2 The banking firm

A bank is just like any other firm, be it that the produced output has a number of special features. The product supplied by the banking firm is called credit and supplied only to consumers. So, consumers and producers alike accept this indebtedness of banks as an ultimate means of payment and as such, credit belongs to the total stock of money. In order to produce these banking services one needs some ingredients. Just as a normal firm needs (for instance) capital (k) and labour (l) as inputs to produce goods (y), the institution "bank" needs labour and a banking licence to produce credit in our case. The rationale behind the need for labour is that every consumer who wants credit has to travel to the bank in order to arrange things, talk to officials, sign contracts etcetera. People that work at the bank to serve clients act as labour input in the bank's production function. The other input, the banking licence, can be compared with capital as input in the case of a standard firm. There are a few important differences however. In the first place, capital can be accumulated over time as a result of the investment decisions of the firm. It is assumed that the licences to bank are available in a strict limited and fixed quantity. The reason is that money as a product is something special related to such phrases as reliability and trustworthiness. Another reason is that the government as a(n) (implicit) supplier of the licences, can control the money supply to a certain extent by adding some specific requirements to the possession of the banking licence (such as a cash-reserve requirement).

A second difference with capital is that we assume that one and only one banking licence is needed to start banking. Earlier on capital and labour could be substituted for one another according to a CES specification.

Now we have for the banking process:

$$(2.2.1)\quad \frac{M_c}{P_y} = \begin{cases} g(l_b) & \textit{when banking licence} \\ 0 & \textit{when no banking licence} \end{cases}$$

where M_c denotes the nominal supply of credit and $g(.)$ is the production function with banking labour (l_b) as input.

The availability of a banking licence thus defines which firm is a bank. Because one of the inputs is of fixed magnitude, it is assumed that the production of the real supply of credit shows diminishing returns to scale in labour. Of course, the product of the bank is not for free. The price of a unit of credit is the nominal rate of interest. Labour hired by the bank is paid the nominal wage rate, assumed to be uniform across the economy. Furthermore, there is (indeed) a cash-reserve requirement for banking business, dictated by the government. As was the case with standard firms, the banking firm's goal is to maximize the shareholder's wealth. The licences to bank are distributed for free once in history and are valuable hereafter.

Now the banker's problem can be stated as maximizing the following objective function:

$$(2.2.2)\quad E_b = \int_t^{\infty} \{ R \,.\, M_c - l_b \,.\, P_l - Z \} \,.\, e^{-\int_t^z R(s)ds} \, dz \;,$$

subject to the following constraints:

$$(2.2.3)\quad \dot{M}_{0b} = Z \ ,$$

$$(2.2.4)\quad M_c \leq \phi \,.\, M_{0b} \ ,$$

$$(2.2.5)\quad \frac{M_c}{P_y} \leq g(l_b) \ .$$

The value of the bank-shares is E_b and is equal to the discounted flow of dividends. The first condition represents a condition for cash-accumulation, while the second tells that a fraction $1/\phi$ of credit supplied must be held at the bank in the form of cash (M_{0b}) . Cash at the bank is part of the total amount of base money, notes issued by the government. Part of the (assumed) fixed amount of government money is held by banks (as a cash-reserve requirement) whereas the other part is held by consumers. Furthermore it is assumed that the cash-reserve parameter ϕ is greater than 1, while the first and second derivatives of the production function have properties $g' > 0 , g'' < 0$. The following first-order conditions can be obtained after some substitution:

$$(2.2.6)\quad g_{l_b} = \frac{P_l / P_y}{R \,.\, \frac{\phi - 1}{\phi}} \ ,$$

$$(2.2.7)\quad M_c = \phi \,.\, M_{0b} \ ,$$

(2.2.8) $\frac{M_c}{P_y} = g(l_b)$.

The amount of labour hired by the bank, and thus the supply of credit, depends negatively on the real wage rate, and positively on the nominal rate of interest.[4] The two inequality conditions turn out to be always binding. Now the worth of the licence (*GW*) can be computed as follows:

(2.2.9) $GW = E_b - M_{0b}$,

which represents the abbreviated version of the balance-sheet of the banking firm. The worth of licences is indicated here by the term "goodwill" since this worth is created "out of nothing" it seems. It is interesting to draw a parallel with the standard firm here. The balance-sheet for the goods-producing firm in the stationary state can be represented by the equality of the (value of) the capital stock and the value of equity. The goods-producing firm shows no sign of goodwill or surplus value in the stationary state. The reason is that the investment decision of the firm depends on the ratio of equity and capital stock, the so-called q-ratio. If this ratio is greater than 1 for some reason, it shows that there are advantages to be got from extra investment. The marginal cost of one unit of

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4 The supply of demand deposits by the banking firm is more commonly found to be dependent on the rate of interest and some technological parameters of the banking process (see for instance Niehans(1978), chapter 9).

investment is less than the marginal revenue of investment in such a case. So, capital accumulation stops when the q-ratio equals 1, so there is no goodwill left.

How does this relate to the banking firm? A crucial assumption is that there is no such thing in our model as "licences accumulation", the equivalent of capital accumulation. So the limited amount of licences brings forth a "first owner" surplus value of licences. It can be clarifying to compute the q-ratio of the banking firm for the stationary state of the model.

We define the q-ratio for banking as follows:

$$(2.2.10)\quad Q_b = \frac{E_b}{M_{0b}} \ .$$

We know that:

$$(2.2.11)\quad D_b = \frac{E_b}{R} = M_c - \frac{l_b \cdot P_l}{R} \ ,$$

where D_b represents the dividend of the bank (see equation 2.2.2). Together with equations (2.2.6) to (2.2.8) and the specification of the production function as follows:

$$(2.2.12)\quad \frac{M_c}{P_y} = g\,(l_b) = \varepsilon_b \cdot l_b^{\alpha_b} \ ,$$

$$(2.2.13)\quad g_{l_b} = \frac{\alpha_b \cdot g(l_b)}{l_b} ,$$

we get:

$$(2.2.14)\quad Q_b = \phi - (\phi - 1) . \alpha_b .$$

Now it is clear that when $\alpha_b = 1$ (constant returns to scale in labour) we have a q-ratio of 1 and consequently no goodwill. In the relevant case of $0 < \alpha_b < 1$ we obtain a q-ratio between 1 and ϕ . The resulting goodwill or surplus value accrues to the first owners of licences.

Defining the return on a banking licence as:

$$(2.2.15)\quad R_b = \frac{D_b}{M_{0b}} = \{ \phi - (\phi - 1) . \alpha_b \} . R ,$$

the relevant range of rate of returns is:

$$(2.2.16)\quad R < R_b < \phi . R ,$$

where the maximum possible return is determined by the cash-reserve requirement parameter ϕ .