Banking and Monetary Policy:  
A Microeconomic Treatment

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1. Introduction

Let us first summarize the essence of our discussion briefly like this. To maximize their profits, banks try to lend as much as possible. But, as they lend more, default risk becomes higher and they must charge their customers higher risk premiums to cover the cost of default. Higher risk premiums will repress the demand of the customers for more loans and limits the credit expansion made by banks to a certain extent. The banks perform an insurance function for default risk, in the sense that they cover the default cost by charging default risk premiums. Monetary policy affects the banks' credit supply by changing their cost of holding required reserves, which depend on deposits, which are passively given to banks.

The objective of this paper is to extend the traditional microeconomic theory to the bank and build a basic model of bank credit and money supply. In a modern monetary market economy, money is supplied by banks through their loans and investments. Bank loans and bank purchases of securities create demand deposits, from which cash is derived. The original source of money supply is the bank credits. Banks are private firms, from whose profit-seeking activities money supply results. Therefore, money supply should be deduced from the profit-maximizing behavior of banks.

The standard microeconomic theory of the firm should be applied to the behavior of the banks as private firms. There is every reason that, just as individual ordinary firms supply their products through their profit-maximizing, so the individual banks supply their credits through their profit-maximizing. Total money supply is determined as an aggregation of such individual bank credits.

Many traditional macroeconomics textbooks have treated money supply as an exogenous variable. Money supply is determined as monetary base times the multiplier of credit-creation. There banks are presumed to expand their loans and investments to the limit the credit-creation process implies. But monetary base, that is, the amount the central bank lends to banks, is properly determined by the business activities of banks
rather than the central authorities: the more loans and investments the banks make, the more reserves they need and the more they must borrow from the central bank or the more securities they must sell to the central bank. It is banks, rather than the central bank, that determine monetary base.¹ How much banks borrow determines how much the central bank lends, although the central bank can control the conditions under which for banks to borrow, that is, the central bank official interest rates and legal reserve ratios.

¹Kaldor(1982) and Moore(1988) argue that the money supply is determined endogenously.

Ordinary firms maximize their profits with regard to their output. To banks, what corresponds to the output of ordinary firms, may be the amount of loans or generally the scale of bank portfolio. Banks will increase their interest or return revenues by making more loans and more investments. But this does not say that they increase their profits. When banks expand their loans and investments, their business cost, especially the cost of default will become higher. Banks will set their levels of loans and investments where the marginal revenue and the marginal cost are equal.

There are at least two main aspects of banking decision: the portfolio management and the portfolio scale. We take up the latter problem, in particular the loan volume. To banks, the liquidity management decision as to how much size of short-term assets and liabilities to hold seems to be subordinate to the decision as to what size of loans and investments to determine, which is a principal one. From the point of view of bank liquidity management, the interbank transactions of short-term assets and liabilities are important, but these assets and liabilities are offset for the banking sector as a whole and do not directly affect the total volume of bank credits. We also ignore the allocation of the total credit size to the nonbank sector between loans and investments, which seems to be a managerial decision from a long-run perspective. The decision as to how much scale of credit supply to determine is of primary importance to the bank, so we pay our attention to this aspect.

2. Default risk

Once we try to apply the theory of the firm to the bank, we should specify the revenue and cost sides of the bank.

In a simplified model where real world minor or miscellaneous items of assets and
liabilities are assumed out, the revenue of a bank may be defined as the amount of loans and investments multiplied by their rates of return. At this point we need to note that in practice the bank charges different interest rates on different borrowers according to its ratings of customers' credits, reflecting their probabilities of default. Thus some borrowers with lowest default risk are charged by the lowest interest rate r, others with higher risk by higher interest rate r+p, still others with still higher risk by still higher interest rate r+p2(assuming that p1<p2), and so on. The additional discriminating portions of interest rates, p1, p2, · · ·, imposed on its various customers can be thought of as a kind of risk premiums, which the bank is assumed to determine on its actuarial basis for each class of borrowers. We call them default risk premiums. They are a kind of cost to the bank. In view of the fact that banks charge their customers these additional premiums, we may say that banks perform an function of insuring default risk as part of their business.

