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Deposit Demand, "Hot Money," and the Viability of Thrift Institutions

RECENT TRENDS in financial markets have stirred fears about the ability of thrift institutions in the United States—savings and loan associations and mutual savings banks—to survive and prosper. Although these institutions constituted the fastest growing segment of the financial system from 1947 to the mid-1960s, their spectacular prosperity has dimmed since then as markets have become increasingly volatile. More and more they have experienced deposit drains, and no relief seems in sight. Accordingly, many knowledgeable observers question the prospects of these institutions as now constituted and regulated.

Virtually every plan for general reform of the financial system implicitly or explicitly assumes some alteration in the powers of the thrift institutions if they are not to suffer serious deterioration. This assumption pervades the analysis and recommendations of the Hunt Commission:

Note: Andrew Carron, Eric Pookrum, and Melba Wood assisted with the computations in this paper. Helpful comments were contributed on an earlier version at a seminar at the University of Oregon.

Thus, even if monetary policy is used more moderately, the problems of liquidity and solvency encountered by financial institutions could be as severe as those experienced during 1966, 1969 and 1970. Modifications in the structure and regulation of the financial system are urgently needed. . . . Without changes in their operations, there is serious question about the ability of deposit thrift institutions to survive.[1]

A similar concern was voiced by Irwin Friend in his "Summary and Recommendations" in the Federal Home Loan Bank Board's *Study of the Savings and Loan Industry:*

For the savings and loan industry, a prolonged period of inflationary pressure contained mainly by monetary policy and rising interest rates could be disastrous.[2]

Even more recently, the Secretary of the Treasury stated a heightened concern:

I would reemphasize that today we are faced with economic and monetary conditions that again raise serious questions about the viability of our financial institutions.[3]

In the summer of 1973 and again in the summer of 1974 trends in market interest rates gave rise to great concern over the survival of these institutions. High interest rates on Treasury securities and the introduction of variable rate notes by bank holding companies punctuated an already bleak outlook for the thrift institutions. Deposits flowed out of mutual savings banks at a rapid pace and savings and loan associations had months of net withdrawals—a rarity for the industry. Never happy with any competition, thrift institutions were especially vehement in opposing high-yielding Treasury securities and variable rate notes, which they felt might generate pressure that their industry could not withstand.

The survival of an industry that holds over 35 percent of deposit liabilities and makes over 65 percent of residential mortgage loans is a vital issue for public policy. Even if all depositors could be fully protected by federal deposit insurance, and mortgage financing were made available through other channels, the functioning of the financial system and the mortgage market would be severely disrupted by widespread failures among the thrift institutions. This paper examines the viability of these institutions and in particular focuses on their susceptibility to rapid and massive out-

1. *The Report of the President's Commission on Financial Structure & Regulation* (U.S. Government Printing Office, 1972), pp. 15, 37.

2. Vol. 1 (U.S. Government Printing Office, 1969), pp. 7–8.

3. "Statement of William E. Simon," in *Financial Institutions Act—1973,* Hearings before the Subcommittee on Financial Institutions of the Senate Committee on Banking, Housing and Urban Affairs, 93 Cong. 2 sess. (1974), p. 6.

flows of interest-sensitive deposits—sometimes called "hot money." It explores the interest elasticities of deposits at thrift institutions and their changes over time, examining the implications of various simulated changes in interest rates, and as a special case, simulating the impact of the variable rate notes offered by bank holding companies. Finally, the paper attempts to determine whether the responsiveness of depositors is too great to allow thrift institutions as now constituted to survive and prosper.

Viability and Recent Trends

The viability of institutions can be defined in two basic ways: (a) the ability to stay in business—that is, to avoid bankruptcy, and (b) the ability to function in a customary manner. The first definition is much easier to quantify than the second, because it is difficult to define "customary." For instance, if the thrift institutions were forced to refrain from making new loans and called as many existing loans as possible, they might survive, but they would cease (temporarily) to be the supporters of the mortgage market they were intended to be. But if they simply curtailed their lending, the threat to their viability would be a matter of degree. This paper uses both definitions, although the first is stressed in the opening sections for two reasons. First, the failure of a financial institution is more serious than the slackening of its activities. Second, while government credit programs are not necessarily a sound approach for the long run, they can keep the mortgage market functioning. The concluding section addresses the question of viability in its sense of customary functioning.

There are at least two reasons for questioning the viability of the thrift institutions, one long term and the other more immediate. Over the long run, some fear, the payments system will evolve in such a way as to put deposit intermediaries that cannot offer third-party payment accounts at an insurmountable disadvantage.[4] The assumption here is that electronic funds-transfer systems will come to dominate paper-oriented systems, and that, given the convenience of dealing with a single institution in such a world, few depositors would place time deposits that did not offer third-party payment.

4. Third-party payment accounts are those that permit the depositor to direct the institution to pay a third party by means of an order issued to the third party. Checking accounts are the most common example.

Of more immediate importance is the inherent problem thrift institutions face in attracting and holding funds during periods of rising interest rates because of their enforced practices of borrowing short and lending long. Such practices are normally safe at roughly stable interest rates since relatively few depositors demand payment on a given day. But when market rates, particularly short rates, rise sharply, these institutions come on difficult times. Federal regulations usually limit the speed and amount of deposit rate increases, but thrift institutions would be constrained even without these ceilings because their earnings do not rise quickly. Forced to hold a high percentage of their assets in fixed-yield, long-term instruments, they can improve yields only on new loans, but must raise deposit rates to attract new funds and to hold many existing deposits.[5] They could pay higher earnings by drawing on reserves, hoping to replenish them in periods of lower rates. Institutions have, however, used this technique very little, inhibited either by their own reluctance or by their regulators—fortunately, as it turns out, because the rising trend in market rates since 1952 implies that they would have been unable fully to replenish reserves.

These constraints have been the facts of life for the thrift institutions since their inception. Those who now fear for their viability cite two important recent changes. First, interest rate fluctuations are becoming more and more pronounced and perhaps more frequent. Second, depositors are getting smarter, so that an increasing amount of funds at depository institutions—so-called "hot money"—is becoming responsive to small changes in the difference between market rates and deposit rates.[6] I believe that so

5. Since 1968 a sizable proportion of thrift deposits has been in fixed-maturity certificates, which are subject to stiff withdrawal penalties under regulations established in July 1973. But holders of passbook deposits, which in 1972 were 47 percent of all deposits at savings and loan associations and 75 percent at mutual savings banks, were free to move their funds without penalty; and before 1973 so were many certificate holders because withdrawal penalties were weakly enforced by institutions. In addition, if market rates climb sufficiently beyond the rates on their holdings, some certificate holders might be willing to pay the penalty to lock in a higher yield elsewhere.

6. "Hot money" should be distinguished from illicit funds and funds that are sensitive to international rather than domestic interest rate differentials. The origin of the term is obscure, although the usage is natural. Dhrymes and Taubman used it in their 1969 study of the savings and loan industry for funds that fled eastern for California associations; see Phoebus J. Dhrymes and Paul J. Taubman, "An Empirical Analysis of the Savings and Loan Industry," in Friend (ed.), *Study of the Savings and Loan Industry*, Vol. 1, p. 99. As is pointed out below, before 1966, Treasury bill rates were well below deposit rates at savings and loan associations, so that they were not as great an attraction for interest-sensitive depositors as they later became.

far this characterization is largely impressionistic. It seems to be based on three facts: (a) a large volume of deposits is in fixed-term accounts paying rates above those on passbook savings; (b) in the mid-1960s California savings and loan associations were apparently able to draw in considerable sums by offering higher interest rates than were paid elsewhere; and (c) in recent years thrift institutions have experienced deposit inflows in inverse relation to market rates. Whether this pattern represents a departure from the past, and how hot this money really is, remains unclear.

But the hot-money argument says that for any given rise in market interest rates more funds will tend to leave thrift institutions, that sharp increases in market rates will become increasingly frequent, and that the resulting flows will be so large as to bankrupt many thrift institutions.

