The Determinants of the Commercial Banks' Credit Potential in a Mixed Money System

1. For the purpose of the present study a "mixed money system" is taken to mean a monetary system in which Central Bank money (comprising notes of and deposits at the Central Bank) and sight balances (demand deposits of non-bank customers (the public and the State) at the commercial banks (which may be called commercial banks' deposit money) serve as payment media, while Central Bank money is the sole ultimate legal tender. We speak of a single-tier mixed money system when the credit apparatus consists of a single Central Bank and a group of commercial banks.

The credit apparatus in most countries nowadays corresponds to the pattern of the single-tier mixed money system. There is an exception in the case of the German Federal Republic, which has a two-tier mixed money system. This system comprises a number of Landeszentralbanken (namely 9 Landeszentralbanken) and the Bank deutscher Länder, which is superior to them and has the sole right to issue bank notes; the Bank deutscher Länder however does not issue these bank notes itself, but puts them into circulation through the Central Banks. Just as the commercial banks keep accounts at the Landeszentralbanken, so these latter keep accounts at the Bank deutscher Länder; and just as the public borrow at the commercial banks, so the Bank deutscher Länder lends at the Landeszentralbanken.

There are however direct banking relations between the Bank deutscher Länder and the commercial banks. Relations between the commercial banks and the Bank deutscher Länder exist only through the Landeszentralbanken. These are however direct banking relations between the Bank deutscher Länder and the Federal Government.

The difference between the West German two-tier system and the one-tier system in other countries is however only of an organisational kind. From the point of view of credit policy the credit apparatus in the German Federal Republic works like a one-tier system.

2. Let us now consider to what extent the system of commercial banks in the one-tier mixed money system can grant credits to nonbanks without resorting to the Central Bank. The question is thus not what amount of credits is in fact granted in a given period without resort to the Central Bank. What we do want to know is the credit potential of the commercial banking system, that is to say the maximum volume of credit which it can grant without recourse to the Central Bank.

3. In considering this question we shall start from the assumption that the banks are required to keep certain minimum reserve ratios in the form of sight balances at the Central Bank (1).

Let us call the minimum reserve ratio r, the percentage being expressed in the form of a fraction; and let us call the sight liabilities or demand deposits of a commercial bank D. Then sight balances to the extent of at least rD will have to be kept at the Central Bank (2).

Now it is at once clear that any "individual" commercial bank cannot grant fresh credits without resorting to the Central Bank only if its stock of Central Bank money, that is its so-called cash reserve (Barrenreserven), exceeds the minimum reserve requirement rD — or in other words if the commercial bank has at its

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(1) The deductions are also valid if the commercial banks maintain certain reserve ratios as a matter of habit.

(2) In the German Federal Republic this required minimum reserve has to be credited on the average of the month.
disposal surplus cash, the amount of that surplus cash being determined by the difference between the cash reserve and the minimum reserve requirement. Evidently the size of the surplus cash determines the maximum amount up to which the individual bank can grant fresh credits (always of course without resort to the Central Bank). This maximum amount is what we call the credit potential or the margin of credit grantable by the individual commercial banks. The bank in question can of course widen that margin by discounting bills or taking loans at the Central Bank. But the consent of the Central Bank will always be a prior requirement for such enlargement. Without resorting to the Central Bank the individual bank can grant credits only up to the amount of its surplus cash.

4. Now it is a central proposition in modern credit theory that the commercial bank system, in the sense of the whole body of commercial banks, can build on the basis of a given amount of surplus cash a volume of credit equal to several times that amount. This process, known as the multiple creation of deposit money, has been described so often that there is no need to go into the actual process in this study (3). Let us call the surplus cash existing in the commercial bank system, in the sense of the total of the amount of surplus cash in the individual commercial banks, $\Delta L$; the minimum reserve ratio $r$, where $0 < c < \Delta L$; and the fraction of the newly granted credits which the borrowers withdraw in Central Bank money and which remains in the hands of the public $e$, where $0 < e < 1$. Then the limit $\Delta L$ for the expansion of credit by the commercial banking system will be given by:

$$\Delta L = \frac{1}{r + c} \Delta L$$

It is simple to deduce this relation. We use the following notations:

$\Delta L$ the maximum volume of credit which can be created on the basis of this surplus cash;

$\Delta N$ the part of $\Delta L$ which is withdrawn in Central Bank money and remains among non-banks;

$\Delta D$ the part of $\Delta L$ which is kept in the form of sight balances at the commercial banks;

$\Delta Z$ the part of the excess cash remaining in the commercial bank system (that is to say, the cash reserve which has to be held against $\Delta D$);

$c$ the percentage ratio of cash out-payments to the credit granted;

$r$ the minimum reserve ratio of the commercial banks.

