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AN EMPIRICAL ANALYSIS OF RISK TAKING BY FIRMS IN THE SAVINGS AND LOAN INDUSTRY

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An Empirical Analysis of Risk Taking by Firms in the Savings and Loan Industry[1]

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Risk taking by individual firms is difficult to evaluate empirically because risky actions and their outcomes are not reported in firms' financial statements. An exception exists in the case of financial institutions which are regulated and insured by government agencies. These agencies collect detailed information about portfolios, earnings, foreclosures, losses, reserves, and write offs from individual firms.

This paper reports preliminary results from a cross-section analysis of risk taking by approximately 4,000 insured savings and loan associations in the United States. Different measures of risk taking are considered in relation to location, corporate form, growth rates, and firm size. In Section 1 the activities and trends in the savings and loan industry are briefly described. A number of measures of risk taking are examined in Section 2. In Section 3 results of single equation regressions and analyses of variance are reported. An experiment with a simultaneous equation model of a savings and loan association is described in the following section. Section 5 summarizes the analysis and suggests hypotheses for future work.

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1. Introduction and Background

Savings and loan associations are financial institutions which acquire savings from the public and lend to the public primarily in the form of mortgages on residential real estate. At the end of 1962 there were about 6,300 savings and loan associations in the United States with total assets of about $94 billion. Of these about 4,350 with total assets of $89 billion were insured by the Federal Savings and Loan Insurance Corporation. In the present study attention is restricted to insured institutions. If an institution is insured it must pay a regular insurance premium on its savings deposits and the first $10,000.00 in each of its savings accounts is fully insured by the Corporation in the event the association fails.

Savings and loan associations represent an important part of the financial picture in the United States. By way of comparison, at the end of December 1962, American commercial banks had $118 billion of demand deposits and $97 billion of time and savings deposits, mutual savings banks had $38 billion of savings deposits, and life insurance companies had total assets of $133 billion.[2]

Table 1-1 shows an aggregate balance sheet for all insured savings and loan associations on December 31, 1962. These institutions, located in all 50 states, are chartered either by the federal government through the Federal Home Loan Bank Board or by individual state banking commissioners. At the end of 1962 there were 1,341 associations with federal charters; by law these are

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2. Federal Reserve Bulletin, June 1963, various pages.

TABLE 1-1 [3]

Balance Sheet of All Insured Savings and Loan Associations

as of December 31, 1962

Assets	(millions of dollars)	Liabilities	
Cash	3,741	Savings deposits	76,590
U. S. Govt. Securities	5,323	FHLB advances	3,426
First Mortgage Loans	75,385	Other borrowed money	124
Other Loans	931	Loans in process	1,983
Other Investments	657	Other liabilities	691
Buildings, Furniture,	1,370	Stock	137
and Fixtures, (net)		Deferred Credits	209
FHLB Stock	1,080	Reserves	5,501
Miscellaneous	844	Surplus	668
Total	89,330	Total	89,330

all "mutual institutions." Mutual institutions are owned directly by savings depositors; depositors select trustees to manage the association. Their management is expected to maximize depositors' welfare subject to legal and "market" (interest rate or demand) constraints. In addition there were 2,391 insured state chartered institutions, of which about 75% were mutuals. The remaining 25% were "stock" institutions which were owned not by depositors but by a group of stockholders who exercised control over management. For stock institutions management is expected to maximize stockholders welfare subject to legal and market restrictions.

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3. Federal Home Loan Bank Board, Combined Financial Statements, Part I, Assets and Liabilities, 1962, p. 14.

The distinction between stock and mutual organizations plays an important role in the following pages. We shall also consider whether federal associations differ from state mutuals and whether associations operating in different states have different operating characteristics.

A remarkable feature of savings and loan associations is their rapid rate of growth in the postwar period. Thus between 1950 and 1960 time and savings deposits in commercial banks grew from $35 billion to $68 billion, savings deposits of mutual savings banks grew from $20 billion to $36 billion, and savings deposits of savings and loan associations rose from $14 billion to $62 billion.[4] At the end of 1965 savings deposits in savings and loan associations amounted to about $110 billion and total assets were about $129 billion.[5] The relation between growth and risk taking is considered below.

A brief survey of institutional practice and regulations will provide a useful backdrop for the subsequent analysis. While regulations and practice vary slightly from state to state the following statements broadly apply to the savings and loan industry. Mortgage loans are made only in an area with a radius of 50 miles from the association's office(s). Approximately 80-90% of the firms' mortgages are conventional mortgages; the remaining 10-20% are federally insured FHA and VA mortgages. Savings and loan associations' mortgages averaged

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4. National Association of Mutual Savings Banks, Mutual Savings Banking, a monograph prepared for the Commission on Money and Credit (Englewood Cliffs: Prentice-Hall, Inc., 1962), p.54.

5. Federal Home Loan Bank Board, "Savings and Mortgage Lending Activities - December 1965," Table 1. This document is a regular monthly press release by the Federal Home Loan Bank Board.

about $20,000 on new homes and $16,000 on existing homes in 1962; these amounts were about 75% of purchase price and both sums had grown about 15% by the end of 1965.[6] The average term of contract of mortgages on new homes is about 24 years and on existing homes is about 20 years. Because people in the United States move about frequently, the average actual maturity of a new mortgage is much shorter, perhaps on the order of 6 or 7 years. Interest rates on new mortgages were about 6.10% at the end of 1962 and fell to about 5.85% at the end of 1965. In addition, when first executing a mortgage, savings and loan associations charge closing fees of around 0.75% of the face value of the mortgage.

Interest rates, fees, terms of contract, and purchase prices vary from area to area in the United States. Thus in December 1965 interest rates on new home mortgages were about 6.15% in Los Angeles and 5.25% in Boston. Fees were 2.10% in Miami and 0.04% in Boston, average term was 29 years in New York and 22 years in Miami, and average purchase price was $20,000 in Miami and about $32,000 in California. Why should such differentials exist at a point in time?

There are really two quite distinct explanations. First, the housing market may not be in equilibrium at any point in time. Even though life insurance companies, savings banks, and other national institutions are presumably buying mortgages where yields are highest, they may not be large enough to even out regional variations. Savings and loan associations, as noted above, are restricted to lending in their own immediate area. If this disequilibrium hypothesis is

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6. Federal Home Loan Bank Board, "Home Mortgage Interest Rates and Terms," March, 1963 and November, 1965. This document is a regular monthly press release by the Federal Home Loan Bank Board.

accepted, over time there should be widely different growth rates of savings flows and mortgage lending which are closely related to regional variations in interest rates. Evidence in support of this hypothesis is presented in Sections 3 and 4 of this paper.

Second, financial contracts are multidimensional. If we assume that in all regions individuals have the same "credit worthiness," then variations in one of the terms of lending would be accompanied by variations in some other terms of lending if the multidimensional mortgage is to be equally acceptable to some group of investors.[7] In this view regional variations in terms of lending are quite compatible with the hypothesis that an economy is in equilibrium. To be sure, the reasons for the existence of regional variations need to be explained but there is no reason why high interest rate areas need grow faster than other areas. This hypothesis is considered briefly in Section 3.

Finally foreclosure rates are reported quarterly for different areas and types of mortgages by the Federal Home Loan Bank Board.[8] They vary widely across the country. The number of foreclosures divided by the outstanding number of mortgage loans averaged 0.57% for the United States for the year ending January 30, 1965. On the west coast (California, Nevada, Arizona, Oregon, Washington, etc.) the foreclosure rate was 1.06%; in the eastern and middle western sections of the country the rate was about 0.41% during the same period.