To simplify, let us confine ourselves to the loan aspect of banks. Denoting the volumes a bank lends to its borrowers or borrower classes with different degrees of default risk by L0, L1, L2, · · ·, respectively, we have the following expression for the gross interest revenue of the bank:

\[
\begin{align*}
\text{(1) } rL0 &+ \left( r+p_1 \right) L1 + \left( r+p_2 \right) L2 + \cdots = r(L0 + L1 + L2 + \cdots) + p_1 L1 + p_2 L2 + \cdots \\
&= rL + p_1 L1 + p_2 L2 + \cdots 
\end{align*}
\]

where L is the total volume of loan by the bank, that is, L0 + L1 + L2 + · · · = L.

The total amount of default risk premiums, or p1 L1 + p2 L2 + · · ·, is a cost or negative revenue to the bank. This amount has to be paid by the bank in any way. Banks charge such cost to their customers in the form of additional discriminating premiums to their borrowers: they shift default costs to the borrowers. So, the default risk premiums appear on both the revenue side and the cost side of banks. Thus the profit of a bank is total interest revenue gross of default risk premiums minus total cost gross of default risk premiums. In other words, the profit of the bank is total interest revenue net of default risk premiums minus total cost net of default risk premiums. In the context of a bank's profit-maximizing, default risk premiums offset themselves on the revenue and cost sides. Therefore we may ignore default risk premiums in applying the standard microeconomic theory of the firm to banks. Thus the marginal net interest revenue of the bank becomes just the net market interest, that is, r, which is equalized to the marginal cost net of default cost in profit-maximizing.\(^2\)

\(^2\)So far investments in equities and bonds made by banks have been assumed out. But it is simple to take account of them. Suppose that a bank charges the rate of interest or return rs on the lowest risk class of securities issuers, r1+q1 on the higher risk class, r2+q2 on the higher risk class, r3+q3 on the highest risk class.
on the still higher risk, and so on. Denoting the amounts of each class of investments, \(S_i\), \(S_j\), \(\cdots\), respectively, we have the following expression for the gross revenue of the bank from its investments in securities:

\[
rS_i + (r_1 + q_1)S_1 + (r_2 + q_2)S_2 + \cdots = r_1(S_1 + S_2 + \cdots) + q_1S_1 + q_2S_2 + \cdots
\]

where \(S = S_1 + S_2 + \cdots \).

Now we have a new concept of the gross earnings revenues of a bank, which becomes the interest revenues from loans plus the return revenues from investments. So we have the following expression for the total revenue of the bank:

\[
rL + (r_1 + p_1)L_1 + (r_2 + p_2)L_2 + \cdots + rS + (r_1 + q_1)S_1 + (r_2 + q_2)S_2 + \cdots
\]

\[
= r_1(L_1 + L_2 + \cdots) + p_1L_1 + p_2L_2 + \cdots + r(S_1 + S_2 + \cdots) + q_1S_1 + q_2S_2 + \cdots
\]

The total size of assets, \(A\), is now divided into the total amount of loans, \(L\), and the total amount of investments, \(S\). Denoting the loan-portfolio ratio by \(a\), we have \(A = L + S = aA + (1 - a)A\), where, as already said, \(L = L_1 + L_2 + \cdots\) and \(S = S_1 + S_2 + \cdots\). Thus the above expression can be rewritten as follows:

\[
rA + (1 - a) rA + pL_1 + p_2L_2 + \cdots + q_1S_1 + q_2S_2 + \cdots
\]

Therefore, a new concept of return revenue of the bank net of default risk premiums becomes:

\[
rA + (1 - a) rA
\]

So the new concept of marginal return revenue becomes:

\[
rA + (1 - a) rA
\]

Alternatively, we can reinterpret the already mentioned expression (1) extensively for its terms of risky loans to include the rate of return in each class of securities and its amount invested.

