

Läufer, Nikolaus K. A.

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A suggestion for simplifying the definition and construction of a monetary indicator

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FAKULTÄT FÜR
WIRTSCHAFTSWISSENSCHAFTEN UND STATISTIK
UNIVERSITÄT KONSTANZ

A SUGGESTION FOR SIMPLIFYING
THE DEFINITION AND CONSTRUCTION
OF A MONETARY INDICATOR

Nikolaus K. A. Läufer

Serie A — Nr. 156

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OF A MONETARY INDICATOR

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1. Introduction and summary

The concept of a monetary base plays a central role in money supply theory of the Brunner-Meltzer kind and is important in discussions about intermediary targets and indicators of monetary policy. There exists a whole family of base concepts: ordinary, adjusted, and extended bases have been defined and constructed. With the use as an indicator in mind the extended base is generally considered as the end of the development, since it incorporates all monetary policy impulses including those from changes in required reserves.

Theoretical defects in the original concept of the extended base as developed by the St. Louis Federal Reserve Bank have later called for revision. Thus, one has to distinguish between an old and a new St. Louis extended base concept. One of the aims of this paper is to clarify the defects of the old St. Louis extended base concept. Such a clarification is not unnecessary, given that the old concept is still in use at some places and that the self criticism of the St. Louis bank (see Burger and Rasche, 1977) is rather soft.

Another aim of this paper is to clarify the meaning of the central bank money stock, a concept developed and used by the German Bundesbank. The Bundesbank's concept has been criticized severely and sometimes has even been ridiculed but mainly as a quantity of money, while the monetary base aspect has been neglected. We shall throw new light on the concept of the Bundesbank by emphasizing the monetary base aspect. By modifying the Bundesbank concept a new central bank money stock is developed.

The new central bank money stock turns out to be a superior concept of an extended monetary base either on theoretical or on operational or on both grounds depending on the object of comparison. Theoretically, the new central bank money stock is equivalent to the new St. Louis extended base, while it is superior on operational grounds.

The paper ends with a suggestion for simplifying the definition and construction of an extended base. On the uses side the extended base simplifies to the sum of excess reserves and currency in circulation, while on the sources side the definition reduces to the difference between the ordinary base and required reserves. For Germany, a country where excess reserve holdings of commercial banks are negligible, the simplification implies that the extended base, if seen from the uses side, reduces to currency in circulation. To the extent that the suggested simplification is applied the analyses of money supply processes will be standardised and gain in comparability.

2. Variants of the central bank money stock/monetary base

a) The Bundesbank concept of the central bank money stock

An operational definition of the Bundesbank central bank money stock (= CBM) may be given by stating the formula for its computation:

$$(1) \quad \text{CBM}_t = \text{CC}_t + \sum_{i=1}^n r_{i0} D_{it}$$

CBM = central bank money stock

CC = currency in circulation¹⁾

D_i = quantity of category i of banks' domestic liabilities or deposits

r_{i0} = ratio of required reserves for domestic deposits of category i in base period zero. (The ratios are: .166 for demand deposits, .124 for time deposits and .081 for savings deposits. The base period is January 1974)

n = number of categories of deposits

This definition has several features:

1. non-domestic liabilities are excluded from the list of deposits when required reserves are computed as part of CBM;

2. excess reserves are not included in CBM;
3. the ratios, r_i , applied to compute required reserves over time are held constant²⁾. Thus, changes in required reserve holdings over time are exclusively related to changes in deposits.

These three peculiar features are implications of the goals the Bundesbank tried to reach when developing its CBM. In its attempt to find an intermediary target variable the Bundesbank had in mind³⁾ to construct a stock of money superior to the traditional M_1 , M_2 and M_3 concepts. The Bundesbank considered shifts in deposits due to movements in interest rates as too difficult to forecast and therefore excluded M_1 and M_2 from the list of candidates for its intermediary target variable. M_3 on the other hand, again in the view of the Bundesbank, while excluding some but not all asset shifts of wealth holders had the disadvantage of attaching equal, i. e. too much weight on deposits whose moneyness was lower than that of currency in circulation. The Bundesbank decided to take the January 1974 ratios of required reserves as representatives of the degree of moneyness of the various deposit components included in M_3 . This procedure has not escaped criticism. It has been pointed out that currency is receiving relatively too much weight and that relative moneyness of the various deposits included is not well reflected by relative reserve ratios⁴⁾.

