the accounts of the workers. As long as the workers do not spend their new incomes, they are saving it (Rossi 1998). By contrast, when households purchase goods, the deposits are transferred back to the firms, who can then use the deposits to reimburse the advances that were granted to them. The deposits of the households do constitute savings that are lent to firms, but the economic process starts when the bank grants an advance, or a loan, to its credit-worthy customers.

2.   A pure credit economy, with privately-issued banknotes

Let us now assume that the customers of the unique bank would like to benefit from the convenience offered by banknotes when doing their transactions. In other words, rather than having all transactions going through a scriptural system of accounts, some transactions, presumably the more petty ones, could be done without the bank being an intermediate. In our modern financial systems, we are accustomed to banknotes being backed by the central bank or by the Treasury of the central

government. Here, neither of these institutions exist. Where are the banknotes going to come from? They are going to be issued by the private bank.

In the past, privately-issued banknotes were quite common. The State would grant some banks the right to issue banknotes. In our pure credit economy, banknotes would be issued by our unique bank, on demand. In other words, whenever a customer desires to have a deposit transformed into banknotes, such banknotes are created by the bank. Banknotes are purely endogenous. The new T-account of the bank would look like Table 4.

Table 4

Banknotes issued by the unique bank are a liability of the bank The bank transforms one kind of liability, the deposits, into another kind of liability, the banknote. There is no limit to the amount of banknotes that can so be created. If customers of the bank were to bring back the banknotes, they could only be exchanged for deposits at the very same bank. There cannot be an excessive creation of banknotes, in line with the reflux principle. It could happen, however, that credit is being granted to finance inflationary expenditures or wage increases. This explains why the best-known exponent of the reflux principle – Thomas Tooke, who was in favour of free enterprise in all aspects of economic life – argued in his later work that while banknotes need not be regulated, credit and loans ought to be (Arnon 1993).

It should be noted that banks should be highly favourable to the issue of private banknotes. Whereas banknotes carry no interest rates, bank deposits do or can easily do so. As a consequence, for a given markup between the loan and the deposit interest rates, the higher the proportion of money in the form of banknotes, the larger the profits of banks. As a result, one should expect banks to favour any technological change that would transform bank deposits into privately-issued banknotes. We shall see that such a transformation is starting to occur with electronic money.

3. The profits of banks

One issue which has been momentarily ignored up to now is that of bank profits. Obviously, in a

perfect world where financial transactions could be conducted at no cost, and where there would be no default risk on the part of borrowers, the condition of zero-profit for the bank would be equivalent to the interest rate charged on loans to be equal to the rate of interest paid on deposits. In the real world, borrowers are sometimes unable to face their debt commitments and must default on their loans. Banks must thus set a spread between the lending and the deposit rates, to compensate for this risk. In addition, banks, like all firms, must pay salaries to their employees, they must service the cost of their fixed equipment, and they must turn out a profit for their owners. Indeed, banks, like all firms, have a certain target rate of return, and the differential between the lending and the deposit rate (on top of service charges) will be such that banks achieve this target rate of return on the capital of their owners in normal times, net of the losses due to loan defaults.

If all the profits are redistributed to the households who own the banks, then the simple equality of Table 1 could still be relevant. This can be seen with the help of Table 5. Assume that the rate of interest on loans is i_c, while the rate on interest on deposits, which is lower, is i_d. By the end of a year, unless interest payments have been made by the borrowers or loans have been reimbursed, outstanding loans will now amount to $L(1 + i_c)$. On the liability side, outstanding deposits will have increased to the amount $D(1 + i_d)$. This implies, assuming that in the initial state deposits and loans were of equal amounts, that the profits of the banks, their own funds, are now of an amount $L(i_c - i_d)$. If all the profits are redistributed as dividends, then we are back to the second line of Table 5, where deposits and loans are once more equal, as they were in Table 1.

It should also be clear, even though loans and deposits appear to grow at a rate equal to the rate of interest on loans, i_c, that there is no need for loans and money deposits to grow at that rate. For instance, if the households who are the owners of the banks decide not to save their dividends in the form of deposits, but rather decide to spend them all on consumption goods, the loans due by the non-financial firms will be reduced by an equivalent amount, and hence there will be no growth whatsoever in the amount of outstanding loans.

Table 5

In general however, one would expect the administrators of the bank to retain part of the

profits, so as to constitute some reserve fund. This reserve fund is the own capital of the bank. It includes the funds initially put up by the owners of the bank when starting business (how that initial fund came about is rather mysterious however), plus the retained earnings of the bank. The own capital of the bank constitutes a liability to itself. It represents the funds which the firm owes to its owners. In general, the own funds play a role similar to deposits that would be in the hands of the owners. The own funds, just like the deposits or the credits, are an accounting entry, but in contrast to deposits, they cannot be drawn down by the owners. They would be reduced whenever a borrower defaults on a loan. In that case, a similar amount would be deducted from the loan assets and the own funds liabilities when the bad loans need to be written off (i.e., when the accountants of the bank consider that the borrowers are unable to service the interest payments on their loan and are unable to ever pay back the loan). When there is too large a proportion of bad loans, own funds, i.e., the net worth of the bank, can become negative, in which case the bank becomes insolvent.

In the simple world described in the first row of Table 5, the additional own funds of the bank have, as a counterpart, additional borrowing by the non-financial firms, as interest accrues on the books of the banks, both on the asset and the liability sides. However, even if profits are entirely retained within the bank, rather than distributed to household owners, it is still possible for loans not to rise at the rate i_c. This is because banks may decide to purchase real capital goods produced by non-financial firms (they may also decide to purchase financial assets (shares) issued by non-financial firms, if we now assume that such financial instruments exist). In that case, as the non-financial firms sell some of their produced output (or some financial assets to the bank), they will be credited in counterpart with money deposits.

This is shown in the transition from the first to the second row of Table 6. However, under the assumption that firms do not hold deposits, using them rather to reduce the value of their outstanding loans, it can be seen in the third row of Table 6 that loans outstanding will be reduced by the amount R – the value of the real assets purchased by the banks. Clearly then, the investment expenditures of the banks allow for a reduction in the debt owed to the banks by the non-financial firms.

Table 6

4.   The liquidity of a bank and capital adequacy ratios

Another interesting feature of the pure credit economy, with no government bonds on the books of private banks, which to a large extent represents most financial systems in the world, is that the liquidity of a bank is rather difficult to assess from the standard point of view. In the standard view, the liquidity of a bank is measured by the ratio of its safe to total assets. This standard view of liquidity has already been criticized by those who point out that, through liability management, it is always possible for large banks to obtain the funds that they need to settle their accounts (Moore 1988, p. 33).

In the pure credit economy, this criticism is highlighted. Here, there are no safe assets since banks hold no government bonds and since there is neither reserves nor central bank cash. The lending behaviour or the liquidity of a bank thus cannot be based in general on the proportion of cash or government bonds that the bank holds among its asset portfolio. Such a ratio would always be equal to zero. The only option left, then, is to measure the liquidity of a bank by the proportion of its own funds. It is the own funds of a bank, rather than its reserves or safe assets, which may play a key role in a theory of endogenous money (de Boyer 1998). The relevant ratio to measure risk would be the *L/F* ratio, that is, the ratio of loans to own funds. Alternatively, if the real assets of the banks are taken into account, it would be the asset to own funds ratio, *A/F*.

Lately, this ratio, or rather its inverse, the own funds to assets ratio, has become the subject of intensive scrutiny, under the guidance of the BIS. The BIS has designed a *capital adequacy ratio*, that private banks ought to respect, under the guidance of central banks or their supervising agencies. The minimum ratio suggested by the BIS is 8%: it is the ratio of the own funds of the banks (their capital) to a weighted measure of their assets, the weights being based on a conventional assessment of the risks associated with each kind of assets, and even off-balance items (BIS 1988).

