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## The endogeneity of money and the eurosystem

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Center for European Integration Studies  
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Otto Steiger

**The Endogeneity of Money  
and the Eurosystem**

**Working Paper**

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# The Endogeneity of Money and the Eurosystem

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September 2004

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## Abstract

The endogenous theory of money, developed by Basil Moore, argues that the supply of central bank money in modern economies is *not* under the control of the central bank. According to this view, a central bank typically supplies cash reserves automatically on demand at its minimum lending rate, resulting in a clearly horizontal money supply function. While the paper agrees with Moore that the supply of central bank money cannot be determined exogenously by the central bank, it wonders whether the supply is determined completely by the demand of the commercial banks. The paper suggests that the central bank has *some* exogenous power to control the quantity of its supply by *rationing*. More importantly, the central bank is *forced* to do so! The central bank cannot not merely exist as an automat responding to the wishes of the commercial banks. Part I discusses the cause why the central bank has to restrict its supply, while part II demonstrates how the supply of central bank money can be controlled by looking at the monetary policy operations of the Eurosystem. In accordance with this analysis, the paper offers a modified horizontal or “staircase” supply function of central bank money.

JEL classification: E 51, E 58

# The Endogeneity of Money and the Eurosystem: A Contribution to the Theory of Central Banking\*

[September 2004]

*Otto Steiger*\*\*

“While a central bank can extend emergency loans for unlimited amounts, *its capacity to absorb losses is limited* (up to the size of its capital)”.  
Dirk Schoenmaker (2000, 222; emphasis added).

## I Is the money supply function clearly horizontal?

In his book of 1988 on *Horizontalists and Verticalists*, which should become the fundamental text for the endogenous theory of money, Basil Moore argues that the money supply in modern economies is *not* under the control of central banks, even if the most important one, the Federal Reserve System, “*purports* to control quantitatively the amount of banking system reserve borrowing” in the US. “Central banks typically supply cash reserves *automatically on demand* at the minimum lending rate. In such cases *the money supply function is clearly horizontal*” at this rate (Moore 1998, 111 f.; second and third emphases added).

While I agree with Moore that the supply of central bank money is not exogenously determined by the central bank, I wonder, however, whether it is determined completely by the demand of its counterparties. Rather, I suggest that the central bank has *some* exogenous power to control the *quantity* of its supply by *rationing* or *queuing*. More importantly, the central bank is *forced* to do so! The central bank cannot not merely exist as an automat responding to the wishes of the commercial banks. Part II discusses more detailed the cause

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why the central bank has to restrict its supply by emphasizing some neglected fundamentals of central banking. Part III demonstrates how the supply of central bank money can be controlled by looking at the monetary policy operations of the Eurosystem. Finally, part IV offers some conclusions on how to revise the horizontal money supply function.

## **II The cause for restricting the supply of central bank money, or: Some neglected fundamentals of central banking**

A two-tiered banking system consists of a central bank, with the monopoly of issuing *banknotes* in credit contracts with its counterparties commercial banks. The latter can obtain these notes only by pledging *good securities* and promising *interest*, while the former for its note issue has – *in addition* to the collateral of its counterparties – to dispose of *own capital*. Since it is *property* that is at the core of any good security and own capital, such a banking system can only function in property-based societies (Heinsohn and Steiger, 1996, 2000, and 2005)<sup>1</sup>.

The central bank must not accept as underlying assets in such a contract any debt instruments issued by its counterparty, or by any other entity with which the counterparty has close links. Commercial bank *A*, e.g. will be accepted at the trading desk of the central bank with securities only bought from a private company *B*, or another entity like the Government<sup>2</sup>, but not with its own paper, or that of a company *C* in which it holds a stake, even if these titles should prove to be highly marketable. The meaning of this rule is that debt titles delivered to a central bank have to be guaranteed by *A*, and not by the issuer of the titles. Thus, genuine central bank money always has to be a *creditor's*, and not a debtor's *money*.

In the classical texts on central banking, these prerequisites of genuine money were not fully understood. However, the founding fathers of the theory of central banking, Henry Thornton (1802) and Walter Bagehot (1873), always tied the creation of money to good securities, even in the case of a liquidity crisis. The former was the first to conceive of a lender of last resort. In his discussion of the financial crisis of 1793 in England, Thornton observed that the country banks ceased to give out their notes because the public refused to accept them demanding instead Bank of England notes. Therefore he proposed two rules:

“First, ... the Bank of England ... should be disposed to extend its discounts in a greater degree than heretofore ... . Secondly, the country bankers should be taught ... to provide themselves with a larger quantity of that *property* which is quickly convertible in Bank of England notes“ (Thornton 1802, 188; emphasis added).

To merely focus on interest, as is common practice in modern texts on central banking, would never have entered the minds of Thornton and Bagehot. The latter’s rationale for the central bank as the lender of last resort, is far from merely providing liquidity by whatever means. Unwaveringly, he emphasized two rules: “First. That these loans should only be made at a very high rate of interest. ... Secondly. That at this rate these advances should be made at all *good* banking securities and as largely as the public ask for them” (Bagehot, 1873, 197; emphasis added).

Also Ralph Hawtrey (1932) was well aware that the lender of last resort-responsibility must never be mistaken in a way that business banks may be allowed to obtain cash without pledging prime property titles. “The essential duty of the central bank as the lender of last resort ... cannot mean that it should lend to *any* bank that needs cash, regardless of the borrowing bank’s behavior or circumstances. Neither a commercial concern nor a public institution could undertake to supply cash to insolvent borrowers” (Hawtrey, 1932, 126).