On the other hand, it is in perfect agreement with conventional monetary theory to limit the stock of money concept to domestic deposits and to exclude non-domestic liabilities. Obviously, the Bundesbank has highly emphasized the medium of exchange function and deemphasized the store of value function. Otherwise the degree on moneyness assumed for the various assets would be more in line with those implicit in M_3 .

The aforementioned criticism of CBM has been directed entirely by the explicit goal of the Bundesbank which is to construct a quantity of money and has neglected too much the monetary base aspect of CBM. While the points of criticism in the literature

with respect to the quantity of money aspect of CBM are well taken, an evaluation of the merits of CBM along monetary base lines has been neglected. It is my goal in this paper to show that slight modifications of CBM make it an attractive monetary base concept.

b) A new concept of the central bank money stock

I shall slightly change the Bundesbank definition of CBM and include excess reserves. The reader will certainly note that in principle, i. e. theoretically this addition is tantamount to a departure from the Bundesbank rationale for CBM. I am shifting the emphasis from the money stock aspect to the monetary base aspect.

The new CBM-concept has the following formal expression:

$$(2) \quad \text{CBM}_t = \text{CC}_t + \text{RE}_t + \text{RR}_t^c$$

where

$$(3) \quad \text{RR}_t^c = \sum_{i=1}^n r_{io} D_{it-1}$$

RE = excess reserves

RR^c = required reserves at constant ratios (c for constant ratios)

A second departure from the Bundesbank definition of CBM is given by the use of lagged deposits (D_{it-1} instead of D_{it}). This is an inessential feature and will be discussed later⁵⁾. This departure allows to minimize the difference between the new CBM-concept and the St. Louis extended base concepts and to be as focal as possible to the main points to be made. In order

to discuss and justify this new concept, I shall consider the St. Louis concepts of the extended base.

c) The old St. Louis concept of the extended base⁶⁾

The old St. Louis concept of an extended base may be represented by the following expression:

$$(4) \quad EB_t = CC_t + RE_t + RR_t + LR_t^{S,0}$$

where

$$(5) \quad LR_t^{S,0} = \sum_{i=1}^n \sum_{\tau=1}^t - (r_{i\tau} - r_{i\tau-1}) D_{i,\tau-1}$$

$$(6) \quad RR_t = \sum_{i=1}^n r_{it} D_{i,t-1}$$

EB = extended base

CC = currency in circulation

RE = excess reserves

RR = required reserves

$LR^{S,0}$ = liberated reserves (superscript for old St. Louis)

D_i = bank liability, category i

r_i = ratio of required reserves for deposits of category i

The St. Louis rationale for adding the liberated reserves to a monetary base is to extract the required reserve policy impulses away from the money multiplier and to transfer them to the monetary base.

The extended base then is expected to be concentrating all the monetary policy impulses while the associated money multiplier is not any more influenced directly by current monetary policy, but only indirectly through changes in the structure of asset holdings arising from policy induced changes in the array of interest rates⁷⁾.

d) The new St. Louis concept of the extended base

The new St. Louis concept of the extended base was introduced by BURGER and RASCHE (1977) and recently applied by DEWALD (1979). It uses a new definition for liberated reserves ⁸⁾:

$$(7) \quad LR_t^{S,n} = - \sum_{i=1}^n (r_{it} - r_{i0}) D_{i,t-1}$$

which replaces $LR_t^{S,0}$ in (4).

e) Formal symmetry and equivalence between the new CBM-concept and the new St. Louis concept of an extended base

Before turning to a criticism of the old St. Louis concept, I shall establish a formal symmetry between my definition of CBM and the St. Louis extended base concepts.

$$(8) \quad CBM_t = CC_t + RE_t + RR_t + LR_t^C$$

where

$$(9) \quad LR_t^C = (RR_t - RR_t^C) = - \sum_{i=1}^n (r_{it} - r_{i0}) D_{i,t-1}$$

RR_t and RR_t^C are defined as in (6) and (3) respectively.