Some economists have argued that the maximum *A/F* ratios that arise from the imposition of minimal capital adequacy ratios may replace the role of reserve multipliers in a world without reserve requirements. This new multiplier would be equal to the allowed assets to own funds ratio. For instance, it has been argued that the incapability of the Japanese economy to come out of economic stagnation in the 1990s has been due to the low net worth of the Japanese banks, following

the huge losses that these banks had to absorb as a consequence of substantial defaults on loans (mainly related to land and construction speculation). Because of their low net worth, it was said that Japanese banks were prevented to grant new loans, because of binding capital adequacy ratios.

Several remarks can be made in this regard. It should be noted first that the capital adequacy ratios have been set in such a manner that they would only be binding for the most risky banks. Solvent and profitable banks accumulate retained earnings that are added to their net worth, and they should have no trouble in inducing economic agents to forego deposits in exchange of newly-issued bank shares, thus allowing these banks to improve their own funds to assets ratio.

What happens however, if all banks incurred large losses, pushing the asset to own funds ratio beyond its maximum value, so that no private agent would be willing to buy bank equity? If such a situation were to occur, and there is no confirmation that it did occur in the case of Japan, it would be the responsibility of the central bank to purchase new equities issued by the banks. As a result of this transaction, the banks would increase both their own funds and their reserves at the central bank. This would allow them, as we shall see in later sections, either to reduce their borrowing from the central bank or to acquire safe assets such as government bonds. They could then resume their business of granting loans to all credit-worthy customers.

Some post-Keynesian authors argue that when banks grant new loans they are automatically decreasing their liquidity and hence are intrinsically reducing their liquidity preference, since the ratio of loans to own funds is immediately rising (Wray 1995, Brossard 1998). That it is true, in some sense, can be seen immediately from the first line of Table 6. At the very moment that a new loan is being granted, the bank commits itself to a more illiquid position. The amount of loans rises while that of own funds remains the same. Thus, at the very moment in time when a new loan has been granted, the bank is in a more risky position.

This situation is however only a temporary one. For the larger stock of loans and deposits will allow the bank to rake up additional net interest revenues (unless the new loans are being defaulted in unusual proportions), as shown in Table 5. These additional revenues, when they are due and integrated to the retained earnings, will thus bring the L/F ratio back to its initial level. At the end of the year, the balance sheet of the bank has increased in size, but the liquidity preference of the bank may remain the same. In other words, there is no upward pressure on interest rates charged on

loans when additional loans are being granted.

5.   A pure credit economy, with two sets of banks

We have seen that a single bank in a pure credit economy cannot encounter any liquidity problems. The unique bank could become insolvent, however, if the amount of defaulting loans were to exceed the amount of own funds of the banks, thus reducing the value of assets below that of liabilities.

What happens when there are two banks? Let us still assume that there is no central bank and no government expenditures. Let us assume that there are two banks, one specialized in making loans to corporations, and the other one specialized in collecting deposits from households. In a sense, this corresponds to the institutional framework of many financial systems. In the USA, for instance, banks located in New York have specialized in making large loans to big business, while the so-called country banks specialize in collecting deposits. Similarly in France, for a long time specialization was institutionalized, with business banks (*banques d'affaires*) and deposits banks (*banques de dépôt*) (see Marchal and Poulon 1987).

With this division of the banking business, it is impossible for each bank to reach an approximate equality between loans and deposits. The deposit bank (Bank D) consistently has excess deposits, while the business bank (Bank B) continuously has an excess of loans over deposits. In other words, at the end of each day, Bank B realizes that the cheques drawn by its customers in favour of the customers of Bank D are in an amount that exceeds the cheques drawn the other way. Bank B is systematically indebted vis-à-vis Bank D. The positive balances of Bank D are exactly matched by the negative balances experienced by Bank B. As soon as the cheques are cleared, Bank B is indebted vis-a-vis Bank D, and bank D holds an asset against Bank B, as shown in Table 7. In a system with only two banks, it cannot be otherwise. Still, if Bank D consents to grant loans to Bank B, the accounts will balance, and such a situation can perpetuate itself.

Table 7

Things are just slightly more complicated in a multi-bank system. A single bank may at the

same time owe funds to a bank and be owed funds by another bank. The clearing house is designed to net out these balances, and bring together all the main participants to the clearing system. Each participant then knows the amounts which it can lend to those in deficit or the amounts which it must borrow from those in surpluses. The clearing house may then act as a broker between the deficit and the surplus banks, i.e., between the business banks (B) and the deposit banks (D). In the aggregate, their T-accounts will look like those of Table 7.

The two banks B and D, or the two sets of banks, need only make sure that they agree on a rate of interest that will be profitable to both of them. In other words, the interbank interest rate, i.e., the rate of interest charged by Bank D to Bank B on the amounts due must be somewhere in between the rate of interest on deposits, which Bank D is paying to its depositors, and the rate of interest on loans, which Bank B is charging to its borrowers. If the interbank rate is set in an appropriate fashion, the rate of return of both banks will be the same, and hence the ratio of own funds to assets of both banks will be the same. Similarly, the loans to own funds ratio will also be the same in both banks, where loans now include the loans made to other banks.

6.   Certificates of deposits and securitisation

Although the above direct lending arrangements between banks are perfectly legitimate, some observers of the banking scene may find it rather worrying that some banks are heavily in debt towards other banks or other financial institutions. To overcome and disguise this feature, a series of arrangements have been designed, two of which we shall briefly outline.

An option for *business* banks, i.e., the banks that specialize in lending to firms, is to issue certificates of deposits (CDs). Bank B, the business bank is attracting an insufficient amount of deposits. Bank B may thus issue certificates of deposits, which would be purchased by Bank D, which has positive balances. The issued certificates of deposits would thus appear on the liabilities side of the balance sheet of Bank B, replacing the amounts due to Bank D, while the purchased certificates of deposits would appear on the assets side of the balance sheet of Bank D, taking the place of the loans made to Bank B. This is shown in Table 8, which is barely different from Table 7. But now Bank B does not "borrow" from bank D any more, or so it appears from a legal point of

view.

Table 8

The above presentation makes clear that credit relations are based on credit-worthiness. As long as Bank D believes that Bank B is able to provide interest payments on its commitments, there is no reason for Bank D to refuse extending loans to Bank B, or purchasing certificates of deposits from Bank B. The same occurs at the level of the customers of a bank. Banks grant loans and renew lines of credit as long as they have faith in the ability of the borrower to make interest payments. Similarly, depositors have no hesitation to leave their deposits at a bank as long as they believe that their orders to transfer these deposits will be honoured. The credit-worthiness of a bank thus ultimately depends on the credit-worthiness of its borrowers and the confidence of its depositors. Credit-worthiness and credibility are the key elements of the system.

It should be emphasized that there are no safe assets in this pure credit economy. When deposit banks lend to business banks, collaterals in the form of risk-free government assets cannot be provided since they do not exist by definition. The credit-worthiness of the loans granted by the banks are the only collaterals available. Conventions based on trust and confidence rule the banking system.

This brings forth another fashionable arrangement, *securitisation*. Securitisation may be defined as the transformation of an asset, which would not previously be marketable, into a marketable one. In other words, the securitisation of an asset implies that this asset can now be sold on some market. A typical example of securitisation is the sale of a set of loans, previously granted by a bank, to some other financial institution. These other financial institutions are usually non-bank financial intermediaries, such as pension funds, trust companies, insurance companies, which collect vast amounts of savings from households. We can call these companies financial intermediaries, under the understanding that financial intermediaries do not create credit, in contrast to banks, being content to recycle existing assets.

