The Market for Deposit-Type Financial Assets

PROJECT FOR BASIC MONETARY STUDIES

Working Paper No. 8

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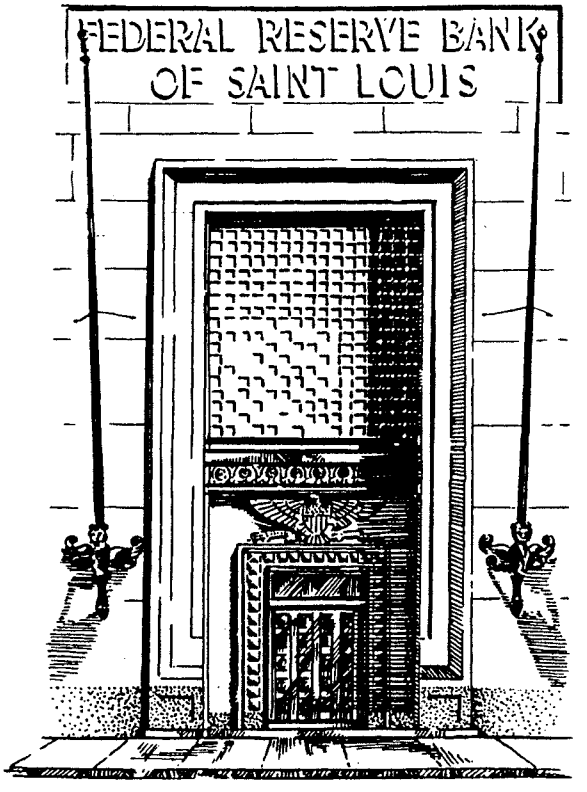
Jerry L. Jordan

March 1969



Research Department
Federal Reserve Bank of St. Louis

A dissertation for the degree
Doctor of Philosophy in Economics
submitted to the
University of California at Los Angeles

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ABSTRACT OF THE DISSERTATION

The Market For Deposit-Type Financial Assets

by

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Doctor of Philosophy in Economics
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This study presents theory and statistical evidence bearing on the determinants of an individual's decision to hold wealth in alternative forms of deposit-type financial assets. A theoretical framework for analyzing the demand and supply relationships for time deposits at commercial banks, savings and loan association shares and mutual savings bank deposits is formulated. Cross-section data for states of the United States are used to estimate the influence of variables affecting an individual's demand for each asset and an intermediary's supply of the asset. Survey member bank data collected by the Federal Reserve System in 1960, 1965 and 1966 are used to develop alternative cross-section

samples of yield and quantity variables for time deposits at member banks. Demand equations are estimated for the "passbook accounts" sub-grouping of time deposits at commercial banks.

The elasticity of demand for time deposits with respect to permanent personal income is estimated from the cross-section data to range from 1.5 to 2.0. The demand for time deposits was estimated to be negatively related to the ratio of the yield on savings and loan shares to the yield on time deposits. Similarly, the demand for time deposits was negatively related to the ratio of savings and loan offices to commercial bank offices in each state.

The demand for savings and loan association shares was estimated to be significantly influenced by permanent personal income, advertising expenditures by savings and loan associations, the ratio of the yield on savings and loan shares to the yield on time deposits, and the ratio of the number of savings and loan offices to commercial bank offices in each state. The supply of savings and loan shares was positively and significantly influenced by building permits, a proxy variable for the supply of mortgages to savings and loan associations.

Quarterly, time series data for the period 1962 to 1967 are used to estimate demand and supply equations for large negotiable certificates of deposit using two-stage least-square techniques. The demand for CDs is found to be positively related to gross corporate profits or other proxy

income variables, positively related to the new issue rate on CDs and negatively related to the yield on Treasury bills or, alternatively, the yield on prime commercial paper. The outstanding volume of business loans and the yield to banks on business loans are used as surrogate exogenous variables in the supply equations for CDs. Outstanding business loans are found to be positive and significantly related to outstanding CDs in the supply equations. The inclusion of an expected interest rate series in the demand equations and the business loan rate in the supply equations yielded mixed results.

The theory and evidence presented in this study contribute to our knowledge concerning the major factors influencing the demand for and supply of alternative financial assets. This knowledge has important bearing on the selection of a monetary aggregate as a summary indicator of the thrust of monetary policy. The implications of this study for the selection of a monetary indicator are summarized and the evidence presented in this study is reconciled with the conclusions of earlier studies.

CHAPTER 1

INTRODUCTION AND BACKGROUND

The purpose of this study is to ascertain the determinants consistent with economic theory of an individual's decision to hold wealth in alternative forms of financial assets. A framework for analyzing the demand and supply relationships for each of several assets will be formulated and time series and cross-section data of states of the United States will be used to quantify variables affecting an individual's demand for the assets and an intermediary's supply of the assets. The coefficients for each set of equations will be estimated by least-square or two-stage least-square regression techniques. Additional evidence concerning the own-and cross-interest elasticities will be obtained from the effects of changes in Regulation Q by the Federal Reserve on the relative influence of variables in the demand functions of various assets.

Study of the demand functions for types of financial assets is stimulated by: (a) the value of knowledge about the demand for (and substitution relationships between) money and other financial assets for purposes of selecting an indicator of monetary actions which may be used for the conduct monetary policy; and, (b) the potential benefit to the suppliers of financial

assets which may be derived from knowledge about the demand for such assets. These points will be discussed in order.

The effects that monetary policy will have on the economy will be more predictable the greater the knowledge about the demand for money. Two points are relevant to this study. The first is a question concerning the importance and stability of the demand function for money with respect to interest rates. The second and related point is that knowledge about the demand function for money will be increased if it is shown empirically that either: (a) money and non-money financial assets are considered to be close substitutes by individuals and this substitution relationship between money and non-money assets is stable; or, (b) the substitutability in demand between money and non-money financial assets is negligible (i.e. cross-interest coefficients approach zero), so that non-money financial assets may be neglected as explanatory variables in a money demand equation.

In recent years there has been considerable discussion in economic literature concerning "indicators and targets" for conducting monetary policy. [1/] In order to serve as

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1/ See the chapter by Karl Brunner and Allan Meltzer on "Targets and Indicators of Monetary Policy" in the book of the same title, edited by Karl Brunner. The book will be published by Chandler House Publishing Co., Belmont, California; and Thomas Saving, "Monetary-Policy Targets and Indicators", Journal of Political Economy (Chicago: University of Chicago Press, August 1967), pp. 446-456.

either an indicator of policy actions or as a target magnitude to be achieved, the forces influencing the level or growth of any monetary aggregate or price must be known.

It has been suggested that some definition of the money supply can serve as an indicator (or target) of monetary influences on the economy. If the rate of change of money defined to include time deposits at commercial banks was highly correlated with the rate of change of money defined exclusive of time deposits, then a choice between these two magnitudes as an indicator of policy would be arbitrary. But the rates of change of money exclusive and inclusive of time deposits have not been very close at times. In fact, the rates of change over time of the two magnitudes have gone in opposite directions on occasion.

Since the choice between the two definitions of money can make a difference in the assessment of the thrust of monetary policy, monetary authorities must choose between them on the basis of their knowledge of the factors influencing the supply of and demand for money exclusive and inclusive of time deposits at commercial banks. It is the aim of this study to present some evidence bearing on the supply of and demand for time deposits and, given certain existing institutional circumstances, to derive some implications regarding the inclusive of these assets in a policy

indicator or target variable.

The suppliers of a financial asset could, as an industry, benefit from increased knowledge concerning income, own-yield, and cross-yield elasticities of demand for the assets they are providing. Similarly, information concerning the effects of advertising by each industry would be useful. The importance to individuals of convenience (transaction) costs associated with the acquisition of an asset would have bearing on the question of how large a market area is best served by an office. (This point has to do with commercial banks, savings and loan associations, and mutual savings banks.) The decision-makers of financial institutions would be interested in the effect of changes in the price level and expectations of price level changes on the demand for the assets they provide. Similarly, relative price theory suggests that the effects of expectations concerning the general level of interest rates may be important.

Relative price theory implies that the amount demanded of any particular financial asset depends positively upon its own yield and negatively upon the yield of alternative financial assets. However, in the economic literature one finds empirically based assertations which appear to refute the implications of this theory. The statements can generally be put into one of two categories: (a) the demand for a particular financial asset is, at most, a weak function of any interest rate;

or, (b) while the amount demanded of a particular asset is a function of its own yield, the demand is not dependent upon the yield of other assets which may have been thought to be a substitute. Both types of statements deny that the financial assets in question are considered by the saver to be substitutes in demand on the basis of relative yields. However, these conclusions go further than the reported research will allow the author to go in the context of generally accepted scientific methodology. An explanatory economic model consists of a set of initial conditions (singular statements) which must be conjoined with the theory in the form of a universal statement, as well as a set of singular prediction statements. The falsification of a proffered theory requires that it be shown both that the prediction statements are not in good agreement with empirical observation and that the initial conditions are confirmed by empirical observation. It is this latter step which is missing in much of the literature, in which case the researcher is guilty of committing the logical fallacy known as affirming the consequent. In the absence of verifying the validity of the initial conditions, the strongest statement that can be made is that the theory is not supported by the evidence. Feige tested the hypothesis that two financial assets are substitutes. Poor or contrary empirical results led him to the conclusion that the assets are complements or independent in

demand, which are not logical conclusions of his study.[2/] (See Appendix A for a more detailed discussion of Feige's study.)

2/ Feige estimated demand functions for financial assets for the period 1949 to 1959 and concluded that "Savings and Loan Association shares and time deposits appear to be independent of one another," (page 30 and 38). He finds that the own-price coefficients of demand deposits and time deposits are positive and statistically significant; "the demand for savings and loan association shares, however, seems to be quite insensitive to changes in the rate of return on these shares," (page 37). Edgar L. Feige, The Demand for Financial Assets: A Temporal Cross-Section Analysis (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1964).

Also, on the question concerning the interest elasticity of demand for savings and loan shares, Shaw asserted that beyond some level of interest rates paid on savings and loan shares, "saver resistance stiffens and elasticity diminishes so that any proportional change in share rate attracts a diminishing percentage increase in consumer response; then total interest costs of associations rise faster than shares outstanding. At some large volume of savings capital,...elasticity fall(s) to zero with savers unwilling to hold more shares at any rate of interest." Edward S. Shaw, Savings and Loan Market Structure and Market Performance (Los Angeles: Study prepared for the California Savings and Loan Comissioner, 1962).

Friedman and Schwartz concluded that "The behavior of deposits from 1954 to 1958 suggests that neither mutual savings deposits nor savings and loan shares are very close substitutes for commercial banks' time deposits, at least for short periods," (page 666). In addition, they asserted that "the more rapid growth of savings and loan shares than of the other forms of deposits cannot be explained by a rise in the relative rate of return. Though the return on savings and loan shares has throughout been higher than that on the other forms of savings, the differential has narrowed," (page 662). Milton Friedman and Anna Schwartz, A Monetary History of the U.S., 1867-1960 (Princeton N.J.: Princeton University Press, 1963).

An object of this study is to present additional evidence bearing on the own-price and cross-price elasticities of demand as well as income elasticities of demand for selected financial assets. 3/

I do not know of studies in which the income elasticities of demand for financial assets other than "money"

2/ (continued)

Similarly, Leo G. Grebler and Eugene F. Brigham have asserted that "To explain varying shares of intermediaries in the savings market, one is first inclined to invoke the price mechanism. It is now a generally accepted and fairly well tested thesis that the amount of total savings (of all forms) is highly insensitive to changes in the general level of interest rates," Leo G. Grebler and Eugene F. Brigham, Savings and Mortgage Markets in California (Pasadena, Calif.: California Savings and Loan League, 1964), p. 71.

Carl Christ observed an "apparent perverse interest-response of time deposits to savings-and-loan capital" when he plotted aggregate annual time deposit and savings and loan share data from 1934 to 1959. He cited advertising and improved insurance on savings and loan deposits as possible explanations for what he observed. He concludes by itemizing unsolved problems such as "can more light be shed on the puzzle of the relation between time deposits and savings-and-loan capital? Carl F. Christ, "Interest Rates and 'Portfolio Selection' among Liquid Assets in the U.S.", Measurement in Economics, By Christ and Others (Stanford, Calif.: Stanford University Press, 1963), pp. 201-218.

3/ M. Friedman concluded that the income elasticity of demand for money is approximately 1.8, where money is defined as the sum of demand deposits, time deposits, and currency, and where income was annual expected (permanent) real income per capita based on net national product. Milton Friedman, "The Demand for Money: Some Theoretical and Empirical Results," (N.Y.: NBER, 1959).

Feige concluded that the income elasticity of demand for demand deposits is 0.92, and the income elasticity of demand for time deposits is 0.69. This, together with Cagan's conclusion that the income elasticity of

have been directly estimated with data subsequent to 1959. For each year 1956-1966 the role of income in the demand for each asset is estimated using cross-section data, and an attempt is made to explain the discrepancy which was reported to exist between the results derived from time series and cross-section data for the period prior to 1960.

"Time Deposits at commercial banks" is usually treated as one type of asset, even though it is technically the sum of several types of interest-paying savings accounts which are provided by commercial banks. Prior to 1961, one of these sub-classes of time deposits, large certificates of deposit ($100,000 or more), was of negligible importance. Since then the volume of this

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3/ (continued)

currency is less than that of demand deposits, appears to be in direct conflict with Friedman's findings. To get an income elasticity of demand for the inclusive money supply from Feige's and Cagan's results, one would calculate a weighted sum of the income elasticities of demand for each component. This calculated elasticity would be less than 1 even if the income elasticity of demand for currency were as large as that for demand deposits. Feige used pooled cross-section and time series data for 49 states for 1949 to 1959. Deposits were per capita, and income was a permanent real income per capita based on personal income per state. By the same method, Feige found that the income elasticity of demand for savings and loan shares is 0.63. This result is clearly in conflict with what one would expect from aggregate time series data on savings and loan deposits.

class of deposits has grown to where now it can properly be considered as a separate asset. The Federal Reserve presently permits higher interest rates to be paid on such deposits than on regular savings deposits, and the regulations governing transferability of the certificates of deposit are different. It appears that a large portion of the short-run fluctuations in aggregate time deposits is due primarily to fluctuations in these large certificates of deposit (CDs). Demand functions for large CDs are estimated separately from total time deposits by using monthly and quarterly data for the post-1960 period. Demand functions for time deposits net of large negotiable CDs are estimated from special 1965 and 1966 cross-section survey data.

Early in 1961, several large New York money market banks began to offer certificates of deposit in a highly negotiable form, and at the same time securities dealers announced that they stood ready to buy and sell prime negotiable certificates of deposit. At the end of 1961, total certificates of deposit outstanding stood at about $3.2 billion. By the end of 1967, total CDs were in excess of $20 billion. In only three years after the development of the market for negotiable certificates of deposit, the Federal Reserve Bulletin concluded that "among money market instruments, these certificates are

now second in importance only to Treasury Bills." [4/]

The growth of certificates of deposit has contributed to the rapid growth of time deposits compared to savings and loan shares and mutual savings bank deposits in the 1960's. However, even time deposits net of certificates of deposit have grown faster than other household monetary assets during this period. Friedman and Schwartz, and Carl Christ [5/] noted that in the period from 1954 to 1958 the volume of savings and loan shares increased at a faster rate than did either the volume of time deposits at commercial banks or the volume of mutual savings bank deposits. At the same time the interest differential between these assets was narrowing. That is, although the national average yield on time deposits was lower in magnitude, it was increasing faster than the average yield on savings and loan shares. The observation that yields on time deposits were rising rapidly relative to the yields on other assets, but the volume of time deposits was growing much slower, led these researchers to conclude that the interest elasticities of such assets were weak.

Time deposits, exclusive and inclusive of certificates of deposit, have increased in the 1960's faster than savings

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4/ "Recent Monetary and Credit Developments," Federal Reserve Bulletin, Vol. 50, (July 1964), p. 818.

5/ References cited in footnote 2/.

and loan shares. At the end of 1958, the relative market shares among these three assets were: savings and loan deposits - 42 per cent; time deposits at commercial banks - 41 per cent; and, mutual savings bank deposits - 17 per cent. By the end of 1967 the relative market shares were: savings and loan deposits - 34 per cent; total time deposits at commercial banks - 49.5 per cent; and, mutual savings bank deposits - 16.4 per cent.

Excluding certificates of deposit at large commercial banks from time deposits, we find that at the end of 1967 the relative market shares were: savings and loan deposits - 36 per cent; time deposits - 46.6 per cent; and mutual savings bank deposits - 17.4 per cent. In the 1950's, deposits in savings and loan associations were the fastest growing financial assets. In the 1960's the growth in time deposits has been faster. An explanation of this reversal in relative growth rates of time deposits and savings and loan shares can be derived from a correct specification of the supply and demand relationships of these assets.

Because of institutional factors (namely, the fact that corporate holders of CDs pay dividends and taxes on a quarterly basis, and revenues of state and local governments are received in uneven intervals), there may be a seasonal pattern in the yields on certificates of deposit. However, there is no more reason to expect a seasonal

pattern in the yields on certificates of deposit traded in the secondary market than there is to expect much of a seasonal pattern in the yields of stock and bonds. 6/

In the six years since CDs were developed as an important financial market instrument, the maximum interest ceiling imposed by the Federal Reserve has caused cash flow problems for individual banks as well as the banking system on several occasions. Either due to seasonal withdrawals for payment of taxes, dividends, etc., or due to higher yields available on Treasury bills and/or other substitutes, banks have at times found themselves unable to renew maturing CDs because of legal restrictions which prevented them from matching market rates of interest available on substitute assets. The existence and misuse of CDs has been blamed for a few highly publicized bank failures, and even the biggest banks have experienced reserve difficulties because of the inability to re-issue maturing CDs. The implications of the above are not necessarily that CDs are undesirable or that the problems bankers are facing call

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6/ It would be profitable to discover a consistent seasonal pattern in the yield on bonds which is greater than would be suggested by the rate of interest. Even so, one can find assertions of sizable seasonal variation in the yields on bonds in the economic literature. A rather interesting, if not amusing, report of the discovery of a sizable and regular seasonal pattern in the yields on Treasury bills and long-term government bonds is found in a Morgan Guaranty Survey: "A Closer Look at Interest-rate Relationships," (Morgan Guaranty and Trust Company, April 1961).

for "regulation and close supervision from banking authorities."[7/] Rather, the evidence presented in this study indicates that the regulations have contributed to the fluctuations in the volume of CDs through their influence on the demand for and supply of CDs. The two conditions necessary for the existence of an adverse cash flow which is serious enough to cause liquidity difficulties are first, the existence of a large and active market in negotiable certificates of deposit, and second, an interest ceiling imposed on the deposit liabilities of banks and maintained at a level which is at times too low to allow the banks to use effectively certificates of deposit as a short-term instrument in competition for funds.

7/ Helen B. O'Bannon, "Certificates of Deposit," Money and Finance, Readings in Theory, Policy, and Institutions, Carson Deane (ed.), (New York, New York: John Wiley and Sons, Inc., 1966), p. 124.

CHAPTER 2

A General Framework for Analyzing the Demand for and Supply of Alternative Financial Assets

The Demand for Financial Assets

The variables which, on theoretical grounds, might be included in the demand function for a financial asset may be categorized into three possible sets. The first set would include variables which appear in the demand function for saving, per se, as well as in the demand function of the particular asset, where saving is defined as a change in wealth, positive or negative.[8/] The variable, as it appears in the saving function, causes a greater (smaller) growth of wealth, and as it appears in the demand for a particular asset causes only a proportionately greater (smaller) rate of acquisition of each asset (e.g., the elasticity of saving with respect to variable X is .5, and the elasticity of each financial asset with respect to X is also .5).

The second category, a subset of the first in that it includes variables which appear as arguments in both the general saving function and the demand equation for each

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8/ The usual "supply of saving" can be interpreted as a demand for interest bearing monetary assets. However the demand for saving as used here is a demand for greater wealth, whether the assets are real or monetary. Conceptually, saving might be defined as the rate of change of wealth, but here saving will refer to the integral of the flow of saving over a year.

asset, contains only those variables that change one's relative preference for the alternative financial assets. That is, the elasticity of demand for some financial asset with respect to explanatory variable Z differs from the elasticity of demand for saving with respect to Z and it differs from the elasticity of demand for other financial assets with respect to Z.

The third category is comprised of arguments in the demand functions for financial assets which do not appear as arguments in the demand for saving function. The variables in this third category are distinguished from those in the other two in that these variables only cause shifts in preferences for one asset relative to another. An example would be a variable which does not affect one's wealth, but does affect the composition of the basket of goods one possesses. One important difference between the variables in the first two categories is the way in which the variables affect the individual's time (and asset) pattern of consumption. Another would be the effect of such variables on relative speeds of adjustment from one portfolio of assets to another. Information and transaction costs will have bearing on this issue.

These points will be developed more fully at a later point in this chapter. First, however, a brief theoretical framework describing financial assets in

terms of their returns will be presented.

The Returns From a Financial Asset

Financial assets may be described in terms of the returns offered to their holders. One way of doing this is to specify the net returns from the asset in terms of utility and then returns of the asset as being the utilities derived from both monetary and non-monetary sources.

The net returns (R_j), in the utility sense, of the j^{th} financial asset can be expressed by the following relation

$$R_j = r_j^m + r_j^n ,$$

where r_j^m is the total utility of the net monetary returns from the j^{th} asset and r_j^n is the utility of the non-monetary returns from this asset. For simplicity we say that $r_j^m = f_j[(i_j \cdot A_j), \left(\frac{dP_j}{P_j}\right)^e, A_t, \ldots]$, where i_j is the annual rate of interest paid on the j^{th} asset (in decimals, taken as given) and where A_j is the absolute dollar amount of the j^{th} asset held by the individual. $\left(\frac{dP_j}{P_j}\right)^e$ denotes the expected rate of change in price of the j^{th} asset. A_t is total assets, and r_j^m is also a function of other factors.

Net non-monetary returns (r_j^n) would be a function of the risk (insurance) and variance of return associated with the asset, the physical establishment or persons selling the asset, and any other non-interest factors associated with the acquisition or holding of the asset. In addition, r_j^n would be a function of the amount of the asset held and the amounts of other assets held.

The cost of holding A_t is the highest valued R_j, $j \neq 1$, foregone (or the foregone utility of the highest valued non-financial asset, but the discussion here is limited to financial assets). Consider an amount of wealth A_t which is held in the form of financial assets 1 and 2 ($A_t = A_1 + A_2$). The cost of holding A_1 is equal to the $R_2 = r_2^m + r_2^n$ foregone. Under the assumption that r_j^m is a linear function of only interest (in dollars per unit of time) [i.e. $r_j^m = k_j(i_j \cdot A_j)$], it follows that the cost of holding any A_1 is $k_2(i_2 \cdot A_1) + r_2^n$. For example, the cost of holding \$100 of asset 1 is the foregone utility of the interest one could have realized by holding \$100 of asset 2, plus the utility of the non-monetary returns one could have derived from asset 2. Likewise, the cost of holding A_2 is $k_1(i_1 \cdot A_2) + r_1^n$.

Under the above assumptions, [9] if $i_1 > i_2$ and $r_2^n > r_1^n$ then A_1 will be positive for an individual only if $k_1(i_1 \cdot A_1) - k_2(i_2 \cdot A_1)$ is greater than or equal to $r_2^n - r_1^n$ for some level of A_1. For example, one would hold \$1 of asset 1 only if the utility from the extra interest he earns from asset 1 instead of asset 2 is greater than or equal to the extra non-monetary utility he derives from asset 2 over the above asset 1.

The above should not be interpreted to mean that an individual will not hold both assets. The r_j^n depends on the size and composition of A_t in any instance, even if all r_j^m are of the same functional form.

Assuming that r_1^m and r_2^m are both the same function of only dollars per unit to time ($k_1 = k_2$), then for an increase in the portion of wealth devoted to A_1 and/or A_2 (where A_t increases to A_t'), the maximum r_1^m (where $A_1' = A_t'$) increases by more than does the maximum r_2^m (where $A_2' = A_t'$), if $i_1 > i_2$. Therefore the proportion of (monetary) wealth held in asset 1 will be greater after the wealth (A_t) increase $\left(\frac{A_i'}{A_t'} > \frac{A_1}{A_t}\right)$,

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[9] Namely, r_j^m is a linear function of only interest and $A_t = A_1 + A_2$.

if (for some increment of A) $r_2^n - r_1^n$ (the subjective value of non-monetary returns from one asset compared with the subjective value of non-monetary returns from another asset) is less than the subjective value of the extra increment monetary (interest) returns as A_t increases to A_t'. But if the subjective value of the extra increment of monetary (interest) returns $(r_1^m - r_2^m)$ is less than $r_2^n - r_1^n$ as A_t increases to A_t', then the proportion of asset 1 to total assets falls as wealth increases $\left(\frac{A_t'}{A_t'} < \frac{A_1}{A_t}\right)$. Of course the converse would be true for asset 2 with respect to its ratio to wealth. [10]

Assuming that the subjective values (per unit) of non-monetary returns from financial assets decrease as greater amounts are required, it is likely that over some ranges of A_j the ratio $\frac{A_j}{A_t}$ is not a constant as A_t changes (i.e. the proportion of one A_j to A_t increases as A_t increases, while for other ranges the proportions of another A_j will increase).

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[10] To generalize to the multiple goods world, the cost of holding A_1 (of the first financial asset) is the maximum utility one could obtain if no A_1 were held. That is, the cost of holding a specific A_1 is $\max \sum_{j=2}^{n} R_j$, when $A_1 = 0$.

This symbolic outline is easily summarized by saying that an individual will acquire some of the asset up to the point where his subjective value of (the returns from) another dollar of the asset is equal to the cost of another dollar of the asset. If either the net return from the asset or one's subjective value of the returns from the asset change, each person will adjust his holdings of assets so as to equate his subjective value for the marginal unit of each asset with the cost of the asset.

Classification of financial assets according to the above formulation can be transalted into a hypothesis that the demand for a financial asset is a function of wealth, the expected monetary returns of the asset, expected non-monetary returns of the asset, monetary and non-monetary returns of other assets, variance of returns of each asset, costs of acquiring the asset, and uncertainty which may be associated with the asset concerning return of principal, payment of interest, or liquidity.

The Demand Function

The following sections present a general, theoretical statement of the demand for the j^{th} financial asset. Definitions of terms and concepts will be presented and a priori expectations of partial derivatives will be specified. The general demand function is as follows:

$$A_j^d = f(y_p, y_m, i_j, i_o, i^e, p^e, TC, IC, O),$$

where: y_p = permanent income in constant prices

y_m = measured (or realized) income in constant prices

i_j = interest yield on the j^{th} asset

i_o = interest yield on other assets

i^e = expected level of interest rates

p^e = expected price level

TC = transaction costs:

a. travel to financial institution

b. commissions on stock and bond transactions

IC = information cost and liquidity (undefined for now)

a. risk and uncertainty

b. insurance

c. spot bid-ask price spread

d. yield

e. other

O = other nonpecuniary returns

a. pretty secretaries or cashiers

b. marble buildings, walnut paneling, thick carpets, . . .

Definitions [11/]

Before defining the income concepts used here it is useful to define wealth. Total wealth is the sum of two components--human and non-human wealth--where the measure of the former is the present value of the stream of wages, salaries, and/or commissions (or whatever the form of the expected returns to human capital); the latter is measured by the market value of non-human assets and is postulated to be the present value of the flow of yields and services to be derived from these assets.

(1) Conceptually, "permanent income" is the constant maximum rate at which an individual would be able to consume (e.g. - equal amounts in each time period) subject to keeping his total wealth unchanged. For measurement purposes, permanent income will be defined as the maximum foreseeable amount an individual can consume in a time period (the integral of permanent income for the time period) subject to wealth being the same at the end of the time period as at the beginning. If he were to consume less than this amount, his wealth would increase; if he were to consume more than this amount, his wealth would decrease.

11/ Much of the discussion in this section is an extension or reformulation of concepts presented by Milton Friedman in his A Theory of the Consumption Function, National Bureau of Economic Research, (New York:1957).

(2) Measured (or realized) income is the maximum actual change in wealth in a time period in the absence of consumption (defined below). Conceptually this measure of income is the accumulated receipts (claims) or income rate for the time period. It can consist of two components--expected "claims to wealth" (i.e., foreseeable growth of assets whether received in cash or in credits) plus profits or losses

"Claims to wealth" refer to the amount (integral of the flow for one time period) one anticipates his cash receipts and credit claims will be in each future time period in his horizon. The profit or loss component of measured income is an unexpected change in total wealth.