Equation (8) is a restatement of equation (2) using (9) which is a new concept of liberated reserves: LR^C . This restatement provides for a formal symmetry to equation (4). Furthermore it shows that by adding the new instead of the old St. Louis concept of liberated reserves to a monetary base the new CBM-concept is obtained. Thus the new CBM-concept and the new St. Louis extended base concept are equivalent in a material sense (provided the same base periods are chosen, consistently).

3. A critique of the old St. Louis concept of liberated reserves

a) Defects of the old St. Louis concept

The use of the old St. Louis concept in constructing the extended base was supposed to have the following effects:

- 1) to make the money multiplier independent from changes in required reserves (independence);
- 2) to concentrate all the impulses of monetary policy in the extended base (concentration).

However, the old St. Louis concept of liberated reserves is not performing satisfactorily if judged by these expectations. The money multiplier that is associated with the old St. Louis extended base is only independent of the current ratio of required reserves, but is dependent on the array of past ratios of required reserves. In addition, the money multiplier is via the liberated reserves ratio (l_t) dependent on the whole series of past deposit volumes. This dependence may be called historical path dependence and is obvious from the construction of the corresponding money multiplier (see Table 1).

TABLE 1

M_1 -money multipliers for two concepts of the monetary base

	<u>old</u> St. Louis extended base concept	<u>new</u> central bank money concept
multiplier	$\frac{1 + k_t}{(r_t + t_t^e + l_t)(1 + t + s) + k_t}$	$\frac{1 + k_t}{(r_o + r_t^e)(1 + t + s) + k_t}$

where

$$r_t = \frac{r_t^d \cdot D_t + r_t^t \cdot T_t + r_t^s S_t}{D_t + T_t + S_t}$$

$$r_t^e = \frac{RE_t}{D_t + T_t + S_t}$$

$$l_t = \frac{LR_t^{s,0}}{D_t + S_t + T_t} \quad (\text{liberated reserves ratio})$$

(table 1 continued)

$$LR_t^{S,0} = \sum_{\tau=1}^t - (r_{\tau}^d - r_{\tau-1}^d) D_{\tau-1} + \sum_{\tau=1}^t - (r_{\tau}^t - r_{\tau-1}^t) T_{\tau-1} \\ + \sum_{\tau=1}^t - (r_{\tau}^s - r_{\tau-1}^s) S_{\tau-1}$$

r , r^e , l are ratios of required, excess, and liberated reserves with respect to total bank deposits ($D + T + S$), which are the sum of demand (D), time (T), and savings (S) deposits, while t , s and k are the ratios of time and savings deposits and of currency with respect to demand deposits.

(end of table 1)

Since the money stock given at any moment of time is defined independently of the historical path of monetary policy with respect to required reserves, the historical path dependence of the money multiplier is neutralized by a complementary historical path dependence of the extended monetary base. This historical path dependence of the old extended base introduces entirely arbitrary dynamics into the analysis of the money supply by its components (multiplier and base).

The failure to reach the concentration goal is a direct consequence of the historical path dependence of the old extended base and its associated multiplier.

Direct inspection of the multiplier for the new CBM concept makes it obvious that there is no path dependence in the sense used so far and that by complementarity CBM itself is independent of the path of reserve policies in the past. Of course, the same result is obtained by direct inspection of the definition of CBM via (8) and (9). Thus, by the new concept both the independence and the concentration goal is reached.