Once again, this kind of arrangement arises as a result of specialization. The non-bank financial intermediaries specialize in collecting time deposits and other long-term savings from

households and even corporations. The banks specialize in finding credit-worthy borrowers. This specialization creates an imbalance in the balance sheets of banks and financial intermediaries, similar to the one shown in the top part of Table 9. This imbalance could be solved by banks issuing certificates of deposits, which would be bought by financial intermediaries, but securitisation seems to be the new fad in finance.

In the case of securitisation, banks typically sell a bunch of their loans to a financial intermediary which has collected a large amount of time deposits. The loans thus disappear from the balance sheet of the bank, and appear on that of the financial intermediary. In the example of Table 9, 70% of the loans end up being securitised. The net result for the bank is a reduction in the size of its balance sheet: the loan made to a non-financial institution is gone, but so is its liability towards financial intermediaries. It is true that the bank is forsaking the future interest revenues to be obtained from the borrower, but the bank has collected up-front fees when initially granting the loan. In addition, the bank is now in a better position with regards to its capital adequacy ratios, as previously discussed. It has collected fees when making the loan, and it can repeat the operation without having to worry about the BIS-imposed capital adequacy ratios, thus circumventing them.

Securitisation, just like lending between banks, requires confidence. The wholesale of loans can only occur as long as the purchasers of these loans are confident that the loans will be repaid and the interest payments will be made.

Table 9

7.   The central bank in an overdraft economy

An interesting classification, underlined by several post-Keynesian authors, is the distinction between *overdraft* economies and *auto-economies*, a distinction first made by John Hicks (1974: 51). In the auto-economy, agents sell their liquid assets to finance new ventures, or they issue new bonds or new shares. For this reason, these economies are often called *financial-markets* economies, but we shall call them *asset-based* economies, to underline the fact that firms in such economies are said to own the financial resources required to make their investment expenditures, whereas banks sell

their liquid assets (mainly Treasury bills) to make new loans.

In the overdraft economy, by contrast, firms or households pull on their lines of credit with private banks when they require new financing means. The same distinction applies to the financial sector. When they need more high powered money, banks borrow it from the central bank instead of purchasing it by selling government securities. As a result, when the focus of the analysis is on the balance sheet of the central bank, the distinction between an overdraft economy and an asset-based economy relies on whether the central bank has claims over the domestic financial sector. "The overdraft economy is thus defined by a double level of indebtedness: that of the firms to the banks and that of the banks to the central bank" (Renversez 1996, p. 475). This distinction will be quite useful in the discussions that follow, although the ultimate functioning of a modern financial system is the same regardless of it being an overdraft or an asset-based system.

Let us start then with the simplest of the two systems, the overdraft system. The overdraft system is in fact an extension of the pure credit economy, to which a central bank has been added. In the overdraft system, the operations of central government, beyond those of the central bank, may still be assumed away, and this is mainly why the overdraft system is easier to describe than the asset-based system.

Let us then assume the existence of a central bank, and that of a network of private banks, consolidated into a single conglomerate for simplification. In this more realistic financial system, we assume that private banks cannot issue banknotes any more. Only the central bank can issue banknotes. Suppose that we start from the situation described by Table 1. The private bank conglomerate has loans on the asset side, and deposits on the liability side (own funds are set aside for simplification). Its depositors now wish to split their money holdings into bank deposits and banknotes. How are the banks going to provide their customers with the banknotes issued by the central bank?

The mainstream answer, provided within the framework of an asset-based financial system, is that the banks will sell government assets to the central bank, thus obtaining the central bank banknotes which they need. These banknotes, which are said to be part of the money supply, are also part of what is called high powered money, i.e., money issued by the central bank, or central bank money. But here, in this pure overdraft economy, there is no government sector (beyond the central

bank) and there are no government bonds lying around. And we assume, in line with present institutions, that central banks just will not buy any privately issued asset. Still, banks are required to obtain the banknotes, for their customers will lose all faith in the banking system if it cannot provide the banknotes that they lust for. How can the banks obtain the banknotes?

If banks cannot sell any asset to the central bank, the only way they can obtain the banknotes is by borrowing them from the central bank. This is the so-called discount window operation, whereby banks borrow from the central bank. This is what is shown in Table 10. The amount borrowed is exactly equal to the required amount of banknotes, i.e., the amount of central bank money. The central bank has a monopoly over the provision of banknotes. As long as there is a demand for central bank banknotes by their customers, private banks are forced to go into debt vis-à-vis the central bank. Private banks cannot but be indebted vis-à-vis the central bank.

Table 10

8. Liability management and the overdraft economy

The overdraft economy is the ultimate example of liability management. Broadly speaking, liability management refers to the ability of banks to increase their lending activity by borrowing funds which appear on the liability side of their balance sheet, without being forced to sell some of their marketable assets — mainly Treasury bills. Several authors have argued that liability management is the latest stage in the historical development of banking systems (Chick 1986). Before the advent of liability management, banks would passively wait for deposits, and only expand their lending activity if new depositors came forth. The attracted deposits were taken as a pool of funds, available for lending.

There is, however, another view of liability management — the radical view. According to this new view, liability management is *not* an innovation that would have transformed the process of banking intermediation. Rather, liability management is a permanent feature. Banks are perpetually engaged in passive liability management, as they must first consent to loans, and later search for funds to finance the deposits which are leaking out. All overdraft systems are compelled

to practice liability management as a logical necessity. Any adjustment is done on the liability side, simply because no adjustment from the asset side is possible. Banks as a whole, when they are in need of banknotes for their customer, or in need of compulsory reserves as we shall soon see, cannot get them by selling liquid assets to the central bank since they hold no Treasury bills. They obtain all of their high powered money by borrowing it from the central bank.

Most European banking systems, for instance those of France and Germany, have structurally been indebted to the central bank. The Japanese banking system is also of the overdraft type, as are most of the banking systems in the less developed countries (Lavoie 2001). The argument, to be found in the traditional view, that liability management would be a new phase in the development of financial systems, thus does not seem to be a correct assessment of the actual evolution of financial systems throughout the world.

An interesting feature of the overdraft economy is that it clearly shows that money and high powered money are endogenous variables, which cannot be under the control of the central bank. In the present overdraft economy, with a demand for central bank banknotes, the banknotes must be provided and the central bank has no choice but to provide the private banks with the loans that they need. The central bank is left however with a powerful tool: that of setting the rate of interest at which the private banks will be forced to borrow the required amounts of banknotes.

The situation is identical when compulsory reserves are taken into consideration. Suppose that we are in an economy where customers only wish to use scriptural money and no banknotes. Is it still possible for the central bank to force indebtedness on the part of private banks? The obvious solution is for the central bank to impose compulsory reserve requirements. It does not matter whether the reserves are imposed upon deposits, as they are in most countries and in the United States in particular, or upon loans and other assets, as they were in France and in other European countries. Reserve requirements have consequences similar to those of central bank banknotes on the accounting structure of banks. Again, because banks in an overdraft system have no assets to sell to the central bank, banks have no choice but to borrow the required reserves, at the rate of interest charged by the central bank. As shown in Table 11, the adjustment to the compulsory reserve requirements is done through the liability side.

Table11

9.   The overdraft economy, with two banks or sets of banks

Finally, let us consider the case of two banks, or two sets of banks, within an overdraft economy. Let us sweep away, again for simplification, all the complications associated with compulsory reserves and banknotes issued by the central bank, as well as the own funds of banks. In a previous section, we also considered the case of two sets of banks, but in the absence of a central bank. All discrepancies in the net claims of each bank had to be made good by a bank borrowing funds from another, usually with the help of some clearing agent, the clearing house.