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7. Donald Hester, "An Empirical Examination of a Commercial Bank Loan Offer Function," Yale Economic Essays, Volume 2, No. 1, (Spring 1962), pp. 1-57.

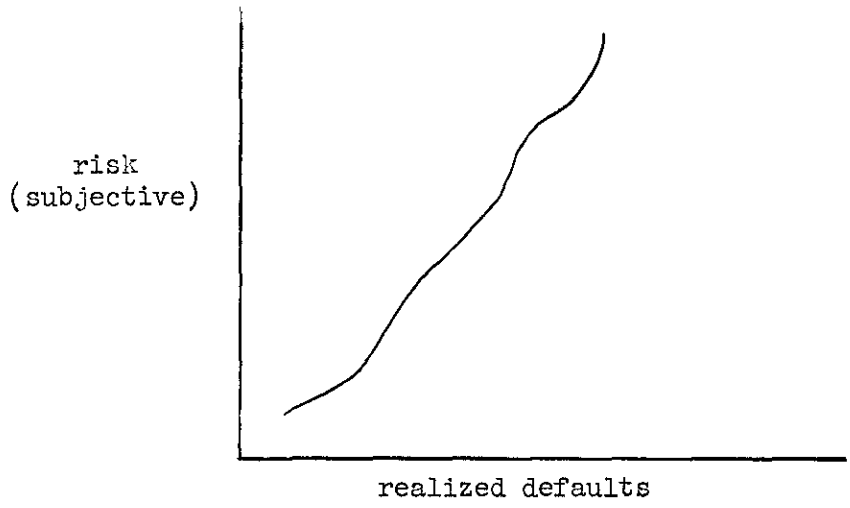
8. A foreclosure is simply a legal action which extinguishes a mortgagor's right to mortgaged property. Foreclosure and loss rates are likely to be closely related.

2. Measures of risk taking.

Before discussing measures of risk taking, the nature of risk itself must be considered. A decision maker typically exposes himself, subjectively at least, to possible losses when maximizing his objective function. Risk or uncertainty in this paper is assumed to be some unspecified function of his set of possible losses; it could be a semi-variance, expected loss, or some other moment of this distribution of losses. Unfortunately, there is very little basis for preferring any single functional form. There is a further problem that we cannot observe what the decision maker's subjective estimate of losses is at any point in time. Consequently for purposes of empirical analysis a crude pragmatic approach must be used.

A basic condition necessary for the subsequent empirical analysis is that differences in risk taking can be inferred from observable differences

FIGURE 2-1



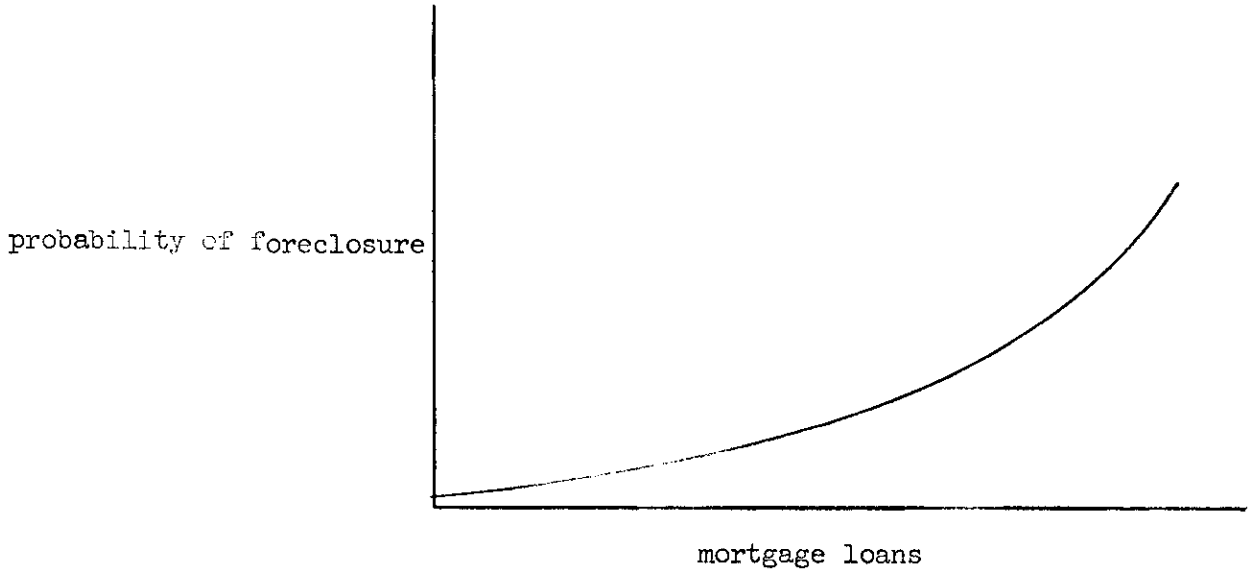
in either actual foreclosure experience or differences in balance sheets and income statements. Specifically, the assumption is that risk is on average a monotonic function of foreclosures experienced and the values of certain balance sheet ratios. Figure 2-1 suggests what this means when mortgage foreclosures are analyzed.

To be sure, an assumption of monotonicity is by no means empty! It is embarrassingly easy to construct plausible examples where the assumption is not satisfied. For example, in the Markowitz quadratic programming portfolio selection model, the correlation between expected losses and risk need not be positive.[9] What is the justification for the assumption in this example? In Figure 2-2 all possible mortgage loans in some community have been ordered according to the expected probability that they will be foreclosed, conditional on a specific forecast about the future prosperity of the community. A savings and loan association probably attempts to rank prospective borrowers similarly. There are two reasons for believing that an institution's subjective evaluation of risks will be a monotonic function of observed average foreclosure rates. First, if associations are able to distinguish between good and poor mortgage loans then a correspondence between subjectively expected and actual foreclosures will exist. Second, if the assumption about the community's economy proves faulty, the curve shifts more in absolute terms for loans with higher expected rates of default. The same factors which make certain individuals have high default rates -- e.g., youthfulness, lack of education, poor previous credit experience, and discrimination -- will also

9. Markowitz, H. M., Portfolio Selection: Efficient Diversification of Investments, New York: John Wiley and Sons, 1959.

make them more vulnerable to cyclical fluctuations in employment.

FIGURE 2-2



Consequently, if different associations serve the same or similar markets, those institutions experiencing higher foreclosure rates are likely to be consciously taking more risks in mortgage lending. A similar defense can be constructed for other measures of risk considered below. These "ordinal" measures of risk are convenient for empirical analysis, but they raise other serious problems of interpretation when comparing associations' willingness to take risks. First, precisely what objective function is an individual savings and loan association maximizing? Some measures of risk which will be proposed may not concern certain institutions. Other measures may relate monotonically to actual risk, but the relation may not be linear. In such cases, tests of hypotheses using the proposed measures will be very weak. Knowledge of the actual objective function would permit more powerful tests of risk taking hypotheses.

Second, when two or more measures of risk are available and contradict each other when applied to two associations, it will not be possible to state unambiguously which association is more willing to accept risks. If all measures point in the same direction there is no problem. An attempt will be made to evaluate informally and qualitatively the significance of different measures at the end of this paper.

a. Measures

(1) Foreclosure rate -- concerns willingness to make marginal risky loans. This is the value of mortgages foreclosed in some period as a percentage of the value of mortgage loans outstanding. The foreclosure rate will be examined for all mortgage loans and for conventional mortgage loans. FHA and VA insured mortgage loans are not included in conventional loans. Because associations should not care about losses on these insured loans it is expected that study of conventional loans will produce sharper evidence.

