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The Revenue from Money Creation and Its Disposition – a Theoretical Analysis

This chapter analyzes the effect of money creation on credit flows and interest rates. For present purposes several methods of money creation need to be treated separately. Currency issued by the government or a private group is one. Another is deposit expansion; franchises to supply deposit services may be granted by the government to a monopoly bank or, in a competitive system, to many banks.

The analysis takes up, first, the return obtained by issuers of money and, secondly, the manner in which they dispose of it. More specifically, we ask whether issuers of money obtain a net profit and, if so, whether such income is largely saved. If the income is saved, the total supply of real loanable funds will increase as a result of money creation; if it is spent for consumption, the total supply will be unchanged. The revenue, saving, and lending discussed here are to be understood as pertaining to *real* flows. Money creation will always increase these variables in nominal terms but will increase them in real terms only under special conditions.

The discussion is simplified by supposing that prices adjust immediately to monetary growth, that resources remain fully employed, and that any redistributions of wealth between debtors and creditors arising from unanticipated price changes can be disregarded. The discussion therefore pertains to positions of a moving equilibrium in which price changes are fully anticipated and short-run disturbances due to

incomplete adjustments are ignored. Such an equilibrium will be most closely approximated when the rate of monetary growth is constant. We shall also consider later the implications of varying rates of monetary growth.

THE REVENUE FROM MONEY CREATION

Currency Issues

Suppose that the government or a franchised group of individuals prints and issues currency which need never be redeemed. For simplicity let this currency be the only money in existence and let the cost of issue and maintenance be negligible. (The irredeemability is critical, for a currency that can be exchanged on demand for some other money must have reserves behind it, and the operation is then equivalent to fractional reserve banking, discussed later.) There are three questions to be answered. At what rate will the currency be issued? What return do the issuers obtain, and what do they do with it? The answers to these questions will indicate the effect, if any, on interest rates. We start with the first two questions, leaving the third until the second part of the chapter.

The Optimal Rate of Issue. Printing and spending irredeemable currency provides disposable income to the issuers. If the new issues are fully anticipated by the public and prices rise commensurately, a higher rate of issue may increase or decrease the real income to the issuers, depending upon the elasticity of the public's demand for real money balances with respect to the rate of change of prices. Issuing money produces a tax on money holdings, in which the tax revenue is obtained by depreciation in the real value of outstanding holdings because of rising prices.[1] The outstanding holdings, the base of the tax, will diminish for higher rates of tax (that is, higher rates of price change), and the revenue depends upon the product of the base and the rate. Let M be the money stock; P, the price level; and t, time. The preceding revenue proposition is demonstrated by identity (3) derived as follows:

[1] M. Friedman, "Discussion of the Inflationary Gap," *Essays in Positive Economics*, Chicago, University of Chicago Press, 1963, pp. 251–62.

$$M \equiv (M/P)P \tag{1}$$

$$\frac{dM}{dt} \equiv \frac{M}{P}\frac{dP}{dt} + P\frac{d(M/P)}{dt} \tag{2}$$

$$\frac{dM}{Pdt} \equiv \frac{M}{P}\frac{dP}{Pdt} + \frac{d(M/P)}{dt} \tag{3}$$

where dM/Pdt is the revenue per period of time in real terms. M/P is determined by the demand for money balances and, among other variables, depends upon real income, X, and the rate of price change, dP/Pdt. If real money balances are unchanging, we have, dropping the last term of (3),

$$\frac{dM}{Pdt} = \frac{M}{P}\frac{dP}{Pdt}. \tag{4}$$

M/P is the base to which the tax on money balances applies, and dP/Pdt is the tax rate.

If X is growing, desired M/P will also expand over time, and this allows growth of the money stock at the same rate without a rise in prices. We may assume with no important loss of generality that M/P is proportional to X (that is, that the income elasticity of real money balances is unity). Then we have, similar to (3),

$$\frac{dM}{PXdt} \equiv \frac{M}{PX}\left(\frac{dX}{Xdt} + \frac{dP}{Pdt}\right) + \frac{d(M/PX)}{dt} \tag{5}$$

where M/PX depends on dP/Pdt. For a constant rate of price change, M/PX will have a corresponding constant equilibrium value. In the long run this value will be attained and remain constant if the rate of price change is constant.[2] If real money balances are unchanging, we have, similar to (4),

$$\frac{dM}{PXdt} = \frac{M}{PX}\left(\frac{dX}{Xdt} + \frac{dP}{Pdt}\right). \tag{6}$$

This equation expresses the revenue obtained from issuing money as a

[2] Other variables which affect the demand for money, such as interest rates, are ignored for the moment. For an analysis of the case in which the income elasticity is not unity, see M. Friedman, "Government Revenue from Inflation," *Journal of Political Economy*, July/August 1971, pp. 846–56.

ratio to national income. The revenue comprises two parts, one obtained by supplying the desired growth in balances due to rising real income, and an additional part obtained by increasing prices.

Note the situation when the money stock is constant and

$$-dX/Xdt = dP/Pdt. \tag{6a}$$

Here prices decline at the rate of growth of real income. The continual appreciation in the real value of money provides an income (not counted by conventional accounting practices) to individual holders which they collectively "use" to accumulate real balances in order to keep constant the desired ratio of money to national income. The power to create money allows the issuers to collect this revenue, which they can do by issuing money at the rate $dM/Mdt = dX/Xdt$.

Among different rates of issue and corresponding rates of price change, the revenue, N, expressed as a percentage of national income, has a maximum value. It is found by differentiating with respect to the rate of price change. Let $dP/Pdt = \pi$ and $dX/Xdt = g$ (a given growth rate independent of π). Then, from (6),

$$N = (M/PX)(g + \pi), \tag{6b}$$

and

$$\frac{\partial N}{\partial \pi} = \frac{\partial (M/PX)}{\partial \pi}(g + \pi) + \frac{M}{PX} = 0. \tag{7}$$

This equation can be simplified by making use of the expression for the elasticity of demand for real balances with respect to the rate of price change (assumed to be correctly anticipated). Usually this elasticity is defined as

$$\frac{\partial (M/PX)}{\partial \pi}\frac{\pi}{M/PX},$$

which has a sign opposite to that of π because $\partial(M/PX)/\partial\pi$ is always negative. However, it is better to define the elasticity in the present context as [3]

[3] I am indebted to Alvin Marty for this point and other suggestions for improving this chapter.

$$\xi \equiv \frac{\partial(M/PX)}{\partial(\pi + g)} \frac{\pi + g}{M/PX}$$

or, assuming g is constant,

$$\xi = \frac{\partial(M/PX)}{\partial \pi} \frac{\pi + g}{M/PX} \tag{8}$$

where the ordinate of the demand curve for money balances is expressed in terms of $\pi + g$. The justification is that the revenue from money creation is positive so long as $\pi + g$ is positive, irrespective of the sign of π alone. If in this way we define ξ to be negative when the revenue is positive, the expression for finding the maximum revenue is simplified. Substituting (8) into (7) we obtain

$$\partial N/\partial \pi = \xi + 1 = 0. \tag{9}$$

Revenue is maximized when ξ, the elasticity of demand with respect to the rate of change of nominal income, equals -1. This is the standard monopoly solution. Marginal revenue is zero at that point, as is also marginal cost, since costs of issue are assumed to be negligible.[4]

By what device do money holders actually "pay" the tax revenue shown by (6b), that is, how do they transfer real resources to the issuers of new money? The holders continually use part of their income to keep their depreciating nominal balances at the desired real level. Hence their expenditures are lower by that amount, and the goods and services thus given up are purchased by the issuers of new money.