The advantage with an overdraft system based on the central bank is that the private banks need not enter into contracts with each other. In other words, the risk of lending to another bank is now taken over by a public institution, the central bank. Suppose again that there are two kinds of banks, the business bank and the deposit bank. The business bank will consistently run negative balances in the clearing house, while the deposit bank will consistently accumulate surpluses in the clearing house. The clearing house is now the central bank, and what the central bank can do, in contrast to the private clearing house, is itself be the counterpart to the required lending and borrowing operations of the banks when accounts have to be settled at the end of the day.

This is shown in Table 12. The discrepancy, for Bank B, between loans and deposits, is exactly equal to the discrepancy, for Bank D, between deposits and loans. And this discrepancy is exactly balanced on the books of the central bank. Provided there is only a small difference between the penalty rate charged on negative settlement balances (the advances provided by the central bank to banks showing a deficiency of funds) and the the rate of interest offered by the central bank on the positive settlement balances (the rate of interest on the surplus funds that banks with excess funds deposit at the central bank), there is no incentive for banks to look for the private arrangements described in Table 7, such as overnight lending (Henckel *et al.* 1999).

Table 12

In other words, provided the central bank is content with making a small profit when running the clearing house, there is no need for private banks to settle their accounts between themselves before relying on the facilities of the central bank for final settlement.

An interesting feature of this overdraft system, with a central bank, is that the amount of high powered money, here excluding banknotes and including only the amount of deposits which are held at the central bank, has no relationship whatsoever with the total amount of money, or money deposits, in the system. This amount of high powered money mainly depends on how extensive are the specializations of the private banks into loan-making and deposit-attracting activities. When banks specialize heavily, the amount of high powered money will be large relative to economic activity. When all banks move together in step in their lending and deposit businesses, the required amount of high powered money is quite low, and may even approach zero.

10.   The central bank in an asset-based economy: the post-chartalist view

Let us now abandon the overdraft economy for a while and deal with the asset-based financial system. In an asset-based economy, there are large stocks of accumulated public debt. In the past, central governments have run public deficits, and as a result there is an outstanding stock of government bonds, which is held by the central bank and by private agents, non-financial and financial ones, banks in particular.

New debt is issued when past issues have come to maturity and the central government is unable to reimburse the debt holders: this is the case of the rollover. New debt is also issued when the government runs a deficit. There are two views with regards to the financing of government deficits. According to the first view, it is best to imagine that the Treasury, the fiscal arm of government, sells bonds to private banks; according to the second view, the Treasury is best seen as drawing cheques from its account at the central bank, and selling bonds to the central bank in order to replenish its bank account at the central bank. The latter view is endorsed in particular by the neo-chartalists from within the post-Keynesian school (Wray 1998; Mosler and Forstater 1999; Bell 2000). The former view – let us call it the post-chartalist view – sees government expenditures in a light which is akin to that of expenditures by private firms: firms need to borrow from banks to

make their expenditures. The bonds issued by government and purchased by banks play a role which is similar to that of the advances made by banks to firms (Lavoie 1992, ch. 4).

Let us suppose that the government is running a deficit, say equal to 100 units, and hence issues Treasury bills (short-run government bonds) to that amount, the bills being bought by a private bank, in line with the post-chartalist view. The counterpart to this purchase are the deposits which are now credited to government. This possibility is quite realistic, as is recognized even by neo-chartalists. Wray (1998, p. 118) for instance points out that: "When new government debt is auctioned, the Treasury often designates a portion of the auction as being eligible for purchase through credit by special depositories. In this case, the special depository obtains the bond as an asset by issuing a deposit in the name of the Treasury".

In the second stage, however, the deposits will revert to households, as soon as the planned government expenditures are made good. This is illustrated in Table 13, where only the relevant transactions are shown.

Tables 11 and 12

Let us now assume that households wish to keep 90% of their money holdings in the form of bank deposits, and 10% in the form of banknotes. Let us assume, as in the previous section, that all banknotes are issued by the central bank Again the question arises as to how the private bank will be able to obtain the banknotes that are demanded by its customers. In this asset-based financial system, private banks do not need to borrow from the central bank to obtain the banknotes; private banks simply need to sell to the central bank some of the Treasury bills which are part of their assets.

In the present case, since households desire 10 units of additional banknotes, banks will be selling 10 units worth of Treasury bills to the central bank, thus acquiring a deposit of 10 at the central bank (i.e., their reserves have now increased by 10 units). The private bank are thus be left with 90 units of Treasury bills, while their reserves have increased by 10 units, as shown in the first row of Table 14. At the second stage, and this is shown in the second row of Table 14, banks will use their reserves to provide their customers with the 10 units of banknotes that they desire, and hence their reserves will fall back to zero while the deposits held by households fall from 100 to 90

units.

11.   The central bank in an asset-based economy: the neo-chartalist view

Will the situation be any different if Treasury bills issued to pay for government expenditures or deficits are sold directly to the central bank, as the neo-chartalists would generally put it? The answer is no, ultimately it will not. Table 15 illustrates this second case, the case put forth by the neo-chartalists. The first row of Table 15 shows the impact of the initial sale of Treasury bills on the accounts of the central bank. This sale has no impact whatsoever on the money supply and the private economy as long as the newly-acquired government deposits are not spent in the economy.

Once the expenditures of government have actually occurred, as shown in the second row of Table 15, the deposits of government at the central bank are now held by households or firms as deposits at private banks. But since the checks were drawn from the central bank, the banks, the customers of which received the checks, now detain deposits of their own at the central bank. In other words, the reserves of banks have increased by 100 units.

Table 15

Banks now dispose of excess reserves of 100 units. In the mainstream story, these 100 units of excess reserves would allow the private banks to provide new loans and start the money multiplier process. The post-Keynesian story at this stage is entirely different however. In the post-Keynesian view, banks provide loans first, and search for reserves latter. Banks do not wait for excess reserves to be provided to them like manna from heaven. They grant loans whenever a credit-worthy customer shows up. It follows that when banks wind up with excess reserves, they have already granted all the loans that they could have made. The fact that they now have excess reserves, or positive settlement balances, does not make their potential customers more credit-worthy.

What then, are banks going to do with their excess reserves? The simple answer is that banks will attempt to purchase safe liquid assets with these reserves. The safest and most liquid assets are the Treasury bills. Banks will thus purchase Treasury bills. Since there is no increase in credit to

private agents and hence in bank deposits, beyond the initial increase, excess reserves in the financial system will only be eliminated if the Treasury bills purchased by the banks are sold by the central bank. What we have here is an example of open market operation, but here at the initiative of the private banks.

If there are no reserve requirements and if there is no demand for additional central bank banknotes by the bank customers, banks will use the entire reserve amount of 100 units to purchase Treasury bills. In the present case, let us assume, as we did in the previous case, illustrated with the help of Table 14, that households now wish to hold 10 extra units of banknotes. Banks will thus purchase 90 units of Treasury bills, using 10 units of their excess reserves to acquire the banknotes that are demanded by the households. The deposits of households, once they have acquired the banknotes, will thus be reduced to 90 units. The last row of Table 15 is now exactly identical to the last row of Table 14. Whether the Treasury bills used to finance government expenditures are initially sold to the central bank or to private banks makes no difference whatsoever to the final requirements of the banking system.

Which view best describes the financial relationship between government and the banking system, the neo-chartalist view of Table 15 or the post-chartalist view of Table 14? It really does not matter. Each view may correspond better to the existing institutional arrangements. In Europe, with the new European Central Bank, central governments just cannot sell any of their newly-issued securities to their national central bank or to the European Central Bank. They must sell their bonds or bills to the private banks. Similar rules apply in the United States. "The Federal Reserve is prohibited by law from adding to its net position by direct purchases of securities from the Treasury – that is, the Federal Reserve has no authority for direct lending to the Treasury. As a consequence, at most the Desk's acquisition at Treasury auctions can equal maturing holdings" (Akhtar 1997, p. 37). Thus, at least in Europe or in the United States, the post-chartalist view may seem to apply best on this issue.