An example using the two income concepts may be useful at this point. For illustration, one quarter will be considered to be the relevant time period. Suppose an individual (or business) received a flow of receipts from either his human capital or non-human capital (e.g.--commissions, rental income, self-employed) which fluctuates from quarter to quarter. Assume that such an individual initially has a permanent income of $4000 per quarter. But assume further that this individual ex ante expects his cash receipts and claims for the coming quarter (the "slow season") to be only $3000, which we call his claims to wealth or "expected measured income". However, if the individual should ex post receive $3600 in receipts

and claims in the quarter, his actual measured income exceeded his expected measured income by $600. Therefore, the individual's wealth at the end of the quarter will be greater than expected by $600.

(3) The potential (foreseeable) growth of wealth during a time period (where actual receipts equal expected receipts, ex post) is permanent income (the product of the rate of interest multiplied by the initial wealth).[12/] Any activity which the individual engages in such that this growth in wealth is less than the potential amount, because of such activity, is called consumption. In other words, consumption is the potential foreseeable growth of wealth minus the actual growth.

If the profit or loss component of income were always zero (i.e., if expectations are exactly realized), and if one concurrently consumed exactly his permanent income, wealth would be constant. To generalize a step further, wealth at time t can be defined as the present value of future net receipts, where net refers to receipts expected when consumption equals permanent income. Under this definition and terminology, an individual can plan for his wealth to increase by planning to consume less than his permanent income, but the present measure of his wealth does not depend on such plans.

12/ More generally, the potential growth rate of wealth at any moment is the amount of one's wealth multiplied by the interest rate.

(4) Planned or "permanent" saving is defined to be the rate of permanent income minus consumption. Actual measured saving, ex post, is the sum of planned saving plus profits or losses--which is the change in wealth. For estimation purposes, saving is measured by the integral of the changes in wealth per time period.

Implications of Economic Theory with Respect to the Saving Versus Consumption Decision

If it is stated that consumption (C) is a function of income (Y) as well as (possibly) other variables, then saving (S), is a function of these same variables, given the identity Y = C + S. Since income, consumption, and saving must all be in the same conceptual units, a model relating consumption and permanent income would not explain measured saving, because measured income (and measured saving) includes profits or losses and is therefore not always equal to permanent income. Measured saving is a function of permanent income and profits or losses. Some previous researchers have specified saving to be a function of permanent income only, and some of measured income only. Empirical estimates of their equation for saving will depend upon the concept of income used.

If an individual discriminates among alternative assets according to a criterion that is independent of his wealth, then the elasticity of each asset with respect to wealth would be 1. Given an increase in wealth of

ten per cent, the individual would want to hold ten per cent more of each asset, and the desired ratio of each asset to total wealth would be unchanged. If the wealth elasticity of any asset is different from 1, then the wealth elasticity of at least one other asset must be different from 1 and in the opposite direction. Considering total wealth, if an individual realized a 10 per cent increase in total wealth in the form of some non-human asset, he may not be able to convert it to a 10 per cent increase in his human assets. His holdings of at least one non-human asset will remain increased by more than ten per cent.

It is assumed that at any time, the ratio of the marginal utility of any asset to the price of a unit of the asset will equal the similar ratio for every other asset. The marginal utility of an asset is related to the amount of that asset one possesses and to the amounts of all assets possessed (non-human wealth). Thus, some assets will constitute a different proportion of wealth when wealth is greater, than when wealth is smaller.

The elasticity of saving with respect to permanent income is larger than the elasticity of saving with respect to measured income by definition. Since the percentage change in permanent income is small relative to the percentage change in measured income, variation in asset accumulation will be largely due to variation in wealth (i.e., profits or losses which are the difference between

actual measured income and expected measured income in my specification).

The relationship between saving and income, when there exists more than one concept of income and saving, is not clear in the literature. Brigham and Grebler have asserted that "It is now a generally accepted and fairly well tested thesis that the amount of total saving (of all forms) is highly insensitive to changes in the general level of interest rates." 13/ This statement is in conflict with the underlying theory of this study, which is discussed below, as is Tucker's conclusion that

> "investment is the volatile component of income and consumption the stable one. Consumption depends only on income, with a distributed lag, and, for this reason, it inevitably must adjust more gradually than income. This leaves investment as the component that responds more vigorously to money supply changes, just as we expect, and the reason is because of its dependence on the interest rate."14/

Interest rates reflect both the ability (i.e., profitability) and the willingness of individuals to convert current consumption rights into wealth. At higher interest rates individuals are willing to forego more current consumption in favor of wealth. The schedule

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13/ Leo Grebler and Eugene F. Brigham, Savings and Mortgage Markets in California, (Pasadena, California: California Savings and Loan League, 1963), p. 71.

14/ Donald Tucker, "Income Adjustment to Money-Supply Changes," American Economic Review, Vol. 56, (June 1966), pp. 438-439.

of amounts of current income which individuals are willing to convert into future wealth at each alternative interest rate is the supply of saving function. In equilibrium, the cost of "not saving," that is, of consuming, is the increase in wealth foresaken. Lower the cost of "not saving" (i.e., lower the interest rate) [15/] and individuals will evidence a willingness for less saving, or equivalently for more consumption. To assert otherwise is to challenge the negative relationship between price and quantity of economic goods. However, this does not deny the income and wealth effects. The sudden increase in money causes a temporary increase in the relative desirability of some monetary assets. The prices of these assets will rise (their yields will fall). An individual's stock of non-human wealth will be greater as a result of a positive shift in the demand for these assets. But this is not evidence against the hypothesis of a positive interest elasticity of saving. [16/]

15/ For instance, interest rates may fall temporarily as a result of the "liquidity effect" accompanying an unexpected, once-and-for-all increase in the money supply. See W. E. Gibson, Effects of Money on Interest Rates, University of Chicago dissertation.

16/ Some confusion remains in economic literature regarding the effects of inflation on interest rates and consequent effects on wealth and saving. For instance, Robert Mundell says in his "Inflation and Real Interest" Journal of Political Economy, LXXI (June, 1963), p. 283, "I have argued that the money rate of interest rises by less than the rate of inflation and therefore that the real rate of interest falls during inflation. The conclusion is based on the fact that

Specification of Relationships

As previously indicated, the demand for a particular financial asset can increase or decrease as a result of: (i) a desire for a larger or smaller rate of present consumption, which affects one's total wealth and asset position; (ii) a change in one's relative preference for financial versus non-financial assets in general; [17/] (iii) a shift in preferences among financial assets; and, (iv) a shift in preferences between less liabilities versus more assets. This section is concerned with the specification of the parameters associated with the variables listed in the general demand function on page 21, and the way in which these variables enter into the demand functions for particular financial assets.

The elasticity of demand for a financial asset with respect to each of permanent income and measured income, is hypothesized to be non-negative, but subject to the

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16/ (continued)

inflation reduces real money balances and that the resulting decline in wealth stimulates increased saving. [emphasis added]. Real conditions in the economy are altered by the purely monetary phenomenon. The evils of benefits of inflation cannot be attributed solely to the failure of the community to anticipate it." See W. E. Gibson, op. cit., p. 20, for a similar discussion. Also see footnote 18/, page 31, where I discuss some complications of estimating interest elasticities of financial assets.

17/ The choice between financial and non-financial assets, is not analyzed explicitly in this study, although certain

following modifications. The greater the absolute amount of transaction costs associated with the acquisition of an unspecified amount of a financial asset (i.e., the cost is constant regardless of the amount of the asset), the greater will be the income elasticities of demand for that asset since the total cost of a large transaction declines per unit of amount purchased relative to small purchases. Similarly, the greater the "invariant" information costs associated with an asset, the greater will be the income elasticity of demand since the cost of information as a proportion of the principal declines as the price and principal increases.

On the other hand, the greater the non-interest returns from a financial asset, the smaller will be the income elasticity of demand if the non-interest returns do not increase in proportion to the amount of the asset held. It becomes more costly in terms of opportunities foregone to hold such assets.

It is anticipated that the elasticity of demand for any asset with respect to measured income or expected claims to wealth will vary for any given percentage change

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17/ (continued)

aspects of that topic cannot be separated from the study at hand. Attention in a study of the demands for real versus financial assets would be on variables such as inflation or possible confiscation or expropriation of property which would cause one to adopt a preference for one class of assets relative to another class.

in measured income or expected claims to wealth, depending upon the proximity of the initial level of measured income or expected claims to wealth or permanent income.

Contrary to the assertions and empirical findings of some investigators, but consistent with the theory of consumer behavior, it will be hypothesized that the own-yield elasticity of demand for a financial asset is positive and statistically significant as well as stable, and that the cross-yield elasticity is negative and statistically significant. 18/

18/ It may be worthwhile to consider some of the complications in the measurement or testing of this specification. If all the world were put into a testing chamber and then the interest rate on, say, savings and loan shares were raised by Congressional action while everything else remained unchanged, the own-price elasticity of savings and loan shares and the cross-price elasticity with respect to the yield on savings and loan shares of all other assets could be found. However, when the yields of more than one asset are changing, the respective own-and cross-price elasticities of each must be considered as well as any changes in relative yields of the different assets. In addition, if interest rates in general change, wealth also changes, and, if not careful, one might confuse the effects of the change in interest rates with the effects of the change in wealth. When the yield on one's bonds rises, the price falls and probably the ratio of bonds to total wealth falls, but it would be false to conclude that the interest elasticity of the demand for bonds is negative, i.e.--that the individual desires less bonds in absolute as well as relative amounts because of the higher yield. The positive interest elasticity of demand for financial assets implies that the individual will desire to shift from other assets to bonds, but the extent which an individual does so will be dampened by the wealth elasticity of bonds since wealth has fallen. The proportion of wealth held in bonds may increase, while the market value of one's bonds holdings in total has decreased. Certainly the aggregate market value of bonds in the economy is lower after a rise in the level of interest rates than previously.

At a time when expectations regarding future interest rate levels are changing, some individuals will desire to adjust their holdings of assets. Of course, if knowledge of future events and conditions were evenly distributed and adjustment were instantaneous, there would be no opportunity for these shifts, since prices would change without any actual exchanges. However, given that the cost of information is positive and all that this implies, when expectations are changing so that it is felt that interest rates will be higher in the future than at present, some people will desire, at existing rates, to exchange long-term bonds and stocks for short-term assets, such as deposits at financial institutions. This is in order to avoid the loss of wealth when rates do rise and prices of such assets fall, as a result, for example, of a sustained higher rate of inflation becoming expected. In the process of negotiating, the prices of bonds are bid down and the yields rise. The inverse of this process occurs when expectations are changing so as to bring about lower rates of interest. In summary, the hypothesis is that the expected interest elasticity of demand for fixed current price financial assets such as deposits is positive, and the elasticity of demand for financial assets such as bonds and stocks, with respect to expected interest rates, is negative.

When the price level changes, one's real wealth may

change both in the absolute amount and in the amount relative to other individuals. Nominal wealth changes, and the proportion of wealth held in the form of various assets may change. The crucial element in analyzing the effects of price level changes lies in the degree to which the price changes are anticipated. 19/

When the price level rises (falls) the market price of one's real assets rises (falls), while the nominal amount of one's fixed price monetary assets (such as deposits or currency) remain unchanged. However, the "real" value of the monetary assets in this sub-class varies since they subsequently can be exchanged for less (more) real assets. The change in net worth or equity resulting from price level changes depends on the individual's net monetary position (amount of monetary assets versus monetary liabilities).

The proportion of each asset to total asset value in both nominal and real terms will have changed also. Since it is assumed that the proportion of each asset to wealth was satisfactory prior to the price changes, it is expected that the individual adjusts his asset position to

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19/ A theory of inflation and its effects is well established. Armen A. Alchian and Reuben A. Kessel, "Effects of Inflation", Journal of Political Economy, Volume LXX, (December, 1962), pp. 521-537. And, A. A. Alchian and W. R. Allen, University Economics, Second Edition, c. 1967 (Belmont, California: Wadsworth Publishing Company, Inc.), Chapter 32.

re-establish former asset to wealth ratios (or to establish new ratios which reflect any revised expectation with respect to prices). However, the wealth elasticities of each asset must be considered. The individual may adjust his holdings of some assets, but the extent which he does so is the combined effect of first, the altered ratio of each asset to real wealth, and second, the wealth change which can affect the relative desirability of each asset. [20/]

The elasticity of demand for a monetary asset with respect to transaction costs is hypothesized to be negative, and it is hypothesized that these costs will contribute significantly to the estimated demand functions. [21/] For

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20/ The interrelationship between observed interest rates and the rate of change of prices tends to confound the results of interest and price elasticities. Change in the observed rate of interest may reflect changes in the "real" rate and/or changes in the expected pattern of prices.

21/ See Harold Demsetz, "The Cost of Transacting," Quarterly Journal of Economics (February, 1968), page 33-53. Demsetz studies the cost of transacting in a specific financial market--the New York Stock Exchange. I conjecture that from the point of view of individual "investors," intermediaries such as savings and loan associations on one hand and mutual investment funds on the other are less different today than they were ten years ago. Both provide professional management services and diversification which narrow the expected variance of return to the individual compared to the variance of return the individual would expect from direct holding of mortgages, stocks or bonds. Laws prohibit savings and loan associations from holding earning assets other than mortgages and bonds whereas mutual investment funds hold common and preferred stocks as well as bonds. Until very recently the returns to holders of mutual fund shares were variable, on a pro rata basis after expenses, while savings and loan share

purposes of empirical estimation, a surrogate for the costs of traveling to and from a financial institution are used in this study. The advent of "banking by mail" will affect the importance of this coefficient over time. For other assets commissions, fees, or taxes would be more appropriate.

There are many aspects to the use of a variable representing the "cost of information" in an equation for the demand for a financial asset. The discussion here is limited to a few points. With regard to financial institutions, an individual may desire information con-

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21/ (continued)

holders earn a specific return which is indicated at the beginning of each payment period.

However, a recent innovation in mutual investment funds is the dual liability "leveraged" funds. Under this arrangement an individual may elect to earn a specific predetermined yield on his "investment" rather than a variable return which depends on the earnings of the mutual fund's asset portfolio.

On the other side, the ability to deposit and withdraw dollars by mail at deposit-type institutions may tend to reduce the importance to the individual of the location of the institution.

In other words, I conjecture that the difference in the demands for deposit-type institutions versus "investment" funds resulting from transaction and information cost variables has been decreasing in recent years. The testing of this proposition will have to wait until a subsequent study.

cerning the following: (a) location (especially important upon the opening of a new office, or to migrating individuals); (b) earnings or dividends and the timing of payments to depositors or shareholders (i.e. what is the minimum time one must hold the assets in order to earn what yield?); (c) insurance of repayment of principal in the event of failure of the institution (maximum coverage, how long of a delay, and are returns in cash or kind?). This information is usually supplied by the financial institution, often in their advertising.

Supply of Monetary Assets

A theoretical framework for analyzing the supply of some types of monetary assets is developed in this section. Factors affecting the supply of government issued currency (and other government issued debt) are not included in this discussion. The emphasis here is primarily on the liabilities of deposit-type non-government financial intermediaries. To simplify the discussion, the framework will be developed in terms of a financial intermediary which holds only one type of earning monetary asset--mortgages. However, the analysis would hold regardless of the number or type of earning assets held.

The supply of deposit-type asset A_j is assumed to be a function (positive) of the supply of earning assets (mortgages) to the supplier of A_j, and a function (negative)

of the cost of "intermediating."[22] The supply of mortgages to the supplier of A_j is assumed to be derived from the total market supply of mortgages and the demand for mortgages by (supply of funds from) sources other than the supplier of A_j. Thus a reduced form equation representing the supply of A_j would include, as explanatory variables, the following: those factors which influence the market supply of mortgages (or any relevant earning assets), factors affecting the demand for mortgages by sources other than the supplier of A_j, and factors which represent other costs of operation incurred by the supplier of A_j. Changes in any of the variables representing these factors would cause a change in the quantities of A_j the intermediary is willing to supply at each supply price (the yield offered on A_j by the supplier).

It is assumed that the market supply of mortgages is negatively related to the interest rate paid on them (the demand for funds from sources which offer mortgages as collateral is negatively related to the price paid for the funds, i.e.--the interest rate). The demand for mortgages is assumed to be a positive function of their yield. By implication, the derived supply of mortgages

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22/ The supply of mortgages to the intermediary can also be viewed as a schedule of funds demanded by a sector of the economy; i.e.--a demand schedule faced by the intermediary.

to the supplier of A_j is a negative function of the price of the borrowed funds to the mortgagor, that is, the quantity of mortgages supplied is inversely related to the interest rate the intermediary charges the mortgagor. The supply of A_j by the intermediary is derived by subtracting the intermediaries operating costs (including opportunity costs and all other costs except interest paid on A_j) from the supply of mortgages faced by the intermediary. This analysis implies (other things equal of course) that an increase in the total supply of mortgages to the market will result in an increase in the supply of A_j, which in turn will result in a higher interest rate being offered for A_j, assuming no change in the demand for A_j.

The above framework is easily generalized for all financial intermediaries by substituting supply of bonds or loans (or any earning asset the institution might acquire) for supply of mortgages wherever it appears in this discussion. However, if the intermediary offers more than one deposit-type asset to the market, as in the case of commercial banks, the above framework would be incomplete and must be generalized further. 23/

23/ In the last couple of years savings and loan associations have also offered more than one type asset since savings (time) certificates are being offered as an alternative to "passbook accounts."

In this case the supply of a specific deposit-type financial asset, large negotiable certificates of deposit for example, is affected by the prices at which the intermediary can sell other deposit-type assets such as passbook accounts. [24/] A wealth maximizing intermediary will equate the marginal cost of a dollar from each source with the marginal cost of a dollar from every other available source. In this context the cost of supplying a specific asset includes the interest payments which must be made, the operational or administrative costs involved, and any advertising or "demand increasing costs" incurred.

Estimation of the influence of all of the variables suggested by the above framework goes beyond the scope of the empirical portion of this study. However estimates of the influence of some supply determining variables are presented in following chapters. The basic approach is to include in the supply equation: the direct monetary (interest) returns offered on the j^{th} asset (endogenous); the total outstanding volume of a primary earning asset held by an intermediary; and, the observed return available on a primary earning asset held by the intermediary.

[24/] In fact, the cost to the intermediary of acquiring additional funds via the creation of any new liability, such as a bank borrowing from the Federal Reserve or a savings and loan borrowing from the Federal Home Loan Bank Board, should be included as explanatory variables in the supply function of any deposit-type asset.

CHAPTER 3

Cross-Section Study

The theoretical framework for analyzing the supply and demand relationships of assets, as developed in Chapter 2, suggests certain economic variables which ought to be included in these relationships. In this chapter the coefficients of some of these variables will be estimated and tested for statistical significance using cross-section samples of observations from states in the U.S. in alternative years. The intent is to quantify the influence of a few main variables, not to detect all factors which may influence the supply of and/or demand for these assets.

The supply of some monetary assets is regulated, or partially determined, by government or quasi-government authorities. For instance Federal Reserve actions and regulations affect the supply functions of time and demand deposits at member banks (e.g., Regulation Q, prohibition of interest on demand deposits, reserve requirements, etc.).[25/] The interest rates at which savings and

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25/ See Karl Brunner and Allan Meltzer, "Some Further Investigations of Demand and Supply For Money", Journal of Finance (May, 1964), regarding formulation and specification of money supply models.

loan shares are supplied may be affected by state laws or by regulations of the Federal Home Loan Bank Board. Certainly the restrictions on the types of loans which these institutions may make affects their supply schedules. However, I do not attempt to measure these influences by directly including them as explanatory variables in the supply equations. Rather, an indication of the effects of these non-market determined factors can be derived from the differences which result in estimates of coefficients of other explanatory variables from samples where a difference in regulations is a main difference between the samples.

I. State Cross-Section Samples

Cross-sectional state data for the United States provide estimates of parameters in structural equations for deposit-type monetary assets. Each year--1965 and 1966, provides a 51 observation sample (the 50 states and the District of Columbia), and for 1956 to 1964, there are a maximum of 49 observations per year (data for Alaska and Hawaii are not available for all variables for these years).

To estimate coefficients for the equations using this cross-section data, it is assumed that consumer behavior in each state, with regard to the allocation of wealth among financial assets, is independent of economic conditions in other states. The questionable validity of this assumption should be readily apparent.

Especially in more recent years, the relative costs of acquiring and of holding out-of-state financial assets has declined. However, even in earlier post-war years, there is little reason to believe that state borders obstructed flows of funds, at least in the north-eastern section of the U.S. To the extent individuals are willing to hold deposits in states other than that in which they live, deposits per capita of state population do not accurately represent the allocation of individual wealth of the people of that state among assets.

For instance, the demand deposit per capita figures for New York are inflated by the fact that large corporations, insurance companies, brokerage houses, foreigners, etc., maintain balances in the New York commercial banks. It also happens that New York has a relatively high per capita income, as is true of D.C. and Delaware.

Thus, if income elasticities of demand for demand deposits were estimated using the cross-section data, the elasticities would be very high. Yet the observed volume

of deposits may be attributed to factors other than personal income.

As an alternative to treating each state of the U.S. as an independent observation, especially in the northeastern areas where state boundaries may not be very relevant, additional estimates will be made where some states are consolidated into one market area. This modification appears to be more consistent with the implications of the theoretical structure, even though the consolidation of several states does not eliminate all of the statistical error which may be attributable to inter-state flows of funds.

II. Variables in Cross-Section Estimation

(1) Income

Personal income data are available on a state by state basis, and are used in this study. Although, disposable income would be a preferable measure, such data are not available. However, disposable and personal income are highly correlated. Personal income is deflated by population in order to adjust for the scale factor of different size states. Also, "permanent income" per capita figures and the ratio of personal income to permanent income are used as explanatory variables in

alternative combinations.[26/]

In estimates of coefficients for demand functions for total time deposits at commercial banks using post-1961 cross-section data, personal income per capita may not, on theoretical grounds, be the appropriate explanatory income variable. Large denomination negotiable certificates of deposit, which were developed in 1961, are included in time deposits reported on a

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26/ The permanent income per capita figures were computed from personal income per capita data. One available series for each year 1949-1959 was computed and used by Feige. This data, according to Feige, was computed with the use of "Friedman weights" for a ten year period.

In addition, I computed four alternative "permanent personal income" series for each state for the years 1941-1966. This computed data series was used primarily for each of the years 1960-1966. A basic (arbitrary) assumption in the computation of these series was that personal income (Y) equaled permanent income (Y*) in 1940. The permanent income figures for each state for each subsequent year were computed according to the following equation:

$$Y^*_t = \eta Y_{t-1} + (1-\eta+\alpha)\, Y^*_{t-1}$$

Two arbitrary values were chosen for η (.3 and .5) and two values for α (.02 and .04). The η coefficient is an adjustment for the difference in expected and measured income in each time period. The η coefficient insures an upward trend in Y* in the event that $Y = Y^*$ in some period. This method of computing permanent income was first used, to my knowledge, by Karl Brunner and Allan Meltzer.

state basis.[27] These certificates are generally purchased by large corporations, state and local governments, and others,[28] and there is reason to assume that state boundaries or personal income in a state have little or no relevance in this market. As a test of these propositions, time deposits at commercial banks net of large negotiable certificates of deposit are estimated on a state basis for 1965 and 1966. These deposits are used to estimate equations for the demand for "passbook" time deposits, and the income coefficients obtained are compared with the income coefficients obtained when data for total time deposits are used.[29]

(2) Savings and Loan Associations and Mutual Savings Banks---Quantity and Interest Rate Variables

For each year 1956-1966 average (over the year) total savings and loan capital and average total mutual savings bank deposits per state are expressed in per capita terms. Mutual savings bank deposits by states are available only on an end-of-year basis from 1956 to 1959. Average deposits per year were calculated for these years by averaging the end and beginning of the

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[27] See Chapter 4 concerning the market for large negotiable certificates of deposit.

[28] See pages 130 to 131.

[29] See pages 49 to 52 regarding the time and saving deposit survey data.

year figures.

Interest rates paid on savings and loan shares were calculated by dividing total dividends paid in the state by average savings capital for the year. Similarly, the yield on mutual savings bank deposits was obtained by dividing average deposits per state in each year into total interest paid by the savings banks in each state.

(3) Aggregating Mutual Savings Banks with Savings and Loan Associations

One of the difficulties of estimating the structural parameters of equations for deposit assets arises from the presence of mutual savings banks in some states but not others. Only eighteen of the fifty states plus D.C. have mutual savings banks. Our theory suggests that for any financial asset the degree of substitutability for any other depends on the relative returns versus costs of acquiring and holding the assets. It is assumed that savings and loan associations and mutual savings banks are the same or very similar in nature of operation from the point of view of the depositors. There is reason to believe that this is an accurate assumption.

Therefore, structural parameters are estimated for equations where savings and loan deposits and mutual savings bank deposits, their yields, and the number of offices in each state are aggregated. However, these estimates will be compared with estimates made for equations which

exclude mutual savings banks.

The yield on this aggregate of savings and loan deposits plus mutual savings bank deposits is calculated the same way as were the separate yields, by dividing total interest paid by average deposits in each state. Implicit in this formulation is an assumption that an individual is indifferent between these two assets, and it is hypothesized that both will be shown empirically to be substitutes for time deposits.

The structural parameters for the equation for the aggregated "savings and loan" and "mutual savings bank" deposits are also estimated from a thirty-eight state sample (forty states in 1965 and 1966) where twelve northeastern states are grouped into a thirty-eighth "state", as well as by regressing across the sample including forty-eight states and D.C. as individual observations.[30/]

(4) Commercial Banks---Alternative Measures of Quantity and Yield on Time Deposits

What is usually referred to as "time deposits at commercial banks" is actually the aggregate of several types of assets. The distinctions among the assets arise

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30/ The twelve states aggregated into one "state" are: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

from regulations of the Federal Reserve which affect maturity, denomination, and negotiability of the assets. Prior to about 1960, the distinctions were not significant. Since then large negotiable certificates of deposit and consumer savings certificates have accounted for a large portion of the growth of total time deposits.

As a first approximation, average total time deposits in each state were converted to a per capita basis for cross-section estimation. The average total time deposits in a state for the year were the average of four call date figures for all insured commercial banks in that state for that year. Total time deposits held at non-insured commercial banks are so small that it is believed their exclusion will not significantly affect the empirical results.

The usual method of computing an interest rate on time deposits at commercial banks divides the total interest paid on time deposits by the average volume of time deposits in a year, in each state. But this is only a rough measure. Other measures of "time deposits" and their yield are employed in selected years in order to discover the effect of the non-homogeneity of time deposits.

The average effective rate received on deposits can be below the proffered rate for several reasons. For instance, depositors may not hold the asset for a full payment period; that is, deposits are made in the middle of a period or funds are withdrawn prior to an interest payment date (the payment period is usually one quarter at present,

however semi-annual interest payments were most common until recent years).

The Federal Reserve Board has collected data from all member banks regarding amounts of deposits in different classes subject to various ranges of proffered rates of interest. One of these surveys was dated June 30, 1960; other surveys were: one in 1965, one in 1966, and four in 1967.[31/] Individual bank information was grouped according to states in the U.S. and used to compute a series of weighted average interest rates on time deposits.

These weighted average rates were calculated by first finding the amount of deposits subject to a particular rate range (e.g., 2.5 per cent to 3.0 per cent) as a proportion of total deposits (for example, deposits in dollars subject to a rate in the range 2 per cent to 2.5 per cent as of June 30, 1960 as a proportion of total deposits on that date). Second, this ratio (weight) is multiplied times the upper limit of the respective rate range. Finally, the resulting products are then summed for all rate ranges. In Table 3-1 the interest rate on time deposits for each state in 1960 as computed by the above method is reported along with the average rate per

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31/ The data from the four quarterly 1967 surveys cannot soon be made available on a state by state basis. The individual bank figures for the 1965 and 1966 surveys were recompiled on a state by state basis for this study.