b) Source of the defects of the old St. Louis concept

It may interest some readers to identify the true source of this path dependence of the old St. Louis extended base and path independence of CBM. A first step into this direction is to note

that the two concepts coincide if there is no change in the volume of deposits over time. Such constancy eliminates the path dependence of the old St. Louis extended base. For further identification of the true source of path dependence of the old St. Louis concept it is not necessary to assume a multitude of deposits. n may be restricted to 1. Equations (3), (5), (6) and (9) then simplify to:

$$(3') \quad RR_t^C = r_0 D_{t-1}$$

$$(5') \quad LR_t^{S,0} = \sum_{\tau=1}^t - (r_{\tau} - r_{\tau-1}) D_{\tau-1}$$

$$(6') \quad RR_t = r_t D_{t-1}$$

$$(9') \quad LR_t^C = - (r_t - r_0) D_{t-1}$$

From inspection of (5) or (5') we find that the old St. Louis concept of liberated reserves is a summation of initial stimuli exercised by past actions of monetary policy using the instrument of required reserves. Any single initial stimulus in (5') may formally be expressed by (10) and interpreted as a weighted reserve policy action:

$$(10) \quad \underbrace{- (r_{\tau} - r_{\tau-1}) D_{\tau-1}}_{\substack{\text{weight of} \\ \text{reserve} \\ \text{policy action}}} \\ \text{reserve policy} \\ \text{action}$$

Expression (5') is a summation of reserve policy actions using historical weights. It implicitly assumes that the relevant weight for the present time t of a policy action taken in the

past at time $\tau (< t)$ is correctly measured by the past volume of deposits ($D_{\tau-1}$). I think this assumption is wrong. Any reserve policy action in the past has a different value today if the volume of deposits has changed since the time when the policy action was taken. A present value expression for a past reserve policy action is

$$(11) \quad - (r_{\tau} - r_{\tau-1}) D_{t-1} \quad (\tau < t)$$

Thus an appropriate expression for liberated reserves would be obtained not by summing up initial stimuli at historical or past but initial stimuli at present values. Such a summation leads to LR_t^C .

$$(12) \quad \sum_{\tau=1}^t - (r_{\tau} - r_{\tau-1}) D_{t-1} = D_{t-1} \sum_{\tau=1}^t - (r_{\tau} - r_{\tau-1}) \\ = - (r_t - r_0) D_{t-1} = LR_t^C$$

Of course, the same expression (12) is obtained if we replace in (5') $D_{\tau-1}$ by D_{t-1} . This shows that our new concept of liberated reserves is equivalent to the old St. Louis concept of liberated reserves if the latter is combined with the as if assumption of constant volumes of deposits over time equal to the "present" volume D_{t-1} ⁹.

In the old St. Louis concept of liberated reserves the current locking in or liberating effect of changes in required reserves is only computed once and is not updated if the volume of deposits changes. This introduces path dependence, i. e. dependence on the history of both deposits and required reserve ratios. To obtain path independence continuous reevaluation of past policy actions is required.

It is clear by now that the original St. Louis concept of liberated reserves is concerned with the wrong question. For the proper evaluation of current monetary policy impulses it is irrelevant and meaningless to ask for the amount of reserves that became locked in or released (liberated) somewhere in the past. The relevant question is to ask for the amount of reserves that is presently locked in or liberated due to actions of reserve policy in the present and the past. For the answer to this second question the particular path of past reserve policy actions is completely irrelevant.

c) Defending the critique

Perhaps, by now, the reader has accumulated some opposition against my demand for path independence. The dynamics of the money supply process may very well require path dependence. However, such an objection may be countered easily.

- 1) Monetary base and central bank money concepts as used here are related to the Brunner-Meltzer nonlinear money supply hypothesis which is essentially static due to an underlying assumption of rapid convergence of money supply processes to equilibrium positions. For this reason dynamics are excluded from base concepts if not justified as for example by lagged reserve requirements.
- 2) If dynamics in form of historical path dependence are introduced for one instrument of monetary policy, why, then, not also for other instruments? What reasons exist for an asymmetric treatment of the various measures of monetary policy?
- 3) I do not oppose dynamics as such but criticize the arbitrariness of the dynamics, i. e. the lack of theoretical basis for the particular dynamics contained in the old St. Louis extended base and liberated reserves concepts.