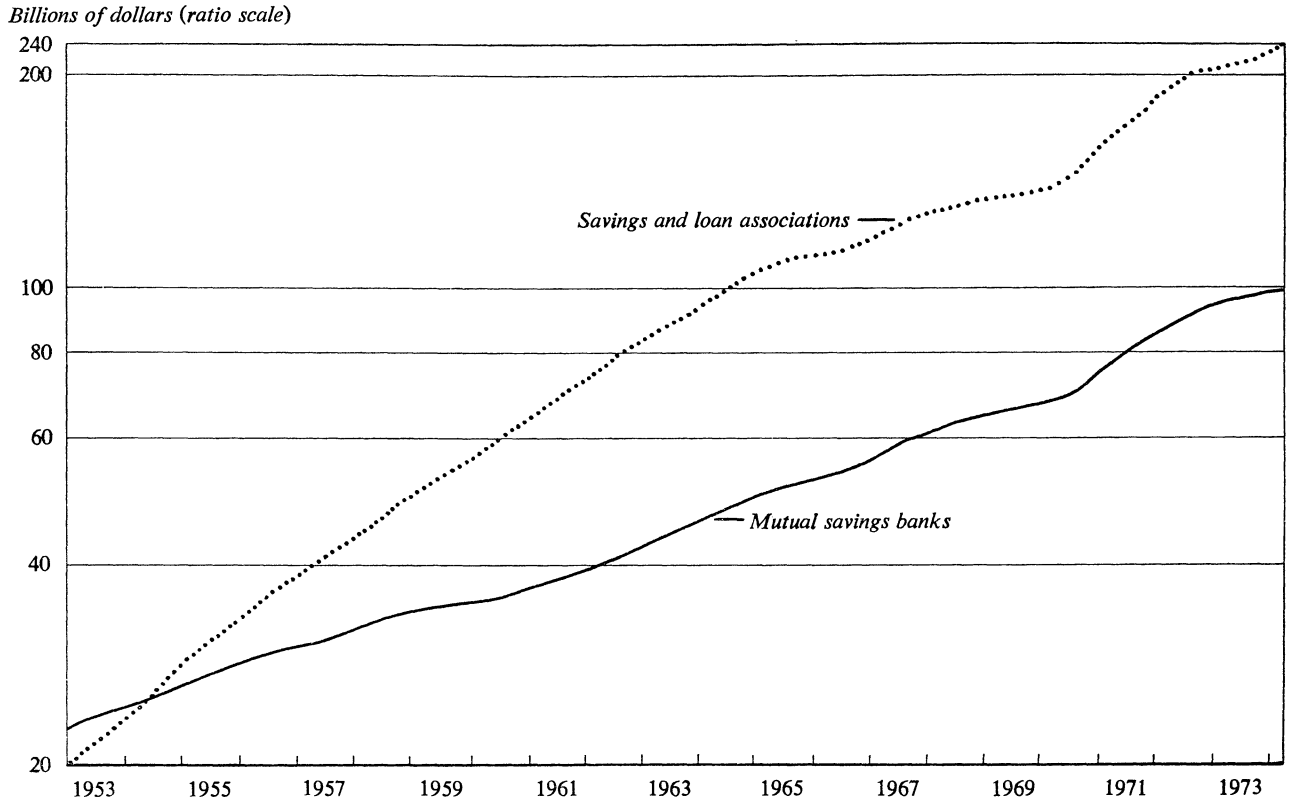
INTEREST RATE AND DEPOSIT TRENDS

While, as Figure 1 indicates, deposits at thrift institutions have increased sharply since 1952, in recent years the growth has been especially strong in forms other than regular passbook saving. In the second quarter of 1974, savings and loan associations held $126 billion of deposits (certificates) earning more than the regular passbook rate, up from $14 billion in the first quarter of 1967. Over the same period deposits earning the regular rate or less rose from $96 billion to $105 billion.[7] Certificates at mutual savings banks rose from $11 billion in the first quarter of 1967 to $42 billion in the second quarter of 1974, while regular deposits expanded from $46 billion to $57 billion. It is dangerous to conclude, however, that these certificates all constitute a new breed of hot money. Almost certainly factors other than interest elasticities contributed to this growth. Undoubtedly, some of the funds would have been put in passbook accounts if certificates had not been available, and this portion might not, then, be subject to any extra interest sensitivity. Actually, the variability of thrift institution deposits does not seem to have been rising before 1968: the quarterly coefficient of variation for savings and loan deposits declined from 0.109 for the period 1952:1 through 1960:4 to 0.045 for the period 1961:1 through 1968:2.

Interest rates have been on a clear upward path since World War II. The three-month Treasury bill rate averaged less than 2 percent in 1952 and

7. In between they also declined in August 1970, while certificates enjoyed uninterrupted growth after August 1968.

Figure 1. Levels of Deposits in Savings and Loan Associations and Mutual Savings Banks, Quarterly, 1953–74



Source: Tapes of flow-of-funds accounts provided by Board of Governors of the Federal Reserve System, Division of Research and Statistics.

over 7 percent in 1973. This trend by itself has been unfavorable to thrift institutions, since their assets have longer maturities than their liabilities. In addition, the variability of interest rates has increased. Since the Federal Reserve ceased to support Treasury securities in 1951, the monthly variance of the bill rate rose from 0.703 for the years 1952–65 to 1.547 for the years 1966–73.

The yields on the portfolios of thrift institutions have adjusted much more slowly than short-term market rates, and accordingly deposit rates have not fully kept pace with market rates, as Figure 2 reveals. It also shows that deposit rates have adjusted somewhat more promptly than asset yields to movements in short rates.

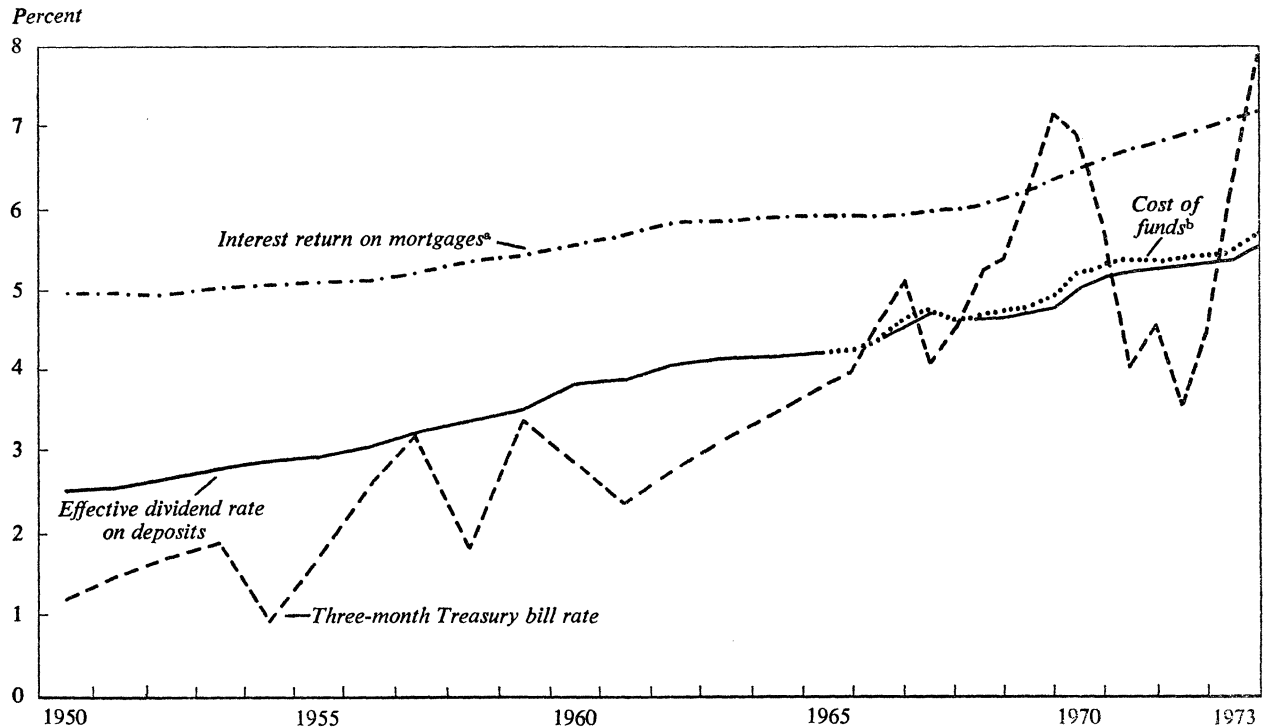
On a seasonally adjusted quarterly basis, total deposits at thrift institutions (including interest and dividends credited during the quarter), as measured in the flow-of-funds accounts, have virtually always risen since 1952. In several quarters deposits were virtually flat. But the average annual rate of growth from 1952 to 1973 was 13.2 percent and 7.5 percent for the two sets of institutions, respectively.

In examining viability, it is instructive to take deposits net of current interest and dividend payments, which are book transfers and do not provide funds for new lending. Without these payments, both savings and loan associations and mutual savings banks had net outflows of funds in 1966:2, 1973:3, and the last three quarters of 1969. In addition, savings and loan associations lost funds in 1966:3, and the mutual savings banks in 1970:1. All these losses are, however, modest compared with total deposits. The largest decline in any quarter was less than $2 billion for savings and loan associations and less than $1 billion for mutual savings banks, or about 1 percent of 1973 assets in both cases.

The Demand for Deposits

Central to the viability of thrift institutions is the responsiveness of their depositors to the costs and returns of holding their liabilities, particularly in relation to alternative forms of wealth. Several studies (cited below) of deposits at savings and loan associations in the late 1960s attempted to estimate this responsiveness by establishing demand functions for thrift deposits. But so many changes took place in the structure of the industry (ceilings on deposit interest rates and the spread of certificates are perhaps

Figure 2. Interest Rates on Treasury Bills and Selected Financial Data on Savings and Loan Associations, Annually 1950–64, Semiannually, 1965–73



Sources: Treasury bill rate—average of monthly data from *Federal Reserve Bulletin*, various issues. Other data—1950–64, tabulation from Federal Home Loan Bank Board; 1965–73—*Federal Home Loan Bank Board Journal*, various issues.

a. Annual data for 1965 for mortgage rate.

b. Includes dividend rate plus cost of advances from Federal Home Loan Banks; the difference between the two was generally constant, although it widened in the second half of 1973.

the most important) after 1965 that estimates based largely on pre-1966 experience naturally come into question. Fortunately, enough experience has accumulated since these studies to provide a basis for more confident estimates of elasticities.

The demand for thrift institution deposits depends on the allocation savers make of their overall wealth.[8] The amount of funds a depositor puts to each use should depend positively on the rate of monetary return it offers as well as on its nonpecuniary advantages, such as liquidity, safety, convenience, and inversely on the corresponding characteristics of other uses available to him. Further, the fraction of wealth that an individual holds in a particular form at a given set of interest rates may vary with his income, although how this relationship runs is not entirely clear. For lower-middle-income people, who hold the bulk of their wealth in durable goods such as houses and automobiles, increases in income are likely to be associated with increases in the share of wealth held in thrift deposits. On the other hand, wealthier individuals probably allocate the bulk of income increases to money market instruments, bonds, equities, and other non-deposit forms of wealth. The overall impact of increases in income and deposit shares is therefore an empirical question and depends on wealth positions of potential depositors. Intuitively, the deposit-augmenting response seems likely to predominate among thrift depositors, but this is a question for the data to decide.

8. This analysis bears some similarities to Franco Modigliani, "The Dynamics of Portfolio Adjustment and the Flow of Savings Through Financial Intermediaries," in Edward M. Gramlich and Dwight M. Jaffee (eds.), *Savings Deposits, Mortgages, and Housing: Studies for the Federal Reserve—MIT—Penn Economic Model* (Heath 1972). Modigliani's precise form was not used for several reasons, however. First, he estimated one equation for all thrift institutions and another to explain the share of savings and loan deposits in the total, obtaining deposits at mutual savings banks as a residual. I have estimated functions for each directly. Second, Modigliani picked 1962:2 as a quarter for a structural shift in demand, while I take 1965:4 (in fact, Modigliani suspends his trend variable at this quarter). Third, his formulation does not incorporate a delayed reaction of perceived to actual rates in his total equation and in general handles shifts in interest rate responses differently.

For other studies of the determination of thrift deposits, see Edward M. Gramlich and David T. Hulett, "The Demand for and Supply of Savings Deposits," in ibid.; Stephen M. Goldfeld, "Savings and Loan Associations and the Market for Savings: Aspects of Allocational Efficiency," in Friend (ed.), *Study of the Savings and Loan Industry*, Vol. 2; William L. Silber, *Portfolio Behavior of Financial Institutions* (Holt, Rinehart and Winston, 1970); George K. Kardouche, *The Competition for Savings: Determinants of Deposits at Commercial Banks, Mutual Savings Banks, and Savings and Loan Associations* (The Conference Board, 1969); and Dhrymes and Taubman, "Empirical Analysis."

Demand for thrift deposits therefore is estimated according to the following form:

$$S_j^* = f\left(i_j^p, i_c^p, i_m^p, \frac{Y}{W}\right), \tag{1}$$

where

S_j = the ratio of deposit type j to wealth; the asterisk denotes the desired value

i_j^p = the rate paid on deposit j (own rate) as perceived by depositors

i_c^p = a vector of perceived rates paid on competing deposit forms

i_m^p = a vector of perceived rates paid on market instruments such as Treasury bills and corporate bonds

$\frac{Y}{W}$ = the ratio of income to household net worth.