A Specified Rate of Issue. The previous analysis assumes that the issuer of money is free to choose the rate of issue. Suppose, however, that the rate is determined by market conditions. The issuer must then

[4] This result is well known and was presented in my study "The Monetary Dynamics of Hyperinflation," in M. Friedman (ed.), *Studies in the Quantity Theory of Money*, Chicago, University of Chicago Press, 1956.

There is a problem, should adjustments be instantaneous. If the demand for money were to adjust immediately to the current rate of price change, inflation would be self-generating. For the solution given in the text, it must be assumed that demand adjusts with a sufficient lag to produce a stable equilibrium. With a lagged adjustment, however, the revenue can be increased indefinitely by increasing the rate of issue, which produces accelerating inflation. Therefore, if the revenue is to remain constant over the long run, the rate of issue must be constant. See *ibid.*

take the rate as given. If the rate increases, the effect on the revenue in the long run depends upon the elasticity of the demand curve. If the demand is elastic ($\xi < -1$), the revenue declines; if inelastic, the revenue increases.

The available evidence suggests that the demand is inelastic for moderate to high rates of price change. For seven hyperinflations, I estimated that the maximum constant revenue was reached with rates over 100 per cent per year.[5] Other studies have obtained similar results[6] and also suggest that the demand is inelastic for low rates of price change. So long as the public is on an inelastic part of its demand curve, an increase in the monetary growth rate produces a larger revenue.

A given rate is relevant to banks, which maintain a reserve ratio and therefore are dependent on the growth of their reserves to expand. There are other complications for banks, too, since the assumption of zero cost is not appropriate for deposits, even as a first approximation.

Deposit Expansion of a Monopoly Bank

With banking, the total money stock consists of currency and bank deposits held by the public. (Whether time deposits are included or not makes no difference for present analytical purposes.) Since currency and deposits can be exchanged on demand, a monopoly bank will maintain some ratio of required and excess reserves to deposits in the long run. Reserves comprise non-interest-bearing currency and central-bank monetary liabilities—that is, high-powered money. The profits of the bank per period of time are the interest from earning assets held over the period, E, less the cost of interest or services on deposits, T, plus any increase in its assets from deposit expansion over the period. For the first item we have

$$E \equiv (1 - r)Di \tag{10}$$

[5] *Ibid.*

[6] See Maurice Allais, "A Restatement of the Quantity Theory of Money," *American Economic Review*, December 1966, pp. 1123–56. See also studies by Colin Campbell, John Deaver, and Adolfo Diz, in David Meiselman (ed.), *Varieties of Monetary Experience*, Chicago, University of Chicago Press, 1970; and Teh-wei Hu, "Hyperinflation and the Dynamics of the Demand for Money in China, 1945–49," *Journal of Political Economy*, January/February 1971, pp. 186–95.

where i is the nominal rate of interest net of lending costs on earning assets and $(1 - r)$ is the ratio of earning assets to deposits, D. If r is 10 per cent, each deposit created by the bank is accompanied by an increase in reserves of one-tenth and in earning assets of nine-tenths.

When prices are rising, we may calculate the real earnings on the initial stock of assets, E/P, allowing for the depreciation in the real value of the principal. Two adjustments are needed. First, we must convert the dollar amount of earnings in (10) to real terms by deflating by an appropriate price index. Second, since the *initial* stock of assets (including reserves) depreciates in real terms by $(D/P)\,\pi$, where π as before is the rate of rise in prices, this amount of depreciation must be deducted from earnings to give the real rate of return. These adjustments give

$$[(1 - r)Di - D\pi]/P. \tag{11}$$

Except for the conversion to real terms, (11) treats gross earnings according to conventional accounting practice.

The second item noted above as affecting bank profits is interest and service costs on deposits. Total costs depend on the rate of interest paid and services provided per deposit dollar and on the total quantity of real deposits. (For given real deposits, the costs of expanding nominal deposits are assumed negligible.) Service costs are introduced into the analysis later.

The third component of bank profits, increases in assets per period of time, is an unconventional item not included in published statements of earnings. Bank accountants treat an expansion of deposits as adding equally to both assets and liabilities; but if the earnings added for each new deposit exceed the costs, the present value of future income streams – that is, net worth – will increase. Continual increases in net worth due to deposit expansion may be viewed for our purposes as *current* income. Whether this income would in fact be used to increase net worth rather than be paid to stockholders or depositors will be considered later. (Some of it might be used to make up for the depreciation in real value of assets, which was deducted from earnings in equation 11.) How the income is used makes no difference here; it is simply the flow of income to the bank from the expansion of nominal

deposits. The increase in total assets from deposit expansion is dD/dt, or in real terms, dD/Pdt.

This can be expressed in a more convenient form. For a given reserve ratio and fraction of money balances held as currency outside banks, C, deposits and total money balances grow at the same rate. That is, $M \equiv C + D$ and $D \equiv [1 - (C/M)]M$; if C/M is constant, $dD/Ddt = dM/Mdt$. We shall ignore growth in real income and assume that real money balances desired by the public have a zero growth rate. This simplification makes no substantive difference. Then the price level and deposits grow at related rates. That is, $M \equiv (M/P)P$ and, if M/P is constant, $dM/Mdt = dP/Pdt$ and, from above, we have $dD/Ddt = dP/Pdt$ or

$$dD/Pdt = (D/P)(dP/Pdt) \equiv (D/P)\,\pi. \tag{12}$$

This expresses the real revenue of the bank from deposit expansion as proportional to real deposits times the rate of change of prices.

We can define net profits per period of time, N, measured in dollars of constant purchasing power, as the sum of (11) and (12) minus total costs in real terms, T.

$$\begin{aligned} N &= (1 - r)(D/P)i - (D/P)\,\pi + (D/P)\,\pi - T \\ &= (1 - r)(D/P)i - T. \end{aligned} \tag{13}$$

The first part of (13) shows that the gross *real* income of a bank equals its earning assets *measured in real terms* times the *nominal* rate of interest.[7]

The revenue from expansion makes up for the continual depreciation in the real value of the bank's financial assets. The nominal rate of interest is assumed to be exogenous to the bank, at least for the long-run equilibrium analyzed here. The rate of price change, π, is ultimately determined by the expansion of high-powered money (if r, C/M, and M/P remain constant). D/P is variable; it depends upon the opportunity cost to the public of holding deposits (i if the alternative is financial assets, and π if the alternative is real capital or goods) and

[7] The nominal rate of interest, i, in (13) may be viewed as composed of the real rate of interest plus π. Banks earn a real return on their deposits equal to the real rate of interest plus the rate of inflation, the latter reflecting the revenue from deposit expansion. It is assumed here that $di/d\pi = 1$, that is, the real rate of interest is given.

the quantity and quality of services and interest which the bank chooses to provide on deposits.