## 12.	The growing repo markets

In standard textbooks, central banks are said to control the amount of high powered money and

money supply through open market operations. Such open market operations have been described in the above section. Open market operations occur on secondary markets, i.e., they deal with second-hand securities, which have already been issued and sold. Open market operations are usually understood as outright purchases or sales of government bonds by the central bank. A large proportion of open market operations are however conducted on different terms.

The so-called repurchase agreements (repos, RP) and reverse repos add flexibility and security to the conduct of monetary policy. With repurchase agreements, central banks can add or subtract liquidities to the financial system, but on a temporary basis, say one week. So, if at the end of the week central bankers desire to call back the previously injected liquidities, they need do nothing; the adjustment will be automatic. "Under the RP agreement, the Desk buys securities from dealers who agree to repurchase them at a specified price on a specified date. The added reserves are extinguished automatically when the RPs mature" (Akhtar 1997, p. 37). Reverse repos do the opposite: they allow the central bank to reduce the liquidities that would be temporarily in excess amount, and to reverse this operation automatically at the end of the purchase and resale agreement.

The repos and reverse repos however should be understood for what they are: both the central bank and the banks are perfectly willing to engage into these special kinds of open market operations. In the case of the reverse repo for instance, the central bank wants to drain excess reserves, in order to maintain the overnight rate (the federal funds rate in the States) at the level of its choice, that is near the discount rate set explicitly by the central bank. The banks on the other hand want to get rid of excess funds that would draw either no interest rate (as in the United States) or a rate of interest below market rates (as in Canada) if it were to be deposited at the central bank.

Repos and reverse repos operations are now the main tool of monetary policy, having so replaced outright open market operations. The Bank of Canada for instance does not conduct traditional outright open market operations in the Treasury bill market since 1995 (Lundrigan and Toll 1997-98, p. 36). It only enters into repo or reverse repo agreements, mainly in the overnight repo market (one-day transactions). In addition, the repo markets have taken extraordinary importance in many countries over the last few years. The growth of the repo market has been exponential in the United States, in Canada and in other countries. The explosion of the repo market and its use of Treasury bills as an alternative liquid reserve asset have been due essentially to three phenomena.

First, there have been improvements in electronic payments systems and broker systems, which induce agents in search of temporary liquidity or with provisional excess funds to engage in a repo. Second, there is the fact that, with the advent of electronic large-value payments transfer systems, electronic banking transactions (electronic cheques so to speak) are cleared immediately, but on a bilateral gross basis, rather than at the end of the day, on a multilateral net basis. This is called *real-time gross settlements*. Its advantage is that settlement is final as soon as the transaction occurs, whereas in the case of net settlements, payment becomes a certainty only at the end of the day, when the net accounts are settled. The disadvantage is that gross settlement requires large stocks of reserve-acting assets. The shift from net to gross settlement payment systems explains why banks have acquired large amounts of government bonds in the 1990s, and why there has been such an increase in the size of the repo market (Henckel et al. 1999, p. 14).

Third, it should be noted that from the point of view of the bank granting the liquidity, the repo is like a collaterized loan. Indeed, this is how the BIS (1988, p. 24) views repos. The loan is backed by a Treasury bill. But this Treasury bill is being held and owned by the bank (for the duration of the repo), not by the borrower. In the balance sheet of the bank, this loan will not appear as a loan, but rather as a Treasury bill. Since capital adequacy ratios attach no risk to this kind of asset, loans based on repos can totally circumvent the capital adequacy requirements.

13. Transfers of government deposits

There are however other means, beyond repos and open market or discount window operations, at the disposal of the central bank to add liquidities to or to subtract liquidities from financial markets. Many central banks, in particular the Bank of Canada, now use transfers of government deposits between the books of the central bank and those of private banks. To increase liquidities in the banking system, government deposits are transferred from the central bank to private banks; to subtract liquidities, government deposits are transferred the other way.

These government deposit transfers are often used to compensate the flows originating from government expenditures and collected taxes. We have already seen, with the help of Table 14, that government expenditures financed by cheques drawn on the central bank automatically lead to the

creation of excess reserves. Reciprocally, taxes collected from private agents and deposited as government deposits in the accounts of the central bank withdraw reserves from the banking system. An obvious way for neutralizing these effects is to transfer government deposits the other way. For instance, if, near the deadline for income tax collection, cheques made by households to the order of the Treasury have been settled at the clearing house, the liquidities of the banks may be replenished by the central bank simply by moving government deposits back to the accounts of the private banks.

This is shown with the help of Table 16. Suppose households have paid their taxes with cheques worth 100 units. Private banks then lose the equivalent of 100 units of reserves, as shown in the first row of Table 16. But the loss can be made good by the autonomous transfer of government deposits from the books of the central bank to those of the private banks, as shown in the second row of Table 16. Reserves will then come back to their zero level.

Table 16

There is another way to neutralize the effects of government expenditures and collected taxes. Instead of setting-up compensating account transfers, one could attempt to avoid account transfers altogether. This is done by setting up government accounts in private banks, thus paying government expenditures with cheques drawn on the government deposit accounts in those private banks; symmetrically, these government accounts at private banks could serve as collection points for tax receipts. Collected taxes would thus accumulate in the government accounts at the private banks, with no effect on high powered money (Wray 1998, p. 115). The only change is that the deposits of the private agents diminish by the amount of the collected taxes, while government deposits in private banks increase by the same amount. In the United States, such a regime is in place, with the so-called Treasury and loan note option accounts at depository institutions (Akhtar 1997, p. 20). This feature gives some additional credence to the post-chartalist view.

Still, the neo-chartalists offer an important insight: when government spends from its central bank account, there is an automatic expansion in the supply of high powered money, unless the central bank takes the counter-acting decision to drain the excess reserves so created. In other words,

government deficits financed from the central bank account tend to lower interest rates, unless other measures are taken. This runs in opposition to the standard neoclassical story, based on the IS/LM model, according to which public deficits crowd out private investment, because they lead to higher interest rates. The IS/LM model is based on the hypothesis of a given exogenously-supplied money stock which is incompatible with a coherent treatment of stock-flow analysis. The correct story is that when banks acquire the excess reserves, they will try to get rid of them by purchasing Treasury bills, as illustrated in Table 15. The central bank will be quite content to accommodate these purchases by providing reverse repos, getting involved in open market operations, or shifting government deposits away from the banks, unless it desires to reduce interest rates.

14.   Open economy considerations

We have not yet taken into account the outside world. In the mainstream story, with fixed exchange rates, a balance of payments surplus leads to an automatic increase in high powered money and in the money supply, unless the monetary authorities decide to engage into so-called sterilization operations. The story ends by claiming that the increase in the money supply drives up domestic prices, thus eventually slowing down net exports and eliminating the surplus in the balance of payments, just as in the old gold-specie mechanism. In the Mundell-Fleming mainstream story, money is endogenous with fixed exchange rates, but this endogeneity is supply-led, in the sense that more money is being provided from abroad, regardless of the domestic demand for money.

Monetary economics based on the post-Keynesian view rejects these mechanisms and provides another interpretation, the so-called compensation approach (Lavoie 2001). The compensation approach applies both to overdraft economies and to asset-based ones. Let us start with the case of an overdraft economy, perhaps the simplest one. Suppose that the economy is running a positive balance of payments, and hence that domestic agents have been accumulated foreign currency which they have exchanged at the central bank. The initial situation, with which all economists would agree, is described by the first row of Table 17. The private banks, in the name of their clients, are selling foreign currencies to the central bank, which is accumulating foreign assets; as a result the private banks are accumulating deposits, or reserves, on the accounts of the

central bank.