All three authors emphasized the necessity of good securities because they understood that the principles of banking apply to a private bank of issue no less than to any other bank. They were beautifully lined out already in 1767 by James Steuart in what can be regarded as mercantilism’s most important treatise. Steuart was also the first to explain *why* good securities are necessary. “Many, who are unacquainted with the nature of banks [of issue], have a difficulty to comprehend how they should ever be at a *loss* for money, as they have a mint of their own, which requires nothing but paper and ink to create millions. But if they consider the principles of banking, they will find that every note issued for value consumed in place of value received and preserved, is neither more or less, than a partial spending either of their *capital*, or profits on the bank”. Therefore, he emphasized “that banks [of issue] give credit upon nothing but the *best* securities” (Steuart, 1767, II, 151 f. and 603; emphases added).

Thornton and Bagehot were no less concerned than Steuart about the dangers in the business of issuing money. “Banknotes emitted without obtaining value in return ... are [a]

great source both of *loss and danger* to a banking company” (Thornton 1802, 244; emphasis added). By accepting “*bad bills or bad securities ... the Bank [of issue] will ultimately lose*” (Bagehot 1873, 198; emphasis added).<sup>3</sup> Hawtrey, too, had no difficulty to see the central bank’s common commercial woes. “A commercial concern in particular cannot afford to take *risks* out of proportion to its *own capital*” (1932, 126; emphases added).

The balance sheet of a central bank, like that of any other business in the monetary economy, has to consist not only of assets and liabilities but also of a surplus of the former over the latter. With this net worth or own capital, it safeguards itself against the threat of bankruptcy. Only a few central banking theorists in our times, most notably David Folkerts-Landau, Peter Garber, Charles Goodhart, and Dirk Schoenmaker, have understood this old wisdom. “In any credit operation that it undertakes in the lender-of-last-resort role, a central bank will incur the credit risk and potential *losses*, associated with the claims it acquires when expanding its liabilities to supply credit” (Folkerts-Landau and Garbert 1992, 99; emphasis added). Therefore, “a LOLR [lender of last resort] loan by a CB [central bank] is like any other loan, in that it may be repaid (plus interest) or alternatively will be subject to *default* and some potential loss”, and independently whether the central bank is private or “becomes explicitly a public sector body” (Goodhart 1999, 233; emphasis added; and see our opening quote of Schoenmaker 2000, 222).

Only because economists have forgotten this insight, dubious recommendations, most prominently by Paul Krugman, were made in recent years to the Bank of Japan to salvage the deflation-ridden Japanese economy by engaging in large scale purchase of long-term government debt. The idea that such a policy will lift bond prices and lower short-term interest rates and, thereby, trigger an upswing, does not take into account that this could bankrupt the Bank. The more this policy succeeds in dispelling deflation and the more the economy prospers, the higher long-term interest rates will be. But their increase means, of course, a decrease in the prices of the bonds held by the Bank of Japan. “If the Bank held only 10 percent of the long-term government bonds outstanding and interest rates rose by two percentage points, the resulting losses would *wipe out the institution’s entire capital and reserves*” (Lerrick, 2001, 13; emphasis added). As underlined by Goodhart (1999, 233; emphasis added), the independent capacity of the Bank of Japan for action remains “in some large part, though not entirely, *bounded by its capital*”.

Notwithstanding these fundamentals of central banking, the view of the omnipotence of the central bank is maintained by modern monetary economists, most prominently Anna Schwartz. “The only institution that had the resources to provide [...] loans in a [liquidity] crisis is the central bank, which could create high-powered money *without limit*, and hence was the lender of last resort” (2002, 450; emphasis added). How can such a view be explained? A closer look at modern textbooks reveals that most central banking theorists never have looked more detailed at the balance sheet of a central bank, in particular never asked why the central monetary institution, like any other bank or company in the monetary economy, must have the item “capital” on its liability side.

In Paul Krugman and Maurice Obstfeld’s classical text on *International Economics* (2003, 486 f.), e.g. no capital exists on the liability side of a central bank’s balance sheet, only the items “currency in circulation” and “deposits held by private banks”. Therefore, one is not surprised to hear, that central bank’s net worth, correctly defined as its total assets minus its total liabilities, is assumed to be zero, and that “because changes in central bank net worth are not important to our analysis we will also ignore those”. This ignorance is also characteristic of Peter Bofinger’s widely used text *Monetary Policy* (2001, 41-43), where in a simplified balance sheet of the Eurosystem the items “capital and reserves” are completely wiped out, although they appear in the official consolidated balance sheet of the Eurosystem on which Bofinger’s simplification is based. In Oliver Blanchard’s well-known textbook on *Macroeconomics* (2003, 76), not only the central bank is devoid of capital but also the commercial banks. While in Frederic Mishkin’s classic on *Banking* (2001, 214 f. and 392-394) the importance of “bank capital, the bank’s net worth which equals the difference between its total assets and liabilities”, is correctly analyzed as a buffer for “bad debts which have to be written off”, such insights are missing in his discussion of the consolidated balance sheet of the Federal Reserve System.<sup>4</sup>

The myth of the unlimited capacity of the central bank to create money is most vehemently maintained by the Berlin School of Monetary Keynesianism, most prominently in the writings of the founder of the school, Hajo Riese (1993 and 2000). The theory of the Berlin School is interesting because it, not unlike those of Moore and Heinsohn and Steiger, does not analyse money as a means to facilitate barter but as a *means of payment* arising out of a credit contract. Riese’s approach to central banking deserves particular attention, because



he is the first central banking theorist who has recognized that Bagehot's discussion of the lender of last resort-responsibility of the central bank manifests itself in "the connection between the elasticity of the money supply [...] and the avoidance of the [...] form of *liquidity crisis*" that results, not from insolvency but "*from payment difficulties of the central bank*" (Riese 1993, 5; emphases added).