(2) Ratio of capital and reserves to assets -- concerns willingness to protect the solvency of the association against a general collapse of the local mortgage market. This measure is very difficult to interpret because of existing tax laws in the United States which allow savings and loan institutions to pay no tax on retained earnings allocated to reserves so long as reserves do not exceed 12% of savings deposits. Nevertheless, a low ratio is interpreted to imply a greater willingness to take risks.

(3) Ratio of foreclosures to capital and reserves -- a measure combining (1) and (2) above. A high ratio implies greater willingness to take risks.

(4) Ratio of borrowing to total assets -- concerns willingness to protect the solvency of the association against general collapse of the local mortgage market by avoiding excessive leverage. Borrowing may be from the Federal Home Loan Bank Board or other financial institutions. A high ratio implies a greater willingness to take risks.

(5) Ratio of real estate owned to assets -- a measure concerning the amount of funds tied up in reacquired real estate. Such real estate may not be salable and thus represents possible inflation of capital and reserves. Real estate owned does not include the value of the firm's office. A high ratio implies a greater willingness to take risks.

(6) Ratio of loans minus capital and reserves to savings deposits -- a rough measure of illiquidity. This measure would be important in the event of a major loss of savings deposits. A high ratio implies a greater willingness to take risks.

These measures of risk taking will be considered intensively in the next section. There are, of course, other measures of risk which could, in principle, be studied. Unfortunately data are not available for examining them in the present paper.

b. Data

The Federal Home Loan Bank Board regularly collects income statements, balance sheets, and foreclosure data from associations which belong to the Federal Home Loan Bank System. In this study income and balance sheets for the years 1961-63 and foreclosure information for the years 1962-64 are studied. Only the 4,220 insured firms which reported income statements and balance sheets for each of the three years and foreclosure information between the third quarter of 1962 and the first quarter of 1964 are included in the sample. At the end of 1962 there were 4,332 such institutions in existence. The 112 associations which were excluded either merged, collapsed, changed charters, closed, or came into existence some time during the years 1962-64. In addition 70 of the 4,220 firms had income or balance sheets which were very untypical in some respects and were excluded.

The majority did not have complete foreclosure reports. Other firms which grew at rates in excess of 500% per annum were excluded because they often yielded estimated rates of return on either savings deposits or mortgages which were far out of line with actual interest rates and may have been the result of mergers. Interest rates on savings deposits were computed by dividing interest paid on savings deposits by the average value of successive year end savings deposits. In addition a small number of other firms, typically with high growth rates, had computed interest rates which deviated from national averages by more than 2% and were excluded from the sample on the grounds that they represented measurement errors.

Of the included banks, 518 have stock charters, 1,747 have state mutual charters, and 1,885 are federally chartered mutual associations. The mean age of associations in the sample is 44 years; their average annual rate of growth in 1962 was 19% and in 1963 it was 16%. Foreclosure rates on conventional loans were about 0.40% per year in 1962 and 0.49% per year in 1963. The average annual interest rate earned on mortgage loans was 5.81% in both years; the average annual interest rate paid on savings deposits was 3.98% in 1962 and 4.04% in 1963. At the end of 1963, capital, reserves and surplus averaged 6.87% of total assets; real estate owned was 0.35% of total assets; and borrowed money was 3.42% of total assets.

In Table 2-1 variables concerning individual associations studied in this paper are defined and assigned symbolic equivalents. If a numerical subscript is associated with a symbol it refers to the last digit of the corresponding year, 1961, 1962, or 1963.

TABLE 2-1

Symbol	Definition
ST	Dummy variable having value of unity if association is stock chartered, zero otherwise.
MU	Dummy variable having value of unity if association has state mutual charter, zero otherwise.
RM	Interest rate earned on mortgages, annual, in percent.
RS	Interest rate paid on savings deposits, annual, in percent.*
LA	Natural logarithm of an association's total assets at year end; assets are measured in thousands of dollars.
YR	Length of time in years since date of incorporation.
SD	Average savings deposits, measured in thousands of dollars by averaging the value of successive year end savings deposits.
GR	Annual rate of growth, in percent, measured for year t by $(SD_t - SD_{t-1})/SD_{t-1}$.
CF	Quarterly foreclosure rate of conventional mortgages, the value of foreclosures of conventional mortgages as a percentage of the average value of an association's conventional mortgages. It is computed for year t by summing the values of foreclosures in the fourth quarter of year t and the first quarter of year $t + 1$ and dividing by twice the year end value of conventional mortgages.
TF	Quarterly foreclosure rate of all mortgages, the value of all foreclosures as a percentage of average value of an association's mortgages, computed in the same manner as CF.

* For stock associations the distinction between interest paid on deposits and cash dividends on capital is not observed. Hence estimates of RS are positively biased. Most stock firms paid no or small dividends; subsequent conclusions about RS are believed to be correct.

Symbol	Definition
FC	Quarterly value of all foreclosures as a percentage of year end capital, reserves, surplus, and undistributed profits. Foreclosures are summed over the months October through March and divided by twice the year end capital, reserves, etc.
LQ	Year end loans minus capital, reserves, surplus and undistributed profits in year t divided by average savings deposits at the end of year t .
CA	Year end capital, reserves, surplus, and undistributed profits as a percentage of year end total assets. It is computed by dividing the average value of the numerator in months October through March by the corresponding average value of the denominator.
OA	Year end real estate owned as a percentage of total assets, computed in same manner as CA.
BA	Year end borrowed money as a percentage of total assets, computed in same manner as CA.
ZI	Dummy variable equals unity if firm is in state I, zero otherwise. All states having 28 or more institutions have an associated dummy variable. There are 34 such states.

3. Single Equation Results

In this section two aspects of risk taking by savings and loan associations are examined. Part a) is concerned with testing hypotheses about what characteristics of associations are related to risk taking. Part b) examines whether or not associations are compensated for bearing risks. This part also considers whether the industry has in some sense been in equilibrium in recent years.

a. Characteristics of risk taking institutions. At the end of Section 1, it was observed that pronounced regional variations exist in statistics of the savings and loan industry. These variations may be associated with disequilibrium in the industry or with variations in asset quality in different areas of the nation. A neutral procedure is to allow for these variations among states with the 34 dummy variables, ZI, while studying the relationship between measures of risk taking and association characteristics. Consequently, empirical results reported in this part should be understood always to have been estimated with individual state effects eliminated. Coefficients of the ZI are not reported in Part a), but some are reported in Part b) of this section.

Five hypotheses about characteristics of risk taking firms are tested below. They are:

1. The form of charter of an association is related to its willingness to take risks; stock associations take more risks.
2. Large associations take more risks than smaller associations.
3. Associations earning high interest rates on mortgages will take more risks than associations earning lower rates.
4. Older institutions take fewer risks than young associations.
5. Rapidly growing associations take more risks than those which grow more slowly.

Hypothesis one is based on a view that stockholders are more effective in controlling managers in stock associations than are depositors in mutual associations. This greater influence derives from their smaller number and from the fact that managers are probably stockholders as well. Stockholders are assumed to value return more in relation to risk than is the case of depositors

or managers of mutual associations. Common stock is held primarily for income in an investor's portfolio, insured savings deposits represent a desire for both income and safety. State and federally chartered mutuals may also exhibit different degrees of risk taking; state and federal laws and examination practices may vary. However one would expect these differences to be small in relation to those associated with the stock-mutual dichotomy.

Hypothesis one is tested with the two dummy variables, MU and ST, which refer to state mutual and state stock associations. Coefficients of these variables measure the deviation of measures of risk taking from federally chartered mutual organizations. For purposes of comparison, the intercept of a regression equation which included the unreported 34 dummy state variables, ZI, and the variables studied in the hypothesis is reported opposite the word "Federal." This procedure is repeated in tests of the other hypotheses.