 In an overdraft economy, however, private banks are indebted vis-à-vis the central bank. The accumulated reserves will thus be used by the banks to reduce their debt vis-à-vis the central bank. At the end of the process, as described by the second row of Table 17, there are no additional bank reserves; banks however have managed to reduce the amounts they owe to the central bank.

Table 17

 One may argue that mainstream theory is still correct, for the amount of bank deposits has risen by the amount of additional bank deposits now in the hands of the exporters, as shown in Table 17. But even this increase is illusory. Now that the exporters have been paid, they are in a position to reimburse the loans that were consented to them to produce and ship their exported goods. As a consequence, the exporters may also use their deposits to pay down their debts, and, with this second round of compensation effects, there would be no increase at all in the money supply.

 Let us now consider the case of the asset-based economy. Let us assume again a positive balance of payments, with the consequences illustrated in the first row of Table 18. The situation is nearly identical to that described in the second row of Table 14. Once again, banks have excess reserves which they do not wish to use to increase loans since they have already, by assumption, granted all the loans that they could make to credit-worthy borrowers. Hence, private banks once more will attempt to get rid of these unwanted reserves by purchasing Treasury bills from the central bank. Simultaneously, the central bank will be quite willing to sell bonds, for it wishes to drain the excess reserves.

 In the mainstream story, this action is called sterilization. But it should be noted that the neutralization that occurs is at the initiative of the private banks, who have no desire to keep excess reserves or to make additional loans. The central bank, unless it wishes to modify the overnight rate, will be quite happy to accommodate the purchases of the private banks. As in the case of government expenditures, the central bank can also wipe out the excess liquidities arising from the positive balance of payments by removing government deposits from their accounts at the private banks.

Table 18

15.   Electronic money

Over the last years, several articles in the popular press and also in academia have underlined the dangers arising from the generalized use of electronic money, in particular an increased difficulty for the central bank to pursue an adequate monetary policy. Different people however, have different definitions of electronic money. The debates regarding the definition of money or electronic money, and the debates regarding the ability of the central bank to still have some control over monetary policy are remindful of the debates that occurred in the 19th century when the usage of the cheque became widespread: were bank deposits to be counted as money or ought they be excluded? These past debates look rather silly today, and today's debates might appear in a similar light in the near future.

As a first approximation, one may consider that there are five kinds of electronic money: (a) large value transfers, done by electronic means; (b) prepaid cards, such as electronic cash, electronic purses, smart cards; (c) credit cards, such as Visa cards; (d) debit cards, that directly take funds from deposit accounts when purchases are made; (e) internet money.

Credit cards and debit cards have now been in operation for a number of years, and people understand their purpose. Debit cards act like a cheque that would be cleared instantaneously. In general, to be able to use the debit card, the bank deposit needs to have a positive balance, unless its user has a pre-arranged credit line with the bank. On the other hand, credit cards increase the velocity of money, for households can buy goods whenever they wish to, and they can pay down the amount due on their credit card the day they get paid.

Finally there is the question of prepaid cards, such as electronic purses, and internet money, which is used to pay goods purchased on the internet. It is clear that prepaid cards play the role of coins and banknotes issued by central banks. As their name indicates, prepaid cards have been paid in advance. They are plastic cash. The act of buying a prepaid cash card is similar to the act of going to one's bank and getting the automatic teller machine to withdraw a certain number of units from one's bank deposit in exchange of banknotes. It is thus clear that the attempt to generalize the use

of prepaid cards is similar to an attempt by the banks to issue their own banknotes in lieu of central bank banknotes.

Exactly the same conclusion can be drawn with respect to the use of internet money. Internet money tends to reduce the amount of bank deposits and the amount of banknotes. It is as if banks were issuing their own banknotes. In other words, prepaid cards and internet money are the modern equivalent of the private banknotes that used to be issued by private banks a century or so ago. This can be demonstrated with the following T-accounts.

When agents want to have internet money, they must first obtain a deposit account in the books of some issuer of electronic money, usually a scheme operator who is itself a branch of some bank (Piffaretti 1998). The agents thus draw on their deposit accounts at their bank, and obtain instead a deposit in the books of the issuer. The issuer in turn has a claim over the bank, which itself has a debt vis-à-vis its own branch operating the electronic scheme. This can all be seen in the first row of Table 19.

Table 19

In the second stage, the deposits of Agent A is transformed into internet money, and then, when the purchase of the good on the internet is completed, the internet money is transferred from Agent A to Agent B. The deposits of Agent A on the books of the issuer of internet money are then finally transferred back on the books of the bank

While the deposits of the agents are on the books of the issuer of electronic money, the deposits carry no interest. In other words, there is a "float", of which the electronic bank can take advantage. In addition, in countries where reserves on deposits still exist, there is an additional advantage for this bank involved in electronic banking. The amount that has been transferred out of the bank deposits does not carry reserve requirements any more.

It is clear from the above that internet money plays the role of privately-issued banknotes. These banknotes are a debt of the bank towards the bearer of the banknote. In the case of internet money, the bank has a debt towards the issuer of internet money, and hence, indirectly, a debt towards the bearer of internet money. As with banknotes, the law of reflux applies: there cannot be

an excess supply of banknotes.

16.   Central banking in a world without high powered money

Some authors, of various persuasions, have recently argued that the electronic money revolution might erode the ability of central banks to pursue monetary policy (Palley 2000, Spotton Visano 2000). Here I argue that internet money does not jeopardize the ability of central banks to control the money supply – central banks never had that power in the first place! In addition, internet money does not jeopardize the ability of central banks to set short-term rates of interest – the ability of central banks to set overnight rates does not depend on their monopoly power over the supply of banknotes; rather their control over short-term interest rates depends on their ability to participate to the payments clearing system. Fears that the generalization of electronic money might make the central bank impotent are thus unwarranted.

The generalization of electronic payments, in my view, has not reduced the ability of central banks to conduct monetary policy. On the opposite, it may have facilitated the work of monetary authorities. For instance, electronic large-value transfer systems (LVTS) are now widespread, and in fact, because these operations have to go through computers, it is even easier for central bankers to keep a check on them and to take them into account when deciding on the amounts of reserves that have to be added to or subtracted from the banking system. In other words, central banks are better equipped than ever to hit their targeted overnight rate of interest.

The introduction of electronic money and electronic payments has made the existing financial system even more in tune with post-Keynesian theory. We are in the so-called zero-reserve financial system, which some people call an *anchorless* or a *Keynesian* banking system (Rymes 1998) and which others call a world *without money* (Black 1970). What is really meant is not that deposit money is inexistent, but rather that the amount of high powered money is zero.

In such a "world without money", why is it still possible for the central bank to set interest rates? By setting an upper and a lower limit on interest rates, a central bank is able to have perfect control over short-term rates of interest, even if there are no reserve requirements and if banknotes have been entirely eliminated. Thus the power of the central bank to set interest rates does not

depend on its monopoly over the issue of high powered money. Rather, central banks retain the power to set interest rates either because, by law, they force private banks to settle their accounts on the books of the central bank, or because they offer this possibility to private banks, at a cost which no other institution could match.

The payments system could even be run by a private institution, provided the central bank is given full membership to the clearing house. However, the fact that central banks are the only entity to retain the power to corner the market, by forcing *all* banks to borrow from the central bank, gives central banks the greatest credibility in terms of interest rate announcements. This central banks can do, as emphasized by the neo-chartalist authors, by moving the proceeds of government taxation from private bank deposit accounts to government accounts at the central bank.