Between these 7 quantities we now have the following 4 relations:

[2] $\Delta N = c \cdot \Delta L$

[3] $\Delta L = \Delta D + \Delta N$

[4] $\Delta Z = r \cdot \Delta D$

[5] $\Delta Z = \Delta Z - c \cdot \Delta L$

The question now is what values $\Delta L$, $\Delta D$, $\Delta N$ and $\Delta Z$ must have for given values of $\Delta Z$, $r$ and $c$; that is to say, what is the maximum volume of credit and deposits that can be created with given surplus cash, given payment habits among the public, and a given minimum reserve ratio for the commercial banks. A further question is how the surplus cash originally present will be distributed between banks and non-banks, when the credit potential is fully used.

By using [2] we have from [3]:

$$\Delta D = \frac{1}{r + c} \Delta L (1 - c)$$

Similarly we have from [5]:

$$\Delta Z = \Delta Z - c \cdot \Delta L$$

And from [4] it follows that:

$$\frac{\Delta N}{\Delta D} = \frac{1}{r + c} \Delta L (1 - c)$$

From [8] we have, by solving for $\Delta L$:

$$\Delta L = \frac{\Delta Z}{r + c} \cdot (1 - r)$$

For $\Delta N$ it follows from [2] that:

$$\frac{\Delta N}{\Delta Z} = \frac{c}{r + c} \cdot (1 - r)$$

For $\Delta D$ we now have from [3], by using [9] and [10]:

$$\Delta D = \frac{1}{r + c} \Delta Z$$

The matter may be made clearer by a numerical example. Let $\Delta Z = 110; r = 0,1$ and $c = 0,4$. Then the credit potential of the banking system will be:

$$\Delta L = \frac{1}{1 + 0,2} \cdot 110 = 200$$

Where full use is made of the credit potential, there will come into existence at the commercial banks new demand deposits amounting to:

$$\Delta D = \frac{1}{r + c} \Delta L = 200$$

The amount of Central Bank money lost by the banking system will be:

$$\Delta N = \frac{1}{r + c} \Delta L (1 - c)$$

The remainder of the original surplus cash, namely 10 DM, remains in the banking system as a minimum reserve against the new volume of deposits.

5. As can be easily shown, the relation [1] or the relation [11] deduced from it is identical with relation [d] deduced by Professor A. Gambino in his work on page 218 of No. 30 of this Review for September, 1924 (4). Let us take $k$ to denote the ratio of $\Delta N$ to $\Delta D$:

$$k = \frac{\Delta N}{\Delta D}$$

As can be easily seen, the deposit multiplier \( \frac{1}{r + k} \) in [13] or in [11] may assume all positive values. It may be smaller or greater than \( r \), and may also be equal to \( r \).

What is of course of special interest from the economic point of view is the credit potential of the commercial bank system. We shall therefore deal mainly with this point. Apart from this the maximum volume of deposits

\[
\text{VALEUS OF MONEY-CREATION MULTIPLIER} \quad \left( \frac{1}{r + k} \right)
\]

\[
\begin{array}{cccccccccccc}
\text{\( r \)} & 0.0 & 0.1 & 0.2 & 0.3 & 0.4 & 0.5 & 0.6 & 0.7 & 0.8 & 0.9 & 1.0 \\
\text{\( k \)} & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 & 0.0 \\
\end{array}
\]

and the credit potential are closely related. From [13] and [15] it follows that:

\[
\Delta D = \frac{1}{r + k}
\]

Thus the volume of deposits corresponding to any given credit potential is always smaller than that credit potential. The ratio of \( \Delta D \) to \( \Delta L \) depends only on \( k \), and becomes smaller as \( k \) becomes greater.