In Table 3-1 hypothesis one is accepted in seven of the eight tests performed. Stock companies experienced higher foreclosure rates, were less liquid, borrowed more money, and held more reacquired property. They also tended to have a lower capital/asset ratio but this was not statistically significant. State mutual associations had about the same foreclosure pattern as the federally chartered mutuals. They appear more conservative in their portfolio ratios; in three of the four ratios they were taking fewer risks than federals. They did tend to have more reacquired property than federals but much less than stock associations. Apparently organizational form is very critical in determining willingness to accept risks. Because of this result

TABLE 3-1

Hypothesis 1

		CF_2	CF_3	TF_3	FC_3	CA_3	OA_3	BA_3	LQ_2
a)	Federal	.0646	.1303	.1443	2.1847	6.5572	.2609	4.3594	.9268
b)	MU	.0104	.0212	.0137	.0469	.1984*	.0542*	-.4195*	-.0130*
		(.0088)	(.0128)	(.0129)	(.2361)	(.0796)	(.0266)	(.1330)	(.0030)
c)	ST	.0730*	.1262*	.1189*	1.2481*	-.1225	.3090*	1.3715*	.0118*
		(.0143)	(.0208)	(.0210)	(.3837)	(.1296)	(.0432)	(.2161)	(.0049)
	R	.268	.293	.283	.238	.274	.399	.339	.332
	F	8.841*	10.710*	9.929*	6.874*	9.290*	21.602*	14.834*	14.123*
	Su	.235	.343	.347	6.326	2.137	.712	3.563	.0805

Hypothesis 2

		CF_2	CF_3	TF_3	FC_3	CA_3	OA_3	BA_3	LQ_2
a)	Federal	.0491	.0949	.0286	2.2395	5.4386	.0509	2.1625	.8265
b)	MU	.0114	.0235	.0211	.0434	.2704*	.0677*	-.2782*	-.0066*
		(.0090)	(.0132)	(.0133)	(.2431)	(.0820)	(.0273)	(.1366)	(.0031)
c)	ST	.0735*	.1274*	.1226*	1.2463*	-.0869	.3157*	1.4413*	.0150*
		(.0143)	(.0209)	(.0211)	(.3848)	(.1298)	(.0433)	(.2162)	(.0048)
d)	LA	.0016	.0036	.0118*	-.0056	.1145*	.0215*	.2249*	.0103*
		(.0034)	(.0050)	(.0050)	(.0916)	(.0309)	(.0103)	(.0515)	(.0012)
	R	.268	.293	.285	.238	.280	.400	.345	.356
	F	8.606*	10.434*	9.822*	6.686*	9.438*	21.153*	15.012*	16.138*
	Su	.235	.343	.346	6.327	2.134	.711	3.555	.0797

* An asterisk indicates the parameter is significantly different from zero with probability of error of .05.

TABLE 3-2

Hypothesis 3

		CF_3	TF_3	FC_3	CA_3	OA_3	BA_3
a)	Federal	-.0732	.1672	1.3067	7.6707	-.2353	2.1845
b)	MU	.0193 (.0128)	.0139 (.0130)	.0386 (.2367)	.2089* (.0799)	.0495 (.0266)	-.4400* (.1333)
c)	ST	.1203* (.0210)	.1196* (.0212)	1.2224* (.3871)	-.0899 (.1307)	.2945* (.0435)	1.3078* (.2179)
d)	RM_2	.0359* (.0166)	.0040 (.0168)	.1585 (.3061)	-.1964 (.1034)	.0875* (.0344)	.3836* (.1723)
	R	.295	.283	.238	.276	.400	.341
	F	10.556*	9.660*	6.694*	9.142*	21.221*	14.581*
	Su	.343	.347	6.326	2.136	.711	3.561

Hypotheses 4 and 5

		CF_3	TF_3	FC_3	CA_3	OA_3	BA_3
a)	Federal	.1510	.1798	2.0134	9.1766	.5505	4.5309
b)	MU	.0227 (.0130)	.0164 (.0131)	.1408 (.2355)	.0927 (.0643)	.0551* (.0270)	-.3324* (.1339)
c)	ST	.0684* (.0220)	.0658* (.0222)	-.6502 (.3988)	1.3773* (.1089)	.2606* (.0457)	.5846* (.2268)
d)	YR	-.00026 (.00022)	-.00036 (.00023)	-.0102* (.0040)	.0095* (.0011)	-.0007 (.0005)	-.0111* (.0023)
e)	$GR^{<0}$	-.0292 (.0226)	-.0244 (.0229)	-.1734 (.4102)	-.2096 (.1120)	-.0537 (.0471)	-.1221 (.2333)
f)	$GR^{0,10}$	-.0025 (.0029)	-.0034 (.0030)	-.0028 (.0533)	-.2379* (.0145)	-.0293* (.0061)	-.0124 (.0303)
g)	$GR^{10,20}$	-.0009 (.0011)	-.0012 (.0011)	.0200 (.0193)	-.1047* (.0053)	-.0013 (.0022)	.0486* (.0109)
h)	$GR^{20,30}$	+.0009 (.0011)	.0007 (.0011)	.0102 (.0207)	-.0162* (.0057)	.0016 (.0024)	.0214 (.0118)
i)	$GR^{30,40}$	+.0030* (.0010)	.0029* (.0010)	.0747* (.0174)	-.0188* (.0048)	.0024 (.0020)	.0078 (.0099)
j)	$GR^{>40}$	+.0005* (.0002)	.0005* (.0002)	.0198* (.0036)	-.0019 (.0010)	.0006 (.0004)	-.0021 (.0021)
	R	.321	.309	.323	.653	.412	.378
	F	10.996*	10.115*	11.093*	70.939*	19.514*	15.894*
	Su	.340	.344	6.170	1.685	.708	3.510

* An asterisk indicates the parameter is significantly different from zero with probability of error of .05.

MU and ST will be included in regressions which test the remaining hypotheses.

Hypothesis two is based on an application of the law of large numbers. If firms are risk averse, they should be less willing to expose themselves to risk when they are small; they unavoidably have less portfolio diversification. Specifically although average mortgage size tends to increase with size of association, it does so less than proportionately. Therefore, if all firms are equally competent at judging mortgage quality and equally risk averse, small firms should experience fewer foreclosures. Alternatively they should have more capital and less borrowing and reacquired property in relation to their total assets. They should have a more liquid portfolio.

In Table 3-1 tests of hypothesis two are reported and are judged to be weakly favorable to the hypothesis. Large associations do experience more mortgage foreclosures, but comparison of CF_3 and TF_3 suggests that they are only in federally insured FHA and VA mortgages. Large firms also have a higher ratio of capital and reserves to assets contrary to the hypothesis. However, large associations do have more reacquired assets, more borrowed money, and less liquidity. The operation of the law of large numbers apparently does not affect standards on individual mortgage loans; it does induce larger institutions to operate with more borrowed funds and to place a larger percentage of their funds in high yielding, less liquid mortgage loans.

Hypothesis three argues that when mortgage interest rates are high, associations are more likely to be taking risks. First, associations can only be induced to absorb risky loans with higher loan rates. This argument implicitly recognizes the joint endogeneity of foreclosures, interest rates, and rate of growth. Second, when mortgage rates are high associations will tend to borrow funds. This occurs because rates at which associations borrow funds are lower than average mortgage rates.

In Table 3-2 coefficients appear to support the hypothesis. Coefficients of RM_2 suggest that conventional foreclosures, borrowing, and reacquired property are higher when mortgage interest rates are high. The evidence is not strong; high interest rates appear to induce associations to reach for debt and for more unsafe loans.