According to Riese, such an inability to pay cannot be avoided when, like in the case of the Bank of England in the wake of Peel's Bank Act of 1844, the money supply is restricted by a given amount of certain assets – in the case of the Bank of England: gold. The ability of the central bank to pay is not achieved, however, by simply suspending the restriction due to gold but through Bagehot's famous *open discount window*. This economic journalist was first to understand what the economics' profession of his time had not grasped: it was "only the opening of the discount window in 1866 which overcame the liquidity crises which had repeatedly shaken England since the pound became a world currency" (Riese 1993, 11).

What is the meaning of an open discount window? According to Riese, it "means that *every* demand for money resulting from a credit relationship is satisfied", and then only the question "remains at to the *price* at which this is satisfied" (1993, 37; emphases in the German original). In other words: the establishment of the central bank as lender of last resort leads to the suspension of the gold restriction for the issue of banknotes, thereby overcoming the payment difficulties of the central bank and "*securing the ability of the economy to function*" (Riese 1993, 31; emphasis in the German original).

However, this praise of the beneficial effects of the role of the lender of last resort is bound to the assumption of its capacity to create money without limit. As we have seen, the founders of the theory of central banking did not adhere to this view, albeit not always on sufficient grounds. For them, generously interpreted, the capacity to create money is limited by a lack of good securities of its counterparties and the capacity of its own capital to absorb losses.

What has Monetary Keynesianism to say about good securities and own capital? More or less nothing! On the one side, Riese (1993, 35) mentions Bagehot's second rule of advancing money only against "proper security" without, however, discussing its meaning. On the other side, he dismisses the rule as a "strictly conservative course [...]" – a condition

which, alongside a high interest rate which acts as a market barrier against the surge to liquidity, is able to avoid the domino effects of a liquidity crisis” (Riese 1993, 38).

With Riese’s dismissal of good securities in mind, it is not surprising that the central bank’s own capital is not mentioned at all, not to speak of its being made a topic for discussion. This is revealed in his analysis of the interaction of the central bank ( $Z$ ), its counterparties commercial banks ( $B$ ) and the non-bank public ( $P$ ). The interaction is demonstrated by numerical examples of the balance sheet structures of the three sectors. Out of eight differing cases of interaction analysed by Riese (1993, 20; and see 24), we discuss – see *table 1* below – (1), the case of a sale of central bank money to the public, and (2), the case of the results of a multiple process of credit creation.

*Table 1: Balance sheet structures à la Riese*

<b>(1)</b>				<b>(2)</b>	
<b>Z</b>		<b>B</b>		<b>P</b>	
$F_b$ 1200	$M$ 1200	$F_p$ 1200	$V_z$ 1200	$C$ 1200	$V_b$ 1200
$F_b$ 1200	$M$ 1200	$R$ 200 $F_p$ 3000	$V_z$ 1200 $D$ 2000	$C$ 1000 $D$ 2000	$V_b$ 3000

$F_b$  = claims on commercial banks  
 $M$  = money supply  
 $F_p$  = claims on the public  
 $V_z$  = liabilities to the central bank

$C$  = holdings of money  
 $V_b$  = liabilities to commercial banks  
 $R$  = reserve holdings  
 $D$  = deposit holdings, with  $C/D = 0.5$

(Excerpt from Riese 1993, 20: “*Figure 1.1: Balance sheet structures*”, upper and lower case).

In his analysis, Riese wants to demonstrate the “*bifurcation of monetary demand and credit demand*” by considering that holdings of money exist for the public –  $C$  – as well as for the commercial banks –  $R$  –, which “*result from the risk of losses of assets*”. Riese regards such holdings as “a market constellation of disequilibrium” allowing for the dissolving of “the identification of money and credit”(1993, 22 f.; emphases in the German original). However, he does not understand that these holdings on the asset side of the balance sheets of both the commercial banks and the public only make sense as *reserves* with the corresponding contra entry *net worth of assets* or *own capital* on their liability side. In case (2), e.g. the commercial banks cannot secure their claims on the public,  $F_p = 3000$ , by reserve holdings of  $R = 200$  because the total of their assets,  $R + F_p = 3200$ , is equal to their liabilities,  $V_z + D$ . To write off bad debts, the banks need a *surplus* of their assets over their liabilities, i.e. a net worth of assets.<sup>5</sup> And the same holds true, of course, for the money holdings of the public,  $C = 1200$ , to secure their claims on the banks,  $D = 2000$ .

Needless to emphasize that the item own capital is also missing in Riese’s balance sheet of the central bank. As distinct from the commercial banks and the public, the “risk of loss of assets” of this institution never becomes a topic of discussion. On the contrary, Riese explicitly rules out such a risk. Why?

Other than the commercial banks, Riese maintains, who “in principle are faced with a liquidity problem because their liabilities, in one way or another, have to be transformed into central bank money” which they cannot create, the central bank is devoid of this problem (2000, 492). Why? Because that which is the essence of the inability to pay, not having enough money to discharge debts, can be created by the central bank itself without any difficulty and *without making commitments*. This can be verified by its balance sheet, he argues, where the money supply on the liability side, as contra entry to its claims to the commercial banks on the asset side, is assumed to express a “production of liquidity”, a “creation of wealth by the central bank” (Riese 2000, 492). “The money in circulation does not simply represent, as sometimes is still supposed, some kind of liability of the central bank. What should the central bank be obliged to do? To formulate it ironically, the central bank as producer of liquidity *ex definitione* can only transform, again and again, self-made liquidity into self-made liquidity” (Riese 2000, 492).

