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Deposit Ceilings and the Efficiency of Financial Intermediation

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CONCERN FOR THE SOCIAL objective of an efficient financial system led several researchers to study economies of scale in financial intermediation during the 1960s.[1] These studies were used to draw inferences regarding the optimal structure of financial institutions.[2] Today, there is added reason to be concerned with the costs of providing financial intermediary services. In 1966, the Interest Rate Control Act[3] extended deposit rate ceilings to savings and loan associations and other thrift institutions much as the Banking Act of 1933 had previously authorized these controls over deposit rates of banks. This imposition of deposit rate ceilings has created incentives for savings associations to attract deposits by inducements in addition to the payment of explicit deposit rates. In a deposit-rate-constrained savings deposit market,[4] the competitive mechanism is exercised through the provision of financial and nonfinancial goods and services to depositors in order to increase deposit holdings. These goods and services take a great variety of forms but to the financial intermediary result in added expenditures for labor, capital equipment or intermediate product.[5] Nonrate competition—the financial analogue to nonprice competition—has become an important equilibrating adjustment mechanism in the rate-controlled savings deposit market.[6]

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[1] The issue of competition and efficiency and its policy implications have been discussed most cogently by Greenbaum [13] and Benston [4]. This issue has also been investigated by Goldfeld [11], as well as by other contributors to the *Study of the Savings and Loan Industry*, Friend [10].

[2] A common conclusion that emerged from the findings of economies of scale is stated by Friend: "The extent of the economies of scale in the Savings and Loan Industry makes it possible to increase operating efficiency by limiting the number of offices serving a given market . . . " [10], p. 15.

[3] The Annual Report of the Council of Economic Advisers indicates: "On September 21, the President signed a bill allowing Federal regulatory authorities to impose new interest rate ceilings on time and savings accounts in order to restrain excessive rate competition among different types of financial institutions. The agencies involved announced new interest rate regulations on the same day the bill was signed." [9], p. 58.

[4] There has been a growing variety of savings instruments since the imposition of deposit rate ceilings. These special accounts also have ceilings, although they permit greater flexibility by thrift institutions in their competition with market instruments.

[5] Intermediate product could include supplies or goods purchased for distribution to depositors.

[6] The theory of nonprice competition among firms in price-constrained goods markets has been developed by Stigler [19] and probably originated with Chamberlin [8]. Nonprice competition among financial institutions has been studied by Havrilesky and Schweitzer [14] and White [21] with banks, Spellman [18] with savings and loan associations, and Taggart [20] with mutual savings banks.

As a result of engaging in nonrate competition for deposits, observed average cost per deposit dollar for savings and loan associations have increased since the imposition of deposit-rate controls, with the increase between 1967 and 1974 of 21 percent nearly equaling the recorded reduction between 1948 and 1967.[7] Changes in observed average cost reflect changes in both the average production cost of financial intermediation and the cost of nonrate competition.

The purpose of this paper is to study the costs of financial intermediation in the savings and loan industry in a framework that allocates total costs into the costs incurred in nonrate competition and costs incurred in the production of financial intermediary services. From a cross section of State data points, estimates have been made of nonrate competitive costs per deposit dollar. These costs constitute an implicit deposit rate. The division of observed costs into financial production costs and implicit deposit rates is based on the following model.[8]

The Model

It is assumed that, due to regulatory imposed limitations to entry, the savings intermediary operates in an imperfectly competitive deposit market. In this market, the intermediary has two methods of attracting deposits D. The intermediary pays an explicit deposit rate per dollar of deposits r and an implicit deposit rate i in the form of financial services or goods. Thus, the deposit demand function is:

$$D = D(r, i) \qquad \frac{\partial D}{\partial r} > 0, \qquad \frac{\partial D}{\partial i} > 0. \tag{1}$$

The intermediary is capable of participation in local and national markets for securities in which they are price takers. The earning rate of these assets is r_a. The annual revenues accruing to the savings intermediary are r_aD.

On the cost side, the intermediary incurs costs associated with the processing of deposits and earning assets. These financial production costs are most conveniently assumed to depend upon the level of deposits.[9] The total production cost function is thus denoted $C(D)$. The intermediary also incurs an interest cost for deposits. Dividends or interest accrue to the deposits at the average rate r, and thus total deposit cost per annum is rD. In addition, the intermediary incurs noninterest costs in an effort to induce larger deposit levels. Deposit-increasing costs

[7] See Appendix 1 for these average cost data. The long-term downward trend in average cost reached its nadir in 1967. It is doubtful that deposit ceilings were constraining in 1967, since market rates declined almost simultaneously with the enactment of the ceilings. See the Annual Report of the Council of Economic Advisers [9] p. 58. Thus, 1968 appears to be the first year in which ceilings were constraining.