Hypothesis four suggests that older associations take fewer risks. This behavior may be a consequence of the battle for survival experienced by most associations during the depression. Older associations may simply be staffed by older and more conservative individuals who weigh safety more heavily in relation to return than is true of their adventurous younger counterparts. In Table 3-2 the hypothesis is not supported when examining foreclosure experience; conventional and total foreclosure rates are lower but not significantly so. However, the coefficients of YR in the FC_3, CA_3, and BA_3 regressions are significant in conformity with the hypothesis. On the basis of these results the hypothesis is tentatively accepted.

Hypothesis five argues that risk taking is more likely to be observed when firms are growing rapidly. Firms which grow very rapidly have a young,

less mature mortgage portfolio. If an individual has met monthly payments for some time on his mortgage, he has proved himself to be somewhat financially responsible. A large proportion of mortgage holders have not passed this weak test and hence are probably on average more risky in the case of rapidly growing associations. Further, the relation between growth and foreclosures is not likely to be linear. High growth associations are located in high growth areas where job turnover is correspondingly high; risk is likely to rise more than proportionately with growth. Also, high growth institutions will not conveniently be able to generate capital and reserves as fast as deposits and thus CA will tend to decline.

Hypothesis five will be tested by estimating a piecewise linear relation between risk measures and growth rates. The relation is estimated so that segments intersect at growth rates of 0%, 10%, 20%, 30%, and 40% per annum. Slopes of these linear segments are reported in Table 3-2 where superscripts on GR define the relevant range of the growth rate. The growth rate is the average annual rate of growth of an institution between 1961 and 1963. The relations between measures of risk and foreclosures are drawn in Figures 3-1 and 3-2. For growth rates of 30% or more foreclosure rates are significantly related to growth as hypothesized. The ratio of reserves and capital to assets is negatively related to GR and is significant for all but the two open ended intervals. On the basis of these results the hypothesis is accepted.[10]

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10. Extreme values for coefficients of GR^{-} apparently are a consequence of a small number of associations which collapsed in 1963.

FIGURE 3-1

Various Risk Measures Versus Annual Average Growth Rate

(All Other Variables Valued at Zero)

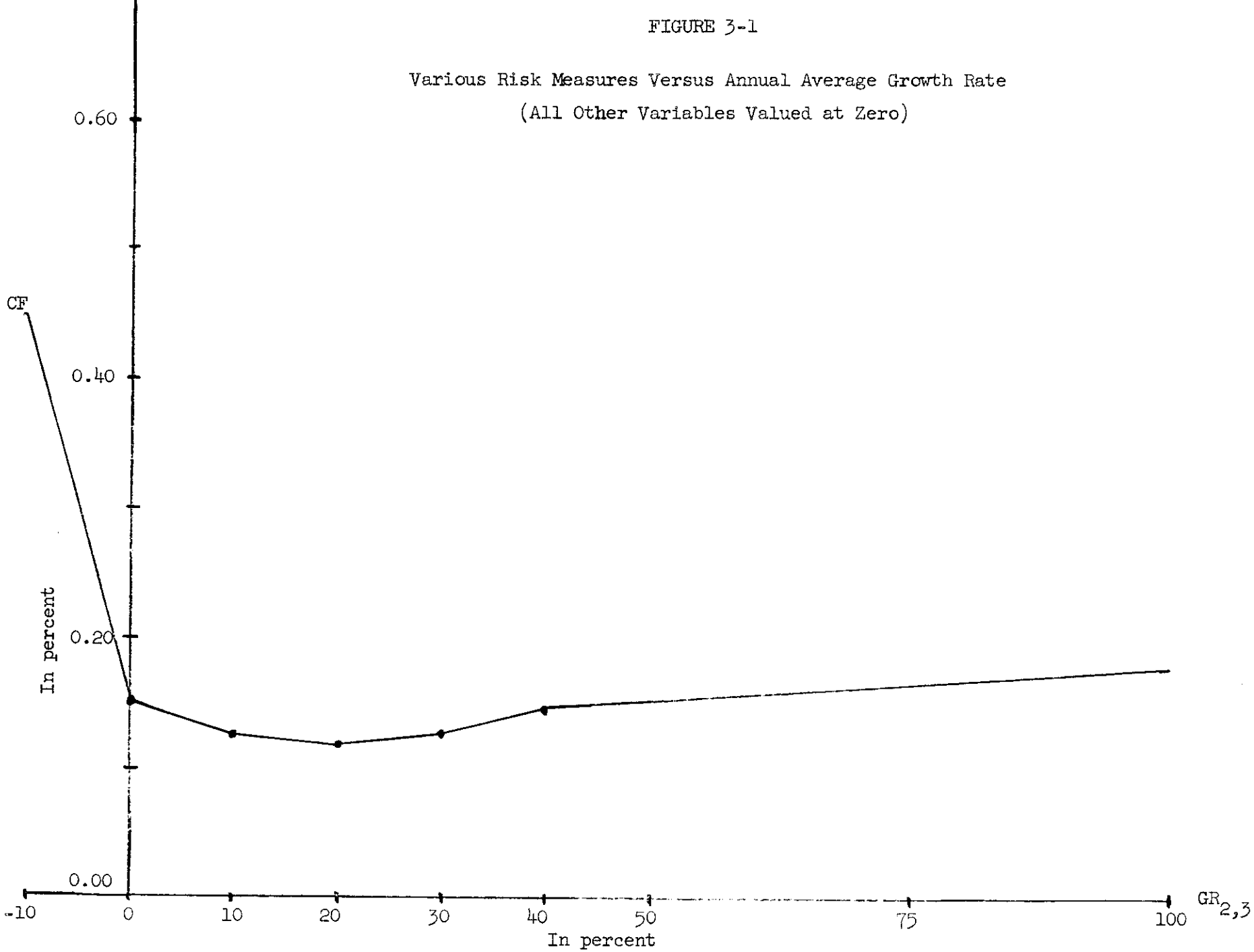
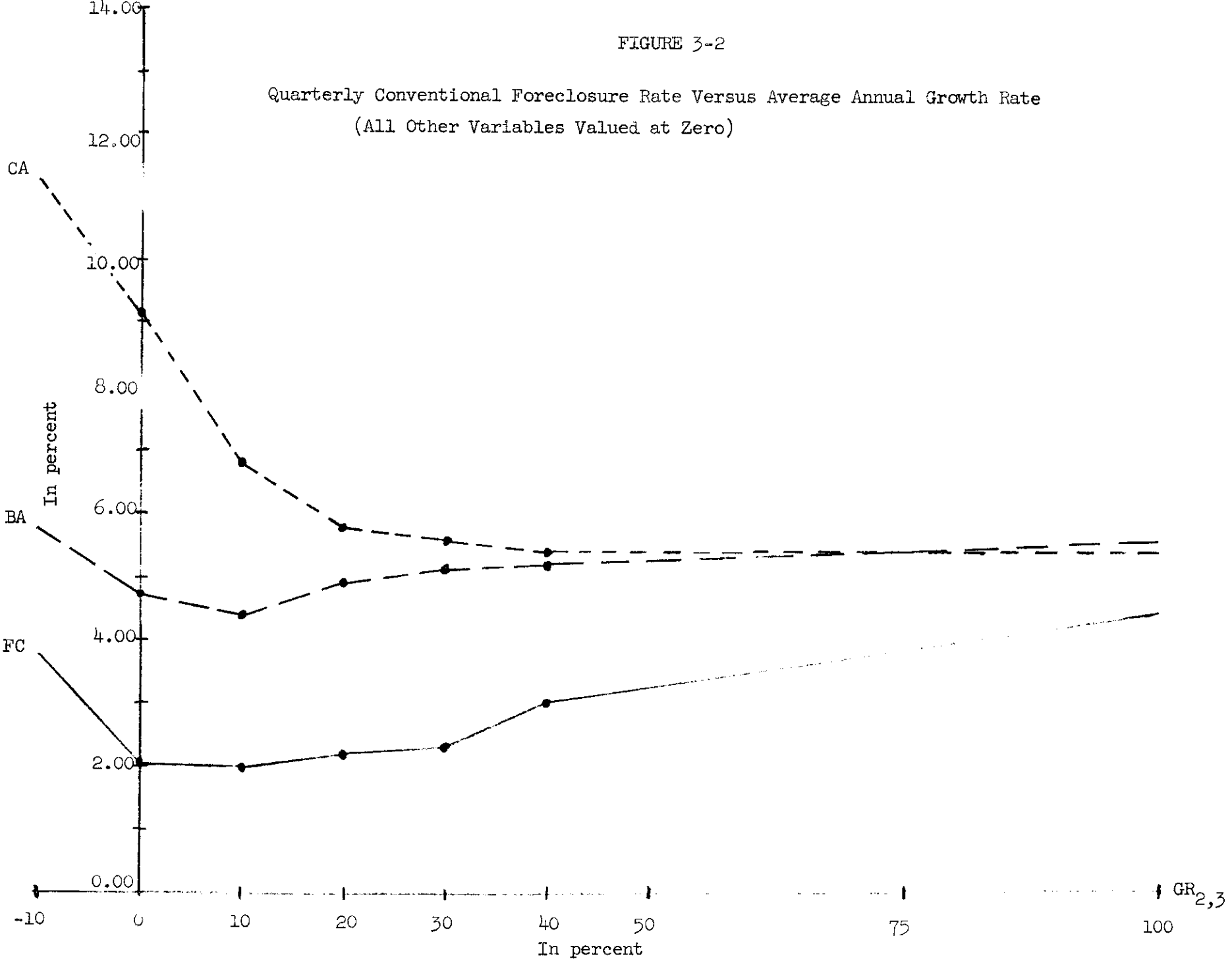