However, Riese is not wholly convinced of this explanation *ex definitione*. Therefore, he provides an additional one. It is true that the central bank is a bank, he concedes, but other than a “ ‘normal’ ” commercial bank, the former is not subject to risk because its creation of money implies a production of wealth. And it is this wealth the disposal of which the central bank parts with in the creation of money in favour of the commercial banks. The central bank “as universal producer of liquidity is *not* subject to a *creditor’s risk* and cannot, therefore, get into payment difficulties because of a bad loan. Being risk-free in its business, it is true that the central bank is forced to behave most carefully when granting a loan ... . However, *the decisive point is that its holdings of money imply a production of wealth* – which in matters of bookkeeping says that a central bank books the issue of money as a liability. And in this, in analogy to a *net worth*, *the parting with the asset ‘money’ is expressed*” (Riese 2000, 493; emphases added).

After all, Riese cannot avoid the term net worth, *i.e.* own capital which he correctly localises on the central bank’s liability side, however, only for “matters of bookkeeping”. Thereby, Riese reveals that does not understand that notes issued by a central bank cannot represent a net worth for the bank, *i.e.* a *surplus* of its assets over its liabilities. Central bank money is created as an asset for commercial banks only. It represents, therefore, a liability for the central bank, and not a net worth the disposal of which the latter has the option to depart with (Heinsohn and Steiger 2000c, 518; and see 2002, 46 f.). By simply looking at a real balance sheet of a central bank, Riese would have immediately recognized why its notes, as distinct from those of other central banks, do not appear on its asset side and why its net worth, *in addition* to its notes, is booked on its liability side as own capital: without this item, the central bank would be unable to withdraw notes from circulation not paid back in case of bad loans. Furthermore, central bank money is not an asset *per se* but “*a derivative of assets*” (Stadermann 2000, 536; emphasis added). Money is a note which a commercial bank receives in an interest-charged credit contract from the central bank against an asset to be pledged to the latter. By redeeming the note, the commercial bank exercises its right to release the pledged asset from the central bank respectively forces the latter to return it.

Other than Riese, another leading Monetary Keynesian, Heinz-Peter Spahn recognizes that a private bank of issue faces a liquidity problem, however, on wrong grounds. According to Spahn (2001, 62), such a problem is due to the redeemability of its notes. He does not

understand that a private bank of issue, in no way other than a central bank, can become illiquid because of a lack of own capital. “Today nearly all currencies in the world are issued without the right of redemption of their bearers”. This is true, but does it rule out the liquidity problem? Spahn does not understand that the abandonment of the right of redemption results from today’s watertight two-tier banking system, with relations only between the central bank and their counterparties business banks on the one side and between the latter and the public on the other. Only the public has no longer the right of redemption, while it still exists – and has to exist – for the commercial banks. More importantly, if the business banks are unable to redeem the notes loaned, the central bank has to withdraw them from circulation by offering its own capital “when the market value of the collateral is less than the amount of the loan or advance to the banks concerned” (Landau-Folkerts and Garber 1992, 99). And when its reserve is exhausted, the central bank faces a liquidity problem like any private bank of issue.

The institution, which Spahn and Riese and even the aforementioned famous textbook authors have in mind when analysing the business of a bank of issue, obviously is not a genuine central bank but a mere state bank of issue. As distinct from the former, the latter can indeed issue notes by buying debt titles from their *issuers*. Such titles are more or less worthless, because they are reproducible in any number and non marketable, while a true central bank has to buy the debt titles on the market from the commercial banks who, as *creditors* of the titles, have to consider their inherent risk when offering them to the central bank: other than in the case of a state bank of issue, the risk here is with the creditor, and not the debtor. Therefore, the state bank is an issuer of a *debtor’s* money – and as such it needs no own capital either because it is obliged in no way whatsoever to redeem its notes.

The genuine central bank, on the other side needs own capital – last but not least to act as lender of last resort. However, as shown above, this role is at the same time restricted by the possible losses its own capital can absorb. Therefore, what even the strongest central bank deserves is the backing of another institution, the State. “What stands behind the liabilities of the CB [central bank] is *not* the capital of the CB but the strength and taxing power of the State” (Goodhart 1999, 234). Therefore, “the central bank’s losses on acquired bank assets fall ultimately on the taxpayers. In effect, the taxpayer has assumed the credit risk inherent in bank assets that serve as collateral for central bank lending” (Landau-Folkerts and Garber 1992, 100).

The message of the first part is clear. The central bank has to control its money supply for the same reason as a commercial bank its credit supply. The latter cannot satisfy every demand from the non-bank public, and the former cannot respond either, like an automat, to the demand from the private banks. Both types of banks have to avoid the danger of bankruptcy and, therefore, to restrict their lending.<sup>6</sup> In the case of the central bank, of course, also other considerations make such a “credit rationing” necessary, first of all, its monetary policy goals. In the second part, it will be demonstrated how this is done in the Eurosystem.

### **III How to control the supply of central bank money, or: What could be learned from the Eurosystem**

The Eurosystem is the de-centralized central banking managing the common currency of European Monetary Union (EMU), the Euro. It consists of the 12 national central banks (NCBs) of EMU and the European Central Bank (ECB ). The peculiarity of the System is that it does not have a central monetary authority. The ECB is not a bank of issue and, therefore, not the System’s lender of last resort. Central bank money is issued exclusive by the NCBs, with the ECB as a form of intermediate agent between the NCBs and Council of Governors of the System, the body that determines monetary policy in EMU. The Council consists of the six Executive Directors of the ECB and the Presidents of the 12 NCBs.<sup>7</sup>

The decisions of the Council on the rate of interest and the amount of central bank money to be supplied are normally implemented by the NCBs, and not the ECB. This means that the ECB only coordinates the refinancing operations, while the transactions are carried out by the NCBs. Refinancing means supplying central bank money by the NCBs to those of their domestic commercial banks which are in need of liquidity. In the following, the Eurosystem’s main refinancing operations (MROs) and its longer-term refinancing operations (LTROs) are discussed to demonstrate whether these procedures confirm the thesis of a clearly horizontal supply function of money or not. Following a suggestion by Marc Lavoie (2004), also the System’s marginal lending facilities (MLFs) are discussed as a monetary policy instrument that could save the horizontal supply function.<sup>8</sup>