TABLE 3-1

Interest Rates On Time Deposits
Cross Section Data - 1960

STATE	1	2	3	4	STATE	1	2	3	4
Ala.	2.97	2.97	2.97	2.76	Neb.	2.91	2.70	2.76	2.45
Ariz.	3.00	3.00	3.00	2.64	Nev.	3.00	3.00	3.00	2.45
Ark.	2.99	2.97	2.97	2.71	N.H.	2.64	3.90	2.89	3.03
Calif.	3.00	3.00	3.00	2.64	N.J.	2.65	2.76	2.76	2.47
Col.	2.76	2.88	2.87	2.57	N.M.	2.99	2.95	2.95	2.56
Conn.	2.57	2.93	2.92	2.59	N.Y.	2.87	2.99	2.97	2.67
Del.	2.38	2.29	2.32	1.92	N.C.	2.92	2.93	2.93	2.51
D.C.	3.00	2.84	2.86	2.32	N.D.	3.00	2.67	2.87	2.74
Fla.	2.94	2.97	2.97	2.64	Ohio	2.93	2.90	2.91	2.45
Ga.	2.93	2.99	2.99	2.72	Okla.	3.00	2.99	2.99	2.66
Ida.	3.00	2.99	2.99	2.75	Ore.	3.00	3.00	3.00	2.69
Ill.	2.73	2.86	2.85	2.53	Pa.	2.93	2.88	2.89	2.60
Ind.	2.96	2.79	2.81	2.47	R.I.	2.99	3.00	3.00	2.69
Iowa	2.97	2.63	2.71	2.57	S.C.	2.42	2.50	2.49	2.20
Kan.	2.97	2.94	2.94	2.44	S.D.	2.96	2.80	2.87	2.74
Ky.	2.92	2.77	2.80	2.26	Tenn.	2.84	2.99	2.98	2.81
La.	2.63	2.89	2.86	2.57	Texas	2.98	2.95	2.96	2.39
Maine	2.66	2.88	2.82	2.62	Utah	3.00	3.00	3.00	2.62
Md.	2.56	2.97	2.94	2.58	Ver.	2.71	2.97	2.96	2.81
Mass.	2.72	2.61	2.62	2.20	Va.	2.96	2.92	2.92	2.53
Mich.	3.00	2.70	2.74	2.41	Wash.	3.00	3.00	3.00	2.70
Minn.	2.99	2.67	2.78	2.63	W. Va.	2.53	2.43	2.43	2.23
Miss.	2.97	2.82	2.85	2.67	Wis.	2.96	2.73	2.76	2.46
Mo.	2.98	2.74	2.79	2.44	Wyo.	3.00	2.98	2.98	2.58
Mont.	2.99	2.98	2.98	2.68					

COLUMN		DESCRIPTION
1.		Rate offered on time deposits other than passbook accounts; weighted average from 1960 survey data.
2.	(rt2)	Rate offered on passbook accounts; weighted average from 1960 survey data.
3.	(rt1)	Rate offered on total time deposits; weighted average from 1960 survey data.
4.	(rt)	Average rate paid on total time deposits; interest paid divided by total deposits.

See text for additional description.

state in that year as calculated by usual methods.

For the years 1960, 1965, and 1966, alternative cross-section estimates of the structural parameters are made under alternative assumptions about which measure of "time deposits" to test as a substitute asset for savings and loan shares. In one case, total time deposits serve when the weighted average interest rate on total time deposits, as described above, is used as a measure of the yield on this asset.

In additional alternative specifications, the rate paid on time deposits and the volume of these deposits are estimates of: (a) the volume and weighted average rates offered on "passbook" savings deposits at commercial banks; (b) the volume and weighted average rates offered on consumer saving certificates; and (c) the volume of pass-book plus consumer savings certificates and the weighted average rate on these deposits (large business-type certificates of deposit are excluded).

These alternative measures of the volumes and yields of time deposits are also employed in the case where mutual savings banks and savings and loan associations are treated as one institution, as well as the case where savings and loan associations are treated independently.

(5) Transactions or "Convenience" Costs

This variable serves to quantify the effects of the

distance households must commute in order to acquire one of these financial assets on their choice between time deposits, savings and loan shares, and mutual savings bank deposits. The empirical measure is the number of offices of each type of institution in the state, per population. It is expected that this variable exerts more influence in the extreme cases, such as states which had only very few savings and loan offices compared to other states in a given year. The number of offices per population serves to reduce some of the scale effect of larger and smaller states.

In the case in which savings and loan associations and mutual savings banks are assumed to sell one homogeneous asset, the total offices of the two institutions are summed in each of the eighteen affected states. Alternatively, in the thirty-eight state sample in which twelve northeastern states are assumed to be one large state, the total offices of savings and loan associations and mutual savings banks in this area (per population) serve as the index of convenience costs. These twelve northeastern states almost all have mutual savings banks and they account for over 95% of the total deposits in mutual savings banks.

Creation of the series of savings and loan association offices per capita required a few special assumptions because of the overlapping sources of the data. In this study the data for per capita savings and loan deposits

was obtained from the Federal Home Loan Bank Board and are the deposits of only those associations which are members of the FHLBB. However, the FHLBB reports only the number of member associations in each state, not the number of branch offices. The United States Savings and Loan League reports the total number of "Savings and Loan Associations and Cooperative Banks" in a state and the total branch offices. It was found that the number of associations reported in the two sources differed substantially in some states because of the inclusion in the latter source of cooperative banks and associations which were not members of the FHLBB. Comparison of the total deposit figures in the two sources indicated that the average size of the cooperative banks and non-member associations was very small (as little as $1000 total deposits each in some cases). Therefore it was assumed that only savings and loan associations which are members of the FHLBB have branch offices. The number of branches reported by the Savings and Loan League was added to the number of associations reported by the FHLBB to create the series used in this study.

(6) Cost-of-Information and Non-Interest Returns

This variable is associated with several aspects of the demand and supply relationships of some financial assets, as discussed in Chapter 2. In addition to measuring the influence on demand of providing information

concerning yield, location, denomination, and maturity, this variable captures the influence of other non-interest returns such as premiums ("gifts") given for new accounts.

The per capita advertising expenditures of all the savings and loan associations in each state serve as the main measure of this variable. It is expected that this index will be significantly positive in the demand functions for savings and loan shares.

Advertising expenditures by mutual savings banks are available only for a few states, for a few years. Separate cross-section samples were created to make use of the available data. In the three years in which data on advertising expenditures of mutual savings banks are available, 1964, 1965 and 1966, the ratio in each state of per capita advertising expenditures of the mutual savings banks to per capita advertising expenditures of savings and loan associations was almost constant. On this basis, for purposes of estimating demand functions for aggregated savings and loan-mutual savings banks, it was assumed that in the years prior to 1964 the ratio was the same as the average ratio for 1964-1966. With this assumption cross-section series for per capita advertising expenditures of savings and loan-mutual savings banks were computed. Clearly the reliability of the estimates of equations in which this variable was used depends critically upon the validity of assumptions underlying the

construction of the series. As somewhat of a test of the validity of the assumptions, the performance of this variable in years prior to 1964 can be compared with the results for 1964, 1965 and 1966 when the actual figures are known.

For each of the years 1964-1966 it was assumed that there were mutual savings banks only in those eight states for which advertising expenditures are available.[32] Savings and loan plus mutual savings bank figures for deposits, interest rate, advertising expenditure, and number of offices was calculated for each of these states for each of the three years. It was assumed that all other states had savings and loan associations, but no mutual savings banks.

Two-stage least-square estimates of demand and supply equations with these aggregated intermediary variables were made in addition to previously discussed formulations of variables. Least-square estimates of demand equations for time deposits were made where the composite savings and loan-mutual savings bank asset is considered the substitute asset.

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[32] The eight states are: Connecticut, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Together these eight states held over 95 per cent of total mutual savings bank deposits in each of these three years.

III Variables in Supply Equations

The theoretical framework in Chapter 2 suggests that the supply of savings and loan shares and/or mutual savings bank deposits to the market is a derived function of the supply of earning assets to these institutions. Both of these intermediaries hold a large portion of their assets in mortgages.[33/] Accordingly, the supply of savings and loan shares (plus mutual savings bank deposits in some cases) will include a proxy explanatory variable for the supply of mortgages. The only data available on a state by state basis which can serve this purpose are residential building permits issued in each year. Therefore, the supply equation for savings and loan shares will include building permits as an exogenous variable and the interest rate on the shares as an endogenous variable.

IV Results from 1956-1958 Cross-Section Data

(1) Time Deposits

Effective January 1, 1957, the maximum interest rate commercial banks could offer on almost all classes of time and savings deposits under the Federal Reserve's Regulation

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33/ In December, 1967, 97.9% of the assets of all savings and loan associations were mortgages and 75.8% of the assets of all mutual savings banks were mortgages. The remaining assets were primarily cash and bonds.

Q (and the comparable regulation of the FDIC) was raised to 3 per cent, up from 2-1/2 per cent which had been the ceiling rate since 1935. This change in ceiling rates gave almost all[34/] commercial banks some leeway within which they could raise the proffered rates on time and savings deposits. In 1956 the average effective rate paid by commercial banks on time deposits exceeded 2 per cent in only 3 states. In 1957 the average rate paid by banks in 34 states exceeded 2 per cent. The apparently broad increases in proffered rates by commercial banks--an indication that the banks in many states had been offering the ceiling rates in 1956 and thus were constrained in the degree they could compete for deposits on the basis of price--provides a test case for the responsiveness of the demand for time deposits to their own-yield relative to the yield of substitute assets.

Supply equations for time deposits at commerical banks have not been formulated for the cross-section study. Data on many of the factors which would enter into a "time deposit supply" model are not available in any form. Data which are available are in aggregate form, usually for prices and quantities of variables which are a part of a national market. Therefore, an implicit as-

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34/ State regulatory agencies sometimes maintain ceiling rates below the Federal limits--effective for state chartered banks.

sumption underlying the estimation of structural equations representing the demand for time deposits is that the supply of time deposits by commercial banks in each state is horizontal at the level indicated by the average effective yield in that year. The implications of this assumption are discussed below.

The demand for time deposits by individuals as a form of holding wealth could be viewed as a supply of savings by individuals to commercial banks. A hypothesis of the economic theory underlying this study holds that the supply of savings is positively related to the rate of interest, that is, in a two dimensional diagram with the interest rate on the vertical axis and quantity on the horizontal axis, the supply of savings schedule is upward sloping to the right. Consequently, the "demand for time deposits" schedule is also upward sloping to the right in a diagram with yield on the vertical axis.[35/] An upward sloping demand for time deposits schedule means that individuals will hold greater quantities of time deposits at higher yields, other things equal.

The supply of time deposits by commercial banks is assumed to be derived from the supply schedule of earning

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35/ This upward sloping demand curve is not in any way inconsistent with the usual demand schedule for goods, which is negatively related to price, since the interest rate is the reciprocal of price.

assets to commercial banks.[36/] This supply schedule of time deposits is hypothesized to be negatively related to yield, however, the supply of time deposits is often horizontal with respect to proffered interest rates for periods of one quarter or longer. As noted above, the least-square estimates of demand equations for time deposits implicitly assume that the supply schedule in each state is horizontal with respect to the average effective yield in each year. Shifts in the supply curve (i.e., its level) are assumed to be determined by some exogenous factor such as state laws.

For each state in the cross-section samples we observe an average quantity of time deposits and an average yield. Since it is assumed that the quantity supplied is infinite at the observed yield in each state, the quantity of time deposits outstanding in the state is determined by the level of demand (where the upward sloping demand curve intersects the horizontal supply curve). A partial analysis (other things equal) would indicate that a greater quantity of time deposits should be observed in states where the average effective yields are greater. If "other things" (see page 22 concerning factors hypothesized to influence the demand for a financial asset) were equal in all states,

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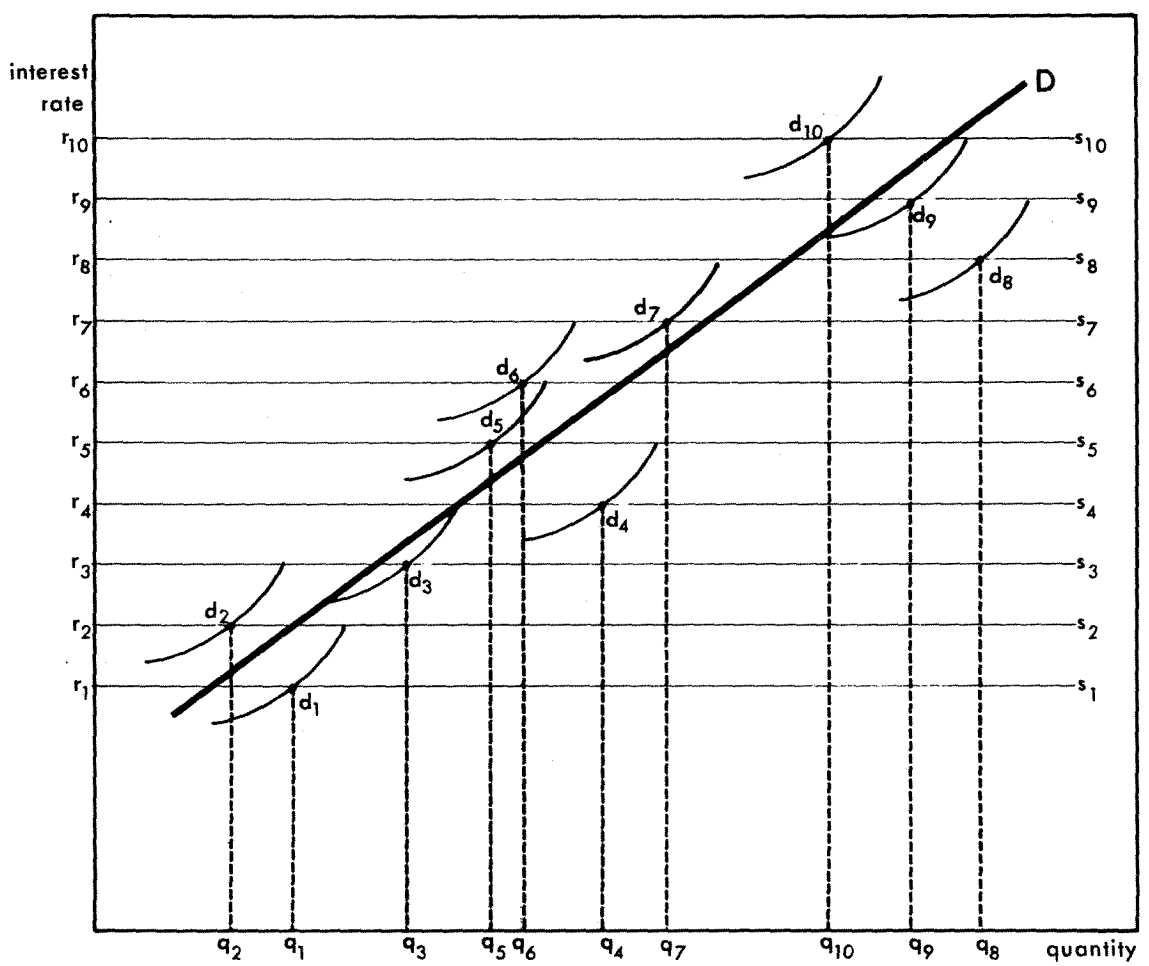
36/ See pages 36 to 39 of Chapter 2.

GRAPH 1

Estimated Demand Schedule



Hypothetical interest rate (supply curve) and quantity points for ten states; assumed actual demand curve in each state (d_i) and estimated demand curve(D).

the observed yields and quantities could be used to exactly trace out "the" demand curve for time deposits.[37/]

Since ceteris paribus does not hold, multiple regression analysis is used to identify the linear demand curve by using least-square techniques and the observed quantity and yield points for each state. The exogenous factors in the demand equation (factors which are excluded from the supply equation) cause shifts in the demand schedule for time deposits and therefore determine where the demand curve intersects the given supply curve in each state.

This procedure is illustrated in a highly simplified example for ten hypothetical values in Graph I. The observed interest rate (r_i) and quantity (q_i) values are plotted for each state. A hypothetical demand curve for each state (d_i) is drawn through the interest rate (supply) and quantity point for the respective states. The estimated demand curve (D) is identified from the observed points since the cross-section "shifts" of the curve are accounted for by the exogenous variables in the demand equation.

The estimates of equations for the demand for time

37/ The problem of identification of the demand curve is summarized here for the specific case at hand. For a more broad and thorough discussion see Carl F. Christ, Econometric Models and Methods (New York: John Wiley and Sons, Inc., 1966), Chapter VIII, especially the supply and demand example in pages 305 to 314.

deposits from 1956-1958 cross-section data are reported in Tables 3-2 to 3-5. There are only three explanatory variables included in each equation; coefficients are estimated from two samples in each year, as discussed previously in this chapter. Tables 3-2 and 3-3 include 49 observations per year, one for each of the then 48 states and the District of Columbia. There are 38 observations per year in Tables 3-4 and 3-5, for thirty-seven states and for the specially aggregated northeastern "state". The variables in these tables are as follows:

TD = per capita time deposits at all insured commercial banks

Y = per capita personal income

Y_p = per capita permanent personal income

$\frac{rs}{rt}$ = ratio of average rate paid by savings and loan associations to average rate paid by commercial banks

$\frac{rsm}{rt}$ = ratio of weighted average rate paid by savings loans associations and mutual savings banks to average rate paid by commercial banks

$\frac{SL}{CB}$ = ratio of number of savings and loan offices to number of commercial bank offices

$\frac{SLM}{CB}$ = ratio of number of savings and loan plus mutual savings bank offices to number of commercial bank offices

$\varepsilon(TD,Y)$ = the elasticity of time deposits with respect to income (personal or permanent)

$\varepsilon(TD,ir)$ = the elasticity of time deposits with respect to the ratio of the yield on savings and loan shares to time deposits

TABLE 3-2

Demand for Time Deposits at Commercial Banks
(Excluding Mutual Savings Banks)
49 State Sample

Year	I	Y	Yp	$\frac{rs}{rt}$	$\frac{SL}{CB}$	R^2	SEE	ε (TD,Y)	ε (TD,ir)
56	70	0.206 (6.34)		- 98 (2.36)	- 87 (0.86)	.497	34.5	1.55	-0.69
56	75		0.254 (6.40)	- 97 (2.36)	- 62 (0.62)	.501	34.4	1.50	-0.68
57	75	0.216 (6.29)		-123 (2.38)	-107 (0.98)	.491	32.6	1.54	-0.74
57	91		0.254 (6.04)	-115 (2.19)	- 98 (0.88)	.472	33.2	1.42	-0.69
58	163	0.225 (5.61)		-192 (2.89)	- 69 (0.56)	.448	34.2	1.49	-0.96
58	203		0.260 (5.55)	-195 (2.92)	- 63 (0.51)	.444	34.3	1.36	-0.97

(t - statistics in parentheses)
I = intercept

TABLE 3-3

Demand for Time Deposits at Commercial Banks
(Including Mutual Savings Banks)
49 State Sample

Year	I	Y	Yp	rsm / rt	SLM / CB	R^2	SEE	ε(TD,Y)	ε(TD,ir)
56	99	0.221 (6.87)		-120 (2.94)	-132 (1.99)	.538	33.1	1.67	-0.84
56	93		0.282 (7.05)	-115 (2.86)	-149 (2.23)	.551	32.6	1.67	-0.81
57	97	0.242 (7.15)		-154 (3.04)	-183 (2.56)	.548	30.7	1.72	-0.92
57	108		0.298 (7.08)	-146 (2.88)	-210 (2.83)	.543	30.9	1.67	-0.88
58	173	0.264 (6.72)		-219 (3.55)	-221 (2.74)	.525	31.7	1.74	-1.10
58	209		0.322 (6.98)	-225 (3.70)	-261 (3.21)	.543	31.1	1.69	-1.12

(t - statistics in parentheses)
I - intercept

TABLE 3-4

Demand for Time Deposits at Commercial Banks
(Excluding Mutual Savings Banks)
38 State Sample

Year	I	Y	Yp	$\frac{rs}{rt}$	$\frac{SL}{CB}$	R^2	SEE	$\varepsilon(TD,Y)$	$\varepsilon(TD,ir)$
56	-165	0.283 (9.59)		- 37 (0.97)	-130 (1.33)	.737	26.6	2.14	-0.30
56	-136		0.348 (9.36)	- 45 (1.15)	-111 (1.12)	.728	27.1	2.06	-0.36
57	- 97	0.286 (8.98)		- 90 (1.93)	-129 (1.23)	.710	26.1	2.06	-0.54
57	- 93		0.365 (9.30)	- 83 (1.84)	-174 (1.68)	.724	25.5	2.04	-0.50
58	- 46	0.298 (8.65)		-143 (2.47)	- 53 (0.48)	.696	25.6	1.98	-0.72
58	1.37		0.372 (9.29)	-158 (2.85)	-112 (1.06)	.725	24.4	1.94	-0.79

(t - statistics in parentheses)
I = intercept

TABLE 3-5

Demand for Time Deposits at Commercial Banks
(Including Mutual Savings Banks)
38 State Sample

Year	I	Y	Yp	rsm rt	SLM CB	R^2	SEE	ε (TD,Y)	ε (TD,ir)
56	- 167	0.287 (9.65)		- 39 (1.03)	-146 (1.61)	.743	26.3	2.18	-0.31
56	- 139		0.355 (9.43)	- 45 (1.17)	-136 (1.47)	.734	26.8	2.11	-0.36
57	- 96	0.291 (9.03)		- 93 (2.02)	-148 (1.50)	.716	25.9	2.09	-0.56
57	- 96		0.374 (9.46)	- 86 (1.94)	-203 (2.09)	.734	25.0	2.09	-0.51
58	- 47	0.300 (8.62)		-141 (2.47)	- 78 (0.76)	.698	25.5	1.99	-0.71
58	-3.60		0.378 (9.35)	-155 (2.86)	-148 (1.49)	.731	24.1	1.97	-0.78

(t - statistics in parentheses)
I = intercept

SEE = standard error of the estimate as a per cent of the mean of the dependent variable

In all cases for the samples from the years 1956-1958, the ratio of personal income to permanent income was included as an additional explanatory variable. However, the variable was not statistically significant, according to the t-test, in any time deposit equation, nor did it add to the regression as judged by the coefficient of determination and standard error of the estimate. The Durbin-Watson statistic is computed as a by-product of the regression programs used in this study. The statistic is not reported since no serial correlation of the residuals was indicated in all samples, as should be the case with cross-section data.

It is clear from the tables that the choice of income variable--personal income versus permanent income--did not matter in the samples for these three years. However, the income elasticity of the demand for time deposits was significantly higher in the 38 observation samples (Tables 3-4 and 3-5) than in the 49 observation samples (Tables 3-2 and 3-3). This can be interpreted as evidence supporting the assumption under which 12 northeastern states were aggregated to create the 38 observation samples, namely that state boundaries do not serve as effective barriers to the flow of saving in at least that region of the country. A second result of the estimates from these samples is the size of the income elasticity of the demand for time deposits

in these years. Feige reported the elasticities at the mean of time deposits with respect to permanent personal income in the years 1956, 1957 and 1958 to be .79, .77, and .63 respectively. Even in 49 observation samples, the same as Feige's, I have found the income elasticity of time deposits to be almost twice that reported by Feige, and in the 38 observation samples, which may be the most reliable, the elasticities approach three times those reported by Feige. Therefore, whereas Feige reported results that were not consistent with Friedman's conclusion that money is a "luxury" asset (i.e., Friedman's estimated income elasticity of the demand for money = 1.8) as he points out, the results reported here are consistent with Friedman's findings.[38/] However, if the income elasticity of demand for demand deposits were found to be sufficiently small (less than unity, for example) then the income elasticity of demand for time deposits reported in this study would indicate a smaller income elasticity of demand for money (inclusive of time deposits) than that obtained by Friedman.

The estimates of the coefficients for the interest rate ratio and the elasticities of the demand for time deposits with respect to this ratio moved in the direction over the three years implied by economic theory, given the change in interest rate ceilings in 1957. The percentage change in the average interest rate on time deposits from 1956 to 1957 was

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38/ See Feige, pp. 27 and 28.

greater than the percentage change in the average rate paid by savings and loan associations in all states, and greater than the percentage change in the rate paid by mutual savings banks in the relevant states. As a consequence, the percentage change in per capita time deposits from 1956 to 1957 was greater (as predicted by the theory) than the percentage change in savings and loan shares outstanding in one-half the states. In contrast, before interest rates on time deposits were allowed to rise, the percentage change in savings and loan shares from 1955 to 1956 was greater than the percentage change in time deposits in 47 (of 49) states. However, in the remaining two states, the percentage change in the average rate paid on time deposits was greater than that paid on savings and loan shares from 1955 to 1956. From 1957 to 1958, the percentage change in time deposits was greater than the change in savings and loan shares outstanding in 15 states, in all of which the percentage change in the yield on time deposits was greater than that on savings and loan shares.

These figures are only suggestive of the developments in the 1956-1958 period. Further interpretation requires additional information regarding the relevant elasticities. The next section of this chapter takes up some of these comparisons. However, an additional observation which may aid in interpreting the response of time deposits to the interest rate changes is that it appears that savings and loan associations responded to the increased ceiling on time deposits

by sharply increasing their per capita advertising expenditures. In 1957 the average yield of savings and loan shares was greater than 2.9 per cent in all states, which indicates an even higher proffered rate. At this level, the narrowest spread between the average rates paid on savings and loan shares and time deposits was over 60 basis points. In 1956 all of the savings and loans,had paid an average yield of at least 2.7 per cent, and most paid 30 to 40 basis points more. Consequently, it appears that in 1957 the savings and loans increased their efforts directed towards informing the public that they were already offering higher rates than the new ceiling rate on time deposits at commercial banks, rather than attempting to maintain the former rate differentials.[39/] The influence of advertising by savings and loan associations on the demand for these deposit-type financial assets will be discussed further in the following section of this chapter.

With regard to the change in the interest ceiling on time deposits in January 1957, the results reported in Tables 3-2 to 3-5 all indicate increased responsiveness of

39/ The above quoted figures on percentage changes in average rates paid do not necessarily indicate that the savings and loan associations did not maintain rate differentials, since the change in the savings in loan rate would be calculated on a greater base. However, the data on the average yields of the two assets in these three years indicates clearly that the 1956 differentials were not maintained. For one discussion of some of the factors affecting the decisions of a savings and loan's management in the trade-off between increased advertising and general rate increases, see Edward Shaw, Savings and Loan Market Structure and Market Performance (Office of the California Savings and Loan Commissioner, 1962).

time deposits to the rate differentials in 1957 as compared to 1956, and further increase in the relative importance of this variable in 1958 over 1957.

The results with regard to the "convenience cost" variables as well as the relative yield variables indicate support for the hypothesis that savings and loan associations and mutual savings banks may be viewed as selling the same asset, at least from the point of view of the consumer and to the extent that they offer a substitute for time deposits at commercial banks. The elasticities of demand for time deposits with respect to the interest ratio reported in Table 3-3, as compared to the results in Table 3-2, indicates that the weighted average rate on savings and loan and mutual savings bank deposits more correctly measures the alternative cost of holding time deposits at commercial banks than does the yield on savings and loan shares alone. Similarly, the inclusion of mutual savings bank offices in the convenience cost variable (Table 3-3) adds considerably to the importance of this variable. Note that in Table 3-2 the convenience cost variable, excluding mutual savings banks, would be considered statistically non-significant according to the t-test. But with the inclusion of mutual savings banks the variable is significant at least at the 5 per cent level in all cases in Table 3-3.

Aggregating mutual savings banks together with savings and loans as a substitute for time deposits at commercial

banks is of less significance in the sample where twelve northeastern states are aggregated into one "state", as indicated by the results in Table 3-5 compared to those in Table 3-4. This is no doubt a result of the fact that of the seventeen states in which there was at least one mutual savings bank, eleven were among the twelve states which were specially aggregated and these eleven included over 95 per cent of all mutual savings bank deposits.