Equation (1) employs perceived interest yields rather than actual yields because the former may not adjust immediately to changes in the latter and it is the former that govern behavior. The nonrate characteristics of various forms of wealth such as liquidity and safety are assumed constant over time.[9]

Equation (1) describes equilibrium levels of deposit holdings relative to wealth, but actual stocks may not instantly adjust to desired values, for several reasons apart from the delay in adapting perceived interest rates to changes in actual rates. (The latter delays are incorporated directly into the equation by the approximations of perceived interest rates.) The first lies in the transactions costs of reallocating wealth among forms—the monetary costs, such as commissions and penalties for early withdrawal, and the nonmonetary cost in nuisance. These costs are likely to be higher, the larger and the more rapid is the adjustment. Second, individuals prefer to spread

9. By and large, these characteristics have varied little if at all. The most important exception is the liquidity of certificate accounts, because penalties for early withdrawal were stiffened in July 1973. The practice of giving gifts to spur new deposits and new accounts complicates the measurement of the perceived own rate because they may add to the actual return on deposits. The prevalence of this practice has varied geographically and over time, in some cases as a result of regulation and legislation. The costs of these gifts appear in advertising expenditures, but this figure includes many other expenses. The values to depositors depend further upon the usefulness of the gifts to them—the reason that gift competition is not fully efficient. I assume that the error in measuring deposit rates arising from omitting the values of gifts is negligible.

some adjustments over time. For instance, at sufficiently high income elasticities of demand for deposits, an increase in income could require a decline in consumption if stock equilibrium were to be regained within a quarter or two. Accordingly, short-run desired levels probably do not adjust instantaneously to the long-run desired levels given by equation (1). This type of delayed adjustment can be accommodated by postulating the following response to discrepancies between desired and actual deposit shares:

$$S_{jt} - S_{jt-1} = \gamma(S_{jt}^{*} - S_{jt-1}), \tag{2}$$

or

$$S_j = \gamma f\left(i_j^p, i_c^p, i_m^p, \frac{Y}{W}\right) + (1 - \gamma)S_{jt-1}, \tag{3}$$

where t denotes time.

Two more special features of the adjustment should be incorporated into the model. First, in the past two decades, up to 1973, the appreciation of assets, particularly common stocks, accounted for a large share—about two-thirds—of the increase in household net worth. Such increases in wealth are unlikely to be reallocated among other components in portfolios as quickly as increases in other forms, for several reasons: (1) selling these assets involves commission costs; (2) a prompt sale of large blocks of equities could depress the price in the short run, particularly for thinly traded issues, which constitute an important portion of net worth; and (3) probably most important, realizing the capital gain on an asset subjects the holder to capital gains tax. For all these reasons, then, the adjustment of actual to desired shares is likely to be slower when appreciation of equities accounts for a larger fraction of the increase in wealth.

At the other extreme, fresh additions to wealth in the form of saving are subject to far fewer of these transactions costs—in particular, they are free from capital gains taxation. They could be allocated among assets on the basis of current preferences as characterized by equation (1), independent of any lag in the adjustment of desired to past actual deposit shares. One might therefore expect that these flows would not involve the lags associated with rebalancing the assets in a portfolio.

On the other hand, a saver might well have regard for the lagged adjustment of the rest of his portfolio in allocating fresh saving. Individuals whose wealth has been increased by the appreciation of some assets can adjust by allocating a greater than average portion of wealth additions to other forms,

such as deposits, instead of realizing capital gains or redistributing other types of holdings. In either case, the volume of thrift deposits should be positively related to personal saving. The issue is whether fresh saving above the equilibrium share will be allocated to these deposits in order to offset slow adjustment to capital gains.

Since the value of household wealth in the economy changes only as a result of capital gains (or losses) and personal saving (or dissaving), the effect of the composition of changes in wealth on deposit shares can be approximated by including capital gains. Ideally, this impact on adjustment should be accounted for by making γ a function of the ratio of capital gains to wealth. To keep the function manageable, however, it is added as a separate variable:

$$S_{jt} = \gamma f\left(i_j^p, i_c^p, i_m^p, \frac{Y}{W}\right) + (1 - \gamma)S_{jt-1} + g\frac{CG}{W}, \tag{4}$$

where CG is capital gains of households (defined as the change in household net worth less personal saving in the current quarter). The discussion above implies that g should be less than or equal to zero. It will be less than zero if the lag effects of capital gains are not fully offset by the allocation of personal saving and zero if they are.

THE SUPPLY OF DEPOSITS

A complete model of thrift deposit determination would also include one or more equations specifying the supply relationships. Presumably the volume of deposits and the yields paid on them are simultaneously determined by the public's willingness to hold deposits and the institutions' willingness to supply them. Supply preference in turn should depend on yields on assets that institutions might acquire with the deposited funds, along with reserves and other opportunities for borrowing.

Separate supply functions were not used here for two related reasons. First, the thrift institutions generally do not directly control the quantities of deposits they supply. Rather, they set rates and stand ready to take all the deposits offered.[10] Their ability to set rates has been exogenously limited

10. Something of an exception appeared in 1973 when savings and loan associations were allowed to issue four-year certificates of deposit with no rate ceiling in volumes up to 5 percent of savings capital. Once the limit was reached, an institution could accept only 5 percent of total deposit growth in such deposits.

by regulation or legislation, particularly since 1966. To a considerable extent, then, demand does not determine deposit rates. Second, the omission of a supply function seems to make little difference to the estimates. Although Dhrymes and Taubman stressed the need to incorporate supply influences in their study, the results of doing so did not appear far different from their single-equation estimates.[11]

Estimated Functions

As Figure 2 shows, the relationship between the rates on deposits in thrift institutions and on Treasury bills changed in 1966. Before that year yields on Treasury bills generally remained below those on savings deposits, but after that the relationship was often reversed. After 1965, therefore, bills (and other open market instruments) probably became much closer substitutes for thrift deposits. A variety of demand functions estimated over both periods show substantial changes in elasticities around 1966, and I have therefore estimated the demand functions for the period 1966:1–1974:2. In the estimations, the own yield is an average of the rates paid on deposits at the two types of institutions, weighted by volumes (i_{SL} and i_{SB}).[12] The yield on competing deposits in commercial banks is denoted as i_c and is approximated by the rate on commercial bank certificates. The yield on market alternatives was approximated by the market yield on

11. "Empirical Analysis."

12. The own-rate series are not perfect measures of the incentives for depositors because they combine changes in the level of rates with changes in the distribution of deposits—that is, since the series is an average weighted by volumes, it can rise because the overall structure of rates rises or because depositors shift their preferences toward higher-yielding deposits. To some extent these shifts should be included in the rate, most importantly when passbook holders realize that they can obtain a higher return with minimal loss in liquidity by moving to a short-term certificate account (as was particularly true before July 1973). On the other hand, if depositors came to expect a decline in interest rates and shifted to longer-term deposits, the average own rate would rise, but not owing to any incentive of higher rate structure since the structure was unchanged.

In general, the higher the yield paid the more restrictions supervisory agencies require in the form of higher minimum denomination or longer minimum term. They also attempt to maintain the structure of incentives when rate ceilings are modified. Accordingly, the primary source of error in this series results from changes in tastes for maturities or denominations, possibly as a result of interest rate expectations. It is assumed here that the effect of this distortion is small.

three-month Treasury bills (i_b),[13] wealth by net worth of households (W), and income by disposable income (YD). Capital gains (CG) are changes in net worth net of personal saving. Finally, for estimation purposes, S_{jt-1} was subtracted from each side to make the dependent variable the change in shares (ΔS_{SL} and ΔS_{SB}). Accordingly, the coefficient of the lagged term should lie between -1 and 0.

The remaining required specification is the process by which perceptions of interest rates are generated. I assume that depositors and potential depositors are not immediately aware of all changes in their opportunity sets—that for instance, it takes time to realize that Treasury bill yields have risen. To account for these delays (which are not necessarily related to the lags in adjusting portfolios), perceived interest rates are approximated by weighted averages of current and past interest rates. Preliminary Almon lag techniques in ordinary least-squares regressions were employed to analyze the lag distributions by which perceived interest rates were generated. In

13. Several other candidates could have served as the proxy for yields on market alternatives. The most important are the commercial paper rate (often used in demand functions for money, as in Stephen M. Goldfeld, "The Demand for Money Revisited," *Brookings Papers on Economic Activity*, 3:1973, pp. 577–638), and the corporate bond rate (used by Modigliani in equations on the demand for thrift deposits). The bill rate was preferred here for a number of reasons. First, and far from trivially, I am not aware that the trade associations for the thrift and home building industries have ever condemned the issue of commercial paper or corporate bonds or cited them as threats to their deposits. Second, commercial paper is typically issued in lots of $100,000 or $1 million. Although lots of $25,000 are not unheard of, even these are far in excess of the average size of accounts at thrift institutions: in 1973 the average was $3,841 at savings and loan associations and $3,406 at mutual savings banks, according to data from the Federal Home Loan Bank Board and the National Association of Mutual Savings Banks, respectively (breakdowns between passbook and certificate accounts are not available); the averages were $2,773 and $2,349, respectively, in 1965. As averages, these figures do not rule out large volumes of sizable accounts, but in general it seems prudent to make the comparison using an instrument with a smaller minimum denomination, such as Treasury bills. Some experiments with the corporate bond rate produced results inferior to those using the bill rate. Furthermore, Treasury bills are more similar to deposits than are these other instruments with respect to liquidity, maturity, and government guaranty. They are available at no commissions at Federal Reserve Banks or at the Treasury Department in Washington, and individuals can be certain of obtaining bills by submitting noncompetitive tenders. Though the minimum denomination of bills was raised from $1,000 to $10,000 in February 1970, they retained their other advantages. The bill rate probably also serves as a proxy for yields of other government securities—notes, certificates, bonds, and agency issues—whose minimum denomination generally remains $1,000.

these estimations, the own-rate responses of deposit demands at both types of institutions were concentrated in the current and past two quarters, with roughly equal weights. Accordingly, three-quarter simple averages (i_{SL3} and i_{SB3}) of current and past own rates were used to capture own-rate responses. On the other hand, responses to the bill rate were spread over the current and past four quarters, suggesting that depositors take several quarters to perceive these changes. As suspected, depositors' perceptions rose more rapidly at first and then more gradually. The bill rate variable was thus constructed as a weighted average of the current and past four quarters with weights of 1, 2, 3, 2, and 1, respectively, and denoted i_{b5}. Finally, the best relationship between thrift deposits and the commercial bank rate was estimated using only the current quarter's rate.[14]

Although no interest rate response is estimated across these institutions, the determination of their deposit flows is very likely not independent—that is, many of the forces outside the model that cause especially large increases in deposits at savings and loan associations also cause them at mutual savings banks. The efficiency of the estimation of the demand functions can be enhanced by taking this relationship into account using the seemingly-unrelated-regressions technique.[15]

Table 1 reports the results of the estimates of equation (4). The coefficients in the table reveal a strongly positive response of both types of deposits to changes in the rates paid on them and negative responses to changes in yields on Treasury bills and commercial bank deposits. In each equation the response to own rate is larger than that to the yields on either substitute. In the mutual savings bank equation the own-rate coefficient exceeds the sum of the coefficients on substitutes only slightly, implying that a relatively small proportion of the new funds drawn in by an increase

14. With the rate variables specified in these forms, the rate at one type of institution has no significant effect on the deposits of the other. First, the two thrift institution rates move in parallel, particularly since 1966 when they became subject to regulatory ceilings. The relative attractiveness of deposits at the two types of institutions, in terms of rates, has therefore been roughly constant. Second, with a few exceptions, savings and loan associations and mutual savings banks tend to dominate different geographic markets. Mutual savings banks are permitted in only eighteen states, primarily in the Northeast, and where they operate they tend to attract larger deposit shares than do savings and loan associations.