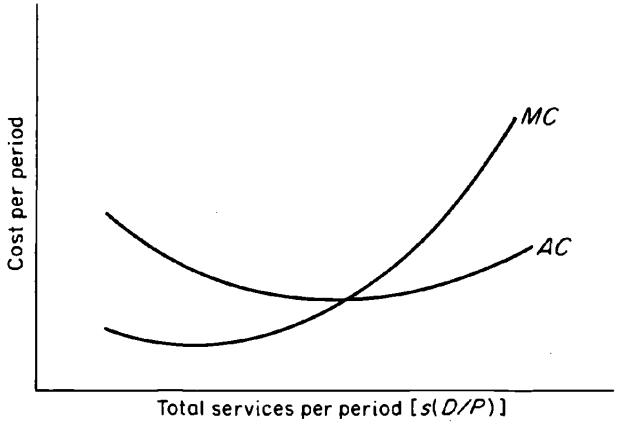
The Optimal Services on Deposits. Banks have always provided the service of clearing checks and bookkeeping for depositors' accounts. Banks also used to pay interest on some demand deposits, but interest payments on such deposits have been prohibited since 1933. In the years since then banks have expanded services on checking accounts and have adopted various devices that amount to the indirect payment of interest (such as charging less for loans if the borrower keeps compensating balances with the bank). Even in those communities where banks have succeeded in establishing and maintaining a tight cartel to obtain monopoly profits, they would not for that reason provide no services at all. On large accounts today, banks offer a variety of bookkeeping services and lines of credit. On small accounts for individuals, one important and costly service is the regular provision of currency, requiring numerous branch offices at convenient locations. Credit cards have far to go to make currency obsolete.

Nonbranch banking laws and other statutory regulations constitute an important barrier to the competitive provision of services on small accounts. Any employed person who does his shopping after work or on weekends must wonder about the still restricted business hours of most of our banks, which perpetuate an earlier tradition of offering to sell currency as infrequently as possible. Although there are some restrictions on the expansion of worthwhile services for nonbusiness accounts, there appears to be room for expanded and improved services if earnings justify them. The cost of servicing deposits is generally ignored in theories of the banking system on the grounds that they are constant.[8] This is highly dubious for demand deposits, particularly because the prohibition of interest payments induces banks to compete through services.

[8] Two recent articles which recognize in different ways the importance of servicing costs are John H. Karekin, "Commercial Banks and the Supply of Money: A Market-Determined Demand Deposit Rate," *Federal Reserve Bulletin,* October 1967, pp. 1699–1712; and Don Patinkin, "Money and Wealth: A Review Article," *Journal of Economic Literature,* December 1969, pp. 1140–60, especially pp. 1150–51. See also Benjamin Klein, "The Payment of Interest on Commercial Bank Deposits and the Price of Money: A Study of the Demand for Money," Ph.D. dissertation, University of Chicago, 1970.

FIGURE 2-1

Marginal and Average Cost of Deposit Services



To take account of bank services, we may view them as a flow per period of time like any other business or consumer service. Let us assume that the service flow can be assigned a dollar value which measures for depositors the quality and amount of service. Then we can express the service flow per period of time as a percentage of the average deposit dollar; call this percentage per year s, a nonpecuniary rate of return like the pecuniary interest rate. Note that s measures the rate of return to depositors, not the cost of providing the services. Defining and measuring the value to consumers of improvements in quality entail some problems, which we shall disregard.

The total quantity of services supplied in real terms is $s(D/P)$. By varying s, a bank can affect the quantity of real deposits demanded of it. The relation of the cost to the quantity supplied can be represented by cost curves like those for any product and presumably are subject to the standard economies and diseconomies of scale.[9] They are illustrated in Figure 2-1. (If s takes the form solely of interest payments,

[9] The value of s will depend in part upon the amount of excess reserves held, since this affects the liquidity of the bank and its ability to convert deposits into currency on demand. This dependence can be ignored here, since r is assumed not to change.

The total real cost of providing a given flow of services on deposits is assumed to depend on the real value of deposits and not to vary with changes in the nominal quantity of deposits.

there are constant costs to scale and $dT/d(D/P) = s$, a special case discussed later.) It is conceivable that the costs of providing more services may be different depending upon whether s or D/P rises; such complications are ignored here.[10]

The level of services provided is set by a monopoly bank to maximize net profits, N. For a given π and i the maximum [11] N is found by partial differentiation of (13) with respect to s. The differentiation gives (Q denotes sD/P)

$$\begin{aligned} \frac{\partial N}{\partial s} &= (1-r)i\,\frac{\partial(D/P)}{\partial s} - \left[\frac{D}{P} + s\,\frac{\partial(D/P)}{\partial s}\right]\frac{dT}{dQ} = 0 \\ &= \quad MR_s \quad - \quad MC_s \quad = 0 \end{aligned} \tag{14}$$

where MR and MC represent the marginal revenue and marginal cost of services. Equation 14 may be interpreted as setting marginal revenue equal to marginal cost according to the traditional formulation of profit maximization.

The variable which the bank controls to maximize profits is not the total quantity of real deposits or of services supplied, however, but the services provided per deposit dollar. (The total cost, of course, still depends upon the flow of total services supplied.) The bank increases services until the additional revenue just matches the increase in cost.

[10] Growth in real income produces growth in desired and actual real deposits. This affects the discounted value of the future growth in costs. Since growth in real income is assumed to occur independently of any expansion by banks of nominal deposits, we may ignore changes in real deposits and costs associated with growth in real income. However, a profit-maximizing bank would take account of the potential growth in real deposits and therefore in future profits due to income growth. A more complete analysis should allow for this.

[11] Letting $Q = sD/P$, the second derivative becomes, after eliminating s by applying (14),

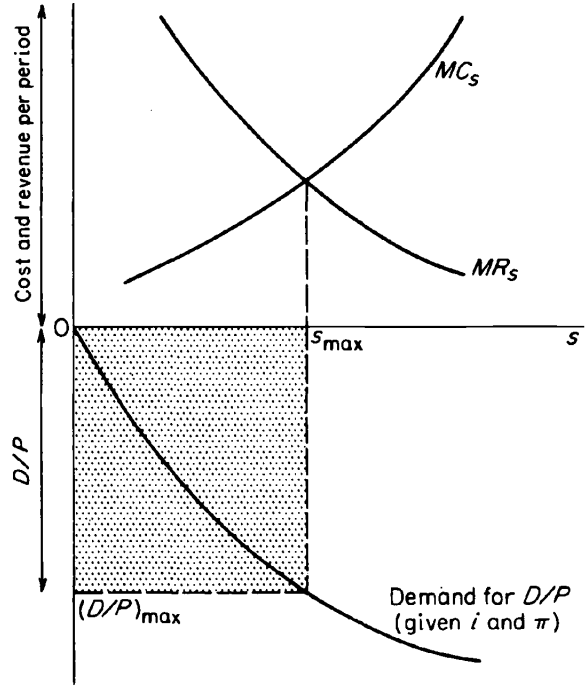
$$\frac{\partial^2 N}{\partial s^2} = \frac{d^2T}{dQ^2}\left[\frac{(1-r)i\,\dfrac{\partial(D/P)}{\partial s}}{\dfrac{dT}{dQ}}\right]^2 - \frac{dT}{dQ}\left[2\,\frac{\partial(D/P)}{\partial s} - \frac{\dfrac{D}{P}\,\dfrac{\partial^2(D/P)}{\partial s^2}}{\dfrac{\partial(D/P)}{\partial s}}\right].$$

This will be negative, indicating that (14) specifies a maximum point, under the sufficient conditions that dT/dQ and d^2T/dQ^2 are positive (which means that marginal cost is positive and rising, respectively), and that $\partial(D/P)/\partial s$ and $\partial^2(D/P)/\partial s^2$ are positive and negative, respectively (which means that the marginal effect of s on the demand for real deposits is positive but diminishing).