Before we present the MROs and LTROs of the Eurosystem, we will give a child's guide to the question: why do commercial banks go to the central bank at all? Is there not another source of getting central bank money? Yes, indeed there are other sources. The banks can go to other banks – this is what they regularly do at the money or interbank market –, or they can go to the non-bank public – their business of attracting deposits which means a withdrawal of banknotes out of circulation. While the first method leaves the liquidity of the banking system unchanged, the latter leads to its increase, because banknotes in circulation means liquidity absorbing liabilities for the banking system. Therefore, as long as banknotes circulate their *circulation creates a structural liquidity deficit*<sup>9</sup> in the banking system which forces the banks to go to the central bank. “Banknotes in circulation absorb the banking system's liquidity because they have to be obtained from the central bank, and credit institutions have to borrow funds from the central bank because of this” (ECB 2004b, 88). However, the necessity to go to go to the central bank does not mean that banknotes in circulation are “under the control of the monetary authority” (ECB 2004b, 87). They are clearly not because of the banks' possibility of attracting deposits respectively the public's preference of banknotes over deposits. And due to these factors, the *stock* of circulating banknotes normally is not a result of monetary policy operations and, therefore, in the Eurosystem labelled as one of the so-called “autonomous factors”<sup>10</sup> determining liquidity in the banking system. Notwithstanding these considerations, they do not answer the question of whether the central bank has any power to restrict the forced demand of the private banks for the *flow* of new funds, *i.e.* banknotes and banks' reserves at the central bank. An answer can only be given by looking more detailed at the main monetary policy operations of the Eurosystem, the MROs and the LTROs.

The MROs within the Eurosystem are conducted by the NCBs<sup>11</sup> as weekly reverse transactions with a maturity of one week.<sup>12</sup> The transactions are executed through standard tenders<sup>13</sup> in the form of variable rate tenders.<sup>14</sup> In this procedure, the Governing Council sets a minimum bid rate in order to signal its monetary policy stance, and the counterparties of the NCBs, their domestic business banks, bid both the amount of money they wish to transact and the interest rate at which they wish to enter into the transaction. In preparing their bids for the forthcoming MROs, the banks are assisted by a weekly announcement of the *estimated* liquidity needs of the banking system in EMU until the settlement day for the next MRO.

However, this does *not* mean a pre-announcement of the quantity of central bank money the Council has decided to allot.

In the variable rate tender, the banks' bids with the highest rates are satisfied first, followed by bids with successively lower rates, until the total quantity of central bank money to be provided is exhausted. The lowest accepted rate is the so-called *marginal rate of interest*, *i.e.* the rate at which the aggregate quantity of bids exceeds the remaining amount to be supplied. At this rate bids are *rationed* in line with the Council's "decision on the total amount of liquidity to be allotted" (ECB 2004b, 80). The allotment procedure follows a *multiple* (American) auction<sup>15</sup>, *i.e.* the interest rate for *each* counterparty's allotment is equal to *its* interest bid.

It goes without saying that the Eurosystem's variable rate tenders imply a clearly horizontal supply function of central bank money – however, it has to be emphasized, only for the commercial banks' bids *above* the marginal rate of interest. For these rates the demands of the banks are fully satisfied, while the bids at the marginal rate are allotted only *pro rata*. Therefore, the thesis of a clearly horizontal supply function of central bank money *in toto* cannot be confirmed with respect to the Eurosystem's MROs.<sup>16</sup>

A closer look at four MROs between October 27 and November 11, 2003 verifies my view. The amount of bids ranged from € billions 113 to 136 and the amounts of allotment from € billions 99 to 117, with a bid-cover ratio between 1.07 and 1.50, *i.e.* in these MRO cases the banks' demand for central bank money was never fully satisfied (ECB 2003, 26). However, at a few occasions each year – *e.g.* in 2003 on March 4 and June 4 (ECB 2003, 8\*) –, the problem of "underbidding" arose, meaning that the aggregate of all bids was lower than the amount the Council wanted to supply.<sup>17</sup> Only in such cases, the demand for money is fully satisfied, and the amounts allotted are equal to the amounts of the bids, *i.e.* the money supply function is clearly horizontal. In other words, the central bank cannot determine its money supply exogenously by forcing the commercial banks to borrow the money it wants to loan, as mainstream's naïve view of "pumping liquidity into the economy" suggests. On the other side, as verified by the overwhelming cases of MROs in the Eurosystem, the central bank clearly has some power to restrict the demand for liquidity. In these cases no clearly



horizontal supply function exists, but a horizontal function restricted by the central bank's rationing of or queuing for the demand for its funds.

The power of rationing the money supply is even greater when the central bank executes fixed rate tenders, which the Eurosystem did before June 28, 2000. In this case, the demand for money by the banks at the fixed interest rate will only be satisfied when it is equal to the quantity the central bank want to supply. In the MROs of the Eurosystem until June 21, 2000, this never happened: on the contrary the bids exceeded the amount allotted tremendously. The ECB's monetary statistics reveal a "severe overbidding [...], which resulted from the existence of a wide and persistent spread between money market interest rates and the fixed rate" (ECB 2004b, 80). In the first half of 2000, the bid-cover ratio was ca 48.5 on average, on one occasion – June 7 – even as high as over 113 (ECB 2000, 6\*). "The information given by the aggregate bids was ... useless, and the sum of aggregate bids was higher than the value of all the available collateral", leading to unforeseeable allotment ratios and the (theoretical) risk of incurring penalties in the case of lack of collateral (Vento 2004, 83). That's why the Eurosystem abandoned the fixed rate tenders and introduced variable rate operations.