15. See Arnold Zellner, "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," *Journal of the American Statistical Association*, Vol. 57 (June 1962), pp. 348–68.

Table 1. Coefficients and Statistics for Demand Functions for Deposits at Savings and Loan Associations and Mutual Savings Banks, 1966:1–1974:2

Independent variable and summary statistic	*Change in ratio of deposits to household net worth*[a]			
	Savings and loan associations		*Mutual savings banks*	
Independent variable[b]				
Constant	−0.01185	(−4.625)	−0.0026	(−2.121)
Own rate				
Savings and loan associations, i_{SL3}	0.00156	(4.980)	...	...
Mutual savings banks, i_{SB3}	...	...	0.0005	(3.996)
Treasury bill rate, i_{b5}	−0.00039	(−3.685)	−0.0002	(−4.519)
Commercial bank rate, i_c	−0.00024	(−0.880)	−0.0002	(−2.289)
Ratio of deposits to household net worth, lagged one quarter				
Savings and loan associations	−0.07665	(−2.185)	...	...
Mutual savings banks	...	...	−0.2072	(−2.790)
Ratio of capital gains to household net worth, CG/W	−0.01831	(−4.233)	−0.0085	(−5.010)
Ratio of disposable income to household net worth, YD/W	0.05301	(3.576)	0.0330	(5.643)
Summary statistic[c]				
R^2	0.691	...	0.723	...
Standard error	0.00035	...	0.00012	...
Durbin-Watson	2.202	...	1.890	...

Sources: Derived from equation (4). See appendix at end of this paper for data sources.
a. The numbers in parentheses are *t*-statistics.
b. See the appendix for a detailed description of the variables.
c. Summary statistics are from the first stage of the regressions.

in own rate comes from money and other assets whose yields are not accounted for in this equation. This is not the case for savings and loan associations, however, whose own-rate coefficient exceeds twice the sum of the other two.[16] The rate on mutual savings bank deposits was tested in this equation but it never yielded a significant coefficient and even its sign was not robust to minor changes in the specification. While deposits at both savings and loan associations and mutual savings banks are sensitive

16. This result does not appear to be due simply to the fact that part of the growth of deposits comes from interest that depositors do not bother moving. The own-rate coefficient for savings and loan deposits remained high even when the deposit variable was taken as deposits less dividends credited in the current quarter.

to the bill rate, the latter are even more responsive to commercial bank rates.[17]

The coefficients show that deposit flows tend to be depressed by a concentration of wealth increases in the form of capital gains. This influence is not offset by allocations of personal saving, a not surprising result since the latter are typically much smaller than capital gains. Individuals allocate increasing shares of their assets to thrift deposits as their income levels rise, so that the behavior of low- and middle-income individuals apparently offsets any tendency of higher-income groups to concentrate on other forms of wealth when their incomes increase.[18] Finally, the coefficients of the lagged deposit stocks have the correct signs but imply that for savings and loan associations only 8 percent of the gap between desired and actual deposits is closed in the first quarter. This result is somewhat surprising, particularly because the delayed response of perceived to actual interest rates is separately accounted for. These coefficients remained low through several changes in the specification, including the omission of the capital gains variable. They are, however, still well above those obtained by Modig-

17. Alternatively, one might postulate that no funds can come from other assets or from induced saving and that, in fact, all the coefficients of the interest rate variables in equation (4) must sum to zero. Equation (4) was reestimated with this restriction. (It does not, however, require the coefficients to sum to zero each quarter but rather is concerned with the overall impact of rates and the maximum decrements that changes in interest rates can produce.) The estimates (with t-statistics in parentheses) are:

$$\begin{aligned}\Delta S_{SLt} = {} & -0.0146 + 0.000633 i_{SL3} - 0.000399 i_{b5} - 0.000234 i_c \\ & (-4.601) \quad (2.104) \quad (-2.922) \quad (-0.662) \\ & - 0.0218 S_{SLt-1} - 0.0148 CG/W + 0.0760 YD/W; \\ & (-0.510) \quad (-2.734) \quad (4.349) \\ \Delta S_{SBt} = {} & -0.00352 + 0.000379 i_{SB3} - 0.000167 i_{b5} - 0.000218 i_c \\ & (-2.706) \quad (4.894) \quad (-4.001) \quad (-2.500) \\ & - 0.155 S_{SBt-1} - 0.00876 CG/W + 0.0338 YD/W. \\ & (-1.996) \quad (-5.000) \quad (5.665)\end{aligned}$$

Comparing these estimates with Table 1 shows that the primary impact on interest rate coefficients is to reduce those for the own rates, primarily for savings and loan deposits. Those for the bill rate and the bank rate are almost entirely unaffected. The speeds of adjustment of actual to desired deposit stocks also decline noticeably. But because the coefficients of the bill and bank rates are virtually unchanged, nearly all of the simulations below are robust to this restriction. The only one that is sensitive involves an increase in own rates to arrest deposit outflows, and the power of this change would be correspondingly reduced under the above assumptions.

18. Modigliani found a negative, although not always significant, coefficient for this variable in his total thrift deposit equation.

liani in his estimates for total thrift deposits over an earlier period. The adjustment of mutual savings bank deposits tends to be much more rapid, over 20 percent a quarter.

Has Money Become "Hotter"?

The essence of the issue about hot money is whether interest rate responses have intensified since 1966. In that year the thrift institutions were pressed by high market interest rates, and suffered net deposit withdrawals for the first time in the postwar period. Furthermore, rates on Treasury bills matched or exceeded thrift deposit rates on a continuing basis, and bills thus offered much more effective competition for funds.

Along with other observers, Dhrymes and Taubman detected a shift of elasticities in 1966. When they extended their sample to include that year, for a regression of the logarithm of the ratio of savings and loan deposits to normal income, the coefficient of the logarithm of the Treasury bill rate went from -0.0198 to -0.0331.[19] But since their study ended with 1966, it could not fully investigate the structural shifts in general or changes in elasticities in particular. Accordingly, equation (4) was estimated for savings and loan associations and mutual savings banks for 1953:2–1965:4, using the seemingly-unrelated-regressions technique.

The estimates of equation (4) comparable to those in Table 1 for the earlier period appear in the first two columns of Table 2. The short-run response of deposits to the bill rate was far lower in the earlier period and, unlike the later period, is not significant. In addition, the commercial bank rate has insignificant coefficients, which is somewhat surprising since it was above open market rates in this period. Preliminary regressions using Almon lags suggested that part of the problem was the dispersion of the impact of the bank rate over time. Accordingly, several weighted averages of past bank rates were tried, and best results were obtained using an average of the current and past five quarters, with equal weights. Estimations using this variable (i_{c6}) appear in the last two columns of Table 2 and show higher coefficients for the bank rate; it was, however, significant only for savings and loan associations, for which it is far higher than in the later period. The coefficient of the bank rate is so much higher in the earlier period than

19. "Empirical Analysis," pp. 94–96.

Table 2. Coefficients and Statistics for Demand Functions for Deposits at Savings and Loan Associations and Mutual Savings Banks, 1953:2–1965:4

Independent variable and summary statistic	*Change in ratio of deposits to household net worth*[a]			
	Using current commercial bank rate		*Using six-quarter average of commercial bank rate*	
	Savings and loan associations	*Mutual savings banks*	*Savings and loan associations*	*Mutual savings banks*
Independent variable[b]				
Constant	−0.00281 (−1.799)	−0.00497 (−5.765)	−0.00389 (−2.733)	−0.00523 (−6.404)
Own rate				
Savings and loan associations, i_{SL3}	0.00109 (5.064)	... ...	0.00134 (6.511)	... ...
Mutual savings banks, i_{SB3}	... ...	0.00044 (3.409)	... ...	0.00056 (4.399)
Treasury bill rate, i_{b5}	−0.00006 (−0.937)	−0.00001 (−0.286)	−0.00002 (−0.284)	0.000001 (0.040)
Commercial bank rate				
Current, i_c	−0.00035 (−1.766)	−0.00010 (−1.006)	... ...	... ...
Six-quarter average, i_{c6}	... ...	... ...	−0.00072 (−3.817)	−0.00018 (−1.860)
Ratio of deposits to household net worth, lagged one quarter				
Savings and loan associations	−0.02343 (−1.158)	... ...	−0.00429 (−0.24439)	... ...
Mutual savings banks	... ...	0.00578 (0.013)	... ...	−0.00336 (−0.075)
Ratio of capital gains to household net worth, CG/W	−0.01892 (−6.376)	−0.01334 (−6.528)	−0.01564 (−5.779)	−0.01208 (−6.271)
Ratio of disposable income to household net worth, YD/W	0.00608 (1.067)	0.01803 (4.576)	0.00794 (1.556)	0.01917 (4.891)
Summary statistic[c]				
R^2	0.658 ...	0.780 ...	0.730 ...	0.798 ...
Standard error	0.00017 ...	0.00009 ...	0.00015 ...	0.00009 ...
Durbin-Watson	1.042 ...	1.264 ...	1.128 ...	1.245 ...

Sources: Derived from equation (4). See appendix at end of this paper for data sources.
a. The numbers in parentheses are *t*-statistics.
b. See the appendix for a detailed description of the variables.
c. Summary statistics are from the first stage of the regressions.

the later period that the sum of coefficients on substitutes is higher in the earlier period.