Given the quality provided, the total quantity of services supplied, $s(D/P)$, depends upon the demand. Consequently, while the bank determines nominal deposits, it does not directly control their real value, which is determined by the public in the light of s, i, and π. The profit maximization is illustrated in Figure 2-2. The two terms of equation 14 are graphed in the top part of the figure, with s on the horizontal axis. The demand for real deposits (for given i and π) is represented in the bottom part. It has been conventionally drawn to increase by diminishing amounts as s increases. With such a demand curve, the marginal revenue term of (14) declines as s increases, and the marginal cost term rises. At the intersection, the corresponding values of s and D/P

FIGURE 2-2

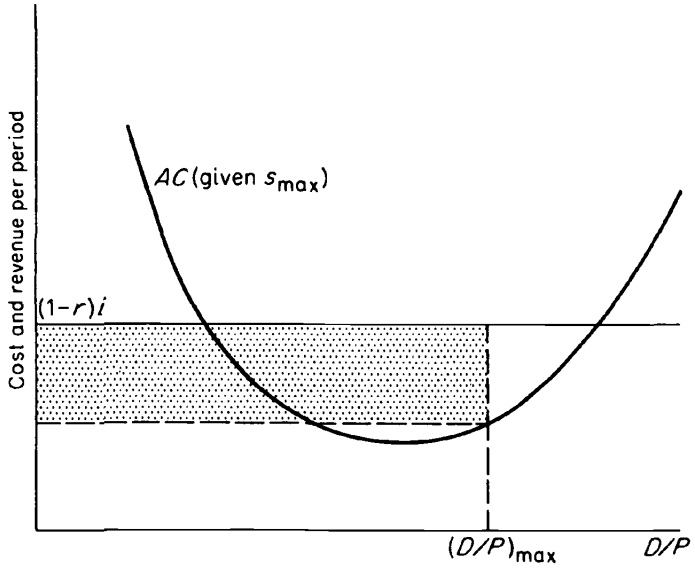
Value of s That Maximizes Net Profits



Shaded area = $s(D/P)$ which maximizes net profits.

FIGURE 2-3

Average Cost and Maximum Profits [a]



Shaded area = N_{max}.

[a] Given s_{max} and $(D/P)_{max}$ from Figure 2-2.

determine the total services supplied, shown by the shaded area. These values are used in Figure 2-3 to find the average cost and net profit per deposit dollar and the maximum total profits (shaded area). (Note that, if π changes, the maximizing value of s changes, thereby shifting the AC curve in Figure 2-3.)

Interest Payments on Deposits. Despite its prohibition, the payment of interest raises interesting and relevant theoretical points for this discussion.

If s is the rate of interest paid on deposits, total cost in real terms is simply $T = s(D/P)$. Average and marginal cost are assumed to be constant and equal to the given value of s. The net profit to the bank may be derived by writing (13) as follows:

$$N = (D/P)[(1 - r)i - s] \tag{15}$$

with a maximum given by

$$\frac{\partial N}{\partial s} = [(1-r)i - s]\frac{\partial(D/P)}{\partial s} - \frac{D}{P} = 0. \tag{16}$$

Interest payments offset the cost to the public of holding deposits, which for present purposes may be represented by the rate of interest foregone if the deposit is not invested in an interest-bearing asset. The demand for deposit balances depends upon the difference in the rate of return on deposits, s, and on other assets, i (assumed the same as for the bank). The value of the demand elasticity with respect to $i - s$ which maximizes profits according to (16) is (i constant)

$$\frac{\partial(D/P)}{\partial(-s)}\frac{(i-s)}{D/P} = \frac{-1}{1-[ri/(i-s)]}. \tag{17}$$

In the special case of no reserves ($r = 0$), the left-hand side of equation 17 reduces to -1, which reformulates the previous proposition about maximum profits to state that a monopoly bank which holds no reserves will provide services up to the point where the elasticity of demand for real deposits with respect to the public's cost of holding them is minus unity. The bank thus maximizes its profits by keeping the public's cost constant. Therefore, an exogenous change in the rate of inflation does not affect the public's cost or the bank's profits.

If r is not zero, the bank's profit in providing deposits is less than the public's cost of holding them. The consequences can be seen from (17), which has a greater negative value than minus unity. Instead of operating where the demand elasticity is -1, the bank operates at a more elastic part of the demand curve.

The Effect of Changes in Monetary Growth on Profits. What happens to profits when the rate of growth of money and prices is increased? To find the answer we may derive $dN/d\pi$ subject to the condition that $\partial N/\partial s = 0$. From (13) we obtain, assuming $di/d\pi = 1$ (see note 7, above),

$$\frac{dN}{d\pi} = (1-r)\left[\frac{D}{P} + i\frac{\partial(D/P)}{\partial\pi} + i\frac{\partial(D/P)}{\partial s}\frac{ds}{d\pi}\right] - \frac{dT}{dQ}\left[\frac{D}{P}\frac{ds}{d\pi} + s\frac{\partial(D/P)}{\partial\pi} + s\frac{\partial(D/P)}{\partial s}\frac{ds}{d\pi}\right]. \tag{18}$$

Rearranging terms we have

$$\frac{dN}{d\pi} = (1-r)\left[\frac{D}{P} + i\frac{\partial(D/P)}{\partial\pi}\right] - \frac{dT}{dQ}\,s\,\frac{\partial(D/P)}{\partial\pi} + \frac{ds}{d\pi}\left\{(1-r)i\frac{\partial(D/P)}{\partial s} - \frac{dT}{dQ}\left[\frac{D}{P} + s\frac{\partial(D/P)}{\partial s}\right]\right\}. \quad (19)$$

The differential $ds/d\pi$ shows the adjustment of s by banks to changes in π to maintain the maximum level of profits. By (14) this condition requires the second line to be zero. The expression can therefore be written

$$\frac{dN}{d\pi} = (1-r)\frac{D}{P}(1+\xi_i) - \frac{dT}{dQ}\,s\,\frac{\partial(D/P)}{\partial\pi} \quad (20)$$

for $\partial N/\partial s = 0$ and where ξ_i is the elasticity of demand for real money balances with respect to i. The second part is definitely positive, since the partial derivative there is negative. Unless the demand to hold deposits is elastic (that is, a greater negative number than minus unity), the first term will also be positive, and profits will increase with a rise in π. The demand must be highly elastic to render (20) negative.

An intuitive explanation of this result is that an increase in π lowers D/P, which tends to reduce costs. If ξ_i is inelastic, revenues rise. Hence net profits increase. Also, as a result of an increase in π, s may increase or decrease, but this does not affect the result. Condition 14—that $\partial N/\partial s = 0$—specifies that any small change in s will not affect profits.