The power of the Eurosystem to control the supply of central bank money can also be shown with respect to its longer-term refinancing operations (LTROs), which accounted on average for 26% of the outstanding amount of open market operations from January 1999, the start of the Eurosystem, until June 2003. The LTROs are executed monthly by the NCBs, with a maturity of three months. They are conducted as pure<sup>18</sup> variable rate tenders with, as distinct from the MROs, a *pre-announcement* of the amounts to be supplied. "The Governing Council indicates in advance the volume to be allotted in forthcoming tenders" (ECB 2004b, 82). In the first half of 1999 the bid-cover ratio varied between 3 and 5; since mid-1999 it has stabilized around 2 (ECB 2000, 7\*, and 2004a, S 8). Therefore, also in the case of the LTROs a clearly horizontal money supply function does not exist.

But what about the Eurosystem's monetary policy instrument of marginal lending facilities (MLFs)? Do they not indicate that central bank money is fully endogenous in the Eurosystem, after all? In support of this view, the ECB can be quoted claiming that "the decisions on the volumes of weekly tenders *are taken so as to ensure that these operations close the liquidity deficit* of the banking system" (ECB 1999, 38; emphasis added). The reason

that there are more bids than available central bank money in the MROs and LTROs could be that banks avoid being forced to go to the MLFs, which carry an interest rate, the marginal lending rate, that is much higher than the rate applied to the MROs or to the overnight rate (EONIA). However, as shown above, according to the ECB “overbidding” has to be explained by the wide spread between the money market rates and the fixed rate, as happened until June 21, 2000 in the case of MROs with fixed rate tenders, or by “significant interest speculation” (counterparties are betting on a rate increase) due to the two weeks duration of the MROs, as happened in the case with variable rate tenders from June 28, 2000 until March 3, 2004 – a speculation which the Council hopes to avoid by shortening the duration to one week from March 10, 2004 onward.

Independently of whether these explanations are right or not, it has to be emphasized that the European banks did not turn their unsatisfied demands for central bank money to the MLFs. On the contrary, these facilities were used to a larger extent only after the exceptional cases of *underbidding*, e.g. after the auctions of February 14 and April 10, 2001 when banks used the MLFs for a total amount above € 60 billions – nearly equivalent to the total underbidding amount of € 52 billions (Vento 2004, 81 f.). The ECB’s monetary statistics clearly show that MLFs are used regularly, and even in cases of overbidding, in a minor scale only. In the early days of the Eurosystem, in February 1999, they provided liquidity to the banks at an amount of € 3.8 billions, while the MROs and LTROs provided €104.6 and 34.2 billions respectively (ECB 1999, 8\*). In 2003, the MLFs had decreased to even more negligible amounts – ranging between € 0.1 and 0.6 billions, with a range of € 179.5 to 235.5 billions for the MROs and € 45 billions for the LTROs (ECB 2004a, S 9).

The small figures are not surprising, because the banks only use the MLFs “when there are no other alternatives” in the money market for overnight loans (ECB 2004b, 74). They *cannot* use them as an alternative to their demands unsatisfied by the MROs and LTROs.. If the banks would turn to the MLFs, the Council would forcefully restrict such a demand. “There is no limit on resources to the standing facilities, although the ECB [the Council] may impose *restrictions* or adapt the conditions connected to their use in particular circumstances. Moreover, in the case of the marginal facility, counterparties must post an adequate amount of collateral” (ECB 1999, 31; emphasis added). In another document, the ECB explains more clearly when and why the use of the MLFs has to be restricted. Within the

monetary policy framework of the Eurosystem, the MLFs form an instrument “intended to satisfy counterparties temporary liquidity needs”, however, *not* corresponding to *what the banking system* deems to be necessary to close a liquidity deficit *but to what the Eurosystem* deems to be necessary (ECB 2004c, 23). The Council as the sovereign institution to decide on the amount of central bank money to be allotted clearly rules the roost, and not the wants of the banks. Therefore, in spite of the fact that “there is no limit to the amount of funds that can be advanced under the marginal facility”, the Council always has the power of “*suspension of the facility*” when it thinks that the banks’ demand for liquidity is not in accordance with its monetary policy goals. “Access to the facility is granted only in accordance with the objectives and general monetary policy considerations of the ECB [the Council]. The ECB may adapt the conditions of the facility or *suspend it at any time*” (ECB 2004c, 23 f.; last emphasis added).