Instances of this power are offered in Tables 18 and 19. In both instances, suppose there are no reserve requirements and no demand for (central bank) banknotes. These components are thus totally absent from the liability side of the central bank balance sheet. Let us then distinguish two cases: the case where governments run mostly budget surpluses, which can most easily be associated with overdraft financial systems (Table 20); and the case where governments are running budget deficits, which can most easily be associated with asset-based financial systems (Table 21).

In the overdraft case, start with a government asking for advances from the banking system to pay for its expenditures (200 units), at the going rate of interest. The balance sheet of private banks will look as shown in Table 20. These deposits will then be transferred to households, but they will soon revert in an even greater amount to the government, as households pay their taxes. On the assumption that the government is running a 50-unit surplus, the government will then be in a position to reimburse the advances that it took, and will be left with a portion of its deposits (50 units). The central bank can force banks to be in a negative settlement balance position by moving some of the remaining government deposits from the private banks to its own account (here 30 units). To settle their accounts with the central bank at the clearing house, banks have no choice: they are forced to draw advances from the central bank – as they would have to do in a pure overdraft economy with central bank money or compulsory reserve requirements.

Tables 18 and 19

A similar situation arises when the government is running a deficit. Assume that in this asset-based economy, government expenditures (200 units) are financed by issuing Treasury bills, with rates of return high enough to induce private banks to purchase them. In exchange, the Treasury will be credited with deposits on the books of these banks. This is shown in Table 21. Once again the deposits are first transferred to households when the government actually incurs its expenditures, but part of these funds – only part of them since we assume a government budget deficit of 50 units – will be flowing back to government deposit accounts when taxpayers pay their taxes. In the example given, the government lets 100 units of Treasury bills to mature without renewal. Once more, the central bank can force banks to be in a negative settlement balance position by moving some of the government deposits, from the tax accounts at the private banks to the government account at the central bank (here 30 units once more). To settle their accounts with the central bank at the clearing house, banks once again have no choice. This time, they must sell some of their Treasury bills to the central bank (30 units).

It is true that the banks could refuse to renew their holdings of Treasury bills when these mature, in which case the rolled-over bonds would have to be sold to the households. Such an extreme situation will not occur however as long as banks are required to hold government bonds in their portfolio. This may happen either because of direct mandatory regulations, such as minimum secondary reserves requirements, or because of indirect regulations, banks being induced to hold safe assets such as government bonds since they have no adverse effect on their capital adequacy ratios. Finally, with real-time gross settlement systems, banks need ever larger stocks of government bonds, to be able to settle their transactions with the other members of the clearing system without encountering any risk.

It must thus be concluded that, whether the government is in a deficit or surplus situation, and regardless of whether the economy is of the overdraft or asset-based type, it is always possible for the central bank to control interest rates and to force banks to be in an overall negative settlement balance position, even if there are no reserve requirements and no demand for central bank money.

In Canada, for instance, where rules oblige banks to clear payments through the central bank, banks that have negative settlement balances can settle their accounts by borrowing from the central bank at the discount rate (say 6%), i.e., by arranging for a collaterized overdraft. The banks that have

positive settlement balances can deposit these balances at the Bank of Canada, at a rate which is 50 basis points below the discount rate (say 5.50%). As a result, banks usually try to find some arrangement between themselves, those with positive balances making loans to those with negative balances. As a matter of fact, almost all of these loans are fully collaterized, since they are made in the repo market described earlier (debts are settled with repos). The rate at which these one-day loans or pseudo-loans are arranged, the overnight rate, is almost always to be found right in the middle of the band between the discount rate and the deposit rate at the Bank of Canada (here 5.75%). The Bank of Canada, as do most of the other central banks, thus has a nearly perfect control over the shortest of the interest rates, although private banks generally hold no settlement balances (Clinton 1997).

Conclusion

The purpose of the present paper was to elaborate a simple, yet consistent, story relating credit creation and money endogeneity. Causality is probably the most crucial aspect of economics: this is how, in many instances, theories can be distinguished from one another. The T-accounts that have been presented thus must be comprehended with the causal story that has been appended. This causal story underlines the importance of credit-worthiness and confidence, as well as the autonomy of credit creation from the previous existence of bank deposits. The coherence of the described financial system also relies on the law of reflux, the existence of credit lines, and the acquisition of own funds.

Several issues have not been dealt with. The multiplicity of financial instruments has been assumed away. Thus only the determination of interest rates of the shortest term has been discussed, while the relationship between these very short rates and the rates of assets of longer maturity has been left aside. In any case, the relationship between these rates and the various financial aggregates should be treated within a fully-integrated accounting framework, where all flows and all stocks are accounted for. This is rarely done in macroeconomics, although there are some exceptions, such as Godley (1999), whose method readers would be well-advised to study.

References

Akhtar, M.A. (1997) *Understanding Open Market Operations*, Federal Reserve Bank of New York, Public Information Department, New York.

Arnon, Arie (1993) "The policy implications of classical monetary theory: Between the two hands", in G. Mongiovi and C. Rühl (eds), *Macroeconomic Theory: Diversity and Convergence*, Edward Elgar, Aldershot, 110-122.

Bell, Stephanie (2000) "Do taxes and bonds finance government spending?", *Journal of Economic Issues*, 34 (3), September, 603-620.

BIS Basle Committee on Banking Supervision (1988) "International convergence of capital measurement and capital standard", Bank for International Settlements, July (www.bis.org).

Black, Fischer (1970) "Banking and interest rates in a world without money", *Journal of Banking Research*, 1 (3), Autumn, 8-20.

de Boyer, Jérôme (1998) "Endogenous money and shareholders' funds in the classical theory of banking", *European Journal of the History of Economic Thought*, 5 (1), Spring, 60-84.

Brossard, Olivier (1998) "Comportements vis-à-vis de la liquidité et instabilité conjoncturelle: une réflexion sur la préférence pour la liquidité", *Cahiers d'économie politique*, 30-31, 123-146.

Chick, Victoria (1986) "The evolution of the banking system and the theory of saving, investment and interest", *Économies et Sociétés*, 20 (8-9), August-September, 111-126.

Clinton, Kevin (1997) "Implementation of monetary policy in a regime with zero reserve requirements", Bank of Canada Working Paper 97-8, 16 pp.

Godley, Wynne (1999) "Money and credit in a Keynesian model of income determination", *Cambridge Journal of Economics*, 23 (2), April, 393-411.

Henckel, Timo, Alain Ize and Arto Kovanen (1999) "Central banking without central bank money", International Monetary Fund Working Paper 99/92, July, 42 pp.

Hicks, John (1974) *The Crisis in Keynesian Economics*, Basil Blackwell, Oxford.

Keynes, John Maynard (1930) *The Treatise on Money*, vol. 1, Macmillan, London.

Lavoie, Marc (1992) *Foundations of Post-Keynesian Economic Analysis*, Edward Elgar, Aldershot.

Lavoie, Marc (2001) " "The reflux mechanism in the open economy", in L.P. Rochon and M.

Vernengo (eds), *Credit, Growth and the Open Economy: Essays in the Horizontalist Tradition*, Edward Elgar, Cheltenham.

Lundrigan, Eugene and Sari Toll (1997-98) "The overnight market in Canada", *Bank of Canada Review*, Winter, 27-42.

Marchal, Jean and Frédéric Poulon (1987) *Monnaie et crédit dans l'économie française*, Cujas, Paris.

Moore, Basil J. (1988) *Horizontalists and Verticalists: The Macroeconomics of Credit Money*, Cambridge University Press, Cambridge.

Mosler, Warren and Matthew Forstater (1998) "A general framework for the analysis of currencies and commodities", in Paul Davidson and Jan Kregel (eds), *Full Employment and Price Stability in a Global Economy*, Edward Elgar, Cheltenham, 166-177.