Now the concept of loans should be replaced for a broader concept of bank earning assets. As a matter of course, we have to reinterpret the cost function to depend on the total amount of asset purchases \(A\).

It does not seem that the imperfections of market have anything to do with the existence of default risk premiums. Even if there is competition among banks, there would exist default risk premium charges. The market structure is one thing and the existence of default risk premiums is another.

What difference does the market structure make in the determination of the default risk premiums? In a competitive market, default risk charges on the borrowers of the same class of default risk may be equalized across banks. But the default risk charges by themselves may not be eliminated. They may continue to exist, with their different

\[
(4)
\]
amounts among different classes of borrower left, reflecting differentials in their degree of default risk. On the other hand, in an imperfect market, the safest rates and/or the default risk charges may vary across banks.

What implications does the existence of default risk premiums have for the revenue side of the banking firm? To a bank, the interest rates gross of additional default risk premiums vary from borrower to borrower. But the interest rates net of default risk premiums are uniform for every borrower. So, in competition, the average revenue net of default risk premiums for a bank are constant for the level of loans. So we may draw the bank's net average revenue curve of loans as a horizontal straight line. As the bank shift the default risk cost to its customers, the existence of default risk premiums does not affect the revenue side of the bank. For the same reason, also in imperfect competitions, the default risk charge does not affect the revenue side of the monopolistic bank.

3. Banking cost and credit supply

Now we look at the cost and supply side of a bank. For purposes of the present analysis, we divide the total cost of the bank into four basic items: (1) the cost of real resource use in banking activities, such as wages and salaries to bank employees, capital costs, rents and rentals, and use costs of intermediate products of other firms, (2) the cost of holding reserves, (3) the cost of time deposits, and (4) the cost of default. Of these categories, the cost (1) is paid for real inputs; and the cost, (2) and (3) are cost of finance. The cost of default has already been mentioned. It is shifted to each customer.

To simplify, we abstract from some details of the real world. For the time being our discussion proceeds in terms of a bank which is subject to no legal regulations, except reserve requirements. We assume that the bank does not have to hold any own capital: they can create credits on their own liabilities, that is, the demand deposits. So we ignore the cost of required capital accounts. We also assume that the bank does not have to hold deposit insurance, so we disregard the cost of deposit insurance. These issues will be taken up afterwards.

Real resource cost. First, there is the real resource cost of the banking business, excluding the above-mentioned three other kinds of cost. In ordinary businesses, this cost is assumed to be marginally diminishing on lower levels of output and marginally increasing on higher levels. In the case of banking, we have something to note. Indeed, if we consider the output of the bank in terms of banking services, the usual assumption may be true. But, if we consider it in terms of loans and investments, such an assumption may not be true. For example, how much money the bank lends may not affect the real
resource costs. In this case the real resource cost becomes a fixed one, so that the average cost is decreasing and the marginal cost is zero. Meanwhile, for another example, the more customers and the more applications the bank deals with, the more input costs are needed. In this case the average and marginal cost may be decreasing, constant or increasing. After all we take the standard assumption that at first marginal cost is decreasing and then increasing. We write the real resource cost function, $E$, as follows:

$$E(L)$$

Cost of reserves. Second, let us look at the cost of reserves, which is an important part of banking costs in connection with monetary policy, because it depends on monetary policy variables.

When banks make loans, demand deposits are created. They need to hold certain reserves against the deposits. To get reserves, the banks need to borrow from the central bank or sell assets to it, and bear the interest cost. The cost of holding reserves is the central bank interest rate $i$ times the amount of borrowing from the central bank $B$:

$$iB$$

How does a bank determine its borrowing volume from the central bank? When the bank borrows $B$ from the central bank, a reserve deposit is created and then some cash $C$ may be withdrawn from it. Now the reserve deposit $R$ after the withdrawal becomes the initial reserve deposit, which is equal to the borrowings from the central bank $B$ minus the amount withdrawn $C$:

$$R = B - C$$

The above reserves are ones that produced by borrowing from the central bank. The reserves of an individual bank are also created by interbank payments and primary deposits as well: when cash is deposited by the public or demand deposits are transferred from other banks, reserves to the bank increase. These reserves are ones that were generated by other banks' past borrowing from the central bank. Here they should be distinguished from the reserves the bank has obtained by borrowing from the central bank.