Deposit Expansion of a Banking System

Determination of Aggregate Real Deposits. If many banks are in competition, an individual bank takes the flow of services provided by other banks as given and either provides an equivalent flow or goes out of business.[12] The individual bank, like any firm in a competitive market, can vary the quantity of deposits supplied—in this case both in real as well as in nominal terms. This differs from a monopoly bank,

[12] Monopolistic competition could be analyzed by making the appropriate assumptions. That case will not be treated here except to consider below the existing situation in which there is competition among banks but lack of free entry.

which directly controls only the nominal quantity of deposits supplied. Total real deposits are determined, through price level changes, by the public's desired real balances. A monopoly bank can affect desired real deposits only by making changes in s. Contrariwise, an individual bank in a truly competitive system takes s as given, and changes in the supply of nominal deposits by one bank do not perceptibly affect prices. Consequently, from the individual bank's point of view, it supplies real deposit balances (that is, P is taken as given). The position of maximum profit is therefore found by differentiating (13) with respect to D/P for a given s:

$$\begin{aligned} \frac{\partial N}{\partial (D/P)} &= (1-r)i - s\frac{dT}{dQ} = 0 \\ &= MR - MC = 0, \end{aligned} \tag{21}$$

which may be interpreted as requiring that the increase in revenue and the increase in cost of adding one more dollar of deposits be equal (s, r, i, and P are taken as given to the bank by the market). The relevant curves for an individual bank are illustrated in Figure 2-4. The bank will operate at the point where the two marginal curves intersect.

The sum of real deposits supplied by all banks at each level of s describes an aggregate supply curve for the system, illustrated in Figure 2-5. Equilibrium is attained through changes in s by banks

FIGURE 2-4

Marginal Revenue and Cost for One Bank in a System

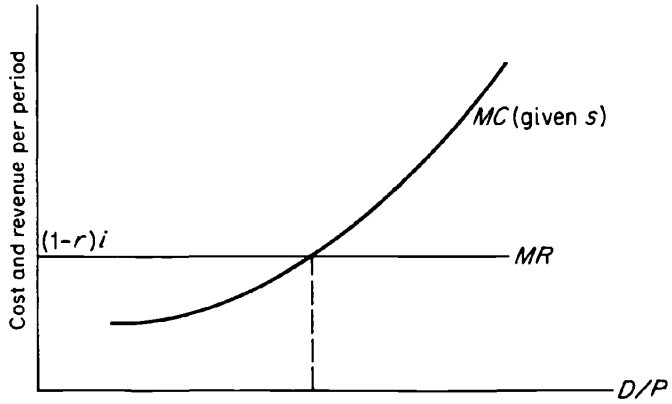
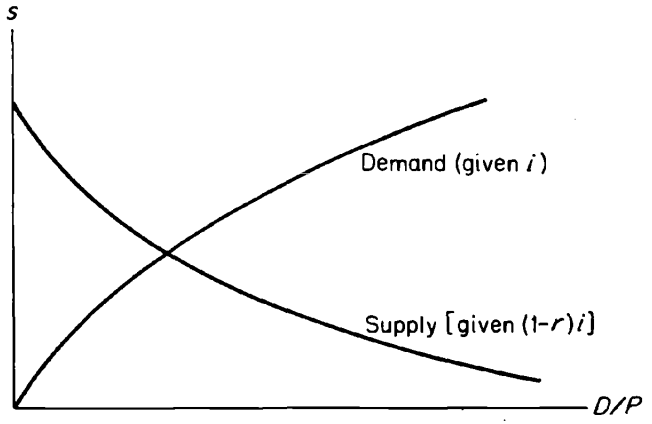


FIGURE 2-5

Aggregate Demand and Supply for Real Deposits



acting individually to supply the quantity of deposits which maximizes their profits. For example, an increase in s attracts more real deposits to a bank (and, for a general increase in s, more to all banks in the aggregate through an inflow of currency reserves and, ceteris paribus, fall in the price level as the public demands larger real money balances). At the same time an increase in s raises the marginal cost curve in Figure 2-4 and reduces the quantity of real deposits which maximizes bank profits. Adjustments by all banks continue until an equilibrium for the system is attained as depicted by the intersection of the curves in Figure 2-5; this position (given r and i) is consistent with profit maximization by each bank.

If the banking system lacks free entry, net profits can be positive. This reflects a net return to the banking franchise. In terms of Figure 2-4 it means that banks operate at a point to the right of the minimum average cost so that average revenue exceeds average cost.[13]

[13] If we substitute (21) into (13), we have $N = (D/P)s(dT/dQ) - T$. Dividing by $s(D/P)$ we obtain net profit per unit of service provided:

$$N/Q = (dT/dQ) - AC,$$

that is, marginal cost minus average cost, which can remain positive only in the absence of free entry. A positive value means that measured costs exclude the imputed value of the banking franchise.

The Effect of Changes in Monetary Growth on Profits. With a change in monetary growth and thus in the rate of price change, the effect on profits may be found, from (18), under the conditions of profit maximization for a competitive system given by (21). Equation 18 was derived without regard to the number of banks and so pertains to any banking system. Substituting the competitive solution of (21) into (18) gives

$$dN/d\pi = (D/P)\,[(1 - r) - (dT/dQ)(ds/d\pi)]. \tag{22}$$

Whether profits rise, fall, or remain unchanged with an increase in the rate of monetary growth and of price change depends upon the relative size of these terms. No general conclusion can be established.

The sign of (22) is ambiguous partly because $ds/d\pi$ is always positive (making the two terms within the brackets of opposite sign), since a higher rate of price change raises both curves in Figure 2-5 and thus definitely raises s. The demand curve shifts to the left for an increase in π, because people now want smaller real deposit balances for the same level of services. The supply curve in Figure 2-5 shifts to the right, because a higher π increases the profit on each deposit dollar, and banks want to supply more real deposits. The intersection therefore occurs at a higher level of s, but at more, less, or the same quantity of real deposits, depending upon the relative amount of the shifts in the two curves.[14]

That $ds/d\pi$ is positive can also be demonstrated by differentiating implicity the right-hand side of equation (21) with respect to π.

$$\frac{ds}{d\pi} = \frac{(1 - r) - s^2 \dfrac{d^2T}{dQ^2} \dfrac{\partial(D/P)}{\partial \pi}}{\dfrac{dT}{dQ} + s \dfrac{d^2T}{dQ^2}\left(s \dfrac{\partial(D/P)}{\partial s} + \dfrac{D}{P}\right)}. \tag{23}$$

All these factors are positive except $\partial(D/P)/\partial\pi$, which is negative, so that all terms and the entire expression are positive. Since $ds/d\pi$ is positive, we cannot establish the sign of (22) and thereby determine the effect of monetary growth on profits without further information.

[14] As pointed out above, this result is not true for a monopoly bank. It supplies the rate of services which maximizes its profits. This could involve a decrease in services when π rises.