(2) Savings and Loan Shares

For each of the three years 1956 to 1958 least-square estimates of equations representing the demand for savings and loan shares were computed from cross-section data. A supply equation for savings and loan shares could not be estimated for these years, since cross-section data of an exogenous proxy variable which could serve in a supply equation were not available. Definitions of new symbols appearing in Tables 3-6 and 3-7 are as follows:

ASL = per capita advertising expenditures of savings and loan associations

$\varepsilon(SS,Y)$ = estimated elasticity of demand for savings and loan shares with respect to income

$\varepsilon(SS,ir)$ = estimated elasticity of demand for savings and loan shares with respect to the interest rate ratio

As with the estimates of the equations for the demand for time deposits discussed in the previous section, the alternative inclusion of personal income or permanent in-

TABLE 3- 6

Demand for Savings and Loan Shares

49 State Sample

Year	I	Y	Yp	$\frac{Y}{Yp}$	ASL	$\frac{rs}{rt}$	$\frac{SL}{CB}$	R^2	SEE	$\varepsilon(SS,Y)$	$\varepsilon(SS,ir)$
56	116	0.030		-142	358	4.71	406	.860	26.6	0.30	0.05
		(1.51)		(0.77)	(7.18)	(0.20)	(5.65)				
56	71		0.036	-105	359	5.10	407	.859	26.7	0.28	0.05
			(1.41)	(0.54)	(7.20)	(0.21)	(5.63)				
57	242	0.021		-219	426	3.01	314	.887	24.3	0.20	0.02
		(1.02)		(1.26)	(9.40)	(0.10)	(3.99)				
57	206		0.025	-190	427	3.26	314	.887	24.3	0.19	0.03
			(0.98)	(1.03)	(9.43)	(0.11)	(3.98)				
58	-236	0.053		103	411	14.6	350	.861	26.7	0.46	0.10
		(1.93)		(0.51)	(6.90)	(0.37)	(3.44)				
58	-328		0.063	179	414	14.8	349	.861	26.8	0.43	0.10
			(1.84)	(0.79)	(6.94)	(0.37)	(3.42)				

(t - statistics in parentheses)
I = intercept

TABLE 3-7

Demand for Savings and Loan Shares

38 State Sample

Year	I	Y	Yp	$\frac{Y}{Yp}$	ASL	$\frac{rs}{rt}$	$\frac{SL}{CB}$	R^2	SEE	$\varepsilon(SS,Y)$	$\varepsilon(SS,ir)$
56	679	0.022 (1.33)		-556 (3.53)	262 (7.01)	12.6 (0.62)	354 (6.05)	.889	18.4	0.23	0.13
56	640		0.028 (1.33)	-526 (3.21)	262 (7.02)	12.6 (0.62)	354 (6.02)	.889	18.4	0.22	0.13
57	507	0.022 (1.23)		-440 (2.97)	299 (7.24)	40.3 (1.63)	268 (4.00)	.885	18.5	0.21	0.32
57	465		0.029 (1.23)	-407 (2.71)	299 (7.24)	40.3 (1.63)	267 (3.99)	.885	18.5	0.22	0.32
58	168	0.037 (1.59)		-189 (0.99)	314 (6.16)	42.9 (1.23)	250 (2.79)	.855	20.0	0.32	0.30
58	93		0.048 (1.61)	-130 (0.64)	313 (6.13)	42.5 (1.22)	250 (2.80)	.856	20.0	0.33	0.30

(t - statistics in parentheses)
I = intercept

come does not significantly affect the results for these three years. In contrast to the estimates of the time deposit equations however, inclusion of the ratio of personal income to permanent income as an additional explanatory variable does affect the results in most cases. The variable is not statistically significant according to the t-test in estimates from the 49 state sample (Table 3-6), but is significant at the 5 per cent level in the estimates for 1956 and 1957 in the 38 state sample (Table 3-7). However in most cases for these three years the coefficient has the opposite sign from that hypothesized for this variable.[40/] The estimates for 1958 reported in Table 3-6 show positive signs attached to this "transitory" income variable and they show income elasticities of the demand for savings and loan shares which are twice the elasticities estimated for 1957. The less than stable estimates of coefficients of income variables for these three years may have been caused by the business recession of 1957 and 1958. Note that the coefficient for the ratio of personal to permanent income in the 38 state sample (Table 3-7) is substantially smaller in 1958 than 1957 and that it is statistically non-significant in the latter year. The drop in personal income relative to permanent income as a result of

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40/ But see the results for subsequent years, discussed later in this chapter, where the variable is estimated to have a positive sign.

the recession does not, according to the theory, imply the results that were obtained for this period.

The elasticities of demand for savings and loan shares with respect to the interest rate ratio are in agreement with the theory for both the 49 state and 38 state samples. In the 49 state samples (Table 3-6) the importance of this variable appears less in 1957 than in 1956, and much greater in 1958 than 1957. In the samples where 12 states are treated as one (Table 3-7) the influence of the interest rate variable is much greater in 1957 than 1956, and the elasticities of demand with respect to this ratio are much greater in the 38 state samples than the 49 state samples.

The tests for these three years alone do not indicate conclusively whether or not the 38 state samples are in some sense better than the 49 state samples or not. Estimates of equations for other years bring more information to bear on this question. In summary of the main differences in the estimates of savings and loan demand functions from the two samples for the three years 1956-1958: the income elasticities of demand are greater in the 49 state sample and the elasticities with respect to the interest rate ratio are greater in the 38 state sample; the interest rate ratio is less important in the 49 state sample in 1957 after the rise in ceiling rates on time deposits, and this ratio is much more important in the 38 state sample in 1957; after the rise in ceiling rates in 1957 the increase in importance of advertising by savings and loan associations

is greatest in the 49 state sample; in both samples the influence of the convenience cost variable (ratio of savings and loan to commercial bank offices) declines after the change in Regulation Q.

The income elasticities of demand for savings and loan shares were much smaller in all three years than those obtained by Feige. The estimates reported by Feige were .60, .51, and .58 for the three years respectfully, which are along the order of magnitude of the income elasticities of demand for the aggregated savings and loan-mutual savings bank deposits estimated in this study, as reported in the next section of this chapter.

(3) Aggregated Savings and Loan Shares plus Mutual Savings Bank Deposits

Under the assumption that savings and loan shares and deposits in mutual savings bank are perfect substitutes in demand from the point of view of consumers, equations of the demand for this aggregated asset were estimated from the 38 state and 49 state samples for each year 1956 to 1958 as a test of the effects of the change in ceiling rates on a hypothesized substitute--time deposits at commercial banks--in January 1957. The estimates are reported in Table 3-8. Definitions of new symbols appearing in this table are as follows:

ASM = per capita advertising expenditures of both savings and loan associations and mutual savings banks (see pages 55 and 56)

$\frac{rsm}{rt}$ = ratio of the weighted average interest rate paid by savings and loan associations and mutual savings banks to the yield on time deposits at commercial banks

$\frac{SLM}{CB}$ = ratio of the number of savings and loan and mutual savings bank offices to commercial bank offices

$\varepsilon(SM,Y)$ = estimated elasticity of demand for the combined savings and loan and mutual savings bank asset with respect to income

$\varepsilon(SM,ir)$ = estimated elasticity of demand for the combined savings and loan and mutual savings bank asset with respect to the interest ratio

The sign attached to the coefficient estimated for the interest ratio is negative in all cases--opposite the hypothesized sign. However the associated t-statistic indicates a very low statistical significance for this variable in all cases. For this aggregated asset, advertising expenditures and the proxy convenience cost variable--the ratio of savings and loan-mutual savings bank offices to commercial bank offices--are better explanatory variables than relative yields for these three years.

As in the case of the demand functions for savings and loan shares alone, the ratio of personal to permanent income is statistically significant in some cases, however always with the opposite sign to that hypothesized. Also, the alternative inclusion of personal income per capita rather than permanent income per capita made very little

TABLE 3-8

Demand for Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits

Year	I	Yp	$\frac{Y}{Yp}$	ASM	$\frac{rsm}{rt}$	$\frac{SLM}{CB}$	R^2	SEE	$\varepsilon(SM,Y)$	$\varepsilon(SM,ir)$
					49 State Sample					
56	1487	0.164	-1209	337	-110	788	.794	46.5	0.78	-0.66
		(2.15)	(2.24)	(2.43)	(1.51)	(5.31)				
57	1649	0.175	-1334	320	-128	725	.796	45.4	0.80	-0.64
		(2.06)	(2.34)	(2.39)	(1.37)	(4.30)				
58	1270	0.194	- 992	353	-204	756	.780	45.4	0.84	-0.81
		(1.97)	(1.67)	(2.36)	(1.89)	(3.84)				
					38 State Sample					
56	1385	0.079	-1074	216	- 63	640	.714	43.3	0.56	-0.63
		(1.36)	(2.48)	(2.11)	(1.19)	(4.35)				
57	838	0.119	- 714	250	- 34	484	.696	43.4	0.79	-0.24
		(1.84)	(1.77)	(2.21)	(0.52)	(2.82)				
58	505	0.137	- 439	269	- 65	473	.671	43.0	0.84	-0.39
		(1.86)	(0.89)	(2.15)	(0.78)	(2.27)				

(t - statistics in parentheses)
I = intercept

difference. The decision to report only the results for equations including permanent income was more or less arbitrary.

The estimated elasticities of demand for this combined savings and loan-mutual saving bank asset with respect to income in both the 49 state and 38 state samples are along the order of magnitude of Feige's estimates of the income elasticities of demand for savings and loan shares alone in these three years. As reported previously in this chapter, these estimates are much larger than those obtained in this study for savings and loan shares alone.

V Results From 1960 Cross-Section Data

(1) Time Deposits at Commercial Banks

It was noted earlier in this chapter that special surveys conducted by the Federal Reserve and the Federal Deposit Insurance Corporation in 1960, 1965 and 1966, provide alternative measures of quantities and interest rates of time and savings deposits at commercial banks. The procedure for using these survey data to compute cross-section interest rate figures is discussed in pages 49 to 52. The figures obtained for 1960 are reported in Table 3-1 (page 51), together with figures for the average rate paid as computed by ordinary procedures. This section discusses the results of regressions using the 1960 survey data.

Estimates of various demand equations for time deposits at commercial banks from 1960 cross-section data are reported in Tables 3-9 to 3-12. In each table total time deposits at all insured commercial banks, averaged over the year, is the dependent variable in equations 1 through 3. In each of equations 4 to 6, the dependent variable is time deposits at member banks (of the Federal Reserve System) on June 30, 1960. The definitions of symbols used in these tables are as follows:

TD = Average time and savings deposits at all insured commercial banks (per capita)

TD1 = Total time and savings deposits at all member banks on June 30, 1960 (per capita)

TD2 = Total savings (passbook) deposits at all member banks on June 30, 1960 (per capita)

Yp = Per capita permanent income

Y/Yp = Ratio of personal to permanent income

For the interest rate ratio variables, the numerators are as previously defined in this chapter, the denominators are:

rt = Average interest rate paid on time and savings deposits at all insured commercial banks

rt1 = Weighted average proffered rate on total time and savings deposits at member banks on June 30, 1960

rt2 = Weighted average proffered rate on savings (passbook) deposits at member banks on June 30, 1960

In the estimates of demand equations for time deposits at commercial banks from 1960 cross-section data (and cross-section data from all subsequent years), each of four

TABLE 3-9

Demand for Time Deposits - 1960
(Excluding Mutual Savings Banks)
49 State Sample

Equation & Symbol		I	Yp	$\frac{Y}{Yp}$	$\frac{rs}{rt}$	$\frac{rs}{rt1}$	$\frac{rs}{rt2}$	$\frac{SL}{CB}$	R^2	SEE	$\varepsilon(TD,Y)$	$\varepsilon(TD,ir)$
1	TD	-63.8	0.233 (5.41)	268 (0.37)	-213 (1.75)			-123 (0.91)	.436	33.7	1.39	-0.85
2	TD	-215	0.224 (5.03)	411 (0.57)		-222 (1.21)		-148 (1.08)	.417	34.3	1.34	-0.89
3	TD	-329	0.227 (5.08)	469 (0.65)			-182 (1.05)	-159 (1.17)	.412	34.4	1.36	-0.73
4	TD1	699	0.177 (5.19)	-453 (0.79)	-237 (2.45)			1.78 (0.02)	.476	39.3	1.56	-1.66
5	TD1	662	0.164 (4.67)	-332 (0.58)		-311 (2.16)		-23.6 (0.22)	.462	39.8	1.45	-1.87
6	TD2	828	0.145 (4.30)	-508 (0.93)			-296 (2.24)	16.5 (0.16)	.457	43.8	1.46	-2.07

(t - statistics in parentheses)
I = intercept

TABLE 3-10

Demand for Time Deposits - 1960
(Including Mutual Savings Banks)
49 State Sample

Equation & Symbol		I	Yp	$\frac{Y}{Yp}$	$\frac{rsm}{rt}$	$\frac{rsm}{rt1}$	$\frac{rsm}{rt2}$	$\frac{SIM}{CB}$	$\bar{R}^2$	SEE	$\varepsilon(TD,Y)$	$\varepsilon(TD,ir)$
1	TD	-182	0.286 (7.09)	410 (0.65)	-264 (2.54)			-321 (3.70)	.559	29.8	1.71	-1.06
2	TD	-324	0.271 (6.49)	581 (0.90)		-303 (1.90)		-316 (3.54)	.532	30.7	1.62	-1.21
3	TD	-416	0.273 (6.57)	651 (1.01)			-288 (1.88)	-327 (3.62)	.532	30.7	1.63	-1.15
4	TD1	601	0.215 (6.36)	-365 (0.69)	-248 (2.86)			-189 (2.61)	.541	36.8	1.90	-1.74
5	TD1	575	0.199 (5.78)	-232 (0.44)		-341 (2.59)		-189 (2.57)	.527	37.3	1.76	-2.04
6	TD2	791	0.174 (5.12)	-443 (0.85)			-330 (2.64)	-142 (1.92)	.497	42.1	1.75	-2.31

(t - statistics in parentheses)
I = intercept

TABLE 3-11

Demand for Time Deposits - 1960
(Excluding Mutual Savings Banks)
38 State Sample

Equation & Symbol		I	Yp	$\frac{Y}{Yp}$	$\frac{rs}{rt}$	$\frac{rs}{rt1}$	$\frac{rs}{rt2}$	$\frac{SL}{CB}$	R^2	SEE	$\varepsilon(TD,Y)$	$\varepsilon(TD,ir)$
1	TD	73.1	0.316 (8.94)	-74.1 (0.14)	-158 (1.43)			-164 (1.47)	.726	23.8	1.86	-0.79
2	TD	-153	0.315 (8.54)	6.31 (0.01)		- 65 (0.42)		-192 (1.70)	.711	24.4	1.86	-0.26
3	TD	-223	0.317 (8.60)	17.7 (0.03)			-22.6 (0.15)	-197 (1.75)	.710	24.5	1.87	-0.09
4	TD1	665	0.248 (9.19)	-567 (1.42)	-203 (2.40)			- 91 (1.08)	.759	26.8	2.17	-1.42
5	TD1	544	0.242 (8.46)	-480 (1.16)		-192 (1.60)		-118 (1.36)	.738	28.0	2.11	-1.15
6	TD2	742	0.222 (7.83)	-722 (1.75)			-153 (1.32)	- 60 (0.69)	.722	32.2	2.24	-1.07

(t - statistics in parentheses)
I = intercept

TABLE 3- 12

Demand for Time Deposits - 1960
(Including Mutual Savings Banks)
38 State Sample

Equation & Symbol		I	Yp	$\frac{Y}{Yp}$	$\frac{rsm}{rt}$	$\frac{rsm}{rt1}$	$\frac{rsm}{rt2}$	$\frac{SLM}{CB}$	R^2	SEE	$\varepsilon(TD,Y)$	$\varepsilon(TD,ir)$
1	TD	26	0.322 (8.98)	-4.95 (0.10)	-146 (1.37)			-188 (1.78)	.731	23.6	1.90	-0.73
2	TD	-204	0.322 (8.60)	38 (0.07)		-56.2 (0.37)		-207 (1.93)	.716	24.2	1.90	-0.22
3	TD	-268	0.323 (8.68)	50.5 (0.10)			-20.1 (0.14)	-210 (1.96)	.715	24.2	1.91	-0.08
4	TD1	639	0.249 (9.05)	-554 (1.39)	-194 (2.37)			-102 (1.25)	.759	26.8	2.17	-1.36
5	TD1	520	0.244 (8.34)	-463 (1.12)		-190 (1.60)		-122 (1.46)	.738	28.0	2.13	-1.14
6	TD2	730	0.223 (7.69)	-718 (1.75)			-148 (1.28)	-65.4 (0.78)	.722	32.2	2.25	-1.04

(t - statistics in parentheses)
I = intercept

alternative measures of permanent income were used in combination with other independent variables. However, the inclusion of alternative permanent income measures did not substantially alter the results as reported in the text for only one measure of permanent income.[41/] See Appendix C for other results.

The income elasticities of demand for time deposits at all commercial banks estimated for 1960 are consistent in both the 49 state and 38 state samples with the results obtained for the comparable samples in each of the years 1956 to 1958. These income elasticities, as noted earlier, are considerably larger than those Feige estimated using cross-section data for the years 1949 to 1959. The results obtained here for time deposits in 1960 are consistent with the estimated income elasticity of demand for money (inclusive of time deposits) Friedman obtained from time series data.

The income elasticities estimated for time deposits at member banks (equations 4 to 6 in Tables 3-9 to 3-12) are greater in all cases than the respective income elasticities estimated for yearly average time deposits at all commercial banks (equations 1 to 3). Additional possible explanations for these differences in estimated income elasticities may be: (a) the proportion of total

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41/ The measure of permanent income to include in the reported results was arbitrarily chosen. For this measure the adjustment coefficient was $\eta = .3$ and the growth coefficient was $\alpha = .02$. See Footnote 26.

time deposits held in member banks differs from state to state, causing an identification problem; and, (b) the concentration of member banks in urban and rural areas is different than the concentration of non-member banks, and the concentrations differ between states.

Both points (a) and (b) tend to be supported by the coefficients estimated for the convenience cost variable--that is, the ratio of savings and loan offices to commercial bank offices. This variable would be expected to be more important in rural areas as compared to the urban areas. The proportion of total time deposits in non-member banks is greater in unit banking states (where branch banking is prohibited) than in states where branch banking is allowed. The member banks are relatively predominant in the more metropolitan areas where the convenience cost variable would be expected to be relatively less important, and the non-member banks are more predominant in the rural areas where this variable would be expected to be more important. The larger coefficients and greater significance of the convenience cost variable in the equations estimated for time deposits at all commercial banks are consistent with this analysis.

The results reported in Tables 3-9 and 3-11 show that a very low statistical significance is associated with the coefficients estimated for the convenience cost variable in 1960 in the case where the ratio of only savings and loan offices to commercial bank offices is used. On the other

hand, Table 3-10 shows the estimated coefficients for this variable to be significant at the 5 per cent level in all cases where both savings and loans and mutual saving banks are considered to be the alternative to commercial banks.

Essentially all mutual savings banks are in a few of the more urbanized states in the northeastern part of the country. In the equations estimated for time deposits at member banks, the convenience cost ratio is of almost no importance if mutual savings bank offices are not included (as in equations 4 to 6 in Table 3-9), but the variable is significant at the 5 per cent level in equations estimated for time deposits at member banks when mutual savings bank offices are included (Table 3-10).

In the estimates from the 38 state samples, the inclusion or not of mutual savings banks does not have much effect on the results. And this is consistent with the foregoing interpretations of the results from the 1960 cross-section data. Almost all of the mutual savings banks are in the twelve northeastern states which are consolidated to create the thirty-eighth "state". Therefore only one observation is substantially affected in this sample when mutual savings banks are included or not.

The estimates of coefficients for the relative yield variable from the 1960 data are consistent with the results obtained from the 1956 to 1958 data. These results are not inconsistent with the hypothesis that both savings and loan shares and mutual savings bank deposits are substitutes in

demand for time deposits on the basis of relative yields. The elasticities of demand for time deposits with respect to the interest ratio are absolutely greater in the results from the 1960 data than the respective elasticities estimated from data for the earlier years; however the statistical significance of the coefficients for this variable is not as great in 1960 as in 1957 and 1958.

The weighted average yield on savings and loan shares and mutual savings bank deposits as a substitute in demand for time deposits in the 49 state sample (Table 3-10) produces better results than when only savings and loan shares are included as a substitute (Table 3-9). As expected, and for reasons stated previously, the inclusion or not of the yield on mutual savings banks does not make much difference in the 38 state samples.

The inclusion of the rate paid on mutual savings bank deposits causes a more pronounced difference in the equations estimated for time deposits at all commercial banks than for time deposits at member banks. The coefficients, t-statistics, and elasticities estimated for the interest ratio are about the same in Table 3-10 as in Table 3-9 for equations 4 to 6. This is the opposite effect to the results obtained from the inclusion of mutual savings bank offices in the convenience cost variable in the equations estimated for time deposits at member banks. This result will be discussed later in this chapter when the estimates of demand equations for time deposits at member banks using

1965 and 1966 survey data are presented.

The estimated interest elasticities of demand for time deposits at member banks are consistently greater (absolute) than the respective elasticities estimated for average time deposits at all commercial banks. Since member banks are more predominant in metropolitan areas than rural areas compared to non-member banks, these results may indicate that the demand for time deposits at member banks is more sensitive to relative yields (time deposits versus substitutes) than the demand for time deposits at the rural non-member banks. On the other hand, the higher interest elasticities may be due to the nature of the data; namely, the member bank data are deposits as of mid-year, whereas the all commercial bank data are average deposits for the year, and, rt is an average rate paid for the year, whereas rt1 and rt2 are weighted average proffered rates at mid-year. Again, the results obtained from the use of the 1965 and 1966 survey data may bring more information to bear on these explanations.

The proposition that passbook deposits may be a better measure of the asset which commercial banks offer as a substitute for other household deposit-type financial assets does not gain support from the results obtained from the use of the 1960 survey data. The elasticities of demand for passbook deposits estimated from the 49 state samples are somewhat greater (absolutely) than the interest elasticities of demand for all time deposits and the relative

size of the interest elasticities are about the same in the 38 state sample. The statistical significance of the coefficient for the interest rate ratio variable is about the same in the equations estimated for passbook deposits and those estimated for all time deposits at member banks. However, comparison of the t-statistics for the interest ratio in equation 1 versus equations 4 to 6 in each of the tables for 1960 data indicates that proffered rates computed from the survey data (rt1 and rt2) are more reliable than the average rate paid (rt).

The demand equations estimated for time deposits, with alternative specifications of the four explanatory variables, are "better" for the 38 state samples than the 49 state samples in the sense that the R^2 is greater and the standard errors of the estimates are lower for the smaller sample. However, only the permanent and transitory income variables are statistically significant at the 5 per cent level or better in most cases of equations estimated from the 38 state sample. The coefficients for the interest ratio variable estimated from the 49 state sample are generally more reliable according to the t-statistic, even though the four independent variables do not "explain" as much of the variation of time deposits in the larger sample as in the smaller.

(2) Savings and Loan Shares

In a previous section of this chapter estimates of "demand" equations for savings and loan shares were reported for the 1956 to 1958 cross-section data. For these estimates it was implicitly assumed that the supply of savings and loan shares (to individuals) was infinitely elastic with respect to the average yield that prevailed in each state in each year. In other words, only demand determined the average outstanding volume of shares in each state.

In this section (and in a subsequent section discussing results from 1965 to 1966 cross-section survey data) supply equations are introduced and simultaneously estimated along with the demand equations. Two-stage least-square regression techniques were used in order to simultaneously estimate these demand and supply equations for savings and loan shares using 1960 cross-section data of states in the U.S.. Results of these estimates for a 38 state sample are reported in Table 3-13. Results of estimates of supply and demand equations from 49 and 45 state samples are also discussed briefly in this section, although the estimates are not reported. As in the case of least-square estimates of demand equations for time deposits, data on proffered interest rates on time deposits were used as an alternative measure of the yield on time deposits.

In Table 3-13 the demand and supply equations estimated

TABLE 3-13

Savings and Loan Shares - 1960

38 State Sample
Two-Stage Least-Square Estimates

Equation & Symbol									R^2	SEE	$\varepsilon(SS,Y)$
1	SS^d =	3527 -	1626 $\frac{\hat{rs}}{rt}$ (2.52)	+ .003 Yp (.091)	- 1073 $\frac{Y}{Yp}$ (1.91)	+ 339 ASL (6.82)	+ 637 $\frac{SL}{CB}$ (5.09)		.879	17.6	.02
2	SS^s =	- 2774 +	2008 $\frac{\hat{rs}}{rt}$ (3.82)	+ .153 BP (0.52)					.370	38.5	
3	SS^d =	-13918 +	7163 $\frac{\hat{rs}}{rt1}$ (2.54)	+ .588 Yp (2.72)	+ 3429 $\frac{Y}{Yp}$ (2.53)	- 610 ASL (1.77)	+ 751 $\frac{SL}{CB}$ (4.63)		.880	17.6	4.34
4	SS^s =	- 2298 +	1857 $\frac{\hat{rs}}{rt1}$ (2.99)	+ .857 BP (2.95)					.289	40.9	
5	SS^d =	- 5169 +	2787 $\frac{\hat{rs}}{rt2}$ (2.52)	+ .269 Yp (2.88)	+ 1011 $\frac{Y}{Yp}$ (2.06)	- 178 ASL (1.00)	+ 824 $\frac{SL}{CB}$ (4.35)		.879	17.6	1.99
6	SS^s =	- 1474 +	1231 $\frac{\hat{rs}}{rt2}$ (2.22)	+ .866 BP (2.78)					.217	42.9	

(t- statistics in parenthesis)

by TSLS techniques are reported in pairs. There were two endogenous variables in all cases: (1) the dependent variable--per capita savings and loan shares; and (2) the relative yield variable--the ratio of the yield on savings and loan shares to one of the alternative measures of the yield on time deposits at commercial banks. The only variable not previously defined is per capita building permits (BP) in dollars, issued in each state in 1960 (see the discussion of this proxy variable in Chapter 2).

The demand equations are just-identified, that is, the number of excluded exogenous variables is just equal to the number of included endogenous variables minus one. The supply equations are over-identified in all cases.

In equations 1 and 2, the average rate paid on time deposits at all commercial banks is included in the interest rate ratio. The sign of the coefficient of this variable is negative in the demand equation and positive in the supply equation--opposite to the signs hypothesized in both cases. However the coefficients for the interest rate ratio are estimated to have the sign hypothesized in demand equations 3 and 5, where the rate on time deposits is a weighted average proffered rate. Also, the coefficients of the interest rate variable are statistically significant at the 5 per cent level in demand equations 3 and 5. In the corresponding supply equations (4 and 6), the coefficients of this ratio are also positive and significant which indicates that there are some specification problems with the supply

equations.

The coefficient of the exogenous variable in the supply equations (BP) has the sign hypothesized and is significant at the 5 per cent level in supply equations 4 and 6. However, the supply equations are not well "explained" by the two explanatory variables, as is shown by the low coeffcients of determination and high standard errors of the estimate associated with these equations. Nevertheless the coefficients in the demand equations are much more statistically reliable, and the standard errors of the estimate are much lower, when estimated together with the given supply equations by two-stage techniques. The alternative employed by others, least-square estimation of "demand" equations under the assumption that supply schedules are horizontal at the average effective yield, perform far less well.

A drawback of the two-stage least-square techniques is that the elasticities of demand for savings and loan shares with respect to the interest ratio are so large they are not very informative. But according to the statistical tests available, these estimates are more reliable than those made with least-square techniques. On the other hand, a good deal of uncertainty persists among statisticians regarding the small sample properties of two-stage least-square techniques. Even so, the results reported in Table 3-13 clearly discriminate between the alternative measures of the yield on time deposits in the

interest rate ratio. The yield on savings and loan shares relative to the yield on time deposits is supported as being a significant variable influencing the demand for savings and loan shares. In this regard, however, the results do not indicate that in 1960 passbook deposits at member banks (equation 5) were a closer substitute in demand for savings and loan shares than total time and savings deposits at member banks (equation 3).

The income elasticities of demand for savings and loan shares are somewhat greater than the income elasticities estimated for earlier years by least-square techniques. Here again the elasticities estimated by two-stage methods vary considerably more for the same cross-section sample than in the case with least-square methods. The permanent income variable performed somewhat better, statistically, than did personal income.

The transitory income ratio and advertising expenditures of savings and loan associations performed oddly as explanatory variables in the demand equations. In equation 1 the transitory income coefficient has the opposite sign to that hypothesized and low statistical significance; the advertising expenditure coefficient carries the hypothesized sign and is highly significant. But in equations 3 and 5 the performance of these two variables is reversed. This may be a result of the two-stage methods. High correlation between these two variables across the sample would explain this result if it existed, but it doesn't.

(3) Other Samples

Two-stage least-square estimates of demand and supply equations for savings and loan shares were also computed from 49 and 45 state samples of the 1960 cross-section data. The standard errors of the estimate of the equations estimated from the 49 state sample were very high in all cases. The signs of the coefficients estimated for the interest rate ratio were negative in the demand equations and positive in supply equations--opposite to the hypothesized signs in both cases. Similar identification difficulties were reflected in signs of other coefficients, and most all were of low statistical significance.

Two-stage least-square estimates were also computed from the 49 state sample for aggregated savings and loan shares and mutual savings bank deposits. These results were somewhat better than the estimates of equations for savings and loan shares alone, however, most of the same problems were present.

The inclusion of the District of Columbia as a state in a cross-section study causes problems since per capita figures for series such as bank and savings and loan deposits do not represent the holdings of these assets by only the residents of D.C. This problem exists with data for all states to some extent, but scatter diagrams revealed that the problem is far more obvious in the case of D.C. in the 49 state samples.

One solution to the question of how to treat D.C. in a cross-section study is to simply leave it out of the sample. In effect this is what Feige did by including a dummy variable for D.C. in his demand equations.[42/] However, the overstatement of per capita figures for D.C. means that per capita figures for other states are understated. The assumption that twelve northeastern states may be treated as one state, as discussed in Chapter 2, is a second alternative solution. The 38 state sample used to estimate the equations reported in Table 3-13 was derived from this assumption.

A third way of handling D.C. in particular was used to create a 45 state sample. It was assumed that the residents of four states surrounding D.C.--Delaware, Maryland, Virginia, and West Virginia--accounted for the exceptionally large per capita savings and loan shares reported for D.C. Therefore, these four states and D.C. were aggregated and treated as one state. An implicit assumption of this procedure is that, with regard to the demand and supply of savings and loan shares, the residents and institutions of these four states and D.C. behave as though they were one state.