Comparison of long-run responses is more problematic because it requires dividing by the coefficients of lagged stocks, none of which differs from zero at a reasonable level of significance. These coefficients are far smaller than in Table 1, so that some of the long-run responses estimated in this way are very large. Because of questions regarding the true sizes of the coefficients of lagged values, the long-run responses are not presented. For the short run, it appears that in a sense savings and loan deposits were no more rate responsive in the later period but simply changed the direction of responses as a result of the change in the structure of rates on alternatives. It should be remembered, however, that the lag structure on the bank rate means that the total response took longer in the earlier period though not for mutual savings banks. The own-rate responses were roughly the same in the earlier period—in fact the coefficient is modestly higher for the mutual savings bank rate. In addition to the lower responses to competitive interest rates, the estimates for the early period are also characterized by extremely slow adjustment of actual to desired deposits. The adjustments have been much more rapid since 1965, in line with the hypothesis that savers are now more responsive to all kinds of influences, not interest rates alone.

For both savings and loan associations and mutual savings banks, then, it appears that the sensitivity of deposits to open market interest rates has shifted sharply since 1965. This phenomenon seems to have been generated in part by a general increase in savers' responsiveness and in part by the change in the relationships among thrift rates, bank rates, and open market rates. Unlike the earlier period, open market rates have tended to exceed bank rates during periods of rising rates since 1965, so that thrift deposits have become less responsive to commercial bank rates and more responsive to open market yields.

Simulations of Interest Rate Increases

To assess the implications of the interest rate sensitivity of thrift deposits, the demand functions in Table 1 were simulated for four shocks from the yields on substitutes. The simulations add to actual experience further increases in yields, calculated to span a range of likely interest rate behavior

and to approach worst possible cases. They thus constitute a "double dose" of sharply rising rates. In each instance, the increases were phased in with equal increments over three quarters because historically this has been about the maximum length of sharp continuous advances in market interest rates. All the simulations begin with 1971:3, because interest rates were fairly stable then and the succeeding quarters were not marked by credit crunch, and because the results then yield twelve quarters of experience by which to gauge the adjustments. All other rates were held unchanged. The numbers are obtained by multiplying actual net worth in the quarter by the difference between the deposit shares predicted by the equation with and without the shocks.

Table 3 reports the results of lifting the three-month Treasury bill rate above its historical path by the largest margin by which it ever rose over three quarters—3.46 percentage points. The increase is phased in over three quarters by assuming that the shift was 1.15 points in the first quarter, 2.31 points in the second, and the full 3.46 points in the third and all quarters thereafter. This case is referred to hereafter as the *maximum increment in the bill rate.*

Table 3. Simulations of Deposit Losses of Thrift Institutions Assuming the Maximum Increment in the Bill Rate, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.2	0.2	0.1	0.1
4	0.7	0.9	0.3	0.4
1972:1	1.9	2.7	0.9	1.3
2	3.3	6.0	1.5	2.8
3	4.5	10.5	2.1	4.8
4	5.2	15.7	2.4	7.2
1973:1	5.5	21.2	2.5	9.8
2	5.6	26.8	2.6	12.3
3	5.7	32.4	2.6	14.9
4	5.7	38.1	2.6	17.6
1974:1	5.7	43.8	2.6	20.2
2	5.7	49.5	2.6	22.8

Sources: Derived from demand functions in Table 1. See text for assumptions and appendix for data sources.

a. Calculated from figures before rounding.

Table 4. Simulations of Deposit Losses of Thrift Institutions Assuming the Maximum Increment in the Bank Rate, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.4	0.4	0.3	0.3
4	0.9	1.3	0.7	1.0
1972:1	1.3	2.6	1.1	2.1
2	1.4	4.0	1.1	3.2
3	1.4	5.4	1.1	4.3
4	1.4	6.9	1.1	5.4
1973:1	1.5	8.3	1.2	6.6
2	1.5	9.8	1.2	7.8
3	1.5	11.3	1.2	9.0
4	1.5	12.9	1.2	10.2
1974:1	1.5	14.4	1.2	11.4
2	1.5	15.9	1.2	12.6

Sources: Same as Table 3.
a. Calculated from figures before rounding.

Table 4 treats the commercial bank rate in a similar fashion, lifting it by its maximum three-quarter rise of 1.54 percentage points, phased in in the manner described above for the maximum change in the bill rate. This case is referred to as the *maximum increment in the bank rate.*

Table 5 gives the results for raising the bill rate above its actual path by the mean three-quarter rise over the 1966–74 period—0.334 point (a case referred to as the *mean increment in the bill rate*); and Table 6 deals with the bank rate similarly (its mean rise in the period was 0.244 point, and this case is called the *mean increment in the bank rate*).

Table 3 demonstrates that because the public lags in perceiving and responding to the change in open market rates, several quarters elapse before deposits decline substantially. But then the losses become indeed large: quarterly decrements exceed past record levels of losses by the second quarter after the one in which the bill rate begins to rise and then reach extremely uncomfortable levels. Five quarters after the process begins, losses exceed $5 billion per quarter for savings and loan associations and $2 billion for mutual savings banks. These impacts are the effects beyond normal growth trends from income and other factors and therefore do not mean net deposit losses of these full magnitudes; furthermore, the bill rates

need not remain so high so long. But these figures do indicate that deposit decrements would quickly become very substantial if the bill rate remained up.

Table 4 reveals that the smaller, 1.54 point, rise in the commercial bank rate has a lesser but still substantial and prompt depressing effect on deposit flows. The deposit losses never match those for the bill rate rise but once again they exceed record outflows, in this case four quarters after the increase in the bank rate.

Tables 5 and 6 reveal the much less harmful impact from the mean three-quarter increases in the bill and the bank rates. After five quarters the bill rate increases produce quarterly deposit decrements of $500 million for savings and loan associations and $250 million for mutual savings banks, compared with average quarterly inflows from 1966:1 to 1974:2 of $3.76 billion and $1.37 billion, respectively. The other positive influences on thrift inflows provide a margin adequate to cushion this type of shock, as is discussed more fully below.

The maximum increment in the bill rate assumed in Table 3 is plainly an extreme case, unlikely to be sustained indefinitely. But it was intentionally selected to explore the effects on deposit flows if the path of interest rates

Table 5. Simulations of Deposit Losses of Thrift Institutions Assuming the Mean Increment in the Bill Rate, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.0	0.0	0.0	0.0
4	0.1	0.1	0.0	0.0
1972:1	0.2	0.3	0.1	0.1
2	0.3	0.6	0.1	0.3
3	0.4	1.0	0.2	0.5
4	0.5	1.5	0.2	0.7
1973:1	0.5	2.0	0.2	0.9
2	0.5	2.6	0.2	1.2
3	0.5	3.1	0.3	1.4
4	0.5	3.7	0.3	1.7
1974:1	0.5	4.2	0.3	2.0
2	0.5	4.8	0.3	2.2

Sources: Same as Table 3.
a. Calculated from figures before rounding.

Table 6. Simulations of Deposit Losses of Thrift Institutions Assuming the Mean Increment in the Bank Rate, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.1	0.1	0.1	0.1
4	0.1	0.2	0.1	0.2
1972:1	0.2	0.4	0.2	0.3
2	0.2	0.6	0.2	0.5
3	0.2	0.9	0.2	0.7
4	0.2	1.1	0.2	0.9
1973:1	0.2	1.3	0.2	1.0
2	0.2	1.6	0.2	1.2
3	0.2	1.8	0.2	1.4
4	0.2	2.0	0.2	1.6
1974:1	0.2	2.3	0.2	1.8
2	0.2	2.5	0.2	2.0

Sources: Same as Table 3.
a. Calculated from figures before rounding.

were suddenly, sharply, and permanently lifted. What would happen if open market rates moved up rapidly and declined just as rapidly, a not uncommon occurrence? Table 7 shows deposit losses on the assumption that the bill rate is elevated by 3.46 points in equal segments over three quarters beginning 1971:3 and then is reduced by the same amount at the same pace.

Because of the delays in depositors' responses, the outflows never reach the rate induced by the sustained rise: the worst quarter—1972:3—is less than 65 percent of the more severe quarters reported in Table 3, and the outflows are particularly sharp in only three quarters. While the accumulated losses are considerable, the impact on thrift institutions is primarily one of inhibiting growth rather than depressing the industry.

VARIABLE RATE NOTES

The estimates obtained here are useful in projecting the impact of variable interest rate notes of small denominations, first issued in 1974 by Citicorp, the holding company of the First National City Bank of New York. This type of note has been viewed as a special threat to deposits at

Table 7. Simulations of Deposit Losses of Thrift Institutions Assuming the Maximum Increment in the Bill Rate Is Applied in Three Equal Steps Beginning 1971:3, and Then a Decline of the Same Amount and Speed to 1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.2	0.2	0.1	0.1
4	0.7	0.9	0.3	0.4
1972:1	1.8	2.7	0.9	1.3
2	3.1	5.8	1.4	2.7
3	3.7	9.5	1.7	4.4
4	3.2	12.7	1.5	5.9
1973:1	2.0	14.7	0.9	6.8
2	0.8	15.6	0.4	7.2
3	0.2	15.8	0.1	7.3
4	0.0	15.8	0.0	7.3
1974:1	0.0	15.8	0.0	7.3
2	0.0	15.8	0.0	7.3

Sources: Same as Table 3.
a. Calculated from figures before rounding.

thrift institutions because its yield can follow market rates above the Regulation Q-type ceilings applicable to commercial banks and thrift institutions. The notes can offer this feature because they are obligations of the bank holding company, not the bank, and therefore are not subject to deposit interest rate ceilings or reserve requirements.[20] As holding company debt, these notes are not liabilities of the banks owned by the holding companies nor are they protected by federal deposit insurance. They have been issued in initial lots of $5,000 or more but they can be sold in units of $1,000 thereafter, either back to the issuer or on the New York Stock Exchange, where they are listed.[21]

Thrift institutions have maintained that, in spite of the legal distinctions, these notes are for all practical purposes bank deposits and as a result

20. Bank holding company debt maturing in less than seven years is subject to reserve requirements, but the notes issued lately have had fifteen-year maturities, although they can be redeemed at the holder's option within two years and every six months thereafter.

21. The Citicorp notes sold below par soon after their issue in the summer of 1974 and rose to approximately par several months later.

should be subject to interest rate ceilings and reserve requirements (although they have not sought authority to issue similar notes). They argue that the generous yields, low denominations, and redemption and marketability features make such an attractive package that depositors are withdrawing funds from thrift institutions to buy these notes. So far as I am aware, there is no firm evidence of this phenomenon on a substantial scale, but the elasticities obtained above should cast light upon the likely size of the response.