To see what additional information is required, we may derive the condition for a positive effect of π on N. According to (22) this condition requires

$$ds/d\pi < \frac{1-r}{dT/dQ}. \tag{24}$$

This will be satisfied, according to (23), if

$$\frac{-s\dfrac{\partial(D/P)}{\partial\pi}}{s\dfrac{\partial(D/P)}{\partial s}+\dfrac{D}{P}} < \frac{1-r}{dT/dQ}, \tag{25}$$

assuming d^2T/dQ^2 is not zero (discussed later). Further simplification occurs if we introduce expressions for the two elasticities of demand, namely

$$\xi_i = \frac{\partial(D/P)}{\partial\pi}\frac{i}{D/P},$$

the same as in equation 20, which assumes $di/d\pi = 1$, and

$$\xi_s = \frac{\partial(D/P)}{\partial s}\frac{s}{D/P}.$$

We may also make use of (21), the condition for profit maximization. Substituting into (25), we have, after simplification,

$$-\xi_i < 1 + \xi_s, \tag{26}$$

that is, profits increase when the rate of inflation goes up, so long as the (absolute value of the) elasticity of demand with respect to the interest rate is less than unity plus the elasticity with respect to services. If the interest elasticity of demand is inelastic (that is, less than unity in absolute value), profits will necessarily increase, because the services elasticity would never be less than zero. Profits will still increase even if the interest elasticity exceeds unity in absolute value, so long as the services elasticity exceeds zero by a greater amount. Actually, it seems most likely that the absolute value of these two elasticities would be about the same, which would insure that (26) holds.

The intuitive explanation for this result lies in the increase in revenue per deposit dollar caused by an increase in π. As a result banks are in-

duced to increase services; while this raises costs, it also raises the demand for deposits and so also revenues. If the proportionate effect of higher π on the demand for deposits is not too large relative to the effect of an induced increase in s, revenues will increase and, except in the special cases discussed next, will not be offset by increases in costs, causing net profits to rise.

Free Entry and Interest Payments. Profits will be exactly zero in the long run under two special conditions. If there is free entry, new banks will be established to take advantage of any attractions of the banking business. Competition for deposits will force banks to raise s and increase the costs of supplying services until economic profits are zero (allowing for the prevailing return on capital). Average cost for each bank will rise until its minimum point passes through the intersection of the MC and MR curves shown in Figure 2-4. Then $MR = AC$ in long-run equilibrium, and profits will be zero.

If s represents solely interest paid on deposits, total costs, as noted before, are $s(D/P)$, since there are no diseconomies of scale in the payment of interest. Hence $dT/d[s(D/P)] = 1$ and (21) implies that $s = (1 - r)i$. Substituting into (15) shows that profits are then zero. Competition among existing banks forces them to pay any and all returns from money creation to depositors. Obviously, in this case, deposit expansion does not change bank profits or net worth in real terms. In the absence of interest payments average cost curves rise in terms of the services provided, and it is possible in equilibrium for marginal cost to exceed average cost. When this occurs, banks receive net profits in real terms.

Conclusion. The preceding analysis shows that a higher average rate of monetary growth is most likely to raise bank profits in real terms. That result depends upon the assumption that demand for real deposits is either inelastic to changes in the rate of price change or not greater in absolute value than unity plus the demand elasticity with respect to services on deposits. The result also assumes that in the United States today there is competition among banks but restricted entry, and that banks are free to recover all of the revenue from money creation by charging for loans what the market will bear. Given a rise in bank profits from deposit expansion, the next question concerns how it is used.

DISPOSITION OF THE REVENUE: THE EFFECT ON SAVING

What happens to the real revenue from money creation? A common answer to this question is that money creation adds in the first instance to investment expenditures, because the banking system creates most new money by a process of lending or purchasing assets. Of course, money creation expands deposits and bank assets in nominal terms. But this proposition asserts that money creation also increases bank lending in real terms because, as explained above, money creation imposes an inflation tax on money balances which provides a revenue in real terms to banks. With this addition to the supply of real loanable funds, equilibrium between total borrowing and lending occurs at a lower rate of interest, since the demand schedule for loanable funds is assumed to remain unchanged. This proposition was referred to in the first chapter as the credit effect on interest rates.

The process of bank credit expansion has been called "forced saving," [15] since the economy thus diverts more resources to capital formation than the nonbanking public had intended via individual decisions to abstain from consumption. Forced saving reflects an institutional characteristic of the monetary system, since in a free-exchange economy resources are otherwise allocated to reflect the preferences of individual consumers and lenders. By such a process the free-banking era in the United States in the first half of the 1800's supposedly helped to finance the industrial development of the West.

Once we ask how it can be that institutional arrangements "force" the economy to save more than it wants to, we recognize that there is nothing necessary about such an outcome at all. The institutions which create and dispose of new money have options on how to use it. To carry out public policy the government or its central bank may lend money to certain eligible borrowers. Why, however, should commercial banks use their power to create money to accumulate financial assets? Why not increase consumption instead? It is true that banks by their nature hold financial assets as the counterpart to deposit liabilities; but the owners of banks do not have to take the benefits of

[15] F. A. Hayek, "A Note on the Development of the Doctrine of 'Forced Saving,'" *Quarterly Journal of Economics*, November 1932, pp. 123–33.

money creation as a future income stream on financial assets: they can sell their rights to the stream and spend the capitalized sum immediately.

One may therefore raise questions about the proposition of forced saving. Further analysis will bring out the assumptions implicit in the proposition. It is desirable to discuss separately the various kinds of monetary expansion, namely, money creation by the government, by a group of individuals, and by banks (not distinguishing for present purposes between a monopoly and a banking system).

Government Currency Issues to Finance Deficits

Government expenditures affect the allocation of resources, whether financed by new money, issues of securities, or taxation. The net effect depends upon the extent to which government expenditures are comparable to and are taken into account in private spending. Some government expenditures may substitute for related private expenditures and so produce little effect on the allocation of total expenditures. Similarly, the use of tax revenues to retire government debt may not affect total saving. While this action adds to the potential supply of funds available for private lending, at the same time it reduces future government interest payments and so reduces the liability of taxpayers to provide the revenue for such payments. The present discounted value to taxpayers of the reduction in future taxes for bond interest equals the value of debt retired.[16] There is, therefore, no change in taxpayers' net worth, and the money received in exchange for the government bonds is equivalent to a remission of taxes. Such an increase in disposable income will not ordinarily affect the allocation of household expenditures between consumption and saving. There is no addition to loanable funds from the debt retirement other than what is normally produced by a shift in the disposition of income from the public to the private sector.

The same argument applies to the retirement of government bonds

[16] This requires that the discount factor applied to future taxes equal the interest rate on government debt. If the equality does not hold, redistributive effects occur. See B. Pesek and T. Saving, *Money, Wealth, and Economic Theory,* New York, Macmillan, 1967, Chap. 10. See also R. Mundell, "The Public Debt, Corporate Income Taxes, and the Rate of Interest," *Journal of Political Economy,* December 1960, pp. 622–26.

by issues of new money, which impose a tax on money balances via the accompanying rise in prices. To the extent that taxpayers act like "stockholders of the government," they will tend not to be influenced by an increase in the current tax on money balances, since it will be exactly offset by a reduction in the present value of future tax payments for bond interest. In practice, the foresight and willingness of taxpayers to behave as stockholders in this way may be less than perfect, and there may be redistributional effects among households, but the effect of government money creation on saving and on interest rates does not differ in principle from expenditures financed by other forms of taxation and depends in each instance upon the particular measures adopted. No general conclusions can be drawn about the direction or magnitude of the effects.

Private Currency Issues [17]

A franchise to supply currency (without obligation to redeem it) bestows an annual income equal to the value per year of the currency issued if the cost of printing and maintaining it in circulation is ignored. The issuers can spend the new money just as though they had first received it as income. If they treat this flow of purchasing power like other income, they will spend most of it on consumer goods and services and save the remainder by purchasing various kinds of assets. The division between saving and consumption need be no different than that for other sources of income. Furthermore, the ratio of saving to income in the economy at large need not change—and most likely would not greatly—provided that the saving habits of the issuers were typical of the economy as a whole. In that event, interest rates and the allocation of expenditures would not be affected.