[8] The division of costs into financial production costs and implicit deposit rates is not available from accounting data, which is reported as wages, office occupancy expense, and so forth.

[9] This formulation implicitly assumes that the unit of output of the financial intermediary is the deposit level. The issue of the appropriate unit of output has received much attention, and researchers have varied considerably in its definition. Greenbaum [13] and Benston [4] provide excellent reviews. Since the interest of this paper is the social cost of financial intermediation, the cost per deposit dollar seems to be a more appropriate unit than individual lines of production services for a given financial firm.

can be stated as iD, where i is the annual cost of financial services or goods per deposit dollar. Alternatively i may be viewed as the implicit rate at which goods and services are paid to depositors. That is, the cost of goods and services to the intermediary are considered monetary transfers to depositors and are calculated in the same unit as the deposit rate.

The objective function of the savings intermediary is assumed to be the maximization of profit P which from the above assumptions may be written as follows:[10]

$$\max_{i} P = r_a D(r, i) - C(D(r, i)) - rD(r, i) - iD(r, i). \tag{2}$$

In periods when the market deposit rate is above the regulatory controlled limit, the firm maximizes profit with respect to i as it is the only variable at its discretion. The derivative of the profit function, with respect to i, is set equal to zero, and the first-order condition is:

$$r_a \frac{\partial D}{\partial i} = \frac{dC}{dD}\frac{\partial D}{\partial i} + r\frac{\partial D}{\partial i} + i\frac{\partial D}{\partial i} + D. \tag{3}$$

Where the marginal relationship of deposits and the implicit deposit rate is characterized by a constant elasticity—equation (3) then can be solved for the profit-maximizing level of the implicit deposit rate i^*:

$$i^* = \frac{e}{1+e}\left(r_a - r - \frac{dC}{dD}\right). \tag{4}$$

From this it can be seen that the level of the implicit deposit rate depends essentially upon two terms. The term, $r_a - r - dC/dD$, represents net revenues per deposit dollar. That is, the intermediary earns r_a from a deposit dollar from which it pays a ceiling deposit rate r and also pays its marginal cost of production, dC/dD.

Net revenues per deposit dollar constitute the available funds to be passed on to the depositor in the form of an implicit deposit rate. The proportion or share of net revenues that are passed on to depositors depends on the strength of the depositors' response to the goods and services provided by the implicit deposit rate. When the market response is weak, i.e., when e approaches zero, the share of net revenues passing to the depositors approaches zero. Conversely, with a strong deposit response to implicit deposit rates measured by a very high value of e, the depositors' share of net revenues approaches unity. Thus, the greater the deposit sensitivity to i, the larger will be the proportion of net revenues paid in implicit deposit rates. In the limit, as e approaches infinity, the implicit deposit rate approaches net revenues, leaving no economic profit.

In order to measure the unobserved implicit deposit rate in terms of observable variables, we equate observed average cost c' to the sum of average financial production costs denoted c plus the implicit deposit rate i^*.

[10] The profit statement implicitly assumes that assets equal deposits. If the profit statement were to reflect a fixed amount of capital this would not affect the derivation of the structural variables as this term would fall out of the first order condition. Furthermore it should be pointed out that the asset earning rate reflects a fixed cash reserve ratio and there is no gain in breaking it out as a separate term.

$$c' = c + i^*. \tag{5}$$

That is, observed costs are the sum of production costs and non-rate competitive costs. Upon substituting the value of i^* from equation (4), observed average cost can be written:

$$c' = c + \frac{e}{1+e}\left(r_a - r - \frac{dC}{dD}\right). \tag{6}$$

The expression can be further simplified if financial production costs exhibit a constant elasticity with respect to the deposit level.[11] In this case,

$$\frac{dC}{dD} = \lambda c, \tag{7}$$

where λ is the constant elasticity of total production costs with respect to the deposit level. Marginal costs with this cost function are multiplicatively related to average costs. Substituting equation (7) into (6) results in:

$$c' = \frac{1 + e - \lambda e}{1+e} c + \frac{e}{1+e}(r_a - r). \tag{8}$$

Hence, by utilizing the constant elasticity functional form for financial production costs, a linear regression equation, with the rate spread, $r_a - r$, as the independent variable, with u being a disturbance term,