The yield on these notes could be determined by any number of formulas, but even though both the banking system and the capital market are commonly considered highly competitive, most of these issues have offered exactly the same formula. Apparently it "works." The formula specifies an initial stated yield of 9.70 percent (first obtained by Citicorp by application of the formula to May 1974 Treasury bill yields) for the first year or so, unless the formula dictates a higher rate in the second half of that year. Thereafter the yield is set 1 percentage point above the average yield on three-month Treasury bills, reported by the Federal Reserve Bank of New York for the twenty-one days immediately preceding May 20 and November 20, and this rate is in effect for the six months beginning the following June 15 and December 15, respectively. After a holding period of about two years the notes can be redeemed at par each six months.[22]

The public's response to such notes depends upon whether it views them as a close substitute for Treasury bills or for commercial bank deposits, or as an instrument different from and riskier than either of these. Since it is a new product, history offers little guidance. Most likely, they are seen as much like Treasury bills or bank deposits. An idea of their effect on thrift deposits can be gleaned by simulating increases in each of these two rates. This approach assumes that these notes become a widespread alternative to other market instruments—a degree of prominence that they have yet to reach—and that they will be issued in whatever volume the public demands at a fixed set of terms. In the first exercise, the notes are assumed to be close but not perfect substitutes for Treasury bills. To approximate this relationship the rate that would have been paid on these notes is reduced by 0.25 point and the bill rate coefficients are applied to the resulting rate. The

22. The minimum holding period first proposed by Citicorp was only six months. It was extended after correspondence between the chairmen of Citicorp and of the Board of Governors of the Federal Reserve System, and the Federal Reserve then withdrew its opposition to the notes.

quarter-point reduction reflects the fact that these notes are not U.S. government obligations and do not enjoy all the special features of Treasury bills, particularly the highly developed market. The reduction is no larger because the notes do offer the convenience of zero reinvestment costs and, for holders who possess the actual notes (rather than leaving them with their brokers), lower redemption charges. One feature of the formula is that it locks the yield in for six months based on interest rate patterns over three weeks. Accordingly, during periods of sharply rising interest rates the yield on bills could exceed that on the notes, and at such times the public is unlikely to buy many notes. In the simulation, the actual Treasury bill rate is substituted for the formula yield less 0.25 point whenever the latter is below the bill rate. Simulations based on the post-1965 estimates from Table 1 for this case appear in Table 8. Deposit losses are quite modest when compared with those of earlier simulations. The decrement to depos-

Table 8. Simulations of Deposit Losses of Thrift Institutions Assuming That Variable Rate Notes Are Prevalent Beginning 1971:3, and Substitute for Treasury Bills, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.0	0.0	0.0	0.0
4	0.1	0.1	*	*
1972:1	0.4	0.5	0.2	0.2
2	1.0	1.5	0.5	0.7
3	1.3	2.8	0.7	1.4
4	1.2	4.1	0.6	2.0
1973:1	0.7	4.8	0.4	2.3
2	0.3	5.0	0.1	2.4
3	*	5.1	*	2.5
4	0.0	5.1	0.0	2.5
1974:1	0.2	5.3	0.1	2.6
2	0.5	5.7	0.2	2.8

Sources: Derived from demand functions in Table 1. The rates on variable-rate notes used in the simulation were calculated on the basis of the formula in the Chase Manhattan Corporation offering prospectus cited in the appendix—that is, they are based on average rates on three-month Treasury bills for the twenty-one days ending May 20 and November 20 and the resulting rate applies for the six-month periods beginning the following June 15 and December 15, respectively.

a. Calculated from figures before rounding.

* Less than 0.05.

Table 9. Simulations of Deposit Losses of Thrift Institutions Assuming That Variable Rate Notes Are Prevalent Beginning 1971:3, and Substitute for Commercial Bank Deposits, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[a]	*Loss in quarter*	*Cumulative loss*[a]
1971:3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
1972:1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0
1973:1	0.0	0.0	0.0	0.0
2	0.1	0.1	*	*
3	0.0	0.1	0.0	*
4	*	0.1	*	0.1
1974:1	1.5	1.6	1.2	1.3
2	1.6	3.2	1.3	2.6

Sources: Same as Table 3.
a. Calculated from figures before rounding.
* Less than 0.05.

its in savings and loan associations does exceed $1 billion for two quarters, but by and large the results are most nearly comparable to the mean rise in the bill rate.

Table 9 reports deposit losses simulated on the assumption that a rise in the rate on commercial bank certificates is more relevant to the attractiveness of the notes. In these simulations, the bank household certificate rate is set equal to 0.25 percentage point below the formula rate or the actual bank rate, whichever is greater, beginning in 1971:3. The rate was not set at the full formula rate because the notes are not liabilities of banks, and thus lack deposit insurance and hence are somewhat riskier. Table 9 shows minimal outflows from thrift deposits to notes until 1974, when the Treasury bill rate rose well above commercial bank deposit rates. Until then, the note yields (0.75 percentage point above bill yields on the assumptions of the table) would not have been more attractive than commercial bank deposit rates to anyone who viewed the notes as substitutes for commercial bank deposits. The particular structure of interest rates in the first half of 1974 probably accounts for the belief of the thrift institutions that the

primary threat of notes comes from the public's confusing them with commercial bank deposits. In fact, the threat typically comes from their being viewed as open market securities.

In perspective, these maximum deviations are substantial. Indeed, they are too substantial to be relevant to the present context because only about $1½ billion of variable rate notes have been issued and recent sales have required an increase in the yields. These estimates assume that the notes become very much more widespread than they now are, and this development will require many more issues. The import of the estimates is that the proliferation of such notes need not mean a massive drain on thrift deposits, particularly if the deposit interest rates are allowed to rise. While quarterly losses of savings and loan deposits of $1 billion are not trivial, they are far different from the losses of $10 billion to $20 billion that were predicted when the new instrument was first proposed.

LOSSES AND GROWTH

Substantial as these implied losses are, they must be put in perspective. Both savings and loan associations and mutual savings banks have enjoyed strong deposit growth since 1952 in general and since 1965 in particular. From 1966:1 to 1974:2 savings and loan associations had an average quarterly inflow of deposits of $3.76 billion, while mutual savings banks averaged $1.37 billion.[23] The decrements to deposits predicted above must be interpreted as deviations both from a fairly prosperous trend and from actual experience.

Table 10 compares actual deposits with those resulting from the cumulative deposit decrements. Two of the assumptions about the Treasury bill rate, those involving the mean rise and the rising then falling rate (shown in columns 2 and 3), do not imply any decline in deposits but merely slower growth—temporarily in the latter and permanently in the former case, and even so the size of the reduction is quite modest. Only the sustained maximum rise in the bill rate causes deposits to fall at all, and then the decline starts rather late—1973:3 for savings and loan associations (a difficult quarter for them anyway), 1973:1 for mutual savings banks. The drops toward the end of the period represent an extreme case and result from a double dose of sharply rising interest rates: the simulated ones plus those

23. Mutual savings bank deposits at the end of 1965 were about half the size of savings and loan deposits, so that the mutuals have experienced less exuberant deposit growth.

Table 10. Actual Deposits in Thrift Institutions, and Actual Less Cumulative Decrements from Various Shocks Arising from the Bill Rate, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Actual deposits*	*Actual less decrement from selected shock*		
		Mean rise in bill rate[a]	*Rise and fall in bill rate*[b]	*Maximum rise in bill rate*[c]
	Savings and loan associations			
1971:3	169.3	169.3	169.1	169.1
4	174.9	174.8	174.0	174.0
1972:1	185.2	185.0	182.5	182.5
2	192.6	192.0	186.8	186.6
3	200.7	199.7	191.2	190.2
4	208.3	206.8	195.6	192.6
1973:1	216.0	213.9	201.2	194.8
2	221.7	219.1	206.1	194.9
3	223.3	220.2	207.6	190.9
4	228.8	225.1	213.0	190.7
1974:1	235.6	231.4	219.8	191.8
2	238.4	233.6	222.6	188.9
	Mutual savings banks			
1971:3	79.4	79.4	79.3	79.3
4	81.5	81.5	81.1	81.1
1972:1	84.8	84.6	83.5	83.5
2	87.2	87.0	84.6	84.5
3	89.7	89.2	85.3	84.9
4	92.2	91.5	86.4	85.0
1973:1	94.6	93.6	87.8	84.8
2	96.2	95.0	89.0	83.9
3	96.3	94.8	89.0	81.3
4	96.9	95.2	89.7	79.4
1974:1	99.0	97.0	91.7	78.8
2	99.3	97.1	92.0	76.5

Sources: Actual—see appendix; decrements—Tables 5, 7, 3, respectively. Also see text.
a. 1966–74 average three-quarter rise.
b. Historical maximum three-quarter rise, and fall of same amount.
c. Historical maximum three-quarter rise.

that actually took place and depressed experienced growth. By and large, the estimates imply that thrift institutions would be able to handle fairly severe increases in interest rates. Particularly since rates typically decline for a period after a sharp rise, the worst-case scenario is improbable—that

is, market interest rates are unlikely to rise by record margins and remain that high indefinitely.

One shortcoming of the numbers in Table 10 is the underlying assumption that rates paid by commercial banks remain fixed. This may or may not be realistic, depending upon the banking supervisors. On the chance that it is not, Table 11 repeats the calculations of Table 10 but assumes that mean and maximum increases in the bill rate are matched by mean and maximum increases in the commercial bank rate. Once again the effects of mean increases are mild, but the combination of the two maximum increases deeply depresses deposits, although again the decline is delayed because of the laggard response to the bill rate.

Adjusting to Deposit Losses

The thrust of the results reported in Tables 10 and 11 is that all but extreme rises in interest rates only dampen the growth of thrift deposits, rather than inducing large deposit outflows. Still, as the last columns of the tables indicate, sizable net losses are possible if rates rise far enough and remain high long enough. In addition, when interest rates rise thrift institutions typically have some mortgage loan commitments outstanding, and have to scramble for funds to meet them out of inflows that are lower than were expected at the time the commitments were made. On the other hand, the bulk of the cash inflow to the institutions is in mortgage repayments, which are unaffected by the movements in market rates.[24] Neither class of institution is likely to suffer deposit losses in excess of $5 billion net of lending commitments and mortgage repayments.[25] In any case this figure provides a guide to assessing the cost of adjustment.

24. To put these flows in perspective, in the third quarter of 1973 cash mortgage repayments to savings and loan associations totaled $7.5 billion, while outstanding commitments averaged $12.3 billion. Monthly extensions of new commitments fell from $4.4 billion in June to $1.2 billion in September, while total commitments outstanding fell from $14.4 billion to $10.7 billion; mortgage loans made fell from $5.7 billion to $3.2 billion. The associations were able to cut back their lending sharply in response to the slowing of deposit inflows but did not, and probably could not, arrest the outflow of mortgage funds. Accordingly, some adjustment burden probably remained.

25. The same figure is used for mutual savings banks and savings and loan associations because deposits of the former, while smaller, are proportionately more interest responsive.