FIGURE 3-2

Quarterly Conventional Foreclosure Rate Versus Average Annual Growth Rate
(All Other Variables Valued at Zero)



It should be noted that in foreclosure equations the highly significant coefficients of ST , the dummy variable for stock associations, are reduced by about 50% when growth is taken into account. In the next section it is seen that stock associations do indeed have very high rates of growth. Nevertheless, even after allowing for growth, stock companies appear more risky in the CF, TF, OA, and BA regressions. In the CA regression, where ST previously had an insignificant negative coefficient, stock associations now appear to have high ratios of capital and reserves to assets. This pattern is repeated in the FC regression where the coefficient of ST is insignificantly negative. Apparently risk taking in stock associations does not extend to operating with little capital once growth is taken into account. Rather stock associations exhibit relatively strong capital and reserve positions when compared to mutual associations.

One other experiment concludes this analysis of the characteristics of risk taking associations. If an association has a large number of conventional foreclosures in 1962, will it tend to have an equally large number in 1963? Holding constant location and organization form, the coefficient of CF_3 on CF_2 was 0.3382 with a standard error of 0.0221. Thus high foreclosure associations tend to remain high foreclosure institutions although there is significant evidence of improvement. A bad foreclosure experience probably reduces an association's appetite for risk taking.

b. Rewards for risk taking?

In Section 1 large variations in rates of return, foreclosures, etc., were reported in different regions of the United States. Two competing

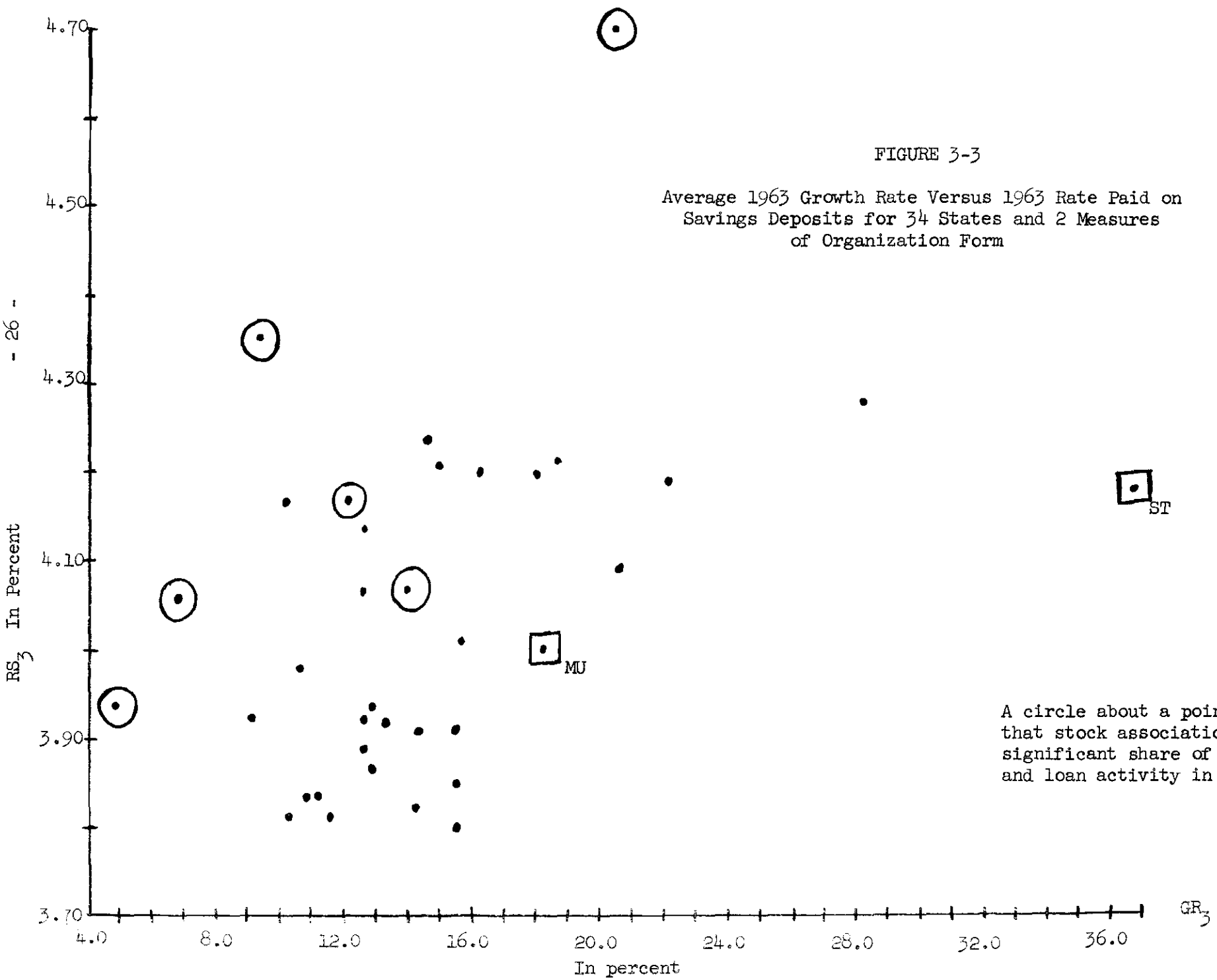
hypotheses were suggested to account for this phenomenon. First, risks were different in various areas and variations in terms of lending (including interest rates) were simply a consequence of regional variations in risk. In this view high interest rates should be related to different measures of risk, but the partial correlation between rates of return and growth should be negligible.