#### IV A modified horizontal supply function of money

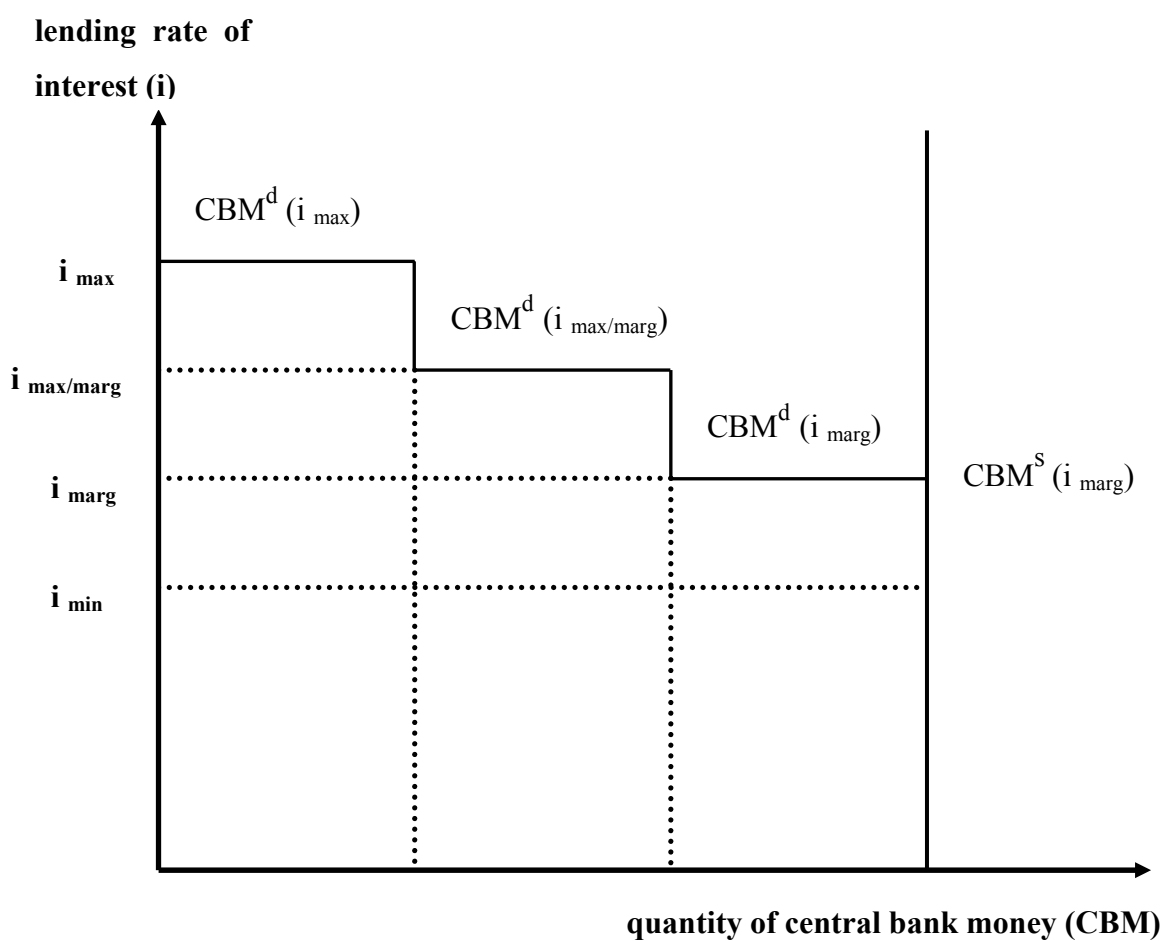
The message of the preceding section is clear. The Eurosystem can restrict its supply of central bank money. Therefore, this contribution concludes that the money supply function cannot be clearly horizontal.

Basil Moore and the adherents of the endogenous money school are right in rejecting the view that the supply of money can be determined exogenously by the central bank, because it cannot force the banking system to demand funds it does not want. However, this thesis does not imply that central bank money is fully endogenous. Central banks do not supply cash reserves in each and every case to the banking system automatically on demand at the minimum lending rate. On the contrary, they have the power to control the supply by restricting the demand through rationing or queuing when they deem the demand as endangering their capital<sup>19</sup> or interfering with their monetary policy goals if fully satisfied. Therefore, the endogenous money supply function is not clearly horizontal and has to be modified. But how?

I suggest a diagram for the MROs of the Eurosystem, with the different bid rates of interest on the vertical axis and the amount of central bank money allotted on the horizontal

axis, in which a vertical line is inserted in that part of the horizontal supply function which is related to the accepted rate of interest, the marginal lending rate. The vertical line indicates the amount of money the central bank supplies by restricting the demand for it at the marginal rate.

In *diagram 1* below, the money supply function would start as a horizontal line at the highest bid rate,  $i_{max}$ , at which the demand for central bank money,  $CBM^d$ , is fully satisfied. It is followed successively by similar, but lower, horizontal lines for all bid rates,  $i_{max/marg}$  below  $i_{max}$  and above  $i_{marg}$ , at which the demand, again, is fully satisfied. Next comes, the again lower horizontal line corresponding to the marginal lending rate,  $i_{marg}$ , at which the demand is



*Diagram 1: The modified horizontal or "staircase" supply function of central bank money*

rationed. This is shown by a vertical line, cutting or, better: “ending”, the  $i_{marg}$ -line. The vertical line represents the supply of central bank money,  $CBM^s$ , and indicates the power of the central bank to restrict the demand. It goes without saying that the horizontal line below  $i_{marg}$ , corresponding to the lowest bid rate,  $i_{min}$ , represents a virtual demand only because it is not satisfied at all. *In toto*, the money supply function looks like a descending staircase ending, not at the floor, but at a wall.<sup>20</sup>

### [Endnotes]

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<sup>1</sup> Basil Moore (1988, 222 and 254) has acknowledged, with reference to my earlier writings with Heinsohn between 1983 and 1986, that our private property approach to money implies an *endogenous* determination of the money supply. They “have argued forcefully that modern money did not evolve from commodity money to replace barter as is conventionally believed, but rather was intrinsically related to the need for credit with the development of capitalism and private property” (222). Due to a better understanding of the role of property as distinct from possession for the creation of money in our writings from 1996 onward, we have modified our view on the endogeneity of money as presented in this contribution.

<sup>2</sup> To avoid the problem of “fictitious assets”, popular in Germany in the 1920ies and decisively contributing to the destruction of its monetary system, also so-called “financial titles”, *i.e.* debt titles issued by a competing bank  $D$ , will not be accepted for the refinancing of  $A$ .

<sup>3</sup> However, Bagehot – other than Steuart, Thornton and Hawtrey – did not comprehend the full meaning of such a loss. While the latter two unequivocally saw the loss of the bank’s *own capital*, the former stressed the loss of the bank’s *reserve* in the form of its own notes. The holding of such a reserve by the Bank of England was due to its particular division into an Issue and a Banking Department. Without this particularity, a central bank never holds its notes as a reserve because for a bank of issue they are not an asset but a liability. Therefore, it deletes them from its books the very moment they flow back against the return of the debt instruments which were conditional for their creation. At the Bank of England, this demonetisation of the notes occurred at the Issue Department when it handed out gold against its notes. Therefore, the Banking Department, which could not create the notes, had to hold a reserve of banknotes equal to the amount deposited with it by the commercial banks which themselves did not hold such a reserve; see more detailed Steiger 2002, 58 f.