Table 11. Actual Deposits in Thrift Institutions, and Actual Less Cumulative Decrements from Increase in the Rates on Both Three-Month Treasury Bills and Commercial Bank Deposits, 1971:3–1974:2

Billions of current dollars

Year and quarter	*Actual deposits*	*Actual less decrement from selected shock*	
		Mean rise in both bill and bank rates[a]	*Maximum rise in both bill and bank rates*[b]
	Savings and loan associations		
1971:3	169.3	169.2	168.7
4	174.9	174.6	172.7
1972:1	185.2	184.5	179.9
2	192.6	191.4	182.6
3	200.7	198.8	184.8
4	208.3	205.7	185.7
1973:1	216.0	212.6	186.5
2	221.7	217.5	185.1
3	223.3	218.4	179.6
4	228.8	223.1	177.8
1974:1	235.6	229.1	177.4
2	238.4	231.1	173.0
	Mutual savings banks		
1971:3	79.4	79.3	78.9
4	81.5	81.3	80.1
1972:1	84.8	84.3	81.4
2	87.2	86.5	81.3
3	89.7	88.6	80.6
4	92.2	90.7	79.5
1973:1	94.6	92.6	78.2
2	96.2	93.8	76.1
3	96.3	93.4	72.3
4	96.9	93.6	69.2
1974:1	99.0	95.2	67.4
2	99.3	95.1	63.9

Sources: Actual—see appendix; decrements—Tables 5, 6, and 3, 4, respectively. Also see text.
a. 1966–74 average three-quarter rise.
b. Historical maximum three-quarter rise.

Faced with deposit outflows of these proportions, thrift institutions have three basic alternative ways of adjusting: (1) raise the rates they pay on deposits to stem the outflows; (2) borrow the lost funds from another source; and (3) sell assets in proportion to the runoff of liabilities.

RAISE DEPOSIT RATES

The most obvious remedy for an outflow is an increase in the rates thrift institutions pay on their deposits. This step requires the consent of regulators and probably cannot now be taken without an increase in commercial bank rates as well. Still, it would help thrift institutions to attract deposits back. Table 12 simulates the impact of a 1 percentage point rise in the rates thrift institutions pay on their deposits in the case of the maximum rise in the bill rate. Historically, this is a very large jump in saving rates, but then

Table 12. Simulations of Deposit Losses of Thrift Institutions Relative to Control Predictions, Assuming Selected Rises in Rates on Three-Month Treasury Bills, Own Deposits, and Commercial Bank Deposits, 1971:3–1974:2[a]

Billions of current dollars

Year and quarter	*Savings and loan associations*		*Mutual savings banks*	
	Loss in quarter	*Cumulative loss*[b]	*Loss in quarter*	*Cumulative loss*[b]
1971:3	−0.4	−0.4	0.0	0.0
4	−1.1	−1.5	−0.1	−0.1
1972:1	−2.0	−3.6	−0.1	−0.2
2	−2.0	−5.5	0.2	0.1
3	−1.2	−6.7	0.7	0.8
4	−0.3	−6.9	1.2	1.9
1973:1	0.1	−6.9	1.3	3.3
2	0.1	−6.8	1.4	4.6
3	0.1	−6.7	1.4	6.0
4	0.1	−6.7	1.4	7.4
1974:1	0.1	−6.6	1.4	8.8
2	0.1	−6.5	1.4	10.2

Sources: Same as Table 3.

a. The assumed rises are 3.46 percentage points for three-month Treasury bills, 1.00 percentage point for own rate, and 0.75 percentage point for commercial bank deposits.

b. Calculated from data before rounding.

so is that for the bill rate. In these simulations commercial bank rates were assumed to rise by 75 basis points as well, because the rates usually move together. A rise of 100 basis points in the bank rate might be more realistic, but thrift institutions are assumed to receive a political favor here in light of the severity of the situation.

Because of the strong own-rate response of savings and loan deposits, the rise in their rates more than offsets the negative impact of increases in the bill rate and the commercial bank rate, so that they enjoy a deposit inflow. Mutual savings banks are not so fortunate but they are still able to curb the outflow. To stabilize deposit flows, mutual savings banks would have to raise their rate by 1.50 points. The results (in billions of dollars) for this simulation were as follows:

Year and quarter	*Loss in quarter*	*Cumulative loss*
1971:3	−0.1	−0.1
4	−0.3	−0.4
1972:1	−0.6	−1.1
2	−0.6	−1.7
3	−0.2	−1.8
4	0.3	−1.6
1973:1	0.4	−1.2
2	0.4	−0.8
3	0.4	−0.3
4	0.4	0.1
1974:1	0.4	0.5
2	0.4	0.9

While successful at holding deposits, such action would be costly—the reason the thrift institutions have opposed it so vehemently. Based on 1973:4 deposits, the rise of 1 percentage point would add $2.28 billion and $825 million (at annual rates) to the costs of savings and loan associations and mutual savings banks, respectively; in 1973 the net worth of savings and loan associations grew $1,786 million and net operating income of mutual savings banks after expenses, taxes, and interest amounted to $673.1 million. While these interest rates were rising, the yields on assets that thrift institutions invest in would also be rising, although not as rapidly, as Figure 2 shows. On balance, however, the very large increase in deposit rates that would be necessary to stabilize deposits would in effect wipe out

the earnings of the industry until the attrition of old mortgages raised average yields on mortgage portfolios sufficiently to offset the impact of added deposit costs.

BORROW FROM OTHER SOURCES

A common means of replacing outflows of deposit liabilities is to borrow from other sources. In the case of savings and loan associations, the Federal Home Loan Bank System operates a large and active program of advances and encourages members to borrow. In fact, the terms of some advances range up to ten years, with prepayment penalties to discourage associations from repaying when deposit inflows resume.[26] Although it does not lack the desire, the system lacks the means of subsidizing advances on a large scale. As a result, the rates savings and loan associations must pay tend to reflect the system's costs of borrowing, which during periods of high and rising interest rates tend to be above yields on new mortgages, and even more above those on existing mortgages.

In the third quarter of 1973 the Home Loan Banks charged an average of 8.13 percent on new advances, while the average dividend rate paid on deposits by member savings and loan associations was 5.59 percent. In the second half of 1969 the margin between these two rates was roughly 200 basis points. If the Treasury bill rate were to rise as it does in the most extreme case simulated above, it seems reasonable to assume that the margin would approximate the 1973 experience. To replace the equivalent of $5 billion of deposits by borrowing, savings and loan associations would incur additional annual costs of $127 million. Since an equally efficacious rise in deposit rates would cost them $2.28 billion a year, it is no wonder that savings and loan associations have never favored raising the rate ceilings.

Most mutual savings banks are in a much less comfortable position because they do not have the well-organized borrowing opportunities available to savings and loan associations. Of the 482 banks in the United States, only 48 belong to the Federal Home Loan Bank System and none is a member of the Federal Reserve System. With the high interest elasticities

26. Presumably, the penalties are meant to encourage associations to lend new inflows in the mortgage market rather than retrenching and paying off debt.

of its deposits the industry is potentially more exposed than the savings and loan industry. Mutual savings banks can and do borrow from commercial banks, but commercial banks are most reluctant to lend to them precisely when they need the funds most—when funds are scarce and costly. Commercial banks also take a harder look at credit risks than do the Home Loan Banks, so that mutual savings banks might not be able to borrow the full amount of their deposit losses as savings and loan associations can. If they could, however, it would be rather costly. In the third quarter of 1973, the commercial bank prime rate was roughly 4 percentage points above the yield on mutual savings bank portfolios. Assuming that this spread held, borrowing to replace a $5 billion deposit loss would add about $200 million to costs annually.

SELL ASSETS

The thrift institutions can also adjust to deposit losses by paring assets, typically by selling mortgages when home buyers find mortgages most difficult to obtain. Indeed, Home Loan Bank advances were designed to save the mortgage market from these impacts. Mutual savings banks are somewhat better off on this score: they have greater latitude in the assets they may hold, and in particular they may hold corporate bonds in many states. But selling a corporate bond at periods of high interest rates usually entails a capital loss, and since data on corporate bond holdings and yields for mutual savings banks are incomplete, I have approximated costs by assuming that all the thrift institutions sell mortgages. Their opportunities for doing so are not vast. The Federal National Mortgage Association (FNMA) and the Federal Home Loan Mortgage Corporation (FHLMC) buy insured and conventional mortgage loans, but only if they are less than a year old. The alternative is to sell loans in the open market at a discount. Such distress sales usually carry a discount higher than is required simply to boost the yield to match that on new loans, partly because the circumstances of the borrower and, to a lesser extent, of the property may have changed since the origination of the loan. Typically, the discount runs about 1½ points beyond what is required to bring the yield in line with market rates.

Federal agencies cannot be relied upon to take all the mortgages that might be offered for sale in response to deposit losses. The largest volume of residential mortgage purchases in one year by FNMA was $6.1 billion in

1973, and the largest by FHLMC was $820 million in 1972.[27] Accommodating the entire amount of mortgages that either of the severe distress simulations imply would be for sale would therefore be beyond the scope of the operations of these agencies. Suppose, as arbitrary assumptions, that half of the mortgages are sold to FNMA and FHLMC, and yield an average of 8 percent, and half in the open market at a 1½-point discount (the yield and yield differential of the third quarter of 1973).[28] On these assumptions, the one-time capital loss from liquidating $5 billion of assets would be about $310 million.

Comparison of the costs of these alternative methods of adjusting to deposit losses suggests that thrift institutions should prefer borrowing to selling assets, and selling assets to raising deposit rates. In reality, the institutions have opposed raising deposit rates, even when that action might have pulled in substantial amounts of funds from the open market. The comparative costs pinpoint the reason. The added costs of rate increases, based on 1973:4 deposit levels, would exceed 1973 earnings for both sets of institutions. The other forms of adjustment, on the other hand, could be carried out comfortably within the 1973 earnings of both. If the increases in rates on market instruments and commercial bank deposits lasted beyond a year, however, these financing costs would begin to be substantial, particularly for institutions with more interest-elastic deposits, and they would thus probably inhibit mortgage lending operations.

Conclusions

In general the thrift institutions in the United States constitute a viable industry. Deposit flows are responsive enough to interest rates on substitutes to make life at thrift institutions a challenge, but they do not appear to be sensitive enough to threaten widespread bankruptcies, at least as long as interest rates remain within historical ranges.

While, under the assumptions of the simulations reported here, the thrift institutions remain viable, in the sense that they do not fail on average, the

27. The figure for FNMA represents gross mortgage purchases. Net of repayments, the highest net investment in mortgages was $4.3 billion, also in 1973. Total mortgage purchases by FHLMC were actually $1,297 million in 1972, but the agency also sold $407 million in mortgages that year.