The cash withdrawn is divided into the amounts outside and inside the banks, $C_1$ and $C_2$:

$$C = C_1 + C_2$$

Defining the ratio of the vault cash to the currency outside the banks as $v$, we have

$$C_2/C_1 = v$$

The bank deposits are divided into demand deposits and time deposits. Their amounts are passively given to a bank. We denote each of the average balances of demand and time deposits during the preceding period, $D_1$ and $D_2$, respectively. We assume that a certain proportion of demand deposits at the bank tends to be withdrawn.
Defining the ratio of the currency outside the banks $C_t$ to the demand deposits $D_t$ as $z$, we have

$$ C_t = zD_t \tag{7} $$

The reserve deposits of the bank, $R_t$, are divided into the one for demand deposits and the one for time deposits, $R_{i_t}$ and $R_{z_t}$. So we have

$$ R_t = R_{i_t} + R_{z_t} \tag{8} $$

Denoting the required ratios of the central bank reserve deposits on the demand deposits and the time deposits by $u_i$ and $u_z$ respectively, we have

$$ R_{i_t} = u_i D_t \tag{9} $$

$$ R_{z_t} = u_z D_z \tag{9} $$

Substituting among the above equations (4)-(9) and solving for the borrowings from the central bank by the bank, $B$, we have

$$ B = (u_i + z + vz)D_t + u_z D_z $$

So the cost of the borrowings from the central bank by the bank is

$$ iB = i[(u_i + z + vz)D_t + u_z D_z] \tag{10} $$

Thus this reserve cost depends on the bank deposits, not on the bank loans. It also depends on various policy variables, i.e. $i$, $u_i$ and $u_z$.

As already said, individual banks are passive to deposits. Indeed, for the banking sector as a whole, lending determines deposits. When a bank makes a loan, the same amount of demand deposits are created at first. Sooner or later, the demand deposits will be transferred in checks to other banks or other branches of the bank, or withdrawn in cash, or transformed into time deposits. In any way, at an aggregate level, how much aggregate loans are made determines how much deposits are created, depending on how much deposits are withdrawn. But, for an individual bank, this is not the case. Through the above processes the bank loses its deposits. Meanwhile, deposits can be created to an individual bank passively without its making loans, when the deposits in other banks are transferred to the bank. Thus the outflows and inflows of deposits are outside a bank's control. So we should treat it as exogenously given in analyzing their choice of how much loans they make. Thus the reserves cost, which depends on the bank deposits, is of fixed nature to individual banks.

The inflows and outflows of deposit are ever occurring, so the deposit balances are ever-changing. Thus the reserve cost shifts up and down every moment over time.

**Cost of time deposits.** Third, we turn to the cost of time deposit. The interest rates on time deposits and on loans, $j$ and $r$, seem to be linked, especially in longer term, through a given production function of the bank. So we assume a certain relation between them. Denoting it by $j(r)$, we can write the cost of time deposits as:

$$ (7) $$
(11) $j(r)D_2$

This cost is also ever changing over time.

**Cost of default.** Finally, let us consider the default risk cost the bank suffers from. The default risk makes the banking business more costly, in other words, it makes the supply price of the bank loans higher. The default risk varies from customer to customer. We assume that the bank estimates the bad-debt costs against various classes of customers in one actuarial way or another.

The default cost is different in nature from other kinds of cost. It is not a true cost to banks, because they shift it to their borrowers by charging them default risk premiums, as we already discussed in the previous section.

Let us note the effects of default risk premiums on customers. Lower ratings of their credit positions imply higher premiums charged on them. Some are willing to borrow, and others not. Credits are available to some, and not available to others. As a bank expands its loans, default risk will get higher and the bank will charge higher premiums. Higher premiums will exclude increasing number of potential customers.