The second hypothesis argues that the industry is in disequilibrium. High interest rates will be associated with high growth rates but the partial correlation between measures of risk taking and interest rates should be negligible. Figure 3-3 suggests that indeed wide variations in both average rates of return to depositors and average growth rates exist in different states. RS_{63} and GR_{63} were regressed on ZI's, ST and MU. Coefficients of the ZI, ST, and MU are plotted in the figure; the intercept has been added to each coefficient so the axes show annual rates of growth and rates of return to savers, both measured in percent.

There does appear to be a positive relation between RS_{3} and GR_{3}, except in a group of states which are encircled, and stock associations grow much faster than mutuals. The encircled states are precisely those where stock associations are prominent. Apparently the presence of stock associations causes mutual associations to grow much more slowly in relation to their rate of interest paid on savings than they otherwise would. Alternatively when stock and mutual associations are placed together, stock associations compete very effectively causing mutual associations to have lower than expected rates of growth.

FIGURE 3-3

Average 1963 Growth Rate Versus 1963 Rate Paid on Savings Deposits for 34 States and 2 Measures of Organization Form



A circle about a point indicates that stock associations have a significant share of the savings and loan activity in that state.

Why should this pattern obtain? Stock associations do have higher advertising outlays than mutuals and also earn higher rates of return on mortgages and pay higher rates on deposits. In the previous part of this section, a conclusion was that the stock form of organization was more willing to run risks; it may also aspire more strongly for growth. It is possible, but most unlikely, that this result is a statistical artifact. There were a very small number of mergers primarily among stock associations during the years 1962-63. There was no way to exclude them from the sample; it is very implausible that this small number could account for the great observed difference in the growth of stock and mutual associations.[11]

To see which of these two hypotheses better characterizes the American savings and loan industry, three experiments were performed. First, mean values of CF_3, CA_3, BA_3, OA_3, LQ_2, GR_3, RM_3, and RS_3 were obtained for each of 35 geographical areas distinguished in this study, i.e., the 34 states having associated dummy variables and a 35^{th} area consisting of the rest of the United States. Using these areas as observations, each of the two interest rates were regressed on: 1) all the risk measures and growth variables, 2) only the risk measures, and 3) only the growth variables. Results of this experiment are reported in Table 3-3.

The only consistently significant variable was GR_3, the rate of growth of savings deposits; the rate of growth of savings deposits is

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11. About 15.0% of all associations in the sample experience growth rates of 30% or more in either 1962 or 1963. Roughly, 40% of these were stock companies even though only about 12.5% of the total sample was stock chartered.

TABLE 3-3

Experiment One

	RM_3	RS_3	RM_3	RS_3	RM_3	RS_3
Intercept	5.605	2.283	5.344	3.613	10.127	5.202
LQ_2	-.794	1.500	--	--	-4.700*	-1.021
	(2.080)	(1.590)	--	--	(2.163)	(1.576)
CF_3	.626	.920	--	--	2.498*	2.128*
	(.873)	(.667)	--	--	(.862)	(.627)
CA_3	.073	.014	--	--	-.056	-.070
	(.062)	(.047)	--	--	(.062)	(.045)
OA_3	-.273	-.086	--	--	-.454	-.203
	(.238)	(.182)	--	--	(.280)	(.204)
BA_3	-.041	-.029	--	--	.037	.021
	(.047)	(.036)	--	--	(.051)	(.037)
GR_3	.036*	.023*	.030*	.027*	--	--
	(.010)	(.007)	(.006)	(.005)		
R	.745	.779	.648	.720	.577	.683
F	5.834*	7.213*	23.869*	35.606*	2.890*	5.075*
Su	.184	.141	.194	.144	.222	.161
N	35	35	35	35	35	35

TABLE 3-4

Experiment Two

	12/65	12/64
Log_ϵ of Per capita income	1.0	1.0
correlation	.699	.329
Log_ϵ RM	-2.058	-.571
Log_ϵ FEE	.090	.010
Log_ϵ MAT	.387	-.322
Log_ϵ L/P	.066	.484
Log_ϵ PRICE	.535	.475
N	18	18

* An asterisk indicates the parameter is significantly different from zero with probability of error of .05.

positively related to interest rates in conformity with the second hypothesis. The partial correlation between risk variables (considered individually or collectively) and interest rates, given the rate of growth, is not significantly different from zero. Hypothesis two is accepted and hypothesis one is rejected. The significant correlation between CF_3 and interest rates in the last two columns of the table is a consequence of the previously noted correlation between GR and CF . This result means that if two associations with the same rate of growth have different foreclosure rates, the association with the higher foreclosure rate is not compensated for its additional risks. However, associations with high growth rates have high interest rates and high foreclosure rates, risk taking related to growth is partly compensated for.

The second experiment consisted of looking at terms of lending which were observed in eighteen metropolitan areas of the United States. The first hypothesis implies that for individuals of a given credit worthiness variations in rates of return should be matched by variations in other terms of lending. The model is a canonical correlation argument where only one variable, per capita gross income, is related to a set of loan terms. The terms are RM, the interest rate on new mortgages; FEE, the closing fees assessed by an association; MAT, the average term of contract on new loans; L/P, the average ratio of a mortgage loan to the purchase price of a new house; and PRICE, the average purchase price of a new house. The variables L/P, MAT, and perhaps PRICE should measure risk and consequently have signs opposite to RM in the equation. FEE should have the same sign as RM . The expression, reported in Table 3-4, was estimated with a standard regression package in which the dependent variable was per capita gross income in the corresponding

metropolitan area as recorded in 1959 income tax returns.[12] Signs conform to a priori expectations in the case of PRICE, L/P, and RM, but coefficients are so erratic in 1964 and 1965 that the results are not interesting.

Given the results in Table 3-3, an attempt was made to measure the rewards for risk taking using individual associations as observations and including the dummy variables, ZI, in the hope that it would be possible to find some compensation for bearing risks which are not related to growth. The results are reported in Table 3-5.

Coefficients of GR_3 in Table 3-5 reinforce the previous conclusion that high rates of growth and associated risks are compensated for by higher earnings on mortgage loans and savers are compensated for these risks with higher interest payments on savings deposits. The coefficient of LQ_2 suggests that savers are compensated for higher illiquidity of an association with higher interest payments on deposits. Interestingly associations which are less liquid appear to earn slightly lower rates on their mortgages; apparently associations attempt to compensate for lower local rates by assuming a less liquid position. Associations with higher ratios of capital and reserves to assets pass on the advantages of this leverage to savers in the form of higher interest payments. Highly capitalized associations tend to earn higher rates of interest on their mortgages. That is, they may take advantage of their higher capitalization to acquire somewhat more risky, higher yielding mortgages. Similarly associations with large ratios of borrowed funds to assets earn higher

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12. United States Treasury Department, Individual Income Tax Returns, Washington: United States Government Printing Office, 1962, various pages.

TABLE 3-5

Experiment Three

	RS_3	RM_3
Federal	3.3960	5.7937
ST	.0437* (.0141)	.0396* (.0200)
MU	.0045 (.0081)	.0547* (.0115)
LQ_2	.5891* (.0516)	-.2200* (.0731)
CF_3	.0304* (.0116)	.0230 (.0164)
CA_3	.0074* (.0019)	.0058* (.0026)
OA_3	-.0030 (.0056)	.0098 (.0079)
BA_3	-.0037* (.0012)	.0033* (.0016)
GR_3	.0041* (.0002)	.0025* (.0004)
R	.736	.601
F	115.406	55.221
Su	.217	.308

* An asterisk indicates the parameter is significantly different from zero with probability of error of .05.

rates on mortgages. They pay somewhat lower rates to savers; apparently some associations acquire marginal funds from other financial institutions rather than bid competitively for savings deposits.