Palley, Thomas (2000) "The e-money revolution: Challenges and implications for monetary policy", AFL-CIO (Washington, DC), Public Policy Department, Economic Policy Paper E045, July, 16 pp.

Piffaretti, Nadia (1998), "A theoretical approach to electronic money", Faculty of Economics and Research Science, University of Fribourg, Working paper 302, February, 23 pp.

Renversez, Françoise (1996) "Monetary circulation and overdraft economy", in G. Deleplace and E.J. Nell (eds), *Money in Motion: The Post Keynesian and Circulation Approaches*, Macmillan, London, 465-488.

Rochon, Louis-Philippe (2000) *Credit, Money and Production: An Alternative Post-Keynesian Approach*, Edward Elgar, Cheltenham.

Rossi, Sergio (1998) "Endogenous money and banking activity: some notes on the workings of modern payments system", *Studi Economici*, 66 (3), 23-56.

Rymes, Thomas K. (1998) "Keynes and anchorless banking", *Journal of History of Economic Thought*, 20 (1), March, 71-82.

Spotton Visano, Brenda (2000) "Electronic finance and exchange rate regimes: Industry changes and the question of a single North American currency", The Political Economy of Monetary Integration: Lessons from Europe and Canada, conference, University of Ottawa, October, 16 pp.

Wray, L. Randall (1995) "Keynesian monetary theory: liquidity preference or black box horizontalism?", *Journal of Economic Issues*, 29 (1), March, 273-280.

Wray, L. Randall (1998) *Understanding Modern Money*, Edward Elgar, Cheltenham.

Table 1: Unique bank

Assets	Liabilities
Loans L	Deposits D

Table 2: Payments through debit balances

Bank Assets	Bank Liabilities
Debit position of purchaser +100 Debit position of seller – 100	

Table 3: Taking explicit account of credit lines

Bank Assets	Bank Liabilities
Loans (used overdraft facilities)	Deposits
Unused overdraft facilities (potential loans)	Unused overdraft facilities (potential deposits)

Table 4: Unique bank with banknotes

Assets	Liabilities
Loans L	Deposits $D' = D - B$ Banknotes B

Table 5: Banks with own funds distributed as dividends

Assets	Liabilities
Loans $L(1 + i_c)$	Deposits $D(1+ i_d)$ Own Funds $L(i_c - i_d)$
Loans $L(1 + i_c)$	Deposits $D(1+ i_c)$

Table 6: Banks with own funds and real assets

Assets	Liabilities
Loans L	Deposits D' Own funds F
Loans L Real assets R	Deposits $(D' + R)$ Own funds F
Loans $(L - R)$ Real Assets R	Deposits D' Own Funds F

Table 7: Two banks, pure credit economy

Bank B		Bank D	
Assets	Liabilities	Assets	Liabilities
Loans to non-financial agents	Deposits Funds owed to Bank D Own Funds	Loans to non-financial agents Advances made to Bank B	Deposits Own Funds

Table 8: Two banks, certificates of deposits

Bank B		Bank D	
Assets	Liabilities	Assets	Liabilities
Loans to non-financial agents	Deposits Sold CDs Own Funds	Loans to non-financial agents Purchased CDs	Deposits Own Funds

Table 9: Financial intermediaries with securitization

Bank B		Financial intermediary FI	
Assets	Liabilities	Assets	Liabilities
Loans to non-financial agents 100	Deposits 30		Deposits 70
	Funds owed to FI 70	Advances made to Bank B 70	
Loans to non-financial agents 30	Deposits 30	Securitized loans 70	Deposits 70

Table 10: Overdraft economy, with banknotes

Private banks		Central bank	
Assets	Liabilities	Assets	Liabilities
Loans L	Deposits $D' = D - B$		
	Funds B borrowed from central bank	Loans B made to private banks	Banknotes B

Table 11: Overdraft economy, with compulsory reserves

Private banks		Central bank	
Assets	Liabilities	Assets	Liabilities
Loans L	Deposits D		
Reserves R	Funds R borrowed from central bank	Loans R made to private banks	Deposits of private banks (reserves R)

Table 12: Overdraft system, with two banks

Bank B		Bank D		Central bank	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Loans to non-financial agents	Deposits of non-financial agents Advances from the central bank (negative settlement balance)	Loans to non-financial agents Deposits at central bank (positive settlement balance)	Deposits of non-financial agents	Advance to Bank B	Deposits of Bank D

Table 13: Treasury bills sold to private banks

Private bank, first stage		Private bank, second stage	
Assets	Liabilities	Assets	Liabilities
Treasury bills +100	Treasury deposits +100	Treasury bills +100	Household deposits +100

Table 14: Treasury bills sold to private banks, with banknotes

Central bank		Private bank	
Assets	Liabilities	Assets	Liabilities
Treasury bills +10	Deposits of banks +10	Treasury bills +90 Reserves + 10	Household deposits +100
Treasury bills +10	Banknotes +10 Deposits of banks 0	Treasury bills +90 Reserves 0	Household deposits +90

Table 15: Treasury bills sold to the central bank, with banknotes

Central bank		Private bank	
Assets	Liabilities	Assets	Liabilities
Treasury bills +100	Government deposits +100		
Treasury bills +100	Deposits of banks +100	Reserves +100	Household deposits +100
Treasury bills +10	Banknotes +10	Treasury bills +90	Household deposits +90

Table 16: Transfers of government deposits

Central bank		Private banks	
Assets	Liabilities	Assets	Liabilities
	Government deposits +100 Deposits of banks −100	Reserves −100	Household deposits −100
	Government deposits 0 Deposits of banks 0	Reserves 0	Household deposits −100 Government deposits +100

Table 17: Positive balance of payments, overdraft economy

Central bank		Private banks	
Assets	Liabilities	Assets	Liabilities
Foreign reserves +100	Deposits of banks +100	Reserves +100	Deposits of exporters +100
Foreign reserves +100 Loans to domestic banks −100	Deposits of banks 0	Reserves 0	Deposits of exporters +100 Loans from central bank −100

Table 18: Positive balance of payments, asset-based economy

Central bank		Private banks	
Assets	Liabilities	Assets	Liabilities
Foreign reserves +100	Deposits of banks +100	Reserves +100	Deposits of exporters +100
Foreign reserves +100 Treasury bills −100	Deposits of banks 0	Reserves 0 Treasury bills +100	Deposits of exporters +100

Table 19: Internet money

Bank		Bank branch issuer (scheme operator)	
Assets	Liabilities	Assets	Liabilities
	Deposits of agent A −100 Debt towards issuer +100	Credit on Bank +100	Deposits of Agent A +100
	idem	Credit on Bank +100	Internet money of Agent A +100
	idem	Credit on Bank +100	Internet money of Agent B +100
	idem	Credit on Bank +100	Deposits of Agent B +100
	Deposits of Agent A −100 Deposits of Agent B +100		

Table 20: A world without money: Government surpluses and overdraft economies

Central bank		Private banks	
Assets	Liabilities	Assets	Liabilities
		Loans to government +200	Government deposits +200
		Loans to government +200	Household deposits +200
		Loans to government +200	Government deposits +250 Household deposits −50
Advances to private banks +30	Government deposits +30	Loans to government 0	Government deposits +20 Household deposits −50 Funds borrowed from the central bank +30

Table 21: A world without money: Government deficits and asset-based economies

Central bank		Private banks	
Assets	Liabilities	Assets	Liabilities
		Treasury bills +200	Government deposits +200
		Treasury bills +200	Household deposits +200
		Treasury bills +200	Government deposits +150 Household dep. +50
		Treasury bills +100	Government deposits +50 Household dep. +50
Treasury bills +30	Government deposits +30	Treasury bills +70	Government deposits +20 Household dep. +50