4. The new concept of central bank money stock in comparison

a) with the old St. Louis extended base

The superiority of the new concept of CBM is a direct implication of all the defects of the old St. Louis concept of liberated reserves which are not present in the new concept of liberated reserves. A list of advantages of the new concept of CBM may look as follows:

- 1) The impulses of monetary policy are all concentrated in CBM.
- 2) The associated money multiplier is independent from current, past and future changes in required reserves¹⁰⁾.
- 3) Consistent with the static character of the underlying money supply theory, both the new CBM and the associated money multiplier are independent of the particular historical path of monetary policy (including policies with respect to required reserves).
- 4) The new concept is free of arbitrary dynamics.
- 5) The various kinds of monetary policy are treated symmetrically.
- 6) In order to account for current policy impulses, past policy actions are evaluated properly.

b) with the Bundesbank central bank money stock

The new concept of CBM is different from the CBM-concept of the Deutsche Bundesbank for two reasons:

1. excess reserves are excluded from the Bundesbank concept;
2. the Bundesbank concept uses D_{it} instead of D_{it-1} (see equations (1), (2), and (3)).

Ad 1:

We have already stated the reason for the exclusion of excess reserves from the Bundesbank concept. The Bundesbank did not have in mind to construct a monetary base but a quantity of money.

Ad 2:

Consistent with its goal of constructing a quantity of money the Bundesbank uses current and not lagged deposits. Again, consistent with the different goal of constructing a monetary base when reserves are lagged, it is appropriate in the new concept to use lagged deposits. However, if reserve requirements are not lagged then lagged deposits are not justified theoretically, but may be used as a forecast of the appropriate unlagged deposits if better information is not available. The availability of such information is, of course, dependent on the time of use of the new monetary base (ex post or ex ante)¹¹).

With unlagged reserve requirements the new CBM differs from the Bundesbank CBM only by excess reserves. By theoretical standards these differences imply superiority of the new CBM as a monetary base. A discussion of the practical relevance of this difference for Germany will be given presently.

In Germany (West) excess reserves have always been relatively unimportant. In a normal month like November 1978, excess reserves have been lower than a fifth of one percent (.00163) of Bundesbank CBM, while in December 1978, the ratio has been below four fifths of a percent (.00792). Decembers are exceptional months, in which excess reserves are abnormally high for window dressing purposes. When dealing with monthly data reserve requirements in Germany (West) are not sufficiently lagged to invalidate the assumption of unlagged reserve-requirements. By implication then and disregarding, transitorily, foreign deposit liabilities, the monthly series of CBM as published by the Bundesbank very closely approximates my new concept of CBM and the error, that is caused by omitting excess reserves, is negligible. (The correlation coefficient for the two monthly series of CBM between January 1976 to September 1979 is .9998.)

Obviously, for some time, and perhaps not knowingly, the Deutsche Bundesbank has been providing measurements for a monetary base which, to the extent that foreign deposit liabilities may be neglected (closed economy), I consider to be conceptionally superior to the old St. Louis extended base and to be operationally superior to the new St. Louis extended base¹²⁾.

Now, we cannot continue to avoid the question of including Banks' foreign deposit liabilities into the new concept of a central bank money stock. If reserve holdings are required for foreign liabilities (deposits) then they should be included in the definition of required reserves and in the definition and construction of the new CBM which is a monetary base concept while they should not be included in the construction of a domestically relevant quantity of money. Thus required reserve holding for foreign liabilities increase the potential degree of deviations between Bundesbank measurements for the Bundesbank's CBM and correct measurements for the new CBM.

c) with the new St. Louis extended base

We have already pointed out that the new CBM-concept and the new St. Louis extended base concept are equivalent if the base periods chosen do not differ. However, operationally, the two concepts seem to be distinct and the new CBM-concept seems to have computational advantages. Adjustments (extensions) of the monetary base via equation (7) may become rather complicated if the system of reserve requirements is very differentiated (e. g. if there exist reserve requirements both on the level and on the growth of liabilities). In such cases the new CBM-concept allows to avoid complicated adjustments by the choice of a base period in which the system of required reserves was still in a relatively primitive or simple state thus establishing operational superiority.