42/ See Appendix A regarding Feige's procedure. His inclusion of a dummy variable for D.C., California, Illinois, and New York, produces exactly the same results as he would have obtained if he had simply left these states out of his sample.

The 45 state sample created by the above assumptions (that five states can be treated as one) was used to estimate supply and demand equations for 1960 by two-stage least-square techniques. Using t-statistics and the standard errors of the estimates as a gauge, the results from this sample were better than the results estimated from the 49 state sample. However, the signs of the coefficients estimated for the interest rate ratio were generally opposite in both the demand and supply equations to the hypothesized signs. These coefficients and most others were of low statistical significance. This indicates that the problem of identification of cross-section observations in the northeast U.S. is still present after D.C. and four surrounding states have been aggregated.

VI Results From 1965-1966 Cross-Section Survey Data

(1) Demand For Time Deposits

As previously discussed, special surveys of time deposits at commercial banks provide alternative data for cross-section estimation of demand equations for time deposits and savings and loan shares. Least-square techniques were used to estimate alternative demand equations for time deposits and sub-classes of time deposits at commercial banks. The results of these tests are reported in Tables 3-14 to 3-17.

The survey deposit and interest rate data used for 1965 estimates (Tables 3-14 and 3-15) are as of December 31

1965. The survey data used for 1966 estimates are as of May 31, 1966.

The definitions of variables in Tables 3-14 to 3-17 are as follows:

TD = per capita average time deposits at all commercial banks

TD1 = per capita passbook deposits outstanding at member banks

TD2 = per capita passbook deposits plus savings certificates[43/] outstanding at member banks

TD3 = per capita total member bank time deposits outstanding

Y_p = per capita permanent personal income

$\frac{Y}{Yp}$ = ratio of actual personal income to per capita permanent personal income

$\frac{SL}{CB}$ = ratio of savings and loan offices to commercial bank offices

$\frac{rs}{rt}$ = ratio of average rate paid on savings and loan shares to average rate paid on time deposits at all commercial banks

$\frac{rs}{rt1}$ = ratio of average rate paid on savings and loan shares to weighted average most common rate proffered by member banks on passbook deposits

$\frac{rs}{rt2}$ = ratio of average rate paid on savings and loan shares to weighted average most common rate proffered by member banks on passbook deposits plus savings certificates

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43/ The category of "Savings Certificates" was created by aggregating the sub-categories of Savings Certificates, Savings Bonds, other nonnegotiable instruments, and negotiable instruments under $100,000.

$\frac{rs}{rt3}$ = ratio of average rate paid on savings and loan shares to weighted average most common rate proffered by member banks on total time deposits

SEE = standard error of the estimate as a per cent of the mean of the dependent variable

$\varepsilon(TD,Y_p)$ = elasticity of demand for the respective measure of time deposits with respect to permanent personal income

$\varepsilon(TD,ir)$ = elasticity of demand for the respective measure of time deposits with respect to the respective interest rate ratio

Data for Alaska and Hawaii were included in the cross-section samples for 1965 and 1966, which provided a 51 state sample and a 40 state sample (where twelve northeastern states are aggregated) for each year. Consistent with results from samples for earlier years, the results from the 40 state samples are superior to the results obtained from the 51 state samples. These results are consistent with the hypothesis that the aggregation of the twelve northeastern states into one "state" provides a more accurate measure of the degrees of freedom of a cross-section sample which is to be used to estimate demand functions for financial assets.

TABLE 3-14

Demand for Time Deposits - 1965

One-Stage Least-Square Estimates

51 State Sample

Equation & Symbol									R^2	SEE	ε (TD,Y)	ε (TD,ir)
1	TD =	896 +	.288 Yp	- 50 $\frac{Y}{Yp}$	-	791 $\frac{rs}{rt}$	-	86 $\frac{SL}{CB}$	.434	30.8	1.18	-1.58
			(4.23)	(.05)		(2.53)		(.39)				
2	TD1 =	1127 +	.161 Yp	- 548 $\frac{Y}{Yp}$	-	572 $\frac{rs}{rt1}$	+	145 $\frac{SL}{CB}$	.493	43.0	1.28	-2.29
			(3.29)	(.84)		(2.78)		(.91)				
3	TD2 =	159 +	.196 Yp	- 211 $\frac{Y}{Yp}$	-	28 $\frac{rs}{rt2}$	+	60 $\frac{SL}{CB}$	.360	39.0	1.25	- .08
			(3.60)	(.29)		(1.91)		(.33)				
4	TD3 =	1201 +	.208 Yp	- 462 $\frac{Y}{Yp}$	-	750 $\frac{rs}{rt3}$	+	94 $\frac{SL}{CB}$	.401	40.5	1.23	-2.25
			(3.28)	(.54)		(2.05)		(.46)				

(t - statistics in parenthesis)

TABLE 3-15

Demand for Time Deposits - 1965

One-Stage Least-Square Estimates

40 State Sample

Equation & Symbol										R^2	SEE	ε(TD,Y)	ε(TD,ir)
1	TD =	363 +	.396 Yp	+	181 $\frac{Y}{Yp}$	- 732 $\frac{rs}{rt}$	- 146 $\frac{SL}{CB}$			.715	20.0	1.58	-1.46
			(7.59)		(.29)	(3.10)	(.86)						
2	TD1 =	1095 +	.228 Yp	-	514 $\frac{Y}{Yp}$	- 674 $\frac{rs}{rt1}$	+ 6.37 $\frac{SL}{CB}$			.643	37.4	1.84	-2.70
			(4.75)		(.91)	(3.59)	(.04)						
3	TD2 =	-136 +	.291 Yp	-	82 $\frac{Y}{Yp}$	- 32 $\frac{rs}{rt2}$	- 98 $\frac{SL}{CB}$			.585	30.7	1.79	- .13
			(5.62)		(.14)	(2.73)	(.58)						
4	TD3 =	1106 +	.290 Yp	-	404 $\frac{Y}{Yp}$	- 836 $\frac{rs}{rt3}$	- 82 $\frac{SL}{CB}$			.602	30.8	1.68	-2.51
			(5.22)		(.61)	(2.82)	(.46)						

(t - statistics in parenthesis)

TABLE 3-16

Demand for Time Deposits - 1966

One-Stage Least-Square Estimates

51 State Sample

Equation & Symbol										R^2	SEE	ε(TD,Y)	ε(TD,ir)
1	TD =	1132	+ .289 Yp (3.94)	- 356 $\frac{Y}{Yp}$ (.35)	- 677 $\frac{rs}{rt}$ (1.76)	- 117 $\frac{SL}{CB}$ (.49)				.395	30.3	1.10	-1.35
2	TD1 =	1211	+ .156 Yp (3.24)	- 909 $\frac{Y}{Yp}$ (1.37)	- 281 $\frac{rs}{rt1}$ (.98)	+ 155 $\frac{SL}{CB}$ (.98)				.424	44.5	1.32	-1.13
3	TD2 =	578	+ .163 Yp (2.90)	- 721 $\frac{Y}{Yp}$ (.91)	+ 198 $\frac{rs}{rt2}$ (.39)	- 3.2 $\frac{SL}{CB}$ (.02)				.308	39.7	1.05	-0.60
4	TD3 =	1051	+ .202 Yp (3.13)	- 893 $\frac{Y}{Yp}$ (.99)	- 131 $\frac{rs}{rt3}$ (.25)	+ 45 $\frac{SL}{CB}$ (.21)				.340	41.5	1.20	-0.39

(t - statistics in parenthesis)

TABLE 3-17

Demand for Time Deposits - 1966

One-Stage Least-Square Estimates

40 State Sample

Equation & Symbol										R^2	SEE	$\varepsilon(TD,Y)$	$\varepsilon(TD,ir)$
1	TD =	1873	+ .400 Yp (7.73)	- 766 $\frac{Y}{Yp}$ (1.22)	-	1085 $\frac{rs}{rt}$ (3.84)	-	310 $\frac{SL}{CB}$ (1.85)		.736	18.2	1.48	-2.17
2	TD1 =	1933	+ .221 Yp (4.57)	- 1143 $\frac{Y}{Yp}$ (2.07)	-	774 $\frac{rs}{rt1}$ (2.59)	-	18.3 $\frac{SL}{CB}$ (.12)		.608	37.8	1.91	-3.09
3	TD2 =	1860	+ .249 Yp (4.53)	- 1196 $\frac{Y}{Yp}$ (1.81)	-	616 $\frac{rs}{rt2}$ (1.28)	-	199 $\frac{SL}{CB}$ (1.16)		.531	31.7	1.55	-1.85
4	TD3 =	2210	+ .272 Yp (4.73)	- 1345 $\frac{Y}{Yp}$ (1.91)	-	829 $\frac{rs}{rt3}$ (1.76)	-	160 $\frac{SL}{CB}$ (.87)		.561	31.5	1.58	-2.49

(t - statistics in parenthesis)

The estimation of demand equations for "passbook" deposits and "passbook deposits plus savings certificates" in addition to demand equations for total time deposits is a test of the hypothesis that a sub-category of time deposits, such as passbook deposits, may be a closer substitute in demand for savings and loan shares than are total time deposits. The results reported in Tables 3-14 to 3-17 are consistent with this hypothesis. The results will be discussed in more detail below.

The estimated income elasticities of demand for time deposits reported for the 1965 and 1966 data are somewhat smaller than the respective income elasticities reported for earlier years. Nevertheless, the income elasticities reported in Tables 3-14 to 3-17 are still significantly greater than those reported by Feige. Also the results reported here are consistent with the income elasticity of demand for money inclusive of time deposits estimated by Friedman from time series data.

The coefficients of the interest rate ratio (and the statistical significance of this variable as indicated by the t-statistic) support the hypothesis that time deposits at commercial banks are substitutes in demand for savings and loan shares on the basis of relative yield. In the case where the yield on mutual savings bank deposits were averaged with the yield on savings and loan shares in the relevant states, the results were similar to those reported in Tables 3-14 to 3-17. These unreported results

were consistent with the hypothesis that mutual savings bank deposits and savings and loan shares are very close substitutes in demand and that both are substitutes in demand for time deposits.

As noted previously, the hypothesis that the aggregation of twelve northeastern states provides a better sample for cross-section estimation of equations for financial assets is supported by the results reported in Tables 3-14 to 3-17. In the estimates from the 40 state samples, the four independent variables explain, in the context of the hypothesis, a substantially greater proportion of the variation of the measures of time deposits than in the corresponding 51 state samples. The interest rate ratio and permanent personal income variables are shown to be the most important and reliable explanatory variables in the samples from these two years.

The coefficients of the "convenience cost" proxy variable--the ratio of savings and loan offices to commercial banks offices--are not estimated to be significant, with the exception of equation 1 in Table 3-17. This variable was of greater significance in the 1950's, and this is not inconsistent with the hypothesis. The ratio of offices of the competing institutions is a proxy variable for the transactions cost of acquiring the deposit assets. However, the continued growth in the importance of "banking-by-mail" in the past decade renders the ratio

of offices to be a less reliable proxy of the transactions costs of acquiring deposit-type assets. Certainly, the "office saturation" level would not, on a priori grounds, appear to be an important factor influencing the demand for large negotiable certificates of deposit.

On the other hand, the convenience cost proxy variable was important (as indicated by the coefficients and t-statistics) in explaining the demand for time deposits in the case where savings and loan associations and mutual savings banks were aggregated. This hypothesis, namely that savings and loan associations and mutual savings banks offer an identical asset from the viewpoint of consumers and that this asset is a substitute in demand for time deposits, tends to be confirmed by the evidence reported in this chapter for earlier years and the results obtained from the 1965 and 1966 cross-section samples.

The interest rate data and quantity of time deposits at commercial banks in equation 1 of Tables 3-14 to 3-17 are the average figures at all commercial banks for the year. The estimates using this average data are better than the results obtained by using the survey data for total time deposits at all member banks, as reported in equation 4 of the Tables. The results obtained by using quantity and yields on only passbook deposits at member banks (equation 2) produced better results than when savings deposits and certificates of deposit were included

(equations 1 and 4), but these results were not much of an improvement compared to those obtained with average figures for all commercial banks. In this regard, the evidence presented is consistent with the hypothesis that passbook deposits are a closer substitute (in demand) for savings and loan shares and/or mutual savings bank deposits. On the other hand, the results obtained from the survey do not indicate that average proffered rates of member banks are a superior measure of the yield on time deposits compared to the average "effective" rate paid by all commercial banks.

Less than one-half of the commercial banks in the United States are members of the Federal Reserve System. The member banks hold a large majority of the total deposits in the country, but the state by state distribution is far from even. In cross-section estimation of demand equations, proffered rates on passbook deposits at all commercial banks may produce substantially different results than those reported here. Data on time deposit volumes and yields at non-member banks were collected by the FDIC at the same time that member banks were surveyed by the Federal Reserve Banks. However, the non-member bank data is not yet available for general use.

(2) Savings and Loan Shares and Mutual Savings Bank Deposits

Demand and supply equations were simultaneously estimated for savings and loan shares, using two-stage least-square techniques and using the 1965 and 1966 survey data on proffered interest rates on time deposits at member banks. Similarly, estimates were made of supply and demand equations using aggregated savings and loan-mutual savings bank data together with the survey data on yields offered on time deposits. Results obtained are presented in Tables 3-18 to 3-25. Variable definitions are the same as previously used in this chapter.

In equations 3 and 4 of Tables 3-18 to 3-21 the proffered interest rate on passbook deposits at member banks was used to compute the interest rate ratio. Estimates were also computed where the proffered rates on total time deposits at member banks and total time deposits less certificates of deposit were alternatively used as the opportunity cost of holding savings and loan shares. The results from these latter tests were generally about the same, but not quite as good in a statistical sense, as those reported. The results are consistent with the hypothesis that passbook deposits are a closer substitute for savings and loan shares than are more inclusive measures of time deposits.

TABLE 3-18

Savings & Loan Shares - 1965

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol												R^2
1	SS^d	= 2249	- 2299 $\frac{\hat{rs}}{rt}$	+ .075 Yp	+ 175 $\frac{Y}{Yp}$	+ 482A	+ 1002 $\frac{SL}{CB}$					.832
			(1.55)	(1.06)	(.17)	(8.29)	(4.81)					
2	SS^s	= 3102	- 2527 $\frac{\hat{rs}}{rt}$	+ 2.75 BP								.239
			(1.14)	(3.70)								
3	SS^d	= -9382	+ 6594 $\frac{\hat{rs}}{rt1}$	+ .589 Yp	+ 520 $\frac{Y}{Yp}$	- 190A	+ 2216 $\frac{SL}{CB}$					.833
			(1.55)	(2.07)	(.58)	(.45)	(2.51)					
4	SS^s	= -1233	+ 1260 $\frac{\hat{rs}}{rt1}$	+ 2.46 BP								.244
			(1.27)	(3.92)								

(t - statistics in parenthesis)

TABLE 3-19

Savings & Loan Shares - 1965

Two-Stage Least-Square Estimates

40 State Sample

Equation & Symbol																R^2
1	SS^d	=	-2342	+	689 $\frac{\hat{rs}}{rt}$			+	.159 Yp	+	1158 $\frac{Y}{Yp}$	+	328A	+	640 $\frac{SL}{CB}$	.807
					(.34)				(1.96)		(.81)		(5.32)		(3.83)	
2	SS^s	=	1287	-	925 $\frac{\hat{rs}}{rt}$			+	2.23 BP							.411
					(.63)				(4.62)							
3	SS^d	=	-308	-	606 $\frac{\hat{rs}}{rt1}$			+	.100 Yp	+	790 $\frac{Y}{Yp}$	+	413A	+	448 $\frac{SL}{CB}$	.807
					(.34)				(.79)		(1.28)		(1.77)		(.75)	
4	SS^s	=	-571	+	688 $\frac{\hat{rs}}{rt1}$			+	2.16 BP							.425
					(1.14)				(5.23)							

(t - statistics in parenthesis)

TABLE 3-20

Savings & Loan Shares - 1966

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol												R^2
1	SS^d	=	-12193	+	6299 $\frac{\hat{rs}}{rt}$ (4.23)	+	.389 Yp (5.25)	+	3707 $\frac{Y}{Yp}$ (4.17)	+	251A (3.20)	+ 940 $\frac{SL}{CB}$ (4.70)	.838
2	SS^s	=	-11358	+	10108 $\frac{\hat{rs}}{rt}$ (5.77)	+	3.64 BP (5.87)						.501
3	SS^d	=	- 7610	+	4822 $\frac{\hat{rs}}{rt1}$ (4.23)	+	.277 Yp (4.67)	+	1326 $\frac{Y}{Yp}$ (1.87)	+	90A (.84)	+ 1549 $\frac{SL}{CB}$ (5.69)	.838
4	SS^s	=	-6822	+	6148 $\frac{\hat{rs}}{rt1}$ (5.33)	+	3.21 BP (5.22)						.469

(t - statistics in parenthesis)

TABLE 3-21

Savings & Loan Shares - 1966

Two-Stage Least-Square Estimates

40 State Sample

Equation & Symbol													R^2
1	SS^d	=	-6036	+	3171 $\frac{\hat{rs}}{rt}$ (2.65)	+	.090 Yp (1.49)	+	1975 $\frac{Y}{Yp}$ (2.60)	+	345A (5.38)	+ 863 $\frac{SL}{CB}$ (4.18)	.782
2	SS^s	=	-4363	+	3992 $\frac{\hat{rs}}{rt}$ (3.00)	+	2.59 BP (4.98)						.406
3	SS^d	=	-3738	+	2823 $\frac{\hat{rs}}{rt1}$ (2.65)	+	.074 Yp (1.18)	+	352 $\frac{Y}{Yp}$ (.58)	+	150A (1.78)	+ 1211 $\frac{SL}{CB}$ (4.04)	.782
4	SS^s	=	-2795	+	2659 $\frac{\hat{rs}}{rt1}$ (3.13)	+	2.14 BP (4.62)						.416

(t- statistics in parenthesis)

TABLE 3-22

Aggregated Savings & Loan Shares and Mutual Savings Bank Deposits - 1965

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol												R^2
1	SSD^d =	10549	-	6961 $\frac{\hat{rsm}}{rt}$ (4.41)	+	.156 Yp (1.66)	-	2563 $\frac{Y}{Yp}$ (1.76)	+	125A (1.16)	1911 $\frac{SLM}{CB}$ (8.54)	.839
2	SSD^s =	10720	-	9041 $\frac{\hat{rsm}}{rt}$ (3.78)	+	3.87 BP (3.88)						.300
3	SSD^d =	-13314	+	9994 $\frac{\hat{rsm}}{rt1}$ (5.29)	+	1.01 Yp (6.14)	-	147 $\frac{Y}{Yp}$ (.14)	-	482A (2.62)	2503 $\frac{SLM}{CB}$ (9.69)	.858
4	SSD^s =	1014	-	576 $\frac{\hat{rsm}}{rt1}$ (.32)	+	2.17 BP (2.02)						.094

(t - statistics in parenthesis)

TABLE 3-23

Aggregated Savings & Loan Shares and Mutual Savings Bank Deposits - 1965

Two-Stage Least-Square Estimates

40 State Sample

Equation & Symbol														R^2
1	SSD^d	=	1933	-	1743 $\frac{\hat{rsm}}{rt}$	+	.173 Yp	-	186 $\frac{Y}{Yp}$	+	295A	+	882 $\frac{SLM}{CB}$	.728
					(.67)		(1.73)		(.10)		(3.66)		(3.81)	
2	SSD^s	=	2671	-	2101 $\frac{\hat{rsm}}{rt}$	+	2.39 BP							.297
					(1.09)		(3.81)							
3	SSD^d	=	-8055	+	5835 $\frac{\hat{rsm}}{rt1}$	+	.587 Yp	+	142 $\frac{Y}{Yp}$	-	443A	+	2623 $\frac{SLM}{CB}$	.791
					(3.30)		(4.42)		(.19)		(1.90)		(4.62)	
4	SSD^s	=	-245	+	429 $\frac{\hat{rsm}}{rt1}$	+	2.09 BP							.280
					(.53)		(3.78)							

(t - statistics in parenthesis)

TABLE 3-24

Aggregated Savings & Loan Shares and Mutual Savings Bank Deposits - 1966

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol															R^2
1	SSD^d	=	-10745	+	4639 $\frac{\hat{rsm}}{rt}$	+	.349 Y_p	+	3980 $\frac{Y}{Yp}$	+	512A	+	1472 $\frac{SLM}{CB}$		.749
					(1.19)		(2.88)		(1.88)		(3.04)		(4.90)		
2	SSD^s	=	1698	-	1145 $\frac{\hat{rsm}}{rt}$	+	2.31 BP								.084
					(.24)		(1.63)								
3	SSD^d	=	-13104	+	9295 $\frac{\hat{rsm}}{rtl}$	+	.466 Y_p	+	1306 $\frac{Y}{Yp}$	-	82A	+	2072 $\frac{SLM}{CB}$		.858
					(6.10)		(5.16)		(1.26)		(.71)		(9.28)		
4	SSD^s	=	-14392	+	12786 $\frac{\hat{rsm}}{rtl}$	+	4.88 BP								.386
					(4.87)		(4.45)								

(t - statistics in parenthesis)

TABLE 3-25

Aggregated Savings & Loan Shares and Mutual Savings Bank Deposits - 1966

Two-Stage Least-Square Estimates

40 State Sample

Equation & Symbol														R^2
1	SSD^d	=	-10588	+	5720 $\frac{\hat{rsm}}{rt}$ (3.08)	+	.036 Yp (.36)	+	3403 $\frac{Y}{Yp}$ (3.02)	+	453A (4.09)	+	1255 $\frac{SLM}{CB}$ (4.91)	.732
2	SSD^s	=	-4127	+	3808 $\frac{\hat{rsm}}{rt}$ (2.31)	+	2.56 BP (3.74)							.281
3	SSD^d	=	-6254	+	5188 $\frac{\hat{rsm}}{rt1}$ (3.79)	+	.037 Y_p (.41)	+	183 $\frac{Y}{Yp}$ (.23)	+	43.8A (.48)	+	1850 $\frac{SLM}{CB}$ (5.50)	.759
4	SSD^s	=	-3658	+	3422 $\frac{\hat{rsm}}{rt1}$ (2.92)	+	2.22 BP (3.68)							.331

(t - statistics in parenthesis)

The use of the proffered rates on passbook deposits, as an alternative to the average yield on time deposits, in the interest rate ratio does not alter the results obtained from the 1966 cross-section samples. However, the signs associated with the coefficients for the interest rate ratio estimated from the 1965 samples are not all consistent with the hypothesis. The two-stage least-square estimates of equations for savings and loan shares obtained from 1961 to 1964 cross-section samples, reported in Appendix C, are similar to those reported here for 1965.

The estimates of equations for the aggregated savings and loan-mutual savings bank deposits obtained from the 1965-1966 cross-section samples (Table 3-22 and 3-25) do support the hypothesis that passbook deposits at commercial banks are a closer substitute for the assets of the other financial intermediaries than are the more inclusive measures of time deposits. The coefficients of the interest rate ratio, as estimated from the 1965 sample, have the opposite sign to that hypothesized when the average rate paid on total time deposits is included in the ratio, but the coefficient is estimated to have the hypothesized sign when the proffered rate on passbook deposits are included. In addition, the coefficients of the interest rate ratio are highly significant in the demand equations in the samples from both years where the proffered rate on passbook deposits is used as a measure of the

opportunity cost of holding savings and loan shares and mutual savings bank deposits.

Equations were also estimated from the data of both years where the proffered rate on total time deposits and total time deposits less certificates of deposits were alternatively used in the interest rate ratio. The coefficient for the interest rate ratio including the proffered rate on total time deposits was estimated from the 1965 and 1966 samples to have the hypothesized positive sign, but was nonsignificant. The coefficients for the interest rate ratio were estimated from both the 1965 and 1966 samples to have the hypothesized positive sign, but the coefficients were of lower statistical significance than were the respective coefficients estimated for the interest rate ratio when the proffered rates on only passbook deposits were included.

The coefficients of the convenience cost proxy variable are estimated to have the hypothesized positive sign and be highly significant in all of the demand equations for savings and loan shares and aggregated savings and loan-mutual savings bank deposits. The results indicate that this variable has a greater influence on the demand for savings and loan shares and mutual savings bank deposits than it does on the demand for total time deposits at commercial banks. Estimates of the influence of this variable on the demand for passbook deposits at commercial

banks are inconclusive since only data on passbook deposits at member banks are presently available.

The "information cost" variable--per capita advertising expenditure of savings and loan associations and mutual savings banks--was estimated to have a greater influence on the demand for these assets in the cases where the average yields on total time deposits were included in the interest rate ratio than when the proffered rates on passbook deposits were included. This would seem to indicate some multicollinearity between the interest rate ratio and advertising expenditures; however the correlation matrix did not show a high level of collinearity between these variables.

In Tables 3-22 and 3-25 the size and statistical significance of the coefficients for permanent income were estimated to be greater in the cases where the proffered rates on passbook deposits were included in the interest rate ratio than in the cases where the average rates on total time deposits were included. There does not appear to be any systematic difference in the income coefficients estimated for demand equations for only savings and loan shares. The statistical significance of the coefficients estimated for the income variable is somewhat greater in the demand equations for aggregated savings and loan-mutual savings bank deposits as compared to the significance of this variable in the demand equations for only savings and loan shares.

Table 3-26

Summary of Cross-Section State Data

I. For each of 49 states in each year; 1956 to 1964:

TD = average per capita time and savings deposits at all insured commercial banks

TD1 = total per capita time and savings deposits at member banks on June 30, 1960

TD2 = total per capita savings (passbook) deposits at member banks on June 30, 1960

SS = average per capita savings capital at savings and loan associations

SSD = average per capita savings capital at savings and loan associations plus savings deposits at mutual savings banks

Y = per capita personal income

Y_p = per capita permanent personal income

rt = average effective interest rate paid on time deposits at all insured commercial banks

rt1 = weighted average proffered rate on total time and savings deposits at member banks on June 30, 1960

rt2 = weighted average proffered rate on savings (passbook) deposits at member banks on June 30, 1960

rs = average effective rate paid on savings and loan shares

rsm = weighted average effective rate paid on savings and loan shares plus mutual savings bank deposits

CB = number of commercial bank offices per capita

SL = number of savings and loan offices per capita

SLM = number of savings and loan offices plus number of mutual savings bank offices per capita

ASL = per capita advertising expenditures by all savings and loan associations

Table 3-26 (continued)

ASM = per capita advertising expenditures by all savings and loan associations plus mutual savings banks

BP = per capita building permits issued in each state (in dollars)

II. For each of 51 states in each year: 1965 and 1966:

TD = average per capita time and savings deposits at all insured commercial banks

TD1 = total per capita passbook deposits at member bank of December 31, 1965 or May 31, 1966

TD2 = total per capita passbook deposits plus savings certificates at member banks on December 31, 1965 or May 31, 1966

TD3 = total per capita time deposits at member banks on December 31, 1965 or May 31, 1966

SS = average per capita savings capital at savings and loan associations

SSD = average per capita savings capital at savings and loan associations plus savings deposits at mutual savings banks

Y = per capita personal income

Y_p = per capita permanent personal income

rt = average effective interest rate paid on time deposits at all insured commercial banks

rt1 = weighted average most common rate proffered by member banks on passbook deposits on December 31, 1965 or May 31, 1966

rt2 = weighted average most common rate proffered by member banks on passbook deposits plus savings certificates on December 31, 1965 or May 31, 1966

rt3 = weighted average most common rate proffered by member banks on total time deposits on December 31, 1965 or May 31, 1966

rs = average effective rate paid on savings and loan shares

Table 3-26 (continued)

rsm = weighted average effective rate paid on savings and loan shares plus mutual savings bank deposits

CB = number of commercial bank offices per capita

SL = number of savings and loan offices per capita

SLM = number of savings and loan offices plus number of mutual savings bank offices per capita

ASL = per capita advertising expenditures by all savings and loan associations

ASM = per capita advertising expenditures by all savings and loan associations

BP = per capita building permits issued in each state (in dollars)

VII Summary of Results from Cross-Section Data

(1) The results of the cross-section estimates of demand equations for time deposits at commercial banks are summarized as follows:

(a) The demand for time deposits is strongly influenced by personal income (or permanent personal income). Coefficients estimated for the income variables were highly significant (statistically, as indicated by the t-test) in all years and samples for all measures of time deposits per capita. The elasticity of demand for time deposits with respect to personal income was estimated to be greater than unity in all cases, and between 1.5 and 2 in a large majority of cases. Both the statistical significance of the income coefficients and the income elasticities were greater for the 38 (or 40) state samples than the respective 49 (or 51) state samples in all years.