If the franchise to issue currency is not permanent, the income stream no longer lasts forever, and the preceding conclusion must be qualified. Suppose that the amount of money issued under the franchise varies over time in an uncertain way or that the franchise has a limited life. Creating money then provides a variable or limited income stream, which affects saving because most people do not like their con-

[17] I am indebted to Milton Friedman for suggesting the following argument. John Scadding also makes some of the same points in his proposed University of Chicago Ph.D. dissertation.

sumption to vary with fluctuations in income. The issuers will seek to maintain a fairly even level of consumption at some fraction of the expected average income stream. For a limited-life franchise, the expected discounted value of the income stream is equivalent to some lower, permanent level of income. For a variable stream, people tend to maintain consumption when receipts fall temporarily below average. Real saving can thus be expected to increase for sudden, apparently temporary increases in the rate of money creation and to decline for temporary decreases in the rate. An uncertain income stream might also lead people to play it safe against unanticipated declines by saving more on the average.

For various reasons, therefore, a franchise to issue money may affect real saving in the economy, but not dollar for dollar of the amount issued. Saving resulting from money creation will depend instead upon deviations of monetary growth from its long-run expected rate, being in real terms higher when new issues exceed the expected rate and lower when new issues fall short. If money creation had the same variability as most other sources of income, the effect on real saving would on the average be zero. None of these effects on saving are "forced," but are the result of voluntary decisions of economic units made in response to an uncertain and variable income stream.

It is important to emphasize our assumption of no redistributional effects from inflation other than the tax on money balances. In the literature, "forced" saving is sometimes attributed to a lag of nominal wages behind prices, causing workers' real incomes to fall and business real income to rise. If workers have the smaller propensity to save out of income, the effect of this redistribution is to increase saving. Such effects are assumed away in the present analysis in order to focus on the credit effects.

Deposit Expansion by Banks

Since banks are obligated to meet requests for deposit withdrawals, newly created deposits are not used, in contrast to irredeemable currency, by the issuers directly for their personal disposition. Yet the institutional practices of banking make a difference more of form than of substance. When a bank expands deposits, it obtains a revenue the size of which in real terms depends upon the rate of expansion, the

costs of operating the bank, the number of banks, and the restrictions on entry, as discussed above. To be sure, bankers would probably not regard the revenue as a tax on deposits. From their point of view, the expansion of assets merely replaces the depreciation in real value of past fixed-dollar investments produced by the accompanying inflation of prices (and provides, in addition, for some growth if the economy is expanding). They would regard the real revenue from deposit expansion as an additional return on a *given real stock* of assets and would attribute it to the higher nominal interest rates in the market resulting from anticipation of the accompanying inflation. Nevertheless, the two points of view are equivalent, as expressed by the two sides of the foregoing equation 12: $dD/Pdt = (D/P)\pi$, where π equals the amount of the change in the nominal rate of interest due to the anticipated rate of price change. On either view the revenue could be treated as income or as a recurring increase in net worth.

If the revenue is treated as income and paid to stockholders, net worth of banks on the balance sheet remains constant in real value while real dividends are paid at a higher rate. In real terms there is no addition to loanable funds; banks in effect use the real revenue from deposit expansion to pay higher real dividends. The process is exactly equivalent to one in which banks charge depositors a fee and transfer it to stockholders as dividend income. To pay the fee, depositors reduce real consumption and saving, and stockholders increase those expenditures. If the division between consumption and saving for each group is the same—and there is little basis for inferring how the owners of the bulk of deposits (mainly businesses) and of bank stock differ in this respect—total real saving is unchanged.

If the revenue is not paid to stockholders but retained to augment earning assets, net worth continually increases in real terms, and there is a corresponding rise in the real value of bank stock which is sooner or later reflected in its market value. A steady rise in real value of the stock represents imputed real income to stockholders. Stockholders can treat this like their other income and consume most of it by regularly selling an amount of stock equal to the continual rise in value. The sale of stock offsets the addition to real loanable funds of the bank expansion. Despite the sales, the stock retained continues to have the same total real value and, even though the real consumption expendi-

tures of stockholders are commensurately higher, their net real wealth remains the same. Or as an alternative, they can reduce their real saving in other forms and continue to hold all the higher-valued bank stock.

Stockholders can thus offset the real loanable funds initially supplied by banks from the revenue of the inflation tax on money balances produced by an expansion of deposits. The economy provides for capital formation at the same rate as before, except that now part of the supply of loanable funds is furnished through the banking system instead of by stockholders through their saving of nonbank income. To illustrate, suppose that all consumers save one-tenth of income, and let us disregard possible changes in real deposit balances. Then depositors consume less in real terms by an amount equal to nine-tenths of deposit growth because of the accompanying inflation tax, and save less in real terms by one-tenth. Banks add to real loanable funds by an amount equal to the tax on deposits (assuming monetary reserves are zero; otherwise the result depends upon how the government disposes of its share, r, of the revenue, discussed below). Stockholders consume in real terms more by nine-tenths of the rising real value of bank stock due to the revenue from the tax; they hold the stock and cover the consumption by saving less in other forms. The rising value of bank stock should be included in their real net worth, which then grows by one-tenth of the tax. Total real loanable funds supplied are lower by one-tenth due to depositors, higher by one due to banks, and lower by nine-tenths due to stockholders; the net effect is zero.

Deposit expansion does not, therefore, add to net national saving unless stockholders regard the higher bank profits as temporary rather than permanent or as more uncertain than other sources of income, and treat these profits differently than depositors treat the tax imposed by the expansion. The argument is precisely the same as that, noted earlier, for the income to the beneficiaries of a franchise to issue currency. There are, however, two special qualifications here because deposits require non-interest-bearing reserves and have service costs.

Non-interest-bearing Reserves. A franchise to create deposits carries with it by law and custom an obligation to invest some fraction of the proceeds in a monetary reserve created independently of the private banking system, such as Treasury currency, central bank mone-

tary liabilities, or specie, none of which pay interest. Reserve money might or might not have added, when first issued, to the supply of real loanable funds. It would not have, if it came into existence through an increase in government expenditures financed by reducing Treasury deposits at the central bank or through an expenditure of newly mined gold in goods or services. Reserve money might have augmented real loanable funds when first issued, if it came into existence through bond purchases by the central bank or by foreigners who converted their own currency into dollars at a fixed rate of exchange.[18] To the extent that reserves, when first issued, add to real loanable funds, deposit expansion reflects an issue of government money used to retire the national debt. Whether real saving increases depends, as discussed earlier, on how taxpayers respond to the decrease in the discounted value of future taxes which occurs because of lower interest on the national debt.

Costs of Servicing Deposits. Total expenses of banks are, for present purposes, of two kinds: One comprises the cost of making loans, acquiring assets, and providing a reserve for bad debts; these expenses may be deducted from gross earnings to derive net earnings on assets. The other expense covers the servicing of deposit accounts. When banks are expanding and prices rise to keep deposit balances in real terms the same, no resources to provide services on the new nominal deposits are necessary; the nominal service cost increases but the real cost remains unchanged. But, as the earlier analysis showed, an increase in the rate of change of prices induces banks to increase the level of services per deposit dollar, and for a system of banks the total cost of services $[s(\dot{D}/P)]$ probably rises.