5. A suggestion for simplifying the definition and construction
of an extended base

Our new CBM-concept suggests for the base period the choice of a period in which reserve requirements were still technically simple and primitive. If we follow this idea to its limit it suggests to choose a period with no reserve requirements at all. Curiously enough, in order to choose such a base period it is not at all necessary that there has ever existed a time period with zero reserve requirements in the history of the country or central bank considered. Why? The reason is simply that any period, past or present, can be the base period. In addition, since the base period needs not to be specified by its time distance from the present period t the base period may even be an arbitrary, fictitious period outside real history, past or future. For such a fictitious period, of course, nothing stands in the way of assuming reserve requirements to be zero.

Thus, by appropriate choice of the base period the new CBM-concept may be reduced to currency in circulation plus excess reserves. By equivalence, the same reduction is possible for the new St. Louis extended base concept.

(14)

$$\text{CBM}_t = \text{EB}_t = \text{CC}_t + \text{RE}_t$$

Liberated reserves become equal to minus required reserves.

(15)

$$\text{LR}_t^S = \text{LR}_t^{S,n} = - \text{RR}_t$$

This particular choice of a base period is possible under any circumstances since it does not presuppose the historical existence of periods with zero reserve requirements.

The M_1 -multiplier for new CBM and the new St. Louis extended base is

$$(16) \quad \frac{1 + k}{(r_o + r_e) (1 + t + s) + k}$$

Following the simplifying suggestions it becomes

$$(17) \quad \frac{1 + k}{r^e (1 + t + s) + k}$$

The multiplier is now directly independent of any ratio of required reserves. Indirect dependence exists of course via changes in interest rates. With a similar choice of the base period the Bundesbank CBM which neglects excess reserves becomes a monetary base concept applicable to open economies with reserve requirements for foreign deposit liabilities and reduces to currency in circulation.

$$(18) \quad CBM_t = CC_t$$

The associated multiplier expression (19)

$$(19) \quad \frac{1 + k}{r_o (1 + t + s) + k}$$

reduces to (20):

$$(20) \quad \frac{1 + k}{k} = 1 + 1/k > 1$$

In discussing the base concepts so far we have restricted our attention to the uses side of the base and have neglected the sources side. This served the purpose of highlighting the monetary base aspect of the Bundesbank CBM and its relation to the new CBM-concept as well as to the new St. Louis base concept. Choosing both an appropriate base period and an approach from the sources side the Bundesbank CBM, the new CBM and the new St. Louis base concept may all be defined as monetary bases by

$$\text{CBM}_t = \text{EB}_t = B_t - \text{RR}_t$$

where B is the ordinary monetary base defined from the sources side and consisting of a domestic and foreign component, RR being required reserves.

6. Some implications

We may further justify our simplifying suggestion by looking at its implications for the stability of the money supply process. Obviously, the difference between the new, simplified money multiplier (17) and its "old" counterpart (16) is equivalent to assuming in their denominators a lower average level of the excess reserve ratio, which has the effect of reducing the (direct) sensitivity of the money multiplier to variations of $(1 + t + s)$. In the extreme case, where excess reserve holdings are negligible, we find by comparison of (20) and (19) that the effect of our simplifying suggestion is to eliminate any direct influence of a fluctuating $(1 + t + s)$ on the multiplier. It will require a suitable nonzero correlation between $(1 + t + s)$ and k if the reduction or even elimination of the direct influence of a fluctuating $(1 + t + s)$ on the money multiplier is to decrease the stability of the money multiplier.

Here, we should distinguish an ex ante from an ex post view. We start with ex ante. We have no theoretical reason to assume, a nonzero theoretical (ex ante) correlation between k and $(1 + t + s)$. Therefore, for purely technical reasons the ex ante stability of the money multiplier will be increased, while the ex ante stability of the base, c. p., will decrease in a compensating fashion, provided the ex ante stability of the money supply process is not affected by the technical choice of a different base period. Of course, the ex ante stability of the money supply process may change, if, e. g., monetary authorities alter their policy behaviour in response to the change in base stability caused by the purely technical reason of choosing a different base period. However, we can assume this either not to happen at all or not to happen in a predictable manner. Thus, there is no point in searching for a base period that maximizes multiplier stability. Ex post the correlation between $(1 + t + s)$ and k can be anything. Therefore, the stability of the money multiplier may rise or fall with our simplifying suggestion. Since, ex post, the variation of the money stock is given the ex post empirical stability of the base will change in a predictable fashion compensating the change of the multiplier stability.