$$c' = b_0 + b_1(r_a - r) + u \tag{9}$$

can be fitted to observed average cost, where the regression coefficient b_0 is an estimate of $\frac{1 + e - \lambda e}{1+e} c$, and b_1 is an estimate of $\frac{e}{1+e}$. From the regression coefficients b_0 and b_1, estimates of the unobserved variables $\hat{e}$, $\hat{c}$, and $\hat{\imath}^*$ can then be identified in terms of the regression coefficients and the parameter λ in the following way:

$$\hat{e} = \frac{b_1}{1 - b_1} \tag{10}$$

$$\hat{c} = \frac{b_0}{1 - \lambda b_1} \tag{11}$$

$$\hat{\imath}^* = b_1\left(r_a - r - \frac{\lambda b_0}{1 - \lambda b_1}\right). \tag{12}$$

An important parameter relevant to the calculation of $\hat{c}$ and $\hat{\imath}^*$ is the elasticity of cost with respect to the deposit level.[12] The existence of economies of scale

[11] This functional form for financial intermediation costs has often been frequently employed. For example, see Benston [4].

[12] On the assumption that the regressors are at least asymptotically uncorrelated with the disturbance term, u, then b_0 and b_1 are consistent estimates of the true regression coefficients. By Slutsky's Theorem it follows that $\hat{e}$, $\hat{c}$, and $\hat{\imath}^*$, are consistent estimates of the true structural coefficients. That is, consistency carries over. Since the structural coefficients are nonlinear functions of the estimated coefficients, we must draw from large-sample distribution theory. The standard errors of the structural

Table I

Regression Equations of Average Cost on the Rate Spread[a, b]

Year	b_0	b_1	R^2	F
1972	.55	.49	.39	31.65
	(4.28)	(5.63)		
1973	.51	.54	.29	20.18
	(2.69)	(4.49)		
1974	.68	.52	.21	12.29
	(3.03)	(3.51)		

[a] Average observed cost is the ratio of Total Operation Expenses to Average Savings Deposits. The variable r_a is equal to the ratio of Gross Operating Income, including fees to average financial assets, while r is the ratio of interest on savings deposits to average savings deposits. The sample includes all states and the District of Columbia except Delaware and Alaska, which were not available. The data source is the Federal Home Loan Bank Board, *Combined Financial Statements*, 1972, 1973, 1974.

[b] The t statistics for the regression coefficients are reported in parentheses. All t and F statistics are significant at the .01 level.

have been analyzed by several researchers. The most thorough evidence for savings and loan associations has been provided by Benston [3, 4], where this parameter was found to be close to .9. This value of λ will thus be utilized to obtain estimates of $\hat{c}$ and $\hat{\imath}^*$.

Empirical Results

A regression equation corresponding to equation (9) was calculated on a cross section of State data points for FSLIC Insured Savings and Loan Associations for the year 1972 through 1974. These results are in Table I. From equations (10), (11), and (12), the unobserved variables $\hat{e}$, $\hat{c}$, and $\hat{\imath}^*$, can be identified in terms of b_0, b_1, and λ. These values are given in Table II.

The value of the elasticity of deposit demand with respect to the implicit deposit rate for the three years ranged between .97 and 1.16. A value of the elasticity of deposit demand with respect to the implicit deposit rate of approximately unity seems reasonable, as it is well below several estimates of the elasticity with respect to the explicit rate.[13]

The level of the implicit deposit rate ranged from 19 to 37 basis points, conforming closely to that predicted by equation (4). In 1973, when net revenue

coefficients are determined from the large-sample approximation given in Kamenta *Elements of Econometrics* [16] p. 444. Admittedly, our sample size is 49. However, this is the best we can do.

[13] See, for example, Goldfeld [11], Boyd [5] and Spellman [17], where estimated explicit deposit rate elasticities in the pre-ceiling era ranged from 5 by Goldfeld to 11 by Spellman to 17 by Boyd for special accounts and 2.5 for passbook accounts.

Table II

Estimated Variables

Year	Elasticity of the Implicit Deposit Rate $\hat{e}$	Average Production Cost $\hat{c}$	Implicit Deposit Rate $\hat{\imath}^*$	Net Revenue $r_a - r - \lambda\hat{c}$	Ratio of Implicit Deposit Rate to Net Revenue $i^*/(r_a - r - \lambda\hat{c})$	Ratio of Implied Deposit Rate to Observed Average Cost $\hat{\imath}^*/c'$
1972	.97	.98	.28	.56	.49	.22
	(.34)	(.09)	(.11)			
1973	1.16	1.00	.37	.69	.54	.27
	(.55)	(.16)	(.15)			
1974	1.09	1.28	.19	.36	.53	.13
	(.65)	(.11)	(.18)			

per deposit dollar was highest, the implicit deposit rate was highest; in 1974, when the net revenue was lowest, the implicit deposit rate was correspondingly lowest. Table II also indicates the interesting result that although there was variation in the level of the implicit deposit rate, the share of net revenues passing through to depositors was consistently near 50 percent.