28. I assume here that regulators permit this sale of assets at realized capital losses, but some difference of opinion exists on whether they would do so.

deposit responses to interest rate increases imply that these institutions cannot continue with business as usual. In face of stagnant or declining deposit trends, they are likely to withdraw from mortgage lending during periods of rising rates, leaving a huge void that cannot immediately be filled by other lenders. While the disruption of homebuilding and mortgage financing is not so serious as the failure of thousands of financial institutions, it poses an issue for policymakers whose aim lately has been to avoid severe constraints in the availability of mortgage financing. On the basis of past experience, then, the response to the weakened viability—in the sense used here—would be additional federal support of the mortgage market, either temporary or permanent.

Everyone concerned—the government and its budget makers, the thrift institutions and their regulators, and the mortgage market—would be better off if these institutions could sustain their earnings and lending when interest rates rise. Under any probable structure of operations, they are likely to suffer reduced earnings in such times, but the unfavorable impacts can be mitigated by any combination of (1) reducing the average maturities of assets, (2) extending maturities of liabilities, and (3) establishing ways of raising the return to longer-term assets when rates rise. These considerations point to broader portfolio powers for thrift institutions on the asset side and to greater use of variable rate mortgages.

Without some such measures, thrift institutions will remain prone to difficult times and disruption of their support for the mortgage market. Recent experience offers no comforting expectation that interest rates will become less volatile; if anything, they are likely to become more so. In addition, deposits have become ever more sensitive to market rates in recent years as yields on low-risk substitutes have reached levels comparable to those on thrift deposits.

Finally, adding to the pressure from established substitutes is the invention of new ones. The most recent has been money market mutual funds, which invest in commercial paper and negotiable certificates of deposit and thus pass along to smaller savers the benefit of high interest rates. The rapid growth of these funds dates from the first half of 1974, and their impact has not been measured in this study. But as long as deposit rates offered by thrift institutions remain below open market rates the market will have an incentive to develop alternative outlets for savers. Thrift deposits will feel these pressures until they can provide fully competitive earnings during periods of rising rates.

APPENDIX

Definitions of Symbols and Sources of Data

CG = Capital gains of households, defined as the change in household net worth from the beginning of a quarter to the beginning of the next quarter, less personal saving over the quarter, in billions of current dollars. Source: Board of Governors of the Federal Reserve System.

i_{b5} = Weighted average three-month Treasury bill rate with weights 1, 2, 3, 2, and 1 on the current and past four quarters, respectively, in percentage points. Source: bill rate from *Federal Reserve Bulletin*, various issues.

i_c = Rate paid on commercial bank passbook accounts through 1967; thereafter the maximum rate paid on certificates of deposit, in percentage points. Source: Board of Governors of the Federal Reserve System.

i_{SB3} = Unweighted average of current and past two quarters' average rates paid on mutual savings bank deposits, in percentage points. Rate for each deposit class is weighted by the volume of deposits in that class. Source: Federal Deposit Insurance Corporation.

i_{SL3} = Unweighted average of current and past two quarters' average rates paid on savings and loan deposits (which are weighted by deposit volumes), in percentage points. Source: Federal Home Loan Bank Board.

S_{SB} = Stock of mutual savings bank deposits divided by household net worth. Both series obtained from Board of Governors of the Federal Reserve System; in billions of current dollars.

S_{SL} = Stock of savings and loan association deposits divided by household net worth. Source: same as S_{SB}.

t = current quarter.

$\Delta S_{SB} = S_{SBt} - S_{SBt-1}$.

$\Delta S_{SL} = S_{SLt} - S_{SLt-1}$.

W = Net worth of households, in billions of current dollars. Source: Board of Governors of the Federal Reserve System.

YD = Disposable income, in billions of current dollars. Source: *Survey of Current Business*, various issues.

The pro forma yields on variable interest rate notes are those used in the prospectus of the Chase Manhattan Corporation, dated August 2, 1974, for a floating rate note issue.

Comments and Discussion

James L. Pierce: I want to congratulate William Gibson for developing a reasonable structure for the determination of deposit flows into thrift institutions. Nonetheless, I am troubled by a few aspects of the equations underlying his simulations. First, although I see the sense of introducing a lag for the perception of interest rates, I am puzzled about the interpretation of a double lag process. According to Gibson, stocks adjust with a distributed lag even after people finally perceive changes in interest rates.

Second, I am concerned about Gibson's practice of fishing for the right length of lags and choosing different lags for different components for no reason except that they fit better. On the other hand, he allows for no distributed lag on capital gains, and yet I could imagine that they too would exert their effect only gradually.

Finally, the variables for interest rates on thrift deposits present a peculiar problem. Since the innovation of certificates, the average interest rate paid by a thrift institution depends on the mixture of its deposits in the passbook and the certificate forms as well as the maturity of its certificates. Thus, a shift of deposits from lower- into higher-yielding certificates in itself raises the average interest rate. In effect, the depositor is determining by his own actions both the quantity of deposits and the interest rate. I view this as a very difficult problem, for which I do not have a solution. But I would be cautious in interpreting Gibson's finding of increased sensitivity of deposits to the interest rate in recent years because his interest rate variable has become a less and less reliable measure since the mid-sixties.

One of the more important, if less surprising, substantive findings in Gibson's paper is that raising interest rates is the most costly way for thrift institutions to adjust to the problems created by tight money. That helps explain why the institutions want the government to maintain ceilings on

interest rates and thus to head off competitive pressures on them to make that costly adjustment.

I consider it important to distinguish the effects of these interest ceilings in creating distortions in the overall economy and financial markets from their implications for disruption in the mortgage market. In general, I don't follow the argument that savings and loan associations should have authority to purchase a wider variety of assets in order to stabilize the *mortgage* market. It may well be true that the associations would have "more viable" earnings—which is a polite way of saying more assurance of positive earnings—if they had the authority to make consumer loans and to buy other kinds of assets. But I don't see how that would make the mortgage market more stable. Under those circumstances, the associations would clearly be better able to afford to buy mortgages in periods of high interest rates; but they probably would not in fact buy them, because they would find other assets even more attractive. Commercial banks currently swing in and out of mortgages in response to changes in relative market yields. Indeed, their sizable portfolio shifts are a major source of instability in the mortgage market.

Such shifts may have favorable effects on the overall efficiency of financial markets and yet be bad for the mortgage market. The right prescription for stabilizing mortgage markets and homebuilding is one set of changes in institutional arrangements; and that for making overall financial markets as efficient as possible is a very different set. The two goals are conflicting, and pursuit of overall financial efficiency may well involve the cost of even greater fluctuations in the mortgage market than are now experienced.

General Discussion

Several of the participants commented on specific aspects of the equations underlying the simulations in the paper. Lawrence Klein observed that he would expect the inflation rate to influence consumer portfolio choices and wished that Gibson had explored that possibility. A high rate of inflation, he felt, would push money out of thrift institutions into real assets. F. Thomas Juster agreed with Klein that the effect of inflation on thrift institution deposits should be studied; but he expressed his judgment that the relationship would turn out to be positive. Overall saving seems to be positively influenced by the rate of inflation, and periods of strongly

rising prices tend to be associated with a shift of assets toward safety and security even at the sacrifice of protection against the losses imposed by inflation.

More specifically, Juster conjectured that if an expected inflation variable were added to the equation, it might occupy the role Gibson assigned to the capital gains variable. William Poole and David Fand both felt that a disaggregation of thrift accounts into passbook and certificate types might reveal that the real sensitivity, or "hot money" characteristics, lay in the certificate (or time) accounts; such a finding would point to a heightened average degree of interest sensitivity at present, as a result of the recent rise in the share of certificates in total thrift accounts.

Franco Modigliani commented on the absence from Gibson's statistical work of an analysis of the deposit substitution between mutual savings banks, on the one hand, and savings and loan associations, on the other. In point of fact, these two types of thrift institutions offer assets that must be extremely close substitutes; but for that very reason their interest rates do not diverge enough to permit a statistical discrimination of the cross-effect. Daniel Brill felt, however, that the two types of institutions may be less competitive than Modigliani supposed, because mutual savings banks operate only in some states and tend to be dominant in most of those. Stephen Marston was concerned about the possible inefficiency of using a moving average as a summary for lags fitted by the Almon technique, particularly when that technique had been applied in a single-equation variant and the moving average was then incorporated into the "seemingly unrelated" technique of estimation.

In response to some of these points Gibson explained that he had been seeking a general pragmatic formulation of the demand for thrift accounts that was fairly robust rather than a precise, definitive set of equations. He told Marston that a wide variety of preliminary regressions generated coefficients that permitted some reasonable approximation by a moving average of interest rates. The preliminary results also suggested to him that, in fact, two kinds of lags were operating—those involved in perceiving interest rates and those involved in adjusting actual to desired deposits. Contrary to what Pierce implied, Gibson found a double lag process quite plausible. He shared Pierce's concerns about the difficulties of interpreting the average interest rates on thrift deposits when these reflected the mix of accounts chosen by depositors, but saw no solution to that problem. As Fand and Poole had suggested, disaggregating among types of deposits

seemed an attractive solution in principle; but doing so had given Gibson unstable and unreliable results.

Another portion of the discussion focused on the interpretation of findings about the behavior of savers. Klein cautioned against interpreting the changes in coefficients after 1966 as a change in the structure of household behavior. Conceivably, a sufficiently complicated relationship that had room for nonlinear or threshold effects would reveal that people were merely adapting to a different set of options associated with new money market instruments rather than behaving differently in any structural sense. The elasticity of response of fluctuations of interest rates in a narrow range around fairly low values was low then and might be low today.

George Perry wondered whether the practice of crediting interest to thrift accounts as an automatic accrual tended to increase the apparent sensitivity of deposits to their own interest rate. If people display inertia, then their thrift accounts will grow more rapidly as a result of higher interest rates simply because they leave that extra interest on deposit. Gibson reported, however, that experiments with a redefined stock of deposits that netted out credited interest had negligible effects on the coefficients.

Recalling the earlier experience with Treasury bills of small denominations, Pierce foresaw that the newly created money market mutual funds would prove to be a particularly potent competitor with thrift deposits. On the other hand, Brill, reporting on what he characterized as an "unscientific survey" of people investing in money market mutual funds, said that the responses suggested that these funds were largely alternatives to mutual funds in common stocks or direct investments in the stock market rather than to deposits in thrift institutions.

The rationale and consequences of federal policy toward thrift institutions and homebuilding also entered into the discussion. Modigliani expressed his concern about the unfairness of interest ceilings to the small saver who had less flexibility and higher transaction costs in finding alternative assets. Michael Wachter felt that an interesting research project could be developed to assess the effects on income distribution stemming from the whole complex of government regulations in these areas, allowing for benefits to home buyers and mortgage borrowers as well as the adverse impacts on thrift depositors.