**Total cost.** Thus the total cost of an individual bank TC is formulated as the sum of these kinds of cost, excluding default cost, as follows:

(12) $TC = E(L) + i[(z + u_1 + vz)D_1 + u_2 D_2] + j(r)D_2$

The real resource cost function, $E(L)$, can be viewed as either of short run or long run, depending on what situation we intend to consider. So the above total cost function, TC, can be viewed also as the same.

Let us note that the above total cost consists of a controllable part and a non-controllable one. As we saw above, the real resource cost is controllable with regard to loans but the reserve cost and the cost of time deposits are non-controllable. These non-controllable cost are a kind of fixed cost, both in the short run and in the long run. As we already saw, monetary policy affects the non-controllable component of total cost, so it does not affect the marginal cost, both of the short run and of the long run, but the average cost.

**Determination of bank credits.** Now that we have cleared the problem of default risk, we can apply the traditional theory of the firm to the bank in a straightforward way.

The profit of a bank $\pi$ is defined as the total revenue net of default risk premium(1) minus the total cost net of default cost(12), so we can write it as follows:

(13) $\pi = rL - E(L) - i[(z + u_1 + vz)D_1 + u_2 D_2] - j(r)D_2$

In market, banks may be price-taker or price-maker. In case of price-taker, the interest rates are given to banks; and in case of price-maker, they depend on how much loans banks make. We have now just a price theory about how much a bank lends. Under
competition, the credit supply of an individual bank is determined where the marginal revenue net of default risk premium and the marginal cost net of default cost are equal. Under monopoly, the interest rate depends on the loan volume. So the loan volume of the bank is determined where the marginal revenue product net of default risk premium and the marginal cost net of default cost are equal.

4. Monetary policy in competition

Now we consider the effects of monetary policy on bank credit supply. For the moment we assume competition in the banking industry.

The short run. Starting with a given size of fixed factors, individual banks determine their level of loans where the marginal revenue, i.e. the market interest rate, is equal to the marginal cost. The credit supply curve of an individual bank is given by that portion of its marginal cost curve which lies above the average variable cost curve; and the aggregate credit supply function is obtained by summing the individual credit supply functions. The short-run equilibrium interest rate and credits are determined by the short-run market supply and the demand for credits.

In short-run equilibrium, before new entry, each bank may enjoy some positive (or negative) excess profits. Suppose that the market interest rate on loan is above the average cost, so the existing banks enjoy some positive profits. As already seen, monetary policy affects a non controllable and fixed part of cost, i.e. the cost of reserves, which depends on monetary policy variables, or, the central bank official interest rate i, and the required reserves ratios, u1 and u2, and hence it influences the level of average cost. For instance, monetary expansion lowers the average cost level. Of course, how much it lowers depends on how much the authorities changes the policy variables. But, in any case, the resulting changed level of the average cost remains somewhere above the lowest level of the average variable cost, because the reserves cost is one of the fixed costs; in other words, the reserves cost is not the only fixed cost. So, the banks will not change their volume of loans. On the other hand, monetary contraction raises the level of the average cost. But, the banks will not change their volume of loan, as long as the resulting level of the average cost remains to be below the market level of loan interest rate. In the short-run, monetary policy does not affect the profit maximizing condition of the banks, so the aggregate volume of loans and the total money supply remain unaffected.

The long run. What happens in the long-run? The existence of excess profits will induce new entry. The credit supply will be increased and the level of market interest rate
of loans will fall. The size of each bank will be adjusted and finally the volume of loans by individual banks is determined at the minimum point of long-run average cost, and no excess profits will be made.

The market supply curve for the long run will be perfectly elastic at the level of interest rate of loans equal to the minimum long run average cost, under an assumption of constant cost conditions. In this case, the market supply curve of loans becomes horizontal.\(^3\) The long run equilibrium market credit volume is determined by interception of this horizontal credit supply curve and the credit demand curve.