The implication of this market adjustment process is quite clear. A ceteris paribus reduction in deposit ceilings (or a failure to adjust r to increase in r_a) will increase net revenues and cause approximately half the increase in net revenues to be expended in implicit rate competition. Finally, this adjustment process resulted in implicit deposit rates which amounted to between 13 and 27 percent of observed average cost.

Estimated average financial production costs, also found in Table II, increased from 1972 to 1974. The change in estimated average production cost appears to be closely related to and might be considered a form of nonrate competition. Some techniques, such as advertising and the provision of goods and financial services, can be adjusted easily each year according to the economic incentive of the level of net revenues. Other capital intensive techniques, such as branching, parking or drive-in facilities cannot be as quickly adjusted if current rate spreads change but once in place become part of the fixed cost structure.[14]

In the financial intermediary cost literature, several studies have indicated the relatively higher costs of expansion of the financial system through branching. For example, Benston [2] found that consolidation of unit banks into a branch bank system raises costs slightly. Bell and Murphy [1] also concluded there were higher costs associated with branching operations. Similarly, Brigham and Pettit [6] found the average cost curve for an association shifts upward as the number of branches of an association increase.

These earlier observations are especially relevant to the interpretation of the increase in average production costs between 1972 and 1974. One could easily conjecture that the large net revenues in 1972 and 1973 provided incentives to

[14] Taggart [20] has found that for mutual savings banks, a sizable fraction of excess expenditures incurred under rate regulation appears to be attributable to branching. Similar results are reported by White [21] for commercial banks.

increase the number of branches and other fixed facilites, and these facilities, which increased average production cost, appeared with a lagged response in 1974.[15] This hypothesis is reinforced by the observation that there was a 25 percent increase in the number of savings and loan offices between 1972 and 1974.[16]

Summary and Conclusions

The imposition of deposit rate ceilings in 1966 caused savings and loan associations to engage in nonrate competition. Deposit ceilings have resulted in efforts to induce deposit holdings through the provision of goods and financial services to depositors and the extension of branches and other fixed facilities. Savings and loan associations adjusted implicit deposit rates to be approximately 50 percent of net revenues since depositors, in turn, responded to implicit deposit rates with an elasticity of the deposit level to the implicit deposit rate of approximately unity. This resulted in implicit deposit rates of between 19 and 37 basis points which amounted to between 13 and 27 percent of observed average cost. Nonrate

[15] Inflation as a cause of the increase in average cost does not historically appeal as an alternative explanation. During the years of rising prices from 1955 to 1957, average costs declined for SLAs (see Burns [7]). Furthermore, this increase in average cost runs counter to the long-term decline in average costs registered from 1948 until the imposition of deposit ceilings. The reason for this is that several researchers found that costs are more related to the number of accounts than to the account size measured in deposit dollars. During periods of inflation, costs increase but so does the average deposit size. Borrowing costs do not hold as an alternative explanation as these costs are reported separately and are not included in Total Operating Expenses or in observed average cost.

[16] See U.S. League of Savings Associations, *1975 Fact Book*, for these data.

Appendix 1

Observed Average Cost[a]

Year	%	Year	%
1948	1.505	1962	1.356
1949	1.482	1963	1.425
1950	1.486	1964	1.342
1951	1.499	1965	1.290
1952	1.480	1966	1.266
1953	1.443	1967	1.235
1954	1.423	1968	1.250
1955	1.403	1969	1.325
1956	1.393	1970	1.395
1957	1.386	1971	1.350
1958	1.379	1972	1.325
1959	1.404	1973	1.398
1960	1.391	1974	1.492
1961	1.381		

Source: Federal Home Loan Bank Board, Combined Financial Statements, 1947–1975, Washington, D.C.

[a] Observed average cost is the ratio of total operating expenses to the average annual deposit level.

competitive forces evidently resulted in inducements to increase the number of branch offices between 1972 and 1974. This, in turn, tended to increase average production costs per deposit dollar. Even with a stringent policy regarding entry, it could be assumed that if earning rates of savings and loan associations were to increase while deposit ceilings remained fixed, half of the increase in net revenues would be embodied in some form of nonrate competition.

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