Banks meet increases in service costs out of the gross return on earning assets. Insofar as the increased services require equipment, banks will make a capital expenditure, financed by funds from their own capital or by borrowing on the open market. If an increase in deposit expansion leads to larger service costs, part of the newly created money will be used, in effect, to purchase additional equipment for banks. To that extent the new money, though initially used to acquire

[18] Insofar as foreign exchange or gold assets are a component of reserves for growing domestic money balances, the public may be viewed as "investing" in such assets in lieu of providing loanable funds for domestic capital formation.

financial assets, still does not augment the net supply of real loanable funds available to nonbank borrowers.

Insofar as increased services require additional clerks and tellers, banks commit themselves to a higher real payroll, which absorbs part of the return on the assets acquired in the expansion. To that extent the new money lent to borrowers is not absorbed by a lump-sum capital outlay by banks, and the supply of real loanable funds increases. What is the difference in principle between these payroll costs and those on bank equipment? Simply that newly hired labor requires no capital outlay. If additional labor were not available, the real wage rate would increase and induce more investment in human capital. Then the additional supply of loanable funds would again be absorbed, now by an induced increase in the demand to finance (human) capital. If idle bank equipment were available, it too could be leased and so would not require an initial outlay that absorbed the loanable funds produced by deposit expansion.

Summary. When a bank creates deposits, it also acquires financial assets, but it does not necessarily add to the net supply of real loanable funds. The earnings on the assets are partly allocated to servicing deposits. Except when there are idle banking resources, provision of the services requires capital expenditures which to that extent absorb the new money. Any net profits of deposit creation go to the stockholders, who thus receive an increase either in real dividends or in the present market value of future profits to dispose of as they wish. If they increase their consumption expenditures to avoid what would otherwise be an unintended increase in their imputed real net worth, then there would be no increase in the net supply of loanable funds in real terms arising from money creation.

If a competitive banking system paid interest on demand deposits, the benefits of expansion (apart from monetary reserves) would go, as noted earlier, not to the stockholders, but to the depositors. The balance sheet of the banking system would remain unchanged in real terms; there would be no transfer of income from depositors to stockholders. Depositors would be compensated for the depreciating value of deposits to the full extent, except for the nonearning money reserves of banks. When inflation imposes a tax on money holders and

the revenues are distributed to them, the same group pays the tax and collects the revenue, and therefore the tax has no real effect.

LAGS AND IMPERFECT FORESIGHT

All of the preceding analysis assumes that changes in monetary growth produce corresponding, fully anticipated effects on the rate of price increase. Let us consider two other situations. First, price increases are not anticipated, but nevertheless occur with no significant lag. Second, the economy is not at full employment, and monetary growth raises output but not prices. Redistributions of wealth due to usury laws or other restrictions on banks may also play a role but will be ignored.

If price increases are not anticipated, nominal interest rates do not rise to compensate for the depreciation in the real value of fixed-dollar assets. As a result, debtors receive unexpected gains and creditors unexpected losses in real terms. There is no net effect on real loanable funds, however, unless the two groups treat such gains and losses differently. It makes no difference that the price increases reflect an expansion of deposits via bank lending: The revenue in real terms from deposit expansion goes, not to the stockholders, but to bank borrowers who dispose of it as they wish.

To illustrate, let us start with the earlier example of fully anticipated price increases. There we first assumed that banks transferred the revenue from deposit expansion to stockholders as dividends. There was no addition to real loanable funds, because banks used the new deposits to make the higher dividend payments. Suppose now that price increases are not anticipated by anyone and nominal interest rates do not adjust. Banks no longer capture the revenue from deposit expansion, and it goes to their borrowers because of an unexpectedly lower real rate of interest. The only change in the example is that borrowers now receive a windfall in the form of a lower interest charge on loans in real terms, while in the previous case stockholders received higher dividends. No other difference is produced by the lack of anticipation of inflation, aside from redistributions of wealth. To be sure, banks are continually expanding deposits and loans in nominal terms, but in real terms their total loans outstanding remain the same because

the added loans just compensate for the depreciation in the real value of outstanding loans. This depreciation is a capital loss to the bank equal to the value of new loans. Until old loans are repaid, a bank expansion can increase lending in real terms. But as loans are turned over, their reduced real value offsets the increase in real loanable funds due to the expansion.

A real effect on saving and the supply of loanable funds can come only from a different treatment of unexpected gains and losses by bank borrowers and depositors. It is not at all obvious what the net effect on aggregate real saving would be. It is true that the real rate of interest is lower, but that is unanticipated and so cannot itself affect borrowing and lending and nominal interest rates.

When the economy is not at full employment, monetary growth can increase real income. Suppose prices remain constant. There is still a revenue from money creation, but it is paid, not by an inflation tax on deposits, but by an increase in real deposits on the part of the recipients of the higher real incomes from the idle resources put to work. Part of the revenue is used to provide services on the larger real balances, and the remainder goes to bank stockholders directly as dividends or indirectly as a rise in net worth of banks.

It is, of course, unrealistic to assume that the beneficiaries of money creation act unhesitatingly and with complete foresight. The income from newly acquired bank assets will not be reflected immediately in the market value of bank stocks or in the services on deposits, and the consumption expenditures of the beneficiaries will not be adjusted rapidly. It takes time to see whether increased deposit growth will produce rising net income for stockholders or increased services for customers, and it is never clear how long any increase will last. Since the next quarter may well bring a reversal, seemingly transitory variations in imputed income hardly warrant an immediate rearrangement of consumption patterns. In that respect the creation of money by banks differs from a franchise given to a group of individuals to print money. The extent to which banks are able to use their franchise is variable and unpredictable. Because of their obligation to redeem deposits and other banking regulations, benefits to stockholders or depositors are slow and uncertain.

The lags and uncertainties suggest that money creation may well in-

crease the supply of real loanable funds without being offset—contrary to the earlier argument—by the spending behavior of the ultimate beneficiaries of the new purchasing power. Stockholders may thus be led to "save" the imputed increase in their net worth. This addition to real loanable funds will not be offset by a reduction in real saving by depositors provided that the revenue reflects, not a tax on deposits imposed by rising prices, but, rather, a rise in real income which induces depositors to increase their real balances. Otherwise, if prices rise, depositors suffer a capital loss on deposits in real terms, and if they had not anticipated the loss we cannot be sure of their response, but it is quite possible that they would divert part of current saving to replenish the loss in real balances as a means of maintaining real balances at the desired level. This diversion of their saving would exactly offset the increased saving of stockholders.

The theoretical conditions for general credit effects on interest rates, therefore, are that deposit expansion not raise prices and that the resulting revenue be unanticipated or uncertain. These conditions are *least* likely to hold for constant rates of monetary growth, and *most* likely to hold for deviations of monetary growth from trend. Such effects are similar, in the economic behavior involved, to the muted response of consumption to transitory changes in receipts and payments. People resist making sharp changes in consumption and tend to even out variations in income by saving more when receipts exceed expected levels and by saving less or even dissaving when receipts fall short. This is also true for saving out of the imputed real income from money creation. Variations in monetary growth may produce inverse movements in interest rates, therefore, because real income and desired real balances are affected and the initial effect on the supply of loanable funds is not entirely offset by reduced real saving on the part of the beneficiaries of money creation.