8. From the relations [1] or [15] and [11] or [13] we can now immediately see what are the factors determining the credit potential and also the absolute magnitude of the corresponding volume of deposits in the commercial bank system. These factors are:

(a) the excess cash \( \Delta Z \) in the commercial bank system;
(b) the minimum reserve ratio \( r \);
(c) the payment habits of non-bank customers given by \( r \).

These three quantities give the factors which, as Gambino rightly points out (6), directly and explicitly determine the credit potential and the corresponding volume of deposits. Let us consider these quantities in a little more detail.

As to (a): In all banking systems which have at their disposal the instrument of open market policy, the excess cash is a fixation parameter of the Central Bank. By buying or selling fixed interest-bearing securities on the open market the Central Bank can increase or reduce the quantity of Central Bank money present in the commercial bank system, and can thereby vary the amount of the surplus cash accordingly.

In the German Federal Republic the Central Bank is allowed to conduct such open market operations only on the money market, that is to say on the market for Central Bank money where the banks appear with offers and demands (7). As the Bank deutscher Länder states in its Report for the year 1956, the possibility of affecting the course of money market rates through open market operations has however been comparatively slight so far, because the Central Banking System had available only a very small quantity of suitable securities (8). It is only since 19th May 1955 that the Bank deutscher Länder has been able to use the instrument of regulating the money market to put into circulation up to a total of DM 2,000 million in either Treasury Bills or non-interest-bearing Treasury Bonds of the Federal Government, as may be required, the latter to run for periods of up to two years (9). Such securities are bought and sold at libelous rates which the Bank deutscher Länder can fix from time to time. In this way the Bank deutscher Länder is in a position to absorb substantial amounts of liquid funds at the points where such funds initially accumulate (10). Thus the Bank deutscher Länder

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(6) loc. cit., page 219.
(7) Article 15 of the Law concerning the Establishment of the Länderbanken.
(8) loc. cit., page 55; see also pages 23, 24.
can influence not only the periodical fluctuations in money market (this being the interest-effect of its open market operations), but also the quantity of Central Bank money in the banking system (this being the quantity-effect of those operations). In conjunction with the policy of minimum reserves the Bank deutscher Länder accordingly has in its hands two very effective instruments, which might readily supplement one another (1), for the purpose of controlling the credit potential of the commercial banks.

<table>
<thead>
<tr>
<th>SIGHT LIABILITIES</th>
<th>TIME LIABILITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserve Class (a)</td>
<td>Reserve Class (b)</td>
</tr>
<tr>
<td>at a Bank</td>
<td>at other places</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

In percent of the Liabilities subject to the Reserve Requirement

<table>
<thead>
<tr>
<th>1938</th>
<th>1939</th>
<th>1940</th>
<th>1941</th>
<th>1942</th>
</tr>
</thead>
<tbody>
<tr>
<td>July</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Aug.</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sept.</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Oct.</td>
<td>10</td>
<td>10</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>1936</th>
<th>1937</th>
<th>1938</th>
<th>1939</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan.</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Feb.</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Mar.</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Apr.</td>
<td>10</td>
<td>10</td>
<td>5</td>
</tr>
</tbody>
</table>

(1) from Table II the credit institutions' Liabilities carrying the reserve requirements.

Relation (16) immediately shows that, other things being equal, the credit potential of the commercial banks will be reduced by a rating of the minimum reserve ratio and increased by a lowering of that ratio.

As to (c): The size of e or k is a fixation parameter of non-bank customers. e indicates what percentage ratio of the credits granted by the commercial banks is withdrawn by the borrowers in Central Bank money and remains outside the banks. The size of k shows how any change in the quantity of money outside the banks is distributed between notes (and coins) on the one hand and sight balances at the commercial banks on the other. Both these quantities, which as indicated above are closely related to each other, reflect whatever preference may be shown by non-banks as to the way in which they hold their cash. For a given reserve ratio r the value of e or k determines the money-creation multiplier; and consequently, for any given excess reserve, it indicates the credit potential of the commercial bank system. The more widespread the method of effecting payments (bargeldliche Zahlungswerte) is in any country, the smaller e will be, and the greater will be the money-creation multiplier for a given reserve ratio r. The latter accordingly affects the credit potential of the commercial bank system through variations in e.