<sup>4</sup> This verdict also holds for a prominent Post Keynesian, Marc Lavoie, who, in an analysis of a pure credit system, emphasizes that the “unique bank could become insolvent ... if the amount of defaulting loans were to exceed the amount of own funds of the bank, thus reducing the value of assets below the value of liabilities” (2003, 515). However, when it comes to the analysis of the two-stage banking system such insights are missing in Lavoie’s discussion of the balance sheet of the central bank (2003, 519-541).

<sup>5</sup> In economic texts, the trivial necessity of double bookkeeping in the balance sheet to contra an entry on the asset side on the liability side and *vice versa*, with a surplus of (deficit) of assets over liabilities to be booked on the liability (asset) side, often leads to improper conclusions as to the character of these items, *e.g.* in the popular view of own capital or net worth as “a liability to oneself”. As a matter of course, positive (negative) own capital is no liability (claim) but an asset (liability), because it is booked on the liability (asset) side only to

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equilibrate the balance sheet. Correspondingly, in the profit and loss account the profit (loss) as surplus (deficit) of returns over costs does not mean that profits are costs and losses returns, because the former have to be booked as contra entries on the cost and the latter on the return side. To avoid such confusions, the Bank of International Settlements has proposed to call the opposite of the asset side not simply “liability side” but “liability *and capital* side”; see Blenck, *et al.* 2002, 39-42; emphasis added.

<sup>6</sup> For a further discussion of this conclusion see footnote 19 below.

<sup>7</sup> More detailed on the Eurosystem, with emphasis on its missing lender of last resort, see Heinsohn and Steiger (2004) and Steiger (2005)

<sup>8</sup> An alternative of injecting central bank money into the banking system are outright purchases of assets in foreign currency by the NCBs which would reduce the need for MROs and LTROs. However, although foreign assets in the Eurosystem provide nearly as much liquidity to the banking system of EMU as it is absorbed by the circulation of banknotes – € billions 331.3 respectively 373.2 daily average stocks between May 24 to June 23, 2003 (ECB 2004b, 88) –, additional purchases are not practiced because, other than the case of repurchase transactions used in the MROs and LTROs (see below), the risk of holding assets purchased outright is with the NCBs, and not with the private banks.

<sup>9</sup> The other factor which has a liquidity-absorbing effect for the banking system are banks’ reserve requirements. Other than the stock of banknotes in circulation (see below), theirs is clearly reliant on monetary policy operations.

<sup>10</sup> The other autonomous factors are government deposits and net foreign assets. While the former are liquidity absorbing liabilities and not under control of the central bank, the latter are liquidity providing assets and can be controlled by the central bank.

<sup>11</sup> The allocation of the MROs between the 12 NCBs and, therefore, of their share of euro banknotes is determined by the NCBs paid-up share in the ECBs capital. (The ECB is owned by the NCBs).

<sup>12</sup> As of March 10, 2004; prior to that date two weeks.

<sup>13</sup> “Standard” means tender operations conducted by a pre-announced schedule, which is completed within 24 hours from the tender’s announcement to the communication of the results.

<sup>14</sup> As of June 28, 2000; prior to that date in the form of fixed rate tenders.

<sup>15</sup> The alternative to this procedure would be a *single* rate (Dutch) auction, *i.e.* the interest rate for *all* counterparties is equal to the marginal interest rate; see ECB 2004c, 63.

<sup>16</sup> A rationing of its money supply was also practiced in the monetary policy operations of the Bundesbank before it became part of the Eurosystem. Until the mid-1980s the Bank’s MROs consisted exclusively of discounting bills of exchange or trade bills which were allotted *pro rata* to the commercial banks, *i.e.* the latter’s demand for central bank money was never fully satisfied. With the rise of repurchase agreements in the mid-1980s, discounting survived at a minor scale. As the repo rate was set above the discount rate, the acceptance of bills of exchange *had* to be rationed, of course.

<sup>17</sup> From the beginning of single monetary policy in EMU until July 2003, underbidding has occurred nine times – one before and eight after the adoption of variable rate tenders (Vento 2004, 81). The ECB regards such cases as “episodes” stemming from “significant interest speculation” (counterparties are betting on a rate cut) triggered by the duration of the MROs’ maturity of two weeks, which the Council hopes to overcome by shortening the maturity to one week as in the Federal Reserve System (ECB 2004b, 82); see footnote 11 above. For a closer look on the Eurosystem’s experience with under- and overbidding see Bindseil 2004, 5-15.

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<sup>18</sup> Variable tenders without a minimum bid rate.

<sup>19</sup> In defence of Moore's clearly horizontal money supply function, it could be argued that the central bank usually is backed by a State with the authority to tax and, therefore, the ability to refill the central bank's own capital in case of a loss. This has been done in some Latin American countries (see Fry 1997), however, with the result that their central banks, and the currencies they issue, lost reputation, as most strikingly in the recent case of the Argentine central bank during the peso crisis of 2000/01; see Steiger 2002, 49 f.. In the Eurosystem such a backing would be impossible because its NCBs – and also the ECB – are owned by the different member states of EMU, and the European Commission in Brussels disposes only of the tiny sum of about 2% of the European Union's aggregate GNP; see Steiger 2005.

<sup>20</sup> Corresponding diagrams for the LTROs and MLFs of the Eurosystem would be in no way different from that for the MROs.

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