Given that the stability of both the money multiplier and the extended monetary base is affected by the choice of a base period, special attention is required to avoid erroneous interpretations of money supply processes. In an analysis with extended base concepts comparisons across different money supply processes require the choice of a standard base period. The obvious candidate is a real or fictitious base period with zero reserve requirements.

7. Conclusion

As an extension of the Bundesbank concept of central bank money our new concept of central bank money is a monetary base equivalent to the new St. Louis extended base. Our suggestion to choose as base period either a real or an entirely fictitious period with zero reserve requirements simplifies the definition of an extended base. Following this suggestion on the uses side both the St. Louis extended base and the new central bank money stock reduce to the sum of currency in circulation plus excess reserves. In countries like Germany where excess reserve holdings by commercial banks are negligible both the extended base and the new central bank money stock are equivalent to the Bundesbank central bank money stock which neglects excess reserves. For such countries the suggested choice of a base period makes the three concepts reduce to currency in circulation¹³⁾. Following the suggested simplification in defining the three base concepts from the sources side the definitions reduce to the difference between the ordinary monetary base as defined from the sources side and required reserves. Thus, paradoxically, the extended base turns out to be a reduced base. Applying the suggested simplification will standardize the analysis of different money supply processes and increase their comparability.

Footnotes

- 1) The Bundesbank has changed its definition of CC over time. Since March 1978 CC does not anymore include bank's cash balances of domestic notes and coins which became deductable from required reserve holdings at the central bank.
- 2) The constancy of the ratios of required reserves applied in the computation of CBM is signified by the timescript zero which relates to the base period. The required ratios of the base period are applied in the computation of CBM for all earlier and later periods.
- 3) The mind of the Bundesbank is here identified by means of the writings of the former head of the economics division and present vice president of the Deutsche Bundesbank, Helmut Schlesinger. See his (1976), esp. p. 444.
- 4) See A. S. Courakis, (1977), pp. 37 - 41.
- 5) We shall emphasize that the use of $D_{i,t-1}$ instead of $D_{i,t}$ may be justified either by the lag in reserve requirements or as a forecasting device in ex ante uses of the concept.
- 6) The old St. Louis concept is still in use by the German Council of Economic Experts (Sachverständigenrat).
- 7) This direct independence of the money multiplier from monetary policy is not dependent on the assumption of lagged reserve requirements. However, to maintain this independence property in the case where reserves are unlagged the $D_{i,t-1}$ in (5) should be replaced by $D_{i,t}$.
It is the definition of liberated reserves in (5), where $D_{i,t-1}$ is used instead of $D_{i,t}$ that caused my switch from $D_{i,t}$ to $D_{i,t-1}$ in the transition from equation (1) to (2). The use of $D_{i,t-1}$ in (5) has become popular even in countries where reserve requirements are not lagged. I do not want to argue with this established practice if it is justified by forecasting needs when reserve requirements are not lagged. Fortunately, the following analysis equally carries through if $D_{i,t-1}$ is consistently replaced by $D_{i,t}$ (for all $t \leq T$).
- 8) See A. E. Burger and R. H. Rasche (1977) and W. G. Dewald (1979).
- 9) "present" means presently relevant for required reserves. With unlagged (lagged) required reserves the "present" volume at time t would be $D_t(D_{t-1})$.

- 10) The size of the money multiplier at any point in time is, of course, not independent of the choice of a base period, i. e. of the level of r_0 . However, it is directly independent of changes in the ratio⁰ of required reserves, although such changes may cause a change in interest rates and induce indirect dependence. ⸢
- 11) Under present institutional arrangements in the U.S. and West-Germany the degree of laggedness is depending on the length of the time period underlying the data and analysis.
- 12) Operational superiority will be demonstrated in the next paragraph.
- 13) For Germany the coefficient of correlation between currency plus excess reserves and currency is 0.9996 (monthly data, seasonally adjusted, January 1950 - December 1979).

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