\(^3\)Kaldor(1982, p.24) deals with money supply curve to be horizontal. There the interest rate is determined by horizontal money supply curve and money demand curve which includes income as well as the interest rate.

In the long run, the interest rate is determined at the level of the lowest long run average cost, which depends on monetary policy variables. Given monetary policy variables, the long run interest rate level is determined accordingly by the cost function of the bank; at the resulting interest rate money supply is infinitely elastic; and the long run equilibrium quantity of money is determined by the resulting horizontal money supply curve and the credit demand function. Let us assume that aggregate money demand \(L\) depends on interest rate and income \(Y\), i.e. \(L = L(r,Y)\). The interest rate is determined at the minimum long run average cost,\(^4\) and, given \(Y\), the quantity of money is determined accordingly in an endogenous way. Unlike the IS-LM model, where the quantity of money is determined exogenously, in the present model, given monetary policy variables, the interest rate is determined by the profit-maximizing behavior of banks and under that interest rate the money quantity is determined by the money demand, which depends on income as well, which in turn depends on aggregate demand.

\(^4\)When Kaldor(1982, p.24) said the interest rate is an independent variable, we interpret it in such a way as we saw above.

If we start with no-profit long-run equilibrium, expansionary monetary policy reduces the fixed cost of banks, so excess profits arise in the existing banks and new entry will be induced. As a result, the volume of loans and the money supply will be increased. Monetary expansion shifts the horizontal long-run credit supply curve downwards, with the result that the level of interest rate will fall and the credit supply will be expanded. Meanwhile, contractionary monetary policy increases the fixed cost of banks and thereby shifts the horizontal long-run credit supply curve upwards. Some
banks will exit, with the result that the volume of loans and hence the money supply will be decreased and the level of interest rate will rise.

**Limited entry.** The competitive model of the banking industry as we saw above might not be realistic. Banks are under close governmental control. Entry into the banking business is carefully regulated by the government. The banks are subject to government license. New entry is limited. So the excess-profit short run situation may continue to exist even in the long run. Expansionary monetary policy, for instance, only make the banks' profits greater and does not affect their volume of loans. Meanwhile, contractionary monetary policy makes the profits of the banks less and does not affect their volume of loans so long as there are positive profits. So much for the short run effects of monetary policy.

What about the long run effects? The long run supply of an existing individual bank is determined by equating the long run marginal cost LMC and the market interest rate of loans, that is, LMC=r. Solving this equation for the bank loans L, we have the long run supply function of an existing individual bank, although the relevant one is that portion of the function for which the marginal cost exceeds the average cost. In the case of no free entry, the market credit supply curve is upward-sloping. Unlike the case of free entry, the market credit supply curve is no longer horizontal in this case. The equilibrium interest rate and credit volume are determined by this market credit supply and the market credit demand.

Monetary policy variables do not affect the long run marginal cost but the uncontrollable reserve cost. For example, monetary expansion shifts the long run average cost curve downwards. The existing banks will have more profits, but they will not change their volume of loans because the long run marginal cost remains unchanged. Meanwhile, monetary contraction shifts the long run average cost curve upwards. If we start with zero profit position, the normal profits of banks are decreased and a long run adjustment occurs, in other words, it will decrease their loans or some will go out of business. If the banks initially have profit enough, they will not change their loans, because the long run marginal cost remains unchanged.

**5. Market imperfections**

Up to this point we have assumed competition among banks. It might be questionable to treat the banking industry as competitive. There may be more or less degree of nonlegal barriers to entry. Some banks may be monopolists or oligopolists in their local markets, and others may be oligopolists in their home cities, competing in
national or international markets. There may be monopolistic situations. In the short-run banks could have their own customers who have more or less fixed preferences on their banks. In the long run customers could choose among banks.