(b) The income elasticity of demand for "passbook" deposits at member banks (survey data, 1960, 1965 and 1966) is estimated to be greater than the respective income elasticities of demand for more inclusive definitions of time deposits.

(c) The demand for time deposits is negatively (and significantly) related to the ratio of the yield on savings and loan shares to the yield on time deposits. The estimated interest (ratio) elasticity

of demand for time deposits was greater after ceiling rates on time deposits were raised in 1957 than previously, and the interest elasticities were much greater in 1965 and 1966 than in earlier years.

(d) The interest elasticity of demand for "passbook" deposits was estimated to be greater than the interest elasticities of total time deposits in most samples.

(e) For the full samples of 49 states, the weighted average yield on mutual savings bank deposits and savings and loan shares was a better measure of the opportunity cost of holding time deposits than was the yield on only savings and loans shares. Both the statistical significance and interest elasticities were greater for the full samples when mutual savings bank deposits were included as a substitute in demand for time deposits.

(f) Both mutual savings bank deposits and savings and loan shares are very close substitutes in demand for time deposits on the basis of convenience cost. For the full 49 state samples, the ratio of mutual savings bank plus savings and loan offices to commercial bank offices was estimated to be an important variable determining the demand for time deposits, especially in the 1950's and early 1960's.

(g) The estimates of the demand equations for time deposits at commercial banks were much better for the 38 (or 40) state samples than for the full 49 (or 51) state samples. The hypothesis that state boundaries do not serve as a barrier influencing the demand for time deposits in the northeastern sector of the U.S., and that for purposes of cross-section estimation, twelve northeastern states could be aggregated into one "state," is supported by the results.

(2) The results of the cross-section estimates of demand and supply equations for savings and loan shares and mutual savings bank deposits are summarized as follows:

(a) The estimated income elasticities of demand for savings and loan shares are generally much smaller than the income elasticities of demand for time deposits. The coefficients of the income variables in the savings and loan equations usually are of less statistical significance than the income coefficients in the time deposit equations, and the coefficients in the former equations vary over a much larger range.

(b) When mutual savings bank deposits are added to savings and loan shares in each state, the income elasticity of demand for this combined asset is greater and more statistically significant than for savings and loan shares alone.

(c) The ratio of personal income to permanent income contributes significantly to the determination of the demand for savings and loan shares and mutual savings bank deposits. The sign of the coefficient for this variable was estimated to be positive as hypothesized in 1960 and subsequent years, but the sign was negative in the 1956 to 1958 samples.

(d) The demand for savings and loan shares is very strongly influenced by advertising expenditures of savings and loan associations. Total advertising expenditures of savings and loan associations and mutual savings banks contributed significantly as an explanatory variable in demand equations for the aggregated deposit asset.

(e) The influence of the interest rate ratio on the demand for savings and loan shares was not consistent in all years and samples. The elasticity of demand for savings and loan shares with respect to the interest rate ratio was very low in the 1950's, however, the interest elasticity was much larger for the 38 state samples than for the respective 49 state samples. The coefficient for the interest ratio was estimated to be statistically significant in the two-stage estimates of demand equations. The proffered rate on "passbook" deposits at member banks (from survey data) was estimated to be a better measure of the alternative cost of holding

savings and loan shares in 1960, 1965 and 1966, as compared to the average rate paid on total time deposits as a measure of the foregone alternative interest cost of holding savings and loan shares.

(f) The convenience cost variable--the ratio of savings and loan offices to commercial bank offices in each state--was an important influence (as indicated by the size and statistical significance of the estimated coefficients) on the demand for savings and loan shares in all years and samples.

(g) The convenience cost variable was a significant factor contributing to the determination of the demand for aggregated mutual savings bank deposits and savings and loan shares.

(h) The value of per capita building permits issued in each state in each year--the exogenous variable in the supply equations for savings and loan shares (and mutual savings bank deposits) and a proxy for the supply of mortgages (earning assets) to savings and loan associations--was estimated to be statistically significant and to have the hypothesized sign in every sample and every year.

(i) The five independent variables in the demand equations for savings and loan shares consistently explained (as measured by R^2) over 80 per cent of the variation in per capita savings and loan share holdings among the states, in both the least-square and two-stage least-square estimates.

CHAPTER 4

CERTIFICATES OF DEPOSIT

The theoretical framework discussed in Chapter 2 can be used to analyze the supply and demand relationships in the market for large negotiable certificates of deposit (denominations of $100,000 or more).[44/]

This chapter discusses the ways in which certain empirical variables may influence the demand for and/or supply of CDs, as implied by the theoretical framework. The coefficients of alternative formulations of these demand and supply relations are estimated with the use of quarterly U.S. data, from 1962 through 1967. The goal is to present evidence bearing on the importance of some of the factors which affect the outstanding volume of CDs.

The class of small denomination certificates of deposit designed to compete for household and small business savings will not be discussed here. The historical development of CDs, their growth pattern and distribution, and the nature of the primary and secondary markets for CDs will also not

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44/ Hereafter large negotiable certificates of deposit will be referred to as CDs.

be discussed since these topics have been exhaustively treated elsewhere.[45/]

Large negotiable certificates of deposit are a relatively new money market instrument, consequently there is not a great deal of data available as yet. The behavior of CDs through a complete business cycle cannot be analyzed; however the period of "tight money" in 1966 and the period of slow growth or mini-recession in the first and second quarters of 1967 yield some information regarding the behavior of this asset during acceleration and deceleration of business activity. Estimation of the own-yield and cross-yield elasticities of demand for CDs as opposed to apparent substitutes can be analyzed on the basis of the experience of 1966 and 1967 when market yields on similar assets rose above the ceiling interest rate which the Federal Reserve's Regulation Q allowed banks to pay on the new issue of CDs.

Commercial banks first began to issue large negotiable certificates of deposit in 1961. A secondary market (for CDs issued by large well-known banks) also developed at that time. Prior to the 1960's it is said that treasurers

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45/ A. Gilbert Heebner, Negotiable Certificates of Deposit: The Development of a Money Market Instrument. A dissertation submitted to the University of Pennsylvania in the field of Business and Applied Economics, 1967. (Available through University Microfilms, Ann Arbor, Michigan.)

of corporations, state and local governments, labor unions, and pension funds did not find it desirable to purchase short-term earning assets for a period of a few months, but rather they allowed balances to build up in demand deposit accounts. The cash flows from operations of these institutions tend to be somewhat lumpy since dividends and taxes are usually paid quarterly or less frequently, sales may be highly seasonal, and so on. By the end of the 1950's, large organizations had begun to purchase liquid short-term earning assets such as Treasury bills, municipal securities, commercial paper, or finance company paper, rather than hold large amounts of demand deposits even for relatively short periods.

Banks were constrained in their competition for such balances since payment of interest on demand deposits is prohibited. Once the non-bank institutions began to seek interest bearing short-term assets on a large scale (by 1961, nonfinancial corporations held over $25 billion in short-term interest bearing assets), it became desirable for banks to seek new ways of competing for deposits. The development of the large negotiable CD market provided depositors with liquidity and gave the issuing banks a way of avoiding the constraint of Regulation Q on normal savings deposits (the Federal Reserve allows higher interest to be paid on CDs than on conventional savings (passbook) accounts at commercial banks).

Price and Maturity

The maturity of a CD is determined by agreement between the lender and borrower, usually payable in three months to one year. The yield is similarly determined by market forces affecting the bid prices of banks and ask prices of depositors. An exception to the general rule of free market determination of price occurs when a free market equilibrium would result in a yield which is above the ceiling interest rate imposed on new issues of CDs by Regulation Q of the Federal Reserve. Interest rates on CDs in the secondary market are usually somewhat higher than, but move together with, Treasury bill yields. The new issue rate on CDs stays in close proximity to the secondary market rates, except when the demand for new CDs intersects the horizontal segment of the supply curve imposed by Regulation Q.

Other Market Instruments in the Demand Equation

Finance companies and other corporations are usually seeking to borrow funds on a short-term basis. One of their sources of funds is the commercial paper market wherein, either through a dealer or directly, the borrower "sells" his own commercial paper to a corporation, labor union or institutional fund which has short-term money to lend. Commercial paper can therefore be considered to be

a demand substitute for certificates of deposit on a priori grounds, along with Treasury bills. The quantity of CDs demanded will depend on the yield on CDs relative to the yield on risk equivalent substitutes.[46]

Expected Future Short-Term Interest Rates

If negotiability is a valuable aspect of CDs and commercial paper, then the lender is contemplating that the asset may not be held to maturity in every instance. This suggests that expected interest rates enter into the demand function for CDs. When interest rates rise after the issue of a CD and the asset is sold in the secondary market prior to maturity, the original purchaser will have realized a lower return on his investment than is indicated on the face of the instrument. The issuer of the CD (borrower) pays the stated rate of interest, regardless of the pattern of rates until maturity. If both lenders and borrowers had the same expectations concerning future interest rates, then current rates would reflect these expectations. However, when expectations diverge, the lender will consider that his earned yield on certificates

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[46] See Heebner, op. cit., for a discussion of the yield spread between CDs, Treasury bills, commercial paper, and other assets. Heebner points out that Treasury bills and commercial paper are sold on a discount basis. Thus an adjustment must be made in order to derive the actual yield spreads from the quoted figures.

not held to maturity may be either greater than or less than the indicated rate, depending on market rates at the time he wishes to sell the CD, while the interest cost to the borrower is fixed.

The influence of expectations regarding interest rates on "the demand for CDs" is ambiguous because CDs are issued to mature in 90 days up to one year. Suppose a corporation desires to hold an interest bearing financial asset for six months, then plans to convert to demand deposits. A decision will be made to purchase a CD (new issue) or to purchase an alternative security from the market (Treasury bills, commercial paper, etc.). Given a decision to purchase a new CD, the corporation may not purchase a CD which matures in six months. If the corporation anticipates that short-term interest rates will fall substantially in the coming six months (more than indicated by the CD term-structure), a capital gain can be realized by purchasing a twelve month CD and selling it on the secondary market at a premium. On the other hand, if the corporation anticipates that short-term rates will rise substantially in coming months, a three month CD can be purchased and renewed at a higher yield.

The above discussion necessarily implies that the interest rate expectations of the corporation diverge from those of the issuing bank. Otherwise the CD term structure will reflect the expectations of future market rates. To

the extent that the purchaser does choose among alternative maturities of CDs on the basis of expected interest rates, these expectations enter positively into the demand for CDs of one maturity and negatively into the demand for CDs of another maturity.

However, expectations with regard to market interest rates in the near future may enter unambiguously into the demand for CDs if the alternatives considered by a corporation are CDs of a particular maturity versus an alternative money market asset of a longer maturity. The term structure of rates and yield spreads of alternative assets are influenced by market expectations of rates over time, and thus reflect the effects of expectations on the supply and demand of alternative securities.

For instance, a corporation chooses between purchasing a twelve month CD (and holding it until maturity) versus purchasing a longer-term Treasury note (which would be sold on the open market in twelve months) on the basis of its expectations of interest rate movements in the coming twelve months compared with the "market expectations" as reflected in the yield spreads presently available on these assets. If expectations change such that it becomes anticipated that the level of interest rates will be higher in twelve months than previously thought, the demand for twelve month CDs would increase relative to the demand for the longer-term Treasury note. These shifts in demands

resulting from changing expectations would result in relatively lower present yields on 12 month CDs and relatively higher present yields on the longer-term security

The above analysis indicates that demand for CDs as a short-term earning asset is positively influenced by expected interest rates. However, as noted above, the demand for particular maturities of CDs may be negatively influenced by changes in expected interest rates if the changing expectations affect the relative attractiveness of alternative maturities.

INCOME

There is not an empirical variable which affects the demand for CDs which is comparable in a straight forward way to the role of disposable income as it appears in a demand function for a consumer-type financial asset. Large negotiable CDs are purchased predominantly by large business firms or by governments, and, as is generally recognized, a business firm or government does not face the same kind of budget constraint that is faced by individuals. The implication of this, with respect to the effect on the firm's or government's choice among alternative assets, goes beyond the scope of this study. Therefore simplifying assumptions are made and empirical variables chosen which may be no more than suggestive of the influence of an "income" or "wealth" variable on the demand for CDs.

The first and simplest surrogate income variable used is corporate profits before taxes and dividends. This gross profit series is chosen rather than net profits because of the proposition that corporations purchase CDs (as well as other earning assets) with funds which are earmarked for subsequent tax or dividend payments.

Two additional statistical series were created to serve as alternative exogeneous "wealth" variables in the demand function for CDs. The series were constructed to serve as proxies for the total potential demand for CDs by the sectors of the economy which have been known to purchase CDs at some time. Both quarterly series were created by summing an accounting entry for each of the relevant sectors in the Federal Reserve's Flow of Funds accounts. I have labeled the two series: flow of funds one (FF1), and flow of funds two (FF2). FF1 is the sum (quarterly) of the following entries: (1) net acquisitions of financial assets by the farm and noncorporate nonfinancial business sector, (2) net acquisitions of financial assets by the corporate nonfinancial business sector, (3) net acquisitions of financial assets by state and local governments, and (4) net acquisitions of financial assets by the "Rest of the World". [47/]

47/ The "Rest of the World" excludes the U.S. government, commercial banks, monetary authorities and all financial institutions.

FF2 is the sum of: (1) net acquisitions of financial assets by farm and noncorporate nonfinancial business, (2) current surplus (gross saving) of corporate nonfinancial business, (3) net surplus of state and local governments, and (4) net acquisitions of financial assets by the "Rest of the World".

Bank Earning Assets in the Supply Equation

According to the theoretical framework developed in Chapter 2, the banks' supply of CDs to the market is a function of the supply schedule of earning assets faced by the banks. Commercial banks may hold a widely diversified portfolio of assets and can acquire funds through the use of a wide range of liabilities. Theory suggests that the supply of CDs is a function of the marginal cost of acquiring funds from each alternative source, and a function of the marginal revenue obtainable from any available earning asset. This implies a far more elaborate model of commercial bank behavior than will be considered in this study. Instead, coefficients will be estimated for equations of the supply of CDs which include an exogenous interest rate variable which represents the supply price of an earning asset which it is assumed the bank might purchase with the proceeds from the sale of CDs. This approach implies a segmenting of the assets and liabilities of commercial banks--which is not an implication of the

theoretical framework--however, it may be that as a short-run operational target the CD account managers partially determine their offering rates on CDs on the basis of the supply conditions of one or a few key earning assets. The empirical formulation used here is a test of this proposition.

The interest rate paid on newly issued six month CDs is an endogenous variable in the demand and supply equations. However, when market rates of interest on substitute assets rise above the ceiling rate allowed on CDs, as in the fall of 1966, the new issue interest rate becomes an exogenous supply variable.[48/]

The variables alternatively used are the volume of and the interest rate charged on short-term business loans of large commercial banks and the 3-5 year government bond yield (a test of the proposition that banks use CDs to borrow short and lend long to take advantage of the usually upward sloping or hump-backed yield curve).

Empirical Analysis of CD Volume

The study by Gilbert Heebner is the only source I

48/ The new issue interest rate on six month CDs reached the ceiling level of 5.5 per cent in September 1966. In subsequent months the market rates on other short-term securities -- Treasury securities, commercial paper and secondary market rate on CDs -- rose substantially. The outstanding volume of CDs declined from $18 billion in September to $15 billion by the end of December 1966.

found which reports results of regression analysis pertaining to certificates of deposit.[49] Heebner collected monthly CD data for a few large New York banks for the years 1962 to 1965.[50] He estimated coefficients for equations explaining the total outstanding volume of certificates of deposit issued by this sample of banks using least square techniques. Explanatory variables included both demand factors (demand for funds by the banks) and supply factors (potential supply of funds to banks via CDs).

Heebner estimated coefficients for his equations using straight monthly data and first differences in monthly data (to explain the change in CD holdings of his sample banks). His explanatory variables were: (1) average reserve position of eight banks in the previous month; (2) average total loans in New York banks in the following month; (3) average holdings of "other securities" in New York banks; (4) average total outstanding volume of short-term instruments; (5) total corporate tax payments; (6) total (adjusted) corporate cash dividend payments; (7) six month CD and Treasury bill interest differential; and, (8) six month CD and finance company commercial paper interest differential.

The results of the regressions on first difference

49/ Heebner, pages 148-176.

50/ Nine banks were used for 1962 and 1963 and fourteen banks for 1964 and 1965.

data were statistically reliable and the independent variables used in various combinations "explained" up to fifty per cent of the monthly change in outstanding volume of CDs issued by the sample of large New York banks. However, in my judgment Heebner has done a better job of discussing the economic factors which affect the outstanding volume of CDs than he has of quantifying these influences through the surrogates he has chosen. 51/

Estimation of Demand and Supply Functions For CDs

Two-stage least-square regression techniques were used to estimate the coefficients of demand and supply functions for CDs. Quarterly data for six years, 1962 to 1967, provided a rather small sample, consequently only a few explanatory variables were included in each equation.

Estimates of demand and supply equations for CDs are reported in Tables 4-1 and 4-2. Both the demand and supply equations are over-identified in all cases except one (demand equation #7 in Table 4-2 is just-identified). The

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51/ The economic theory discussed both in the present and Heebner's study suggests that the outstanding volume of CDs is determined at any time by the forces influencing the supplies of and demands for CDs in the market. However, some of the empirical variables used by Heebner are not factors which affect the supply of or demand for CDs. Heebner's approach appears to be the use of a "reduced form" equation for CDs, although he does not say so or derive the equation from a structural model.

definitions of variables in Tables 4-1 and 4-2 are as follows:

r^{CD} = new-issue rate on CDs maturing in six months

r^{t} = new-issue rate on three-month Treasury bills

r^{l} = average rate paid on short-term business loans at large commercial banks

i^{e} = expected interest rate[52/]

$\frac{r^{CD}}{r^{t}}$ = ratio of the new-issue rate on CDs to the new-issue rate on Treasury bills

CP = corporate profits

FF1 = wealth proxy, see pages 126-128

FF2 = wealth proxy, see pages 126-128

BL = average outstanding business loans at large commercial banks

SEE = standard error of the estimate as a per cent of the mean of CD

D-W = Durbin-Watson statistic

52/ The expected interest rate series employed here were generated according to the following equation:

$$i^{e}_{t} = \eta\, i_{t-1} + (1-\eta)\, i^{e}_{t-1},$$

where i^{e} = expected interest rate

i = market rate from which the expected series is generated, such as the government bond yield.

η = adjustment factor for the difference between the actual and expected rate in the previous quarter

TABLE 4-1

Certificates of Deposit

Two-Stage Least-Square Estimates

Equation & Symbol										R^2	SEE	D-W	(CD, r^{CD})
1	CD^d =	-27.9	+	5.73 $\hat{r}^{CD}$ (3.73)	-	6.36 r^t (5.11)	+	.254 CP (3.04)	+ 5.83 i^e (2.37)	.981	6.5	2.685	1.86
2	CD^s =	8.76	+	2.02 $\hat{r}^{CD}$ (4.76)	-	5.49 r^1 (6.95)	+	.533 BL (8.71)		.980	6.6	1.895	
3	CD^d =	-28.9	+	7.03 $\hat{r}^{CD}$ (5.12)	-	5.64 r^t (3.68)	+	.101 FF1 (3.27)	+ 7.85 i^e (2.52)	.970	8.2	2.117	2.28
4	CD^s =	8.97	+	1.82 $\hat{r}^{CD}$ (3.87)	-	5.57 r^1 (6.37)	+	.556 BL (8.18)		.975	7.3	1.672	
5	CD^d =	-13.4	+	7.91 $\hat{r}^{CD}$ (4.86)	-	7.06 r^t (4.17)	+	.144 FF2 (1.86)	+ 3.07 i^e (0.86)	.967	8.6	2.054	2.57
6	CD^s =	8.93	+	1.86 $\hat{r}^{CD}$ (3.95)	-	5.56 r^1 (6.41)	+	.552 BL (8.15)		.975	7.2	1.644	

(t - statistics in parentheses)

TABLE 4-2
Certificates of Deposit
Two-Stage Least-Square Estimates

Equation & Symbol									R^2	SEE	D-W
1	CD^d	=	-51	+	18.5 $\hat{r}^{CD}_{r^t}$ (5.10)	+	.222 CP (5.77)	+ 7.02 i^e (3.15)	.980	6.5	2.466
2	CD^s	=	-18.5	+	21.3 $\hat{r}^{CD}_{r^t}$ (3.67)	-	1.94 r^1 (1.30)	+ .402 BL (3.74)	.974	7.5	1.347
3	CD^d	=	-76	+	17.9 $\hat{r}^{CD}_{r^t}$ (2.87)	+	.137 FF1 (3.24)	+ 16.4 i^e (4.72)	.937	11.6	.795
4	CD^s	=	19.1	-	5.90 $\hat{r}^{CD}_{r^t}$ (0.62)	-	7.62 r^1 (3.35)	+ .866 BL (5.08)	.956	9.7	.711

(t-statistics in parenthesis)

TABLE 4-2 (continued)
Certificates of Deposit
Two-Stage Least-Square Estimates

Equation & Symbol									R^2	SEE	D-W
5	CD^d	= -49	+	$20.6\ \hat{r}^{CD}_{r^t}$ (3.32)	+	.222 FF2 (3.05)	+	$6.81\ i^e$ (1.71)	.951	10.2	1.632
6	CD^s	= -6.2	+	$12.3\ \hat{r}^{CD}_{r^t}$ (1.13)	-	$3.80\ r^1$ (1.49)	+	.554 BL (2.84)	.958	9.5	.815
7	CD^d	= -34	+	$30.7\ \hat{r}^{CD}_{r^t}$ (5.07)	-	.241 FF2 (4.13)			.956	9.4	2.154
8	CD^s	= -80	+	$66\ \hat{r}^{CD}_{r^t}$ (3.48)	+	$7.41\ r^1$ (1.82)	-	.363 BL	.973	7.6	2.013

(t-statistics in parenthesis)

$E(CD, r^{CD})$ = estimated elasticity of demand for CDs with respect to the new issue on CDs.

The demand for CDs was found to be highly responsive to the own-yield on CDs (positive and statistically significant as hypothesized) and negatively related to the cross-yield on hypothesized substitutes. Treasury bills are hypothesized to be a substitute in demand for CDs in all reported results. The estimated coefficients for the own-and cross-yield variables were statistically significant where the variables enter the equations separately (Table 4-1) and in ratio to each other (Table 4-2). As an alternative to Treasury bills, the yield on prime commercial paper was included in the equations as a substitute in demand for CDs. The results were quite similar to those reported for Treasury bills, consequently these results are not reported.

The own-interest elasticities of demand for CDs (Table 4-1) are much higher than the interest elasticites of demand for time deposits estimated from cross-section data. This is consistent with the hypothesis that CDs are a different asset than passbook and savings deposits at commercial banks. There is a national market for large negotiable CDs, and the quantity of this asset outstanding appears to be strongly influenced in a relatively short time span by changes in own-and cross-yields. On the other

hand, passbook and savings deposits are influenced relatively more by local and regional factors such as income, information, and convenience costs, and adjust more slowly to changes in relative own-and cross-yields.

The coefficient of the own-yield variable (r^{CD}) is also highly significant in the supply equations, however the sign is opposite to that expected for a supply function. This indicates some problem of identification of the supply relation. The sign of the yield on business loans is negative in the supply equations, also opposite to the hypothesized sign except in one case (equation #8 in Table 4-2). These adverse results may be attributable to the very small sample employed in these estimates. Econometric and statistical literature indicates that very little is known about the small sample properties of two-stage least-square techniques. Thus the results reported here can be considered to be only suggestive of the influence of these variables on the demand and supply functions for CDs.

The coefficient for the ratio of the new-issue rate on CDs to the Treasury bill rate (Table 4-2) has the sign expected in the demand equations. However, the sign is negative as expected in only one supply equation (equation #4) and the coefficient is statistically non-significant in that case. The results reported here for the interest rate ratio as it enters the demand equations are consistent

with the results from cross-section data. In contrast to the estimates from cross-section data, though, the own-and cross-yield variables are also statistically significant and carry the sign hypothesized when they are included separately in the demand equations. These results do not support the conclusions of other studies, namely that deposit-type financial assets are not substitutes in demand on the basis of relative yields.

The coefficient of the expected interest rate variable enters the demand equations with the opposite sign to that hypothesized. The theory suggests that expectations or rising market rates would exert a negative influence on the demand for CDs. As an alternative to the expected market rate reported here, the 3-5 year government bond yield was included in estimates of demand equations. The proposition being tested was that the term structure of interest rates is influenced by expectations of future market rates, such that the present yield on an intermediate-term security reflects expectations regarding the future yield on short-term securities. The coefficient for the 3-5 year rate was estimated to have a negative sign in some cases, however the coefficient was generally of very low statistical significance.

The use of the 3-5 year rate, and the expected series generated from market rates, poses an identification problem in two-stage least-square estimates of supply and

demand equations for CDs. Commercial banks, the suppliers of CDs, hold government securities as earning assets. Consequently the yields on these securities are endogenous factors influencing both the demand and supply of CDs. The ratio of the interest rate on CDs to the interest rate on other securities, as in Table 4-2, seems to be the more appropriate way of treating these yields as endogenous to both the demand and supply functions. However, as pointed out previously, the interest rate ratio does not enter significantly into the supply equation with the sign hypothesized.

The three proxy income variables were estimated to be statistically significant at the 5 per cent level in the demand equations in almost all cases. The elasticity of demand for CDs with respect to corporate profits is estimated to be substantially larger than the elasticities of demand with respect to FF1 and FF2. There is some indication that the corporate income variable is a better (in a statistical sense) proxy measure of income than either FF1 or FF2. The multiple correlation coefficients are generally greater for the former variable than for the latter two, and the standard errors of the estimate are lower for demand equations including corporate profits.

Similarly the Durbin-Watson statistics indicate no auto-correlation in demand equations including corporate

profits in all cases.[53/] There is no auto-correlation indicated in the demand equations including FF1 and FF2 in Table 4-1, however, negative auto-correlation is indicated in equation 3 of Table 4-2 and the test for auto-correlation is indeterminent in equation 5. Also the statistical tests generally indicate that the supply equations corresponding to the demand equations including corporate profits perform better than the other supply equations.

Demand and supply equations 7 and 8 in Tables 4-2 deserve special note. These equations are the same as 5 and 6 except that the expected interest rate variable is excluded from demand equation 7. Supply equation 8 is one of the few instances in which no serial correlation is indicated by the Durbin-Watson. Also, the sign of the coefficient for the interest rate on business loans is positive, as hypothesized. This favorable exception to other results is offset by the negative sign associated with the coefficient for business loans and the low statistical significance of this latter variable.

53/ J. Durbin and G.S. Watson, "Testing For Serial Correlation in Least-Squares Regression", Biometrika, Part I (1950) and Part II (1951).

CHAPTER 5

SUMMARY AND CONCLUSIONS

Money Defined Inclusive of Time Deposits

Economic theory suggests, and is supported by empirical evidence, that sufficiently large variations in the quantity of money will influence economic activity by causing adjustments in the demands and supplies of factors of production and in the prices of all goods. If the government had direct control over the stock of "money", and knew what the effects of changes in this magnitude were, such control and knowledge could be used to at least avoid causing unwanted disturbances in the economy and possibly to speed adjustment back to equilibrium following some non-monetary exogenous disturbance in the economy.

However, government agencies do not have absolute control of the quantity of "money" (for most definitions) and there is disagreement among economists as to which of many definitions of money the government can best control and which it should try to control. The choice of an indicator of the influence of monetary actions, for purposes of conducting monetary policy involves two central questions. First, which definition of money can the authorities best control in fact, and second, for which concept of money is there the most predictable influence on the economy?

The government has complete control over the quantity

of currency and coin in circulation. However, it is contended that changes in the quantity of a monetary aggregate which includes deposits at commercial banks have a more predictable effect on the economy. If that contention is correct, then the complete link between policy tools and economic activity is closer if efforts are made to control money inclusive of deposits rather than only currency.

The next issue is whether only demand deposits should be included in the definition of money, or whether time deposits should also be included. Evidence has been presented in this study regarding both the "controllability" of a money aggregate which includes time deposits at commercial banks and the predictability of the effects of variations of such an aggregate.