Institutions with high foreclosure rates reward depositors by paying higher interest rates. Interestingly they are not compensated for these risks by high mortgage interest rates. No explanation for this result is apparent. Stock associations earn high rates on mortgages and pass these earnings on to depositors. State mutual associations also earn higher rates on mortgages than federal associations, but do not pass on these higher earnings to depositors.

To summarize this part, high interest rates are primarily related to high growth rates; because high growth rates are associated with risk, associations and their depositors are observed to be rewarded for bearing risks. However, high interest rates represent not only compensation for higher risks in growth associations but also the existence of excess demand in some areas of the country. Thus, results in Table 3-5 suggest that, even when allowance is made for higher values of risk measures studied here, high growth associations reward depositors for moving funds to areas where excess demand for mortgages exists.

4. A simultaneous equations model.

In an attempt to gain further insight into savings and loan associations' risk taking behavior, savings growth, foreclosures, and deposit interest rates are integrated in a system of simultaneous equations. A very simple three equation model is considered in this section. It is estimated by two stage least squares.

An important assumption necessary for the construction is that RM is exogenously given to a savings and loan association. Specifically RM is assumed to be a function of dummy variables ZI, ST, and MU. If an association sets rates on mortgages too high it may lose customers to rival lenders; if it sets rates too low it foregoes income and probably will cause other lenders to lower rates to their mutual disadvantage. The personal relationship between association and borrower is very important; associations must deal with local borrowers because of the fifty mile limit on lending. The relationship between savers and associations is less close. How does the association behave? The first structural equation is:

$$4\text{-}1 \quad RS_3 = \alpha_o + \sum_{i=1}^{34} \alpha_i Zi + \alpha_{35} ST + \alpha_{36} MU + \alpha_{37} RM_3 + \alpha_{38} CF + u_1$$

The argument is that associations, stock or mutual, always try to maximize the volume of mortgages made subject to the condition that $RM > RS + \epsilon$ where ϵ is the average rate of net income plus servicing costs associated with a dollar of mortgage lending. Because markets are broadly competitive RM - RS should not differ greatly across associations. If savers are rewarded for bearing foreclosure risks, α_{38} should be positive. However, if foreclosures are frequent, associations with a given rate on mortgages may pay less to depositors, the results in Table 3-5 notwithstanding.

How does the public respond to variations in RS_3 ? As suggested in the previous section, associations paying high interest rates on deposits grow much more rapidly than other associations. The second equation of the system is:

$$4\text{-}2 \quad GR_3 = \beta_o + \sum_{i=1}^{34} \beta_i Zi + \beta_{35} ST + \beta_{36} MU + \beta_{37} RS_3 + u_2$$

Clearly β_{37} is assumed to be positive. The third equation of the system concerns the foreclosure rate. In the preceeding section we observed that foreclosure rates tended to be higher when RM was higher. This relation is assumed to be transmitted from RM to RS to GR to CF in this model.

$$4\text{-}3 \qquad CF_3 = \gamma_0 + \sum_{i=1}^{34} \gamma_i Zi + \gamma_{35} ST + \gamma_{36} MU + \gamma_{37} GR_3 + \gamma_{38} YR + u_3$$

The assumptions underlying this equation are that γ_{37} should be positive and γ_{38} should be negative; the arguments were presented in the previous section. Table 4-1 reports estimated coefficients for this system of equations. Again coefficients of individual state dummy variables are not shown to conserve space, although many are significant.

The coefficient of RM_3 in equation 4-1 is positive and significant as expected. However the margin between RM_3 and RS_3 is not constant; a difference in RM_3 of 1.0 is matched by only a 0.086 difference in RS_3. Thus when RM_3 is above its mean, gross receipts of the association are substantially higher; payments to savers appear to be only slightly higher. Further, the coefficient α_{38} concerning the effect of foreclosures on RS is positive although not significantly different from zero. The explanation for this peculiar result is not clear; perhaps the firms with negative growth rates which distorted relationships in Figure 3-2 are the villains. Stock associations pay significantly higher rates on savings deposits than mutuals.

Equation 4-2 suggests again that the rate of interest paid on savings deposits is a principal determinant of the growth rate. The coefficient indicates that for every difference of 1% in rate paid on savings capital

TABLE 4-1

Estimate of Simultaneous Equations Model [1]

	RS_3	GR_3	CF_3
ST	.0301* (.0370)	11.4376* (1.3055)	-.0707 (.0689)
MU	-.0087 (.0099)	.4388 (.5635)	.0082 (.0147)
RM_3	.0862* (.0190)	-- --	-- --
CF_3	.3054 (.2840)	-- --	- 1 -
GR_3	-- --	- 1 -	.0107* (.0037)
RS_3	- 1 -	61.5162* (7.3418)	-- --
YR	-- --	-- --	.0006 (.0005)
R	.708	.463	.298
F	108.739	30.333	10.577
Su	.226	15.086	.343
N	4150	4150	4150

[1] Coefficients of intercept and state dummy variables were estimated but are not reported to conserve space. An asterisk indicates the parameter is significantly different from zero with probability of error of .05.

there is an associated difference of 60% in growth rates. Stock associations appear to grow faster than mutual associations.

In Equation 4-3 the coefficient of YR, the average age of the association, is positive, contrary to hypothesis and the coefficient of GR is significant in the expected direction. The latter coefficient suggests that for each 10% increase in GR, the annual foreclosure rate on conventional mortgages will rise 0.4%.

The system superficially seems quite plausible; yet it seems to shed no new light on the behavior of savings and loan associations. Perhaps the telling failure is that coefficients of the dummy state variables ZI retained their significance in all equations. Presumably a correct structural model would account for interregional variations among associations.

5. Summary

Risk taking by savings and loan associations has been measured by seven indices constructed from foreclosures and balance sheet ratios. In single equation tests, five characteristics of associations were found to be related to risk measures. The characteristics are organizational form, size, age, growth rate, and mortgage interest rate. In addition, individual risk measures of savings and loan associations vary significantly among states in the United States. No stress was given to the last point because the explanation for observed regional variations would require a very extensive discussion of local housing markets and examination standards which are of limited interest to the present conference.

The second phase of the empircal analysis concerns measurement of the rewards for bearing risks.[13] The savings and loan industry has been growing very rapidly, especially in the southwestern and western parts of the United States. Interest rates in local mortgage markets and interest rates paid on savings deposits exhibit correspondingly great variations. In Section 3 empirical evidence that high growth associations earn high interest rates on mortgages and pay high interest rates on deposits was introduced. In part these high rates represent compensation to savers and associations for the risks which they bear. However, even after allowing for the risks examined in this paper, high growth associations earn significantly higher rates of return on their mortgages and pay correspondingly higher rates to depositors. The conclusion is that high interest rates in part reflect greater risks associated with growth, but primarily are evidence that the industry is out of equilibrium. Of course, one reason for this disequilibrium may be that potential depositors thought risks were present; we don't observe their subjective beliefs. A simple simultaneous equations model was examined in Section 4, but did not add appreciably to our understanding of savings and loan associations.

A number of results in this paper suggest directions for future research. First, what precisely is the relation between organizational form and decision making? There are two important aspects of this question: a) Are there differences in the objective function for different organizational forms?

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13. For another study in which rewards for bearing risks are estimated, see: Hester, Donald and John F. Zoellner, "The Relation between Bank Portfolios and Earnings: An Econometric Analysis," forthcoming, The Review of Economics and Statistics.

b) Is the implementation of decisions different? In the present study markedly different behavior is observed when stock and mutual associations are compared, but determinants of these differences cannot be inferred.

Second, large associations are found to take more risks than small associations, apparently as a result of the operation of the law of large numbers. However large organizations may also be characterized by very rigid organizational