In case banks are more or less monopolistic, the demand curves for them are downward-sloping and their interest rates on lending depend on their lending volumes. To maximize profits, individual banks will choose their levels of loans where the marginal cost and the marginal revenue are equal. As we saw above, changes in the monetary policy variables influence just the reserves cost, fixed and uncontrollable to banks. Looser monetary policy decreases the fixed cost of each bank, so it does not affect its profit-maximizing condition; and its volume of loans remains unchanged, just resulting in increased monopoly profit of each bank. Tight monetary policy decreases the monopoly profit of each bank and again its volume of loans remains unchanged as long as normal profit is not eroded.

Let us note that it is impossible to define an individual credit supply and hence the market credit supply for the case that individual banks are monopolistic on their own markets. In that case the loan rate of interest is not exogenous; the bank's decisions depend on the credit demand; and we cannot deduce what quantity will be supplied from the bank's cost function and from the interest rate actually charged. Thus we cannot define an individual credit supply function and an aggregate credit supply function. There each bank determines its own interest rate and volume of loans on monopolistic profit-maximizing behavior. In such a world the notion of aggregate volume of credit becomes a mere collection of individual bank credits.

Neither ideal competitive models nor ideal imperfect competitive models can be realistic. Their applications depend and are limited.

6. Required capital accounts and deposit insurance

So far we have assumed out some items of bank costs. But in the real world settings, law requires banks to hold their own capital and also to have deposit insurance.

Cost of required capital accounts. First, we look at the cost of required capital accounts. Denoting the required ratio of capital accounts to loans L by q, the required amount of capital accounts K becomes as follows:

\[
K = qL
\]

This amount of equity capital requires the bank to pay the implicit return to the equity owners. The cost of required capital accounts to the bank is equal to the amount of
required capital accounts multiplied by the normal implicit rate of return, which is assumed to be equal to the interest rate of time deposit \( j(r) \) in this setting, so we have the following expression for the cost of required capital accounts:

(14) \[ j(r)K = j(r)qL \]

The cost of capital accounts depends on the level of loans. The system of required capital accounts makes the marginal and average costs of loans higher.

**Cost of deposit insurance.** Second, we turn to the cost of deposit insurance. We assume that this cost is set to be a certain proportion \( s \) of total amount of all kinds of deposit \( D_1 + D_2 \). The formulation of this cost is as follows:

(15) \[ s(D_1 + D_2) \]

The cost of deposit insurance is non-controllable with respect to the loans volume. So it does not affect the marginal cost curve, only shifting the average cost curve.

**New cost function.** Taking account of the above-stated two kinds of bank cost, we have a new total cost of an individual bank, which is the basic total cost (13), added by these costs, as follows:

(16) \[ TC = E(L) + i(\{z + u_1 + vz\}D_1 + u_2 D_2) + j(r)D_2 + j(r)qL + s(D_1 + D_2) \]

7. Conclusion

In this paper we considered the bank as an output-producing firm, not as an investor or portfolio-selector, and analyzed how it determines the size, not allocation, of its portfolio. We applied the traditional microeconomic theory of the firm to the bank and tried to give a simple picture of money supply.

In a market economy, the banks are private corporations to earn profits, but they are not under laissez faire scheme. They are influenced by macroeconomic monetary policy and they must submit to governmental regulations. Profit maximization by banks is within limitations by the government.

Given market interest rate, banks are induced to lend more to maximize their profits, so long as the cost of loans is covered. But, as they expand their loans, the market interest rate will fall. At the same time, expanded loans will increase default risk and the banks will have to charge higher default risk premiums, with the result that the demand for loans will decrease. Equilibrium will be attained where marginal revenue and marginal cost are equalized on the side of individual banks and marginal borrowers accept marginal default risk premiums.

Monetary policy measures, such as operations of official interest rates and required reserve deposit ratios, affect the reserves cost of the banks, independent of their amount
of loans.

Governmental regulations for sound management and deposit protection, such as expanded deposit insurance and capital accounts adequacy requirement, are factors of increasing the total cost of the bank. Deposit insurance increases the reserves cost in a broader meaning, which is a fixed cost with respect of loans. Higher capital account requirements increase the variable cost.
The Kyoto Protocol and Political Conflicts among the Triad

References