The Federal Reserve System possesses the ability to exercise absolute control over the monetary base.[54/] The relationship between the base and some definition of money or "bank credit" depends upon the supply and demand function of currency, demand deposits, time deposits, excess reserves

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54/ See Karl Brunner and Allan Meltzer, "Some Further Investigations of Demand and Supply Functions for Money", Journal of Finance (Worcester, Mass.: Hefferman Press, May 1964), pp. 240-283; and Leonall C. Andersen and Jerry L. Jordan, "The Monetary Base - Explanation and Analytic Use", Review, (St. Louis: Federal Reserve Bank of St. Louis, August, 1968).

and several institutional factors.[55/]

Inclusion of time deposits in a definition of money to be used as an indicator of monetary policy implies that the monetary authorities possess knowledge concerning the demand and supply functions for time deposits. As pointed out in Chapter 1 and discussed in detail in Chapters 3 and 4, time deposits at commercial banks is an aggregate which includes several distinct assets. The factors influencing the supply of and demand for these assets have been shown to be quite distinct.

The evidence presented in Chapters 3 and 4 indicate clearly that the elasticities of demand for the major sub-classifications of time deposits--passbook deposits, savings certificates, and large negotiable certificates of deposit--with respect to interest rate differentials are large and statistically significant. Variation by commercial banks of the interest rates at which these sub-classes of time deposits are offered to the public relative to interest rates on substitute (in demand) assets does affect the outstanding volume of time deposits. Therefore, in order to predict the growth of money inclusive of time deposits which would accompany a given

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55/ See Karl Brunner and Allan Meltzer, "Liquidity Traps for Money, Bank Credit, and Interest Rates", Journal of Political Economy (Chicago: University of Chicago Press, February 1968) pp. 1-34.

growth rate of the monetary base, monetary authorities must be able to predict both (a) the behavior of commercial banks in setting proffered rates on the sub-classes of time deposits, and (b) the response of the non-bank public to changes in the proffered bank rates under existing economic conditions.

Under presently existing institutional conditions, namely the existence of Regulation Q which gives the Federal Reserve the power to establish ceilings on the interest rates member banks may offer on time deposits, at times the monetary authorities in effect set the supply prices on time deposits, rather than these prices being market determined. When market interest rates on assets which are substitutes in demand for time deposits rise above the administered ceiling rates on time deposits, the growth rate of the outstanding volume of time deposits declines, and on occasion has been negative. Thus the growth of money inclusive of time deposits is altered from what it would have been in the absence of the administered ceilings. Because of the limitations of existing knowledge for predicting changes of the demand for time deposits, interpretation of money inclusive of time deposits as an indicator of the thrust of monetary policy is rendered less certain.

On two occasions in recent years, late 1966 and early 1968, the effects of Regulation Q interest rate ceilings at

a time of sharply rising market rates of interest have been quite evident. In the winter and spring of 1968 the market rates of interest on most financial assets were rising sharply. The bulk of passbook deposits at commercial banks had been earning the ceiling 4 per cent rate for a couple of years, and the proffered rates on large negotiable certificates of deposit were at their ceiling 5.5 per cent rate. The rates on substitute assets--Treasury bills, commercial paper, savings and loan shares, etc.--continued to rise in subsequent months. Consequently, the total outstanding volume of time deposits declined slightly on balance in the spring of 1968 after rising 12 per cent in 1967. The outstanding volume of large negotiable CDs declined $2 billion in this period after rising 12.8 per cent in the previous year when market rates of interest were sufficiently low that the ceiling rate on CDs was not effective.

The growth rate of the monetary base was very stable from early 1967 to mid-1968. Money inclusive of time deposits increased at a 10 per cent annual rate in 1967 and early 1968. Then from March to June 1968, as a direct result of the ceiling rates on time deposits becoming effective in the face of rising market rates of interest, the growth rate of money inclusive of time deposits declined to a 5.7 per cent annual rate. In contrast, the growth of money exclusive of time deposits accelerated to an 8.3 per cent annual rate from March to June compared to a 5.9 per cent

growth in the previous twelve months.

Analysts using money inclusive of time deposits as an indicator of the thrust of monetary policy have on occasion in the past three years come to conclusions concerning the direction of policy actions which were opposite to the conclusions reached by analysts who used exclusive money as an indicator. The opposite conclusions reached by different analysts were not per se a result of the movements in opposite directions of the two money measures, but rather were a result of incorrect assumptions regarding the demand for money inclusive and exclusive of time deposits. And the incorrect assumptions concerning the demand for money including time deposits were the result of a lack of knowledge concerning the own-and cross-interest elasticities of demand for the sub-classes of time deposits.

In the absence of any administered ceiling rates on time deposits at commercial banks, the rates offered by banks on these assets would be market determined as are the observed rates on substitute short-term financial assets. However, when the supply curves of time deposits become horizontal at the ceiling rates, changes in the outstanding volume of total time deposits are determined only by shifts in the demands for these assets.

The evidence presented in Chapters 3 and 4 indicates that the demand for the major sub-classes of time deposits are strongly influenced by the interest rate differentials

between time deposits and substitute assets. Therefore, when the interest rates on substutute assets rise relative to the effective ceiling rates on time deposits, the demands for time deposits decline. Consequently, the declining growth rate of money inclusive of time deposits in early 1968 must be interpreted in view of the declining demands for these assets. If the relative demands for time deposits were falling sufficiently rapidly (in response to rising yields of substitute assets) then even the slowing growth rates of inclusive money would be interpreted as being highly stimulative.

In summary, more knowledge is required and more factors must be considered in order to use money defined to include time deposits as an indicator or target of monetary policy than to use money defined exclusive of time deposits at commercial banks. The evidence presented in this study indicates that the demand schedules for the various subclasses of time deposits are relatively stable functions of interest rates and interest rate differentials, as well as other variables. Because of the significance of the interest rate variables and the existence of Regulation Q, the demand for money inclusive of time deposits is less predictable than the demand for money exclusive of time deposits.

Prior to 1961 and the development of negotiable certificates of deposit, total time deposits at commercial banks

consisted almost exclusively of passbook deposits. Regulation Q appears to have influenced the growth of passbook deposits since at least 1956; this point will be discussed in more detail later in this chapter. Prior to Regulation Q becoming "effective", i.e. - market rates of interest available on substitute (demand) assets rising sufficiently high that the offering rates of some commercial banks were constrained by the ceiling, the problem of using money inclusive of time deposits as an indicator of policy was not as great as it has subsequently become.

Evidence presented in this study and others[56/] indicates that the elasticities of demand for time deposits with respect to interest rates (own-and cross-yields) are greater than the interest elasticities of demand for demand deposits and currency. In spite of this, the relative percentage changes over time of money inclusive and exclusive of time deposits were very similar prior to Regulation Q becoming effective. Thus the choice between inclusive and exclusive money as an indicator of policy

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56/ Phillip Cagan, "The Demand for Currency Relative to the Total Money Supply", Journal of Political Economy, (Chicago: University of Chicago Press, 1958) pp. 303-328. Also see Cagan, Determinants and Effects of Changes in the Stock of Money 1875-1960, (New York: National Bureau of Economic Research, 1965) distributed by Columbia University Press; Edgar Feige, The Demand for Liquid Assets: A Temporal Cross-Section Analysis; and Milton Friedman & Anna Jackson Schwartz, A monetary History of the United States 1867-1960.

did not lead to substantially different conclusions until the past decade. The long-run trend growth in time deposits was determined primarily by growth in income and the short-run (e.g., three to six months) deviations of the growth rate of time deposits around its long-run trend were minor compared to recent years.

The "quantity theory" underlying the use of the rates of change of "money" as an indicator of the influence of government actions on economic activity suggests that when the amount of money supplied to the economy is "excessive" relative to the demand, people will switch from money to other goods to eliminate the excess. In the process supplies of and demands for the other goods are affected. This theory emphasizes the importance of knowledge regarding the demand for "money" in interpreting growth in the supply of money.

Elasticities of and Substitutes for Time Deposits

Feige estimated demand functions for various financial assets using cross-section data for the years 1949 to 1959. [57/] A major conclusion drawn from the evidence assembled was that the money supply defined exclusive of time deposits at commercial banks should be "employed in further empirical studies. Utilizing the narrow definition

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57/ See Chapter 1 and Appendix A.

of money avoids many of the conceptual problems of interpreting interest and income effects which will vary according to the definition of money adopted".[58/] The major reason given for this conclusion is that the "evidence supports the view that the demand for demand deposits was not significantly affected by changes in the yields on time deposits, savings and loan association shares, and mutual savings bank deposits."[59/] Given the existence of Regulation Q, the analysis and evidence presented in the present study led to the conclusion that money defined exclusive of time deposits is a more reliable indicator of the thrust of monetary policy than is money defined to include time deposits.[60/] This is consistent with Feige's conclusion re-

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58/ Feige, p. 43.

59/ Ibid.

60/ The effects of Regulation Q on the alternative use of exclusive or inclusive money as an indicator of the influence of monetary actions on economic activity can be made within the context of a "money supply" model. See Karl Brunner and Allan Meltzer, op. cit., and Albert E. Burger "A Summary of the Brunner-Meltzer Non-Linear Money Supply Hypothesis", Working Paper No. 7, Federal Reserve Bank of St. Louis, January 1969. In this note the following definitions will be used:

B = monetary base;

M^j = money supply;

M^1 = demand deposits plus currency;

M^2 = M^1 plus time deposits;

garding the definition of money but the reasoning behind the conclusion in this study, as discussed earlier in this chapter, is quite distinct from the analysis and evidence which led Feige to this conclusion. The Cohen-Kaufman and Hamburger studies also reject the inclusion of time deposits in the definition of money.[61/] Their conclusion is also based in part on empirical evidence indicating that time deposits are highly responsive to changes in yields.

The findings of the present study are in conflict with many of Feige's results. Feige's conclusion that "time deposits and savings and loan association shares are independent in demand" is not supported by evidence

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60/ (continued)

m^j = monetary multiplier, where j=1 for M^1 and j=2 for M^2;

i = vector of all interest rates;

i^t = banks' proffered rate on time deposits;

i_o = vector of rates other than i^t;

t = ratio of time deposits to demand deposits;

(x,y) is read "elasticity of x with respect to y".

Federal Reserve actions are summarized by the monetary base (Andersen and Jordan, op. cit.) and it is assumed here that actions of the Federal Reserve influence some summary

61/ See Appendices A and B for discussion of these studies.

presented in this study.[62] Similarly, Feige's results indicating that 1) time deposits and mutual savings bank deposits are complementary in the long-run or independent in demand, and 2) savings and loan shares and mutual savings deposits are weak short-run substitutes and weak long-run complements, are not supported by the present study.[63] Feige's results and the results obtained in the present study are discussed further in Appendix A.

60/ (continued)

measure of economic activity such as GNP. Both M^1 and M^2 can be considered to be intermediate variables through which changes in B are transmitted to changes in GNP. Thus the link between B and GNP is dependent upon the link between B and M^1 or M^2, and between M^1 or M^2 and GNP. When Regulation Q ceiling rates prevent banks from offering market clearing interest rates, the correlation between B and M^2 becomes unambigously lower than the correlation between B and M^1, as shown below.

Briefly, the elasticities of both M^1 and M^2 with respect to B are defined by:

$$\{\varepsilon(M^j,B) = 1 + \varepsilon(m^j,i) \cdot \varepsilon(i,B)\}.$$

The relative size of the elasticities of m^1 and m^2 with respect to interest rates $\{\varepsilon(m^j,i)\}$ depends on the elasticity of t with respect to market interest rates (i):

$$\varepsilon(t,i) = \varepsilon(t,i^t) \cdot \varepsilon(i^t,i_o) + \varepsilon(t,i_o).$$

When banks are prevented by Regulation Q from offering market clearing rates, $\varepsilon(i^t,i_o) = 0$, consequently $\varepsilon(t,i) = \varepsilon(t,i_o)$.

62/ Feige, p. 38.

63/ Ibid.

Previous studies have observed that from the mid-1950's until at least the early 1960's the national average "effective" yield on time deposits at commercial banks was rising relative to the national average yields on alternative financial assets such as savings and loan shares and mutual savings bank deposits.[64/] Two inferences have been drawn from this observation. First, in spite of the above observation of interest rate movements in the period, it was also observed that the rate of growth of time deposits was slower than the growth rate of

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60/ (continued)

According to the assumptions of and evidence supporting the Brunner-Meltzer model, $\varepsilon(m^1,t) < 0$, $\varepsilon(m^2,t) > 0$, and $|\varepsilon(m^1,t)| < |\varepsilon(m^2,t)|$. The cross-interest elasticity of the time deposit ratio $\varepsilon(t,i_o)$ is estimated to be negative and statistically significant (based on the relatively large negative cross-interest elasticities of demand for time deposits; see especially Table 4-2 in Chapter 4). Consequently, the variation in m^2 associated with a change in other market interest rates (i_o) relative to the (ceiling) rate on time deposits (i^t) is greater than the corresponding variation in m^1.

In summary, the "feedback" effects" through interest rates on M^2 are greater than the feedback on M^1. Brunner and Meltzer (op. cit.) have concluded that the effects of changes in interest rates are generally greater on M^2 than on M^1. When Regulation Q impinges, the elasticity of t with respect to interest rates becomes larger (negative) and the variation of M^2 relative to M^1 for a given change in interest rates is increased.

64/ See Chapter 1, pages 6 and 7.

alternative assets such as savings and loan shares. From these observations it was concluded that the interest elasticity of demand for time deposits was weak and/or that neither savings and loan shares nor mutual savings bank deposits were very close substitutes for time deposits.[65/]

Second, the national average effective yield on time deposits at commercial banks was always below the ceiling rate on time deposits (at least prior to November, 1964 when differential rates according to size and maturity were first established). For example, in 1956 the "effective" yield on all time deposits was only 1.66 per cent nationally compared to the ceiling rate of 2.5 per cent. The ceiling rate on time deposits was raised to 3 per cent on January 1, 1957, but the "effective" yield on time deposits rose only 2.14 per cent for 1957. These facts led some analysts to conclude that at such times (or at any time until 1965) the ceiling rates were not "effective". Since the average yield on time deposits was well below the ceiling rates, it has been argued that no bank was constrained by the ceiling limits in competition for funds with other institutions.

The evidence presented in this study disconfirms either of the above inferences. The substitution relationship between time deposits and savings and loan shares

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65/ See footnote 2 and Appendix A.

and/or mutual savings bank deposits has been tested directly and discussed at length in Chapter 3. The hypothesis that these assets are independent in demand or only "weak" substitutes is disconfirmed by the evidence. The cross-section data indicates that there is a stable and significant substitution relationship between these deposit-type financial assets on the basis of relative yields and relative convenience costs. The evidence supports the hypothesis that the elasticity of demand for time deposits with respect to own-yields is positive and significant. The observations in the mid to late 1950's which led to the conclusions that the interest elasticities of demand for time deposits and the substitution relationships between time deposits and other deposit-type assets were weak can be interpreted differently. This interpretation ties in with the discussion of the second inference below.

The judgement as to whether or not the ceiling rates on time deposits are constraining a bank in competition for deposits is properly based on whether or not the bank is presently offering to pay the maximum rate allowed and would offer to pay a higher yield in absence of the ceiling limit. For several reasons the average rate paid on time deposits (total interest paid in a period divided by average

deposits) may be well below the proffered rate.[66/] Table 3-1 showing cross-section average rates paid and proffered rates in 1960 is informative in this regard. The average rate paid in 1960 was up to 40 basis points below the end-of-year weighted average proffered rates in some states. The average rate paid by banks in all states was 2.6 per cent in 1960 which, if viewed in isolation, would indicate that the ceiling rate of 3 per cent was not effective in constraining banks' efforts to acquire deposits. However, the table shows that all of the banks in several states were offering the ceiling rate permitted on passbook deposits at the end of 1960 and the weighted average offering rates in most other states were very near the ceiling rates.

If at least one commercial bank is prevented from offering a higher yield, the ceiling rates must be viewed as being effective in constraining banks' ability to compete for funds on the basis of relative yields. The 1960 survey data, summarized in Table 3-1, indicate that many banks were offering the existing ceiling rates. There is, of course, no evidence that the banks would have offered higher rates had they been permitted to do so.

66/ Deposits may not be held for the entire interest period, there is a seasonal pattern in deposits, and proffered rates may have varied in a period.

The data available for the period before and after the increase in ceiling rates in January 1957 indicate that many banks had been constrained by the lower ceiling prior to that time. Yet the data do not show to what extent banks immediately increased their offering rates to the new one-half per cent higher ceiling in 1957.

The average rate paid at all commercial banks increased sharply relative to the average yields on savings and loan shares or mutual savings bank deposits. However, the outstanding volume of these latter assets increased relative to the outstanding volume of time deposits during this period. Nevertheless, the observation of these events is not sufficient to conclude that the substitution relationship between time deposits and the alternative deposit-type assets is weak. First, the banks in some areas of the country may have been offering the ceiling rates throughout the period and thus constrained in their ability to compete for deposits. The deposit growth that did occur may have been in areas where banks had not been paying the ceiling rates, but in moving toward the ceilings in this period were able to attract deposits and raised the national average rate paid. Second, the general theoretical framework discussed in Chapter 2 concerning the returns of financial assets indicates that such assets may be substitutes in demand on the basis of relative non-interest returns. The evidence presented in Chapter 3 supports the hypothesis

that transactions and convenience costs as measured by the ratio of offices, and information costs and pecuniary non-interest returns as measured by advertising expenditures, were significant variables in the demand functions estimated in this period. In addition, the cross-section evidence indicates that the income elasticities of demand for these deposit-type assets differed in the 1950's. Thus the many other factors influencing the aggregate demand for time deposits indicate that the relative movements of rates and deposits in the mid-1950s cannot be interpreted as evidence rejecting the hypothesis that time deposits and savings and loan shares were substitutes on the basis of relative yields.

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Appendix A
Previous Studies Using Cross-Section Data

There have been two previous studies, by Edgar L. Feige [67] and by Bruce C. Cohen and George G. Kaufman [68], to use U.S. cross-section data in a study of deposit-type financial assets. The methods, results, and conclusions of these studies are discussed in this appendix.

Feige Study

Feige's basic approach was to specify an equation (demand) for each of the assets - demand deposits, time deposits, and savings and loan deposits. Coefficients were estimated and conclusions drawn on the basis of estimates from "pooled" data. In addition, income and price elasticities of demand were estimated across the states for each year and for the "pooled" sample.

The sample used consisted of observations from each of forty-eight states and the District of Columbia for each year 1949 to 1959. The "pooled" sample from which most conclusions were drawn is simply all 49 states for all

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67/ Edgar L. Feige, The Demand For Liquid Assets: A Temporal Cross-Section Analysis (N.Y.: Prentice-Hall, Inc., 1964).

68/ Bruce C. Cohen and George G. Kaufman, "Factors Determining Bank Deposit Growth by State: An Empirical Analysis", Journal of Finance, Vol. XX, No. 1 (March, 1965), pp. 59-70

eleven years, treated as one large sample of 539 observations. Implicit in this sample is the assumption that the observations for the states in 1950 are independent of the observations for the states in 1949, and so on for each year 1949-1959.

Estimates are made for each of three equations in which demand deposits at commercial banks per capita, time deposits at commercial banks per capita, and savings and loan association shares per capita are the respective dependent variables. Independent variables include permanent income per capita, the yields of four types of deposits, and up to ten "regional shift" dummy variables. The equation for savings and loans also includes per capita advertising expenditures per state. Table A-1 shows Feige's symbols and definitions of variables.

The coefficients estimated from pooled data were reported in the text and results for the individual years were reported in an appendix to Feige's study. I reproduced these results in tables A-2 through A-4, along with samples of some estimates I made for comparison purposes, using Feige's data.

There are some striking differences between Feige's results from the "pooled" data and from individual years. For instance in Tables A-2 to A-4 the size of the coefficients for r^m and D^m are substantially different for the pooled and individual year estimates. For the individual

years, the signs of the dummy variables are mostly negative in Table A-3, but the signs are all positive for the pooled regression.

The t-values are substantially different for many variables between the pooled regressions and the individual year regressions. The substantially smaller standard errors of regression coefficients (in parentheses under coefficients) which Feige reports for the pooled estimates is probably the result of the high serial correlation implicit in his method of pooling. The larger sample would also contribute to lower standard errors.

Note that Feige does not report intercepts for his equations. The dummy variables representing four geographical sectors of the country and four major financial centers are called "free intercepts" (Feige, page 21).

The variables r^m (yield of mutual bank deposits) and D^m (dummy variable, 1 for states with mutual savings banks, 0 otherwise) deserve special note. For states that have mutual savings banks Feige included an observation for r^m as the interest paid (e.g. - 3.22 per cent for New York in 1959). However if a state had no mutual savings banks then r^m was zero. This means that r^m behaves much like a dummy variable for mutual savings banks states. I correlated r^m and D^m for the year 1959 and found the simple correlation $R = .985$. This means that there is high multicollinearity

in Feige's estimates caused by the inclusion of both of these variables.[69] For each equation--time deposits, savings and loan deposits, and demand deposits--I estimated coefficients for the year 1959, using Feige's data, in one case including D^m and in the other excluding it. In all cases the other dummy variables Feige employed were excluded for simplicity. The results of these comparisons are reported at the bottoms of Tables A-2 to A-4 respectively. In tables A-3 and A-4 the sign of r^m reversed when D^m was excluded. In Table A-2 the coefficient for r^m changed from -122. to -5. and became statistically non-significant. In the equation for savings and loan deposits (Table A-3), the sign of the coefficient for the interest rate on time deposits (r^t) is reversed when D^m is excluded. Thus the implied relationship changes from one of complementarity between the assets to substitution when this redundant dummy variable is omitted. Feige's conclusions concerning complementary and substitute relationships between mutual savings bank deposits and the other assets are seriously affected by this multicollinearity.

Further comparison between these equations and Feige's results for 1959 will show the effects of the dummy variables on the signs and sizes of the coefficients and

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[69] For a discussion of the effects of high multicollinearity among variables on the estimated coefficients, see Carl F. Christ, Econometric Models and Methods (New York, Wiley and Sons, Inc.), pp. 387-389.

t-statistics. I estimated additional equations for 1959 using Feige's data to check the influence of the dummy variables giving a "free intercept" to the "major financial centers" (Table A-1, CAL, DC, ILL, NY). Estimates were made for Feige's demand deposit equation excluding all dummy variables except NY, regressing across all 49 states. Then the equation was estimated regressing across 48 states, excluding New York and excluding the NY dummy variable. The coefficients for remaining variables were identical in both cases. Thus the effect of the four dummys is to neutralize any influence of the states: California, District of Columbia, Illinois, and New York. The results would have been the same if Feige had used only 45 states, excluding the above 4 altogether.

One important influence of the dummy variables is on the income and interest elasticities. Excluding the dummy variables makes the income elasticities of demand for time and demand deposits much larger than Feige reported, while the income elasticity of demand for savings and loan deposits is much smaller when the dummys are excluded.

Feige's study is concerned exclusively with the estimation of demand functions for the selected financial assets. There is only one reference to supply in the study, namely the following assumption:

> "The level of the supply curve of a particular asset differs between states, and is independent of the variables which

> shift the demand curve. The level of the supply curve in each state is determined primarily by state laws and regulations governing the activities of financial intermediaries. The rates of return are therefore considered as exogenous variables." 70/

In other words, Feige is assuming that the rates of interest paid on deposits (average interest paid on savings and loan deposits and time deposits, and service charges on demand deposits) are set by state law. This means the supply curve in a state for each asset is horizontal and unchanged in each year. Since "time deposits at commercial banks" is actually several types of assets with different yields treated as one, Feige's simplifying assumption concerning this asset is not a good approximation of actual supply conditions. Similarly, service charges on demand deposits usually depend upon average balances or frequency of cleared checks or both. Therefore assuming that the "average negative yield" on demand deposits is an exogenous variable set by state law appears to be a poor simplifying assumption.

Feige concluded that "Savings and Loan Association shares and time deposits appear to be independent of one another". 71/ He finds that the own-price coefficients of

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70/ Feige, pp. 21-22.

71/ Feige, pp. 30 and 38.

demand deposits and time deposits are positive and statistically significant; but the demand for savings and loan association shares is found to be insensitive to their rate of return.[72] His pooled data produced an income elasticity of demand for demand deposits of .92, and an income elasticity of demand for time deposits of .69. These estimates are contrary to Friedman's income elasticity of demand for money of 1.8. Feige's income elasticity of demand for savings and loan shares, from the pooled data, is .63.

Cohen and Kaufman

Cohen and Kaufman (C and K) estimated equations for total deposits, demand deposits, and time deposits using pooled U.S. cross-section data (48 states) for the years 1951-1961. They do not specifically indentify their equations as demand functions, however they preface their work saying, "The analysis is organized within the framework of the demand for money".[73] Estimates are for the year to year changes in deposits in each state, pooled into a sample of 480 observations.

C and K add independent variables to their equations one at a time to find the combination yielding the highest

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72/ Feige, p. 37.

73/ Cohen and Kaufman, p. 59.

R^2. Variables whose coefficients are not statistically significant at the 5 per cent level are removed.

Differences between the equations for C and K and for Feige are that the former use percentage changes in some variables and ratios of others (interest rate ratios, or deposits to income ratios). They also add the year to year percentage change in commercial bank offices and a dummy for branch banking legislation as explanatory variables in their equation for time deposits at commercial banks.

In addition to percentage changes in permanent income, C and K include the level of wealth in their equations. The variable enters significantly in the equations for time deposits and near bank deposits, but not for total deposits or demand deposits. Permanent income per capita is used as a proxy for wealth.

The differences in the conclusions between C and K and Feige are: 1) C and K found the income elasticity of "near bank deposits" to be greater than Feige's income elasticity of demand for savings and loan deposits; and 2) C and K found the interest elasticity for time deposits to be large and positive and large and negative for near bank deposits, which, they say, indicates the assets are close substitutes, whereas Feige concluded these assets are weak substitutes at most.