(c) In 1933 J. E. Meade made some further measurements for Great Britain for the period 1925 to 1930 in a study entitled "The Amount of Money and the Banking System" (14). The quantity measured by Meade is N + D and his measurements yielded the following results:

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>N + D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1925</td>
<td>0.145</td>
<td>0.174</td>
</tr>
<tr>
<td>1926</td>
<td>0.145</td>
<td>0.174</td>
</tr>
<tr>
<td>1927</td>
<td>0.145</td>
<td>0.174</td>
</tr>
<tr>
<td>1928</td>
<td>0.145</td>
<td>0.174</td>
</tr>
<tr>
<td>1929</td>
<td>0.145</td>
<td>0.174</td>
</tr>
<tr>
<td>Average</td>
<td>0.145</td>
<td>0.174</td>
</tr>
</tbody>
</table>

Thus the values of N / N + D show a slight fall.

As to (b): In 1932, in the course of an investigation of the order of magnitude in the German monetary system (13), J. Marschak and W. Ledercer calculated values for the quantities that are relevant for this purpose. Let us call the amount of cash held by credit institutions and by non-banks respectively N_s and N, and the narrow balance of non-banks at credit institutions D. On this basis Marschak and Ledercer found for Germany in 1922/30:

\[
\frac{N_s}{N} = \frac{N}{D} = \frac{11}{2} \approx 6 \text{ to } 8
\]

and

\[
r = \frac{1}{11} \approx 6 \text{ to } 8 = \frac{1}{12} \text{ to } \frac{1}{16}
\]

(b) According to Keynes, Governor Strong estimated (12), in his evidence before the U.S. Congress Committee on Stabilisation, that the increment of cash in circulation is in the United States about 20 per cent of the increment in demand deposits, and the reserves 10 per cent of the demand deposits. Keynes then adds: "[If these figures are correct, an injection of additional resources (in cash or Central Bank money) will lead to an ultimate increase in demand deposits equal to 3.3 times the amount of the additional resources]." According to Strong's estimate the position was therefore that:

\[
k = \frac{1}{5} \text{ and } r = \frac{1}{10}
\]

and accordingly:

\[
\frac{N}{N + D} = \frac{k + r}{1 + k + r} = \frac{11}{12} \approx \frac{11}{16}
\]


no material influence on the credit potential or on the corresponding volume of deposits.

(d) An attempt to measure the preference shown by non-banks as between deposits at the commercial banks on the one hand and notes and coin on the other has recently been made by A. Gambino for the period from 1927 to 1951 in Italy (15). However, the values which he finds for \( K_n \) being the ratio of absolute volume of deposits to the amount of bank notes in the hands of the public, cannot be used for the relations which we are here considering because Gambino evidently includes deposits in \( D \) not only the slight deposits but also the time and savings deposits (16).

10. — In connection with the evaluating of these measures, within the framework of our inquiry there is an important point to bear in mind. If one has to answer the question what is the maximum amount of credits which the commercial bank system can grant on the basis of a specified surplus reserve, the only thing which is important for us to know is how the quantity of additional money that arises among non-banks when credit is granted will be distributed between notes and coins on the one hand and sight balances at the commercial banks on the other. The value of \( \varepsilon \) or \( k \) accordingly expresses the ratio of marginal and of absolute quantities. Regarded in this light, therefore, only Strong's statement would meet our requirements, while Meade's measurements, representing as they do quotients between total quantities, appear to be not relevant to the size of the credit potential. Such a conclusion would however be hasty. In Fig. 2 the \( N \)-curve is intended to represent the movement in function of time of the note and coin circulation, while the \( (N+D) \)-curve represents the movement in function of time of the money supply held in sight balances at the commercial banks. The quotient \( \frac{N}{D} \) and \( \frac{N}{N+D} \) accordingly express, at any given time, the preference between the two possible methods of holding cash. In an economy where the cashless payment system is well developed the quotient \( \frac{N}{D} \) will of course be smaller than in one where it is less developed. There can therefore be no doubt that supply habits too are reflected in the values of \( \frac{N}{D} \) and \( \frac{N}{N+D} \).

If at a given moment \( \frac{N}{N+D} = \frac{3}{4} \), then it is at all events not unfair to assume that people who take credits at around that time will on the whole dispose of the proceeds in approximately the same ratio. This on the other hand cannot be said in regard to the ratio \( \frac{N}{N+D} \), where \( \Delta N \) denotes the change in the note and coin circulation and \( \Delta (N+D) \) denotes the change in the quantity of money among non-banks in the short period \( \Delta t \). It can at once be seen that this ratio cannot express the payment habits in the short period that is considered. One need think only of the money supply is continuously rising, while the note circulation on the other hand remains constant. The quotient \( \frac{N}{N+D} \) would then be continuously constant. It would in fact be zero, and accordingly indicate constant payment habits, whereas obviously the preference of non-banks would have moved in favour of cashless trans-

FIG. 2

**QUANTITY OF MONEY IN CIRCULATION OUTSIDE THE CREDIT INSTITUTIONS**

![Graph](image)

**NOTES AND COINS IN CIRCULATION, OUTSIDE THE CREDIT INSTITUTIONS**

![Graph](image)


![Graph](image)

**TOTAL QUANTITY OF MONEY \( N+D \) IN THE GERMAN FEDERAL REPUBLIC (1954-1956)**

![Graph](image)

**VALUES OF \( e \) \( N+D \) IN THE GERMAN FEDERAL REPUBLIC (SEPTEMBER 1954 - NOVEMBER 1954)**

![Graph](image)
from 1949 to 1954. Table IV contains in Columns 1 and 2 the amount of the note and coin circulation, and of the sight balances held by non-banks in the banking system, in the form of monthly figures. Columns 3 and 4 contain the calculated values for $c$ and $\xi$. Figs. 3, 4 and 5 show the time series for the note and coin circulation ($N$), the sight deposits ($D$) of business and private customers and public authorities in the banking system, as well as the time series for the quantity of ($N + D$). From Column 4 in Table IV and from Fig. 6 it can be seen that between September, 1948 and December, 1954 the value of $c$ in the German Federal Republic shows only slight variations around 0.4. We are therefore entitled to say that on the average 4/10ths of the cash of non-banks are kept in the form of notes and coin, and 6/10ths in that of sight deposits at the banks. By comparison with what Marchak and Lederer found for 1932 these have accordingly shown some slight increase in the preference for sight deposits as against notes. For the German Federal Republic it is accordingly true to say that the way in which cash was held, and accordingly the value of $c$, can be regarded as practically constant for the period considered. Thus in substance the variations in the credit potential of the commercial banks must be attributed solely to changes in the amount of the surplus cash and in the minimum reserve ratio. The point P in Fig. 1 shows the value of the money-creation multiplier for the German Federal Republic at this present time (before Sept. 1, 1955), with the minimum reserve ratio on the average 9.7% and $\xi = 0.4$.

12. — If in any country the value of $c$ does not show the same constancy as that which we have found for Germany in the period considered, this does not of course mean that the non-banks can frustrate the Central Bank's credit policy by varying their preference as to the way in which they held their cash — always presupposing, of course, that the Central Bank has at its disposal the appropriate means of enforcing credit policy. The basis on which the commercial banks grant credit is always the existence of surplus cash $\Delta Z$. The minimum reserve ratio $\rho$ and the cash-holding preference $\xi$ or $c$ determine what is the maximum volume of credit that can be built on a given amount of surplus cash through the process of multiple creation of deposit money. It is at once clear that every variation in $\xi$ or $c$ which affects the credit potential in a direction not desired by the Central Bank can be offset by the Central Bank through appropriate variation of that surplus cash (say by the use of open market operations), and can be further offset by variation of $\rho$ in countries where the minimum reserve ratio is a fixation parameter of the Central Bank. In all cases the Central Bank is and remains the controller of the credit system and of the volume of credit. It is exclusively within the Central Bank's power to determine the extent to which it will give the banks surplus cash or take it away from them (17).

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Erich Schmalenbach

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(17) An increased propensity to save is then never a necessary prior condition for the granting of bank credits. The only thing required to enable the commercial banks to grant bank credits is the existence of surplus cash in the commercial bank system.