TABLE A-1

VARIABLES USED BY FEIGE

D	Per capita commercial bank demand deposits held by individuals, partnerships, and corporations
T	Per capital commercial bank time deposits
S	Per capita savings and loan association shares
Y	"Permanent" per capita personal income
r_d	Actual interest rate on commercial bank demand deposits (negative)
r_t	Actual interest rate on commercial bank time deposits
r_s	Actual interest rate on savings and loan association shares
r_m	Actual interest rate on mutual savings bank deposits
D_m	Dummy variable (1 for mutual savings bank states, 0 for non-mutual savings bank states)
I	Survey estimate of the ratio of commercial bank demand deposits held by individuals to total commercial bank demand deposits
A	Per capita advertising expenditures by savings and loan associations
Cal	Dummy variable (1 for California; 0 for all other states)
DC	Dummy variable (1 for Washington, D.C.; 0 for all other states)
Ill	Dummy variable (1 for Illinois; 0 for all other states)
NY	Dummy variable (1 for New York; 0 for all other states)
W	Dummy variable (1 for Western states excluding California; 0 for all other states)
S	Dummy variable (1 for Southern states excluding Washington, D.C.; 0 for all other states)
C	Dummy variable (1 for Central states excluding Illinois; 0 for all other states)
NE	Dummy variable (1 for Northeastern states excluding New York; 0 for all other states)

(Feige, Page 22)

TABLE A-2

TIME DEPOSITS - DEMAND FUNCTIONS

1949-59 and Pooled

(Feige - Page 47)

Year	Y	r_d	r_t	r_s	r_m	D_m	Cal	DC	Ill	NY	W	S	C	NE	R^2
1949	.208	-127	194	11	-224	444	- 81	-287	-158	-240	-292	-316	-287	-284	.842
	(.058)	(125)	(51)	(24)	(50)	(85)	(162)	(158)	(144)	(130)	(126)	(118)	(124)	(138)	
1950	.232	-111	216	9	-271	527	-160	-355	-220	-293	-362	-366	-339	-326	.843
	(.055)	(129)	(48)	(25)	(61)	(107)	(170)	(167)	(142)	(126)	(132)	(121)	(126)	(137)	
1951	.195	- 65	124	- 20	-290	575	68	-162	- 26	-139	-157	-169	-144	- 67	.820
	(.051)	(140)	(50)	(32)	(69)	(126)	(188)	(182)	(150)	(136)	(141)	(131)	(133)	(144)	
1952	.191	-227	92	- 42	-194	436	120	-112	44	- 47	-114	-109	- 92	- 41	.792
	(.062)	(153)	(42)	(32)	(57)	(115)	(202)	(195)	(169)	(154)	(159)	(140)	(148)	(158)	
1953	.187	-158	86	- 50	-188	436	176	- 57	95	- 19	- 56	- 72	- 41	1	.788
	(.064)	(136)	(43)	(39)	(54)	(114)	(236)	(219)	(198)	(181)	(188)	(169)	(176)	(184)	
1954	.156	-158	79	- 52	-173	417	241	2	165	55	5	- 30	8	55	.764
	(.060)	(132)	(50)	(41)	(58)	(124)	(245)	(232)	(204)	(190)	(200)	(180)	(183)	(190)	
1955	.147	-136	89	- 43	-161	405	225	2	144	44	- 20	- 55	- 14	25	.746
	(.059)	(132)	(52)	(44)	(62)	(137)	(253)	(240)	(210)	(197)	(209)	(189)	(192)	(197)	
1956	.133	-118	122	- 76	-140	380	279	83	207	73	28	- 17	43	57	.738
	(.056)	(133)	(59)	(59)	(59)	(138)	(313)	(291)	(264)	(258)	(264)	(246)	(242)	(255)	
1957	.137	- 61	139	- 15	- 54	199	- 32	-177	- 22	-209	-231	-279	-170	-242	.692
	(.060)	(154)	(61)	(61)	(65)	(168)	(317)	(280)	(254)	(253)	(252)	(238)	(30)	(240)	
1958	.121	- 5	201	- 50	- 46	183	56	- 73	43	-164	-191	-269	-143	-212	.676
	(.069)	(165)	(68)	(58)	(72)	(194)	(348)	(308)	(257)	(233)	(283)	(258)	(255)	(264)	
1959	.112	- 89	134	- 49	- 66	230	184	- 8	122	- 8	- 62	-143	- 35	- 77	.592
	(.080)	(186)	(85)	(95)	(77)	(219)	(467)	(429)	(396)	(388)	(396)	(376)	(367)	(371)	
Pooled	.122	-101	76	- 44	- 82	235	304	86	204	69	39	7	57	57	.942
	(.037)	(37)	(10)	(10)	(11)	(25)	(40)	(39)	(35)	(32)	(28)	(27)	(27)	(27)	

Additional estimates using Feige's data:

Estimates for 1959 only, including D_m, but excluding other dummy variables

$$T = -367 + .258\,Y - 146\,r_d + 156\,r_t - 49\,r_s - 122\,r_m + 359\,D_m \qquad R^2 = .458$$
$$(.05) \quad (130) \quad (80) \quad (83) \quad (69) \quad (207)$$

Standard error of estimate as a percentage of the Mean of T = 33.96

Estimates for 1959 only, excluding all dummy variables

$$T = -273 + .246\,Y - 159.3\,r_d + 111\,r_t - 41\,r_s - 5\,r_m \qquad R^2 = .419$$
$$(.055) \quad (133) \quad (77) \quad (85) \quad (13)$$

Standard error of estimate as a percentage of the Mean of T = 34.74

Simple correlation between r_m and D_m = .985, for 1959

TABLE A-3

SAVINGS AND LOAN ASSOCIATION SHARES - DEMAND FUNCTIONS

1949-59 and Pooled

(Feige - Page 48)

Year	Y	r_d	r_t	r_s	r_m	A	D_m	Cal	DC	Ill	NY	W	S	C	NE	R^2
1949	.042	1	- 8	- 1	- 33	.499	75	- 37	118	- 32	- 41	- 24	3	- 13	- 16	.915
	(.021)	(45)	(19)	(10)	(18)	(.084)	(31)	(63)	(67)	(56)	(47)	(48)	(45)	(46)	(51)	
1950	.042	- 35	- 4	5	- 47	.557	99	- 97	73	- 79	- 62	- 62	- 34	- 45	- 45	.928
	(.020)	(48)	(18)	(11)	(23)	(.082)	(39)	(74)	(80)	(63)	(49)	(55)	(50)	(52)	(55)	
1951	.045	- 71	- 8	8	- 61	.501	128	-115	125	- 81	- 71	- 75	- 46	- 59	- 55	.934
	(.019)	(54)	(19)	(14)	(26)	(.070)	(47)	(80)	(84)	(65)	(53)	(57)	(54)	(54)	(57)	
1952	.053	- 86	0	11	- 55	.499	126	-161	97	-122	0	- 1	- 0	0	0	.933
	(.024)	(59)	(16)	(13)	(22)	(.063)	(44)	(86)	(89)	(73)	(61)	(64)	(58)	(61)	(63)	
1953	.057	- 77	- 11	22	- 46	.469	116	-166	57	-149	-105	-124	- 94	-104	-109	.913
	(.030)	(65)	(20)	(20)	(26)	(.064)	(54)	(119)	(120)	(103)	(88)	(92)	(84)	(87)	(90)	
1954	.042	- 90	- 37	9	- 33	.548	102	-104	123	- 95	- 17	- 33	- 6	- 27	- 29	.937
	(.027)	(58)	(22)	(18)	(26)	(.058)	(55)	(110)	(110)	(94)	(84)	(89)	(80)	(81)	(84)	
1955	.068	-106	- 17	52	- 65	.513	186	-330	- 6	-246	-189	-245	-190	-218	-223	.972
	(.030)	(64)	(21)	(16)	(31)	(.052)	(69)	(100)	(96)	(81)	(70)	(75)	(61)	(66)	(69)	
1956	.075	-137	- 30	- 30	- 82	.452	237	-279	142	-171	-118	-164	-110	-160	-150	.924
	(.033)	(77)	(35)	(35)	(35)	(.049)	(80)	(184)	(173)	(156)	(150)	(153)	(143)	(141)	(148)	
1957	.068	-101	- 25	13	- 80	.478	253	-230	148	-122	- 60	-100	- 47	- 99	- 93	.945
	(.031)	(77)	(31)	(30)	(32)	(.048)	(84)	(157)	(141)	(126)	(128)	(126)	(119)	(114)	(121)	
1958	.084	-116	- 25	51	- 75	.441	250	-334	121	-232	-195	-254	-181	-220	-236	.939
	(.037)	(85)	(35)	(30)	(37)	(.049)	(99)	(178)	(161)	(148)	(145)	(145)	(133)	(130)	(136)	
1959	.103	- 81	2	47	- 77	.420	269	-423	148	-289	-299	-328	-248	-286	-309	.937
	(.042)	(98)	(43)	(49)	(40)	(.049)	(112)	(238)	(221)	(203)	(198)	(202)	(192)	(187)	(190)	
Pooled	.069	- 48	.25	9	- 14	.48	66	-177	125	-128	-118	-114	- 69	- 94	-116	.968
	(.008)	(19)	(5.39)	(5)	(6)	(.01)	(14)	(21)	(21)	(18)	(17)	(15)	(14)	(14)	(16)	

Additional estimates using Feige's data:

Estimates for 1959 only, including D_m, but excluding other dummy variables

$$S = -156 + .047\,Y + 98\,r_d + 9.4\,r_t + 39.9\,r_s - 45.8\,r_m + .555\,A + 181.4\,D_m \qquad R^2 = .804$$
$$(.048)\quad (103)\quad (62.2)\quad (66)\quad (55.5)\quad (.055)\quad (164)$$

Standard error of estimate as a percentage of the Mean of S = 32.19

Estimates for 1959 only, excluding all dummy variables

$$S = -96 + .036\,Y + 96.8\,r_d - 12.8\,r_t + 41.5\,r_s + 14.3\,r_m + .567\,A \qquad R^2 = .798$$
$$(.047)\quad (103)\quad (59)\quad (66)\quad (11)\quad (.054)$$

Standard error of estimate as a percentage of the Mean of S = 32.31

Simple correlation between r_m and D_m = .985, for 1959

TABLE A-4

DEMAND DEPOSITS - DEMAND FUNCTIONS

1949-59 and Pooled

(Feige - Page 46)

Year	Y	r_d	r_t	r_s	r_m	D_m	I	Cal	DC	Ill	NY	W	S	C	NE	R^2
1949	.475	642	-147	23	144	-319	464	50	150	200	751	66	- 20	85	57	.902
	(.095)	(204)	(84)	(39)	(80)	(138)	(233)	(274)	(264)	(238)	(217)	(217)	(205)	(216)	(238)	
1950	.483	641	-154	53	203	-425	452	- 5	136	141	705	12	- 84	20	- 16	.902
	(.096)	(225)	(85)	(45)	(106)	(187)	(249)	(304)	(296)	(250)	(225)	(240)	(222)	(232)	(251)	
1951	.476	628	- 65	72	181	-414	441	-148	79	20	613	-122	-220	-111	-170	.906
	(.079)	(217)	(79)	(51)	(106)	(195)	(250)	(305)	(292)	(240)	(219)	(235)	(221)	(224)	(242)	
1952	.454	660	- 19	47	97	-281	415	-107	124	65	628	- 91	-181	- 65	-144	.887
	(.094)	(231)	(64)	(49)	(86)	(172)	(257)	(314)	(300)	(259)	(239)	(252)	(225)	(237)	(253)	
1953	.411	629	- 28	46	154	-411	454	- 85	166	103	638	- 72	-156	- 25	-121	.883
	(.095)	(202)	(64)	(58)	(81)	(170)	(250)	(363)	(337)	(301)	(278)	(294)	(268)	(278)	(292)	
1954	.399	639	3	26	145	-379	480	11	260	140	644	- 18	-124	- 10	-109	.882
	(.086)	(188)	(71)	(58)	(82)	(176)	(256)	(362)	(343)	(299)	(279)	(300)	(274)	(278)	(290)	
1955	.407	703	3	23	186	-466	568	8	249	124	593	- 36	-128	- 29	-134	.880
	(.082)	(184)	(73)	(61)	(87)	(192)	(259)	(371)	(351)	(304)	(286)	(311)	(285)	(289)	(299)	
1956	.364	559	- 34	44	150	-413	468	31	296	158	651	16	- 85	16	- 82	.877
	(.075)	(177)	(80)	(79)	(79)	(184)	(256)	(443)	(411)	(369)	(362)	(378)	(356)	(351)	(372)	
1957	.338	594	59	37	146	-430	371	- 76	249	53	536	- 64	-188	- 58	-166	.889
	(.069)	(175)	(70)	(69)	(74)	(191)	(246)	(387)	(343)	(305)	(306)	(314)	(300)	(290)	(306)	
1958	.302	566	36	- 42	156	-478	272	417	735	452	900	354	221	327	218	.878
	(.075)	(175)	(73)	(62)	(76)	(206)	(266)	(412)	(366)	(332)	(330)	(343)	(320)	(315)	(330)	
1959	.331	581	72	14	105	-354	271	40	386	74	543	26	- 94	- 8	- 88	.897
	(.067)	(154)	(71)	(79)	(63)	(180)	(234)	(420)	(385)	(349)	(344)	(361)	(344)	(338)	(345)	
Pooled	.365	535	- 35	53	25	-126	405	4	238	151	734	10	-103	.2	- 32	.978
	(.08)	(48)	(13)	(13)	(15)	(34)	(71)	(57)	(55)	(48)	(48)	(43)	(42)	(43)	(45)	

Additional estimates using Feige's data:

Estimates for 1959 only, including D_m, but excluding other dummy variables

$$D = -351 + .547\,Y + 728\,r_d + 219\,r_t - 39\,r_s + 42\,r_m - 234\,D_m \qquad R^2 = .714$$
$$(.063)\quad (152)\quad (94)\quad (98)\quad (81)\quad (242)$$

Standard error of estimate as a percentage of the Mean of D = 22.08

Estimates for 1959 only, excluding all dummy variables

$$D = -412 + .554\,Y + 735\,r_d + 248\,r_t - 44.5\,r_s - 34.5\,r_m \qquad R^2 = .707$$
$$(.06)\quad (152)\quad (88)\quad (97)\quad (15)$$

Standard error of estimate as a percentage of the Mean of D = 22.03

Simple correlation between r_m and D_m = .985, for 1959

Appendix B
Time Series Study

In his "Household Demand for Financial Assets"[74], Hamburger presents a model of household investment behavior and estimates the model using levels and first differences of semiannual data for the period 1952 to 1962. The major conclusions of the article are that "the findings cast considerable doubt on the view that households treat time and savings deposits at commercial banks as if they were substantially different from other savings accounts", and that "although time deposits and savings accounts are very similar assets, they are not much closer substitutes for one another than they are for bonds". [75] On the basis of these results, Hamburger rejects the hypothesis that money should be defined to include all commercial bank deposits but not accounts at other savings institutions.

A further conclusion reached by Hamburger is that "the principal arguments in the demand functions for these assets are interest rates and total financial wealth. The contribution of income appears negligible".[76] The wealth

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[74] Michael J. Hamburger, "Household Demand for Financial Assets", Econometrica, Vol. 36, No. 1 (January 1968), pp. 97 to 118.

[75] Hamburger, pages 105 and 106.

[76] Hamburger, pp. 111.

measures alternatively used are financial assets and net worth. The income measure used was disposable permanent income. Hamburger's results regarding the influence of income on the demand for time deposits and savings accounts are not consistent with the results obtained from cross-section data and reported in this study.

APPENDIX C

Additional Results of Estimates of Supply and Demand Equations From the Cross-Section Data

Demand for Time Deposits at Commercial Banks

49 State Sample

One-Stage Least-Square Estimates

Year	I	Y_p	$\frac{Y}{Yp}$	$\frac{rs}{rt}$	$\frac{rsm}{rt}$	$\frac{SL}{CB}$	$\frac{SLM}{CB}$	R^2	$\varepsilon(TD,Yp)$
59	688	.205 (4.70)	-370 (.75)	-248 (2.74)		- 71 (.56)		.438	-1.24
59	379	.260 (6.14)	- 63 (.14)		-292 (3.50)		-258 (3.07)	.533	-1.46
61	926	.299 (5.32)	-516 (.98)	-331 (2.37)		-107 (.79)		.484	-1.33
61	146	.273 (6.06)	-198 (.38)		- 43 (.81)		-286 (2.88)	.510	- .17
62	- 40	.268 (5.74)	314 (.72)	-310 (2.00)		-193 (1.30)		.467	- .93
62	-399	.323 (6.94)	266 (.66)		- 44 (.71)		-362 (3.37)	.537	- .13

(t-statistics in parenthesis)

I = intercept

Demand for Time Deposits at Commercial Banks

49 State Sample

One-Stage Least-Square Estimates

Year	I	Y_p	$\frac{Y}{Yp}$	$\frac{rs}{rt}$	$\frac{rsm}{rt}$	$\frac{SL}{CB}$	$\frac{SLM}{CB}$	R^2	$\varepsilon(TD,Yp)$
63	718	.285 (4.92)	-400 (.37)	-336 (2.06)		-175 (1.05)		.455	-1.01
63	312	.330 (5.83)	-380 (.36)		-48 (.65)		-410 (3.30)	.516	- .14
64	653	.296 (4.79)	-375 (.42)	-302 (1.78)		-181 (.88)		.422	- .60
64	-255	.368 (5.82)	128 (.15)		-45 (.53)		-500 (3.11)	.490	- .09

(t-statistics in parenthesis)

I = intercept

Demand for Time Deposits at Commercial Banks

38 State Sample

One-Stage Least-Square Estimates

Year	I	Yp	$\frac{Y}{Yp}$	$\frac{rs}{rt}$	$\frac{rsm}{rt}$	$\frac{SL}{CB}$	$\frac{SLM}{CB}$	R^2	$\varepsilon(TD,Yp)$
59	471	.284 (7.99)	-377 (1.08)	-191 (2.16)		-60 (.57)		.723	-.95
59	437	.287 (7.98)	-355 (1.01)		-183 (2.11)		- 85 (.84)	.724	-.92
61	359	.320 (9.14)	-375 (1.00)	-149 (1.16)		-147 (1.35)		.761	-.60
61	349	.323 (9.14)	-365 (.98)		-151 (1.20)		-156 (1.49)	.763	-.60
62	-384	.366 (10.34)	363 (1.26)	-226 (1.99)		-195 (1.66)		.776	-.68
62	-369	.370 (10.38)	356 (1.25)		-236 (2.07)		-206 (1.79)	.779	-.71

(t-statistics in parenthesis)

I = intercept

Demand for Time Deposits at Commercial Banks

38 State Sample

One-Stage Least-Square Estimates

Year	I	Yp	$\frac{Y}{Yp}$	$\frac{rs}{rt}$	$\frac{rsm}{rt}$	$\frac{SL}{CB}$	$\frac{SLM}{CB}$	R^2	$\varepsilon(TD,Yp)$
63	-678	.417 (9.21)	683 (.92)	-337 (3.09)		-192 (1.55)		.774	-1.01
63	-698	.422 (9.24)	703 (.95)		-345 (3.17)		-195 (1.62)	.776	-1.03
64	-105	.418 (8.41)	109 (.18)	-279 (2.48)		-305 (1.96)		.740	- .56
64	-143	.423 (8.30)	139 (.23)		-284 (2.51)		-297 (1.92)	.739	- .57

I = intercept

(t-statistics in parenthesis)

Savings & Loan Shares

49 State Sample

2-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rs}}{rt}$	BP	Yp	$\frac{Y}{Yp}$	ASL	$\frac{SL}{CB}$	R^2
59	SS^d	74334	-42469 (3.18)		3.09 (3.24)	-18066 (3.15)	-2714 (2.77)	13216 (3.28)	.877
59	SS^s	-2377	1758 (4.06)	.181 (.47)					.313
61	SS^d	4735	-3313 (5.35)		.017 (.47)	-119 (.30)	482 (8.91)	885 (6.71)	.854
61	SS^s	-5726	4232 (2.60)	-.775 (1.03)					.175
62	SS^d	6796	-3880 (7.96)		-.132 (3.59)	-1240 (3.78)	730 (11.55)	-451 (2.61)	.920
62	SS^s	3736	-2669 (2.76)	1.33 (3.20)					.194

I = intercept

(t-statistics in parenthesis)

Savings and Loan Shares

49 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rs}}{rt}$	BP	Yp	$\frac{Y}{Yp}$	ASL	$\frac{SL}{CB}$	R^2
63	SS^d	1385	-3166 (4.47)		.119 (2.16)	2136 (2.29)	409 (5.56)	846 (5.62)	.821
63	SS^s	2407	-1813 (1.00)	2.50 (1.78)					.203
64	SS^d	-228	-4312 (3.31)		.270 (4.41)	4519 (3.88)	756 (6.07)	104 (.41)	.858
64	SS^s	-3707	3367 (2.07)	.561 (.54)					.370

I = intercept

(t-statistics in parenthesis)

Savings and Loan Shares

38 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rs}}{rt}$	BP	Yp	$\frac{Y}{Yp}$	ASL	$\frac{SL}{CB}$	R^2
59	SS^d	- 523	328 (1.78)		.032 (1.23)	52 (.24)	311 (7.05)	213 (2.08)	.886
59	SS^s	-1589	1160 (5.57)	1.00 (4.86)					.588
61	SS^d	2519	-2425 (3.52)		.035 (.89)	990 (2.32)	306 (6.37)	798 (5.84)	.851
61	SS^s	-664	615 (.91)	.687 (2.14)					.197
62	SS^d	8047	-4122 (4.98)		-.400 (3.77)	-1623 (3.68)	934 (5.74)	-823 (2.86)	.860
62	SS^s	1777	-1149 (2.17)	.804 (3.37)					.247

I = intercept
(t-statistics in parenthesis)

Savings and Loan Shares

38 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rs}}{rt}$	BP	Yp	$\frac{Y}{Yp}$	ASL	$\frac{SL}{CB}$	R^2
63	SS^d	26223	-14627 (1.69)		-1.28 (1.43)	-5787 (1.33)	1906 (1.74)	455 (2.69)	.815
63	SS^s	779	-427 (.68)	1.26 (2.48)					.368
64	SS^d	-577	-2036 (.46)		.182 (3.88)	2587 (.69)	504 (.92)	51 (.06)	.874
64	SS^s	-372	491 (.71)	1.91 (3.92)					.578

I = intercept

(t-statistics in parenthesis)

Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits

49 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rsm}}{rt}$	BP	Y_p	$\frac{Y}{Y_p}$	ASM	$\frac{SLM}{CB}$	R^2
59	SSD^d	28407	-30094 (2.80)		5.10 (2.86)	8058 (2.74)	-3512 (2.56)	-1537 (1.64)	.780
59	SSD^s	1220	-619 (.65)	.705 (.76)					.015
61	SSD^d	3598	-3689 (3.87)		.277 (3.09)	1147 (1.37)	224 (2.14)	890 (5.00)	.819
61	SSD^s	23137	-16228 (9.24)	6.81 (8.30)					.658
62	SSD^d	4266	-3725 (3.61)		.139 (1.49)	401 (.56)	365 (3.19)	615 (2.21)	.814
62	SSD^s	14295	-10735 (11.32)	3.43 (8.58)					.741

I = intercept

(t-statistics in parenthesis)

Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits

49 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rsm}}{rt}$	BP	Yp	$\frac{Y}{Yp}$	ASM	$\frac{SLM}{CB}$	R^2
63	SSD^d	541	-3644 (3.81)		.321 (3.22)	3117 (2.04)	377 (3.71)	1046 (5.06)	.829
63	SSD^s	18393	-15225 (7.53)	12.4 (7.92)					.578
64	SSD^d	-1304	-5943 (3.74)		.701 (4.87)	6646 (3.70)	612 (4.66)	79 (.18)	.827
64	SSD^s	6058	-4964 (2.44)	5.07 (3.53)					.216

I = intercept

(t-statistics in parenthesis)

Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits

38 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rsm}}{rt}$	BP	Y_p	$\frac{Y}{Y_p}$	ASM	$\frac{SLM}{CB}$	R^2
59	SSD^d	-1368	1077		.014	-176	360	216	.731
			(2.26)		(.22)	(.37)	(3.39)	(.96)	
59	SSD^s	-2769	1964	1.03					.498
			(5.28)	(3.14)					
61	SSD^d	2685	-2895		.030	1370	232	970	.728
			(2.95)		(.44)	(1.98)	(2.76)	(5.11)	
61	SSD^s	688	-315	.863					.096
			(.30)	(1.84)					
62	SSD^d	7865	-4332		.314	-1344	867	-659	.738
			(3.06)		(1.67)	(1.71)	(3.06)	(1.29)	
62	SSD^s	3491	-2445	1.12					.339
			(3.71)	(3.77)					

I = intercept

(t-statistics in parenthesis)

Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits

38 State Sample

Two-Stage Least-Square Estimates

Year	Symbol	I	$\frac{\hat{rsm}}{rt}$	BP	Y_p	$\frac{Y}{Y_p}$	ASM	$\frac{SLM}{CB}$	R^2
63	SSD^d	27622	-15406 (1.51)		-1.35 (1.18)	-6103 (1.07)	2001 (1.51)	462 (1.57)	.764
63	SSD^s	1758	-1231 (1.41)	1.83 (2.59)					.256
64	SSD^d	269	-7088 (1.31)		3.18 (4.09)	7172 (1.55)	1045 (1.56)	-813 (.71)	.790
64	SSD^s	122	88 (.08)	2.07 (2.86)					.373

I = intercept

(t-statistics in parenthesis)

Demand for Time Deposits

One-Stage Least-Square Estimates

51 State Sample

Year	Equation & Symbol											R^2	SEE	(TD,Y)	(TD,ir)
1965	1	TD	=	1569	+	.263 Y	-	677 $\frac{Y}{YP}$	-	776 $\frac{rs}{rt}$	-	90 $\frac{SL}{CB}$	.434	30.8	1.18	-1.55
						(4.23)		(.79)		(2.47)		(.40)				
1966	2	TD	=	1266	+	.361 Y	-	671 $\frac{Y}{YP}$	-	700 $\frac{rs}{rt}$	-	155 $\frac{SL}{CB}$	.717	19.9	1.58	-1.40
						(7.65)		(1.17)		(2.97)		(.92)				
								40 State Sample								
1965	3	TD	=	1799	+	.259 Y	-	967 $\frac{Y}{YP}$	-	663 rt	-	199 $\frac{SL}{CB}$	.397	30.2	1.11	-1.33
						(3.97)		(1.04)		(1.73)		(.50)				
1966	4	TD	=	2795	+	.355 Y	-	1610 YP	-	1056 rt	-	308 CB	.738	18.2	1.48	-2.11

(t- statistics in parentheses)

Equation 1 corresponds to Equation 1 on Table 3-14
Equation 2 corresponds to Equation 1 on Table 3-16
Equation 3 corresponds to Equation 1 on Table 3-15
Equation 4 corresponds to Equation 1 on Table 3-17

Savings and Loan Shares - 1965

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol											R^2
1	SS^d	= 2294 -	2174 $\frac{rs}{rt}$ (1.47)	+ .066 Y (.95)	+ 15.2 $\frac{Y}{Yp}$ (.02)	+ 485 ASL (8.31)	+ 995 $\frac{SL}{CB}$ (4.73)				.830
2	SS^s	= 2943 -	2388 $\frac{rs}{rt}$ (1.12)	+ 2.72 BP (3.71)							.239
					40 State Sample						
1	SS^d	= -2171 +	808 $\frac{rs}{rt}$ (.41)	+ .145 Y (1.85)	+ 876 $\frac{Y}{Yp}$ (.68)	+ 329 ASL (5.27)	+ 634 $\frac{SL}{CB}$ (3.77)				.804
2	SS^s	= 1285 -	923 rt (.65)	+ 2.22 BP (4.67)							.412

(t - statistics in parentheses)

Equation 1 corresponds to Equation 1 on Table 3-18
Equation 2 corresponds to Equation 2 on Table 3-18
Equation 3 corresponds to Equation 1 on Table 3-19
Equation 4 corresponds to Equation 2 on Table 3-19

Savings and Loan Shares - 1966

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol															R^2
1	SS^d	=	-11413	+	6379 $\frac{rs}{rt}$	+	.354 Y	+	2917 $\frac{Y}{YP}$	+	248 ASL	+	939 $\frac{SL}{CB}$		.835
					(4.17)		(5.15)		(3.64)		(3.11)		(4.66)		
2	SS	=	-10966	+	9768 $\frac{rs}{rt}$	+	3.59 BP								.485
					(5.55)		(5.71)								

40 State Sample

3	SS^d	=	- 5912	+	3214 $\frac{rs}{rt}$	+	.084 Y	+	1813 $\frac{Y}{YP}$	+	344 ASL	+	867 $\frac{SL}{CB}$		.778
					(2.60)		(1.59)		(2.31)		(5.38)		(4.12)		
4	SS^s	=	- 4379	+	4006 $\frac{rs}{rt}$	+	2.60 BP								.400
					(2.92)		(4.93)								

(t - statistics in parenthesis)

Equation 1 corresponds to Equation 1 on Table 3-20
Equation 2 corresponds to Equation 2 on Table 3-20
Equation 3 corresponds to Equation 1 on Table 3-21
Equation 4 corresponds to Equation 2 on Table 3-21

Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits - 1965

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol													R^2
1	SSD^d	=	10758	-	6776 $\frac{rsm}{rt}$	+	.116 Y	-	2896 $\frac{Y}{Yp}$	+	148 ASM	+	1901 $\frac{SLM}{CB}$	.836
					(4.32)		(1.32)		(2.09)		(1.39)		(8.41)	
2	SSD^s	=	10647	-	8978 $\frac{rsm}{rt}$	+	3.86 BP							.304
					(3.83)		(3.89)							

40 State Sample

3	SSD^d	=	1990	-	1516 $\frac{rsm}{rt}$	+	.147 Y	-	459 $\frac{Y}{Yp}$	+	304 ASM	+	875 $\frac{SLM}{CB}$	.723
					(.59)		(1.52)		(.26)		(3.75)		(3.75)	
4	SSD^s	=	2705	-	2131 $\frac{rsm}{rt}$	+	2.39 BP							.300
					(1.15)		(3.86)							

(t - statistics in parentheses)

Equation 1 corresponds to Equation 1 on Table 3-22
Equation 2 corresponds to Equation 2 on Table 3-22
Equation 3 corresponds to Equation 1 on Table 3-23
Equation 4 corresponds to Equation 2 on Table 3-23

Aggregated Savings and Loan Shares and Mutual Savings Bank Deposits - 1966

Two-Stage Least-Square Estimates

51 State Sample

Equation & Symbol													R^2
1	SSD^d	=	- 9643	+	4473 $\frac{rsm}{rt}$ (1.11)	+	.311 Y (2.79)	+	3171 $\frac{Y}{Yp}$ (1.54)	+	507 ASM (3.0)	+	1477 $\frac{SLM}{CB}$ (4.87)	.746
2	SSD^s	=	2391	-	1747 $\frac{rsm}{rt}$ (.37)	+	2.22 BP (1.56)							.986

40 State Sample

3	SSD^d	=	- 10835	+	5883 $\frac{rsm}{rt}$ (3.05)	+	.040 Y (.46)	+	3435 $\frac{Y}{Yp}$ (2.76)	+	452 ASM (4.12)	+	1271 $\frac{SLM}{CB}$ (4.86)	.727
4	SSD^s	=	- 4075	+	3764 $\frac{rsm}{rt}$ (2.20)	+	2.55 BP (3.68)							.272

(t - statistics in parentheses)

Equation 1 corresponds to Equation 1 on Table 3-24
Equation 2 corresponds to Equation 2 on Table 3-24
Equation 3 corresponds to Equation 1 on Table 3-25
Equation 4 corresponds to Equation 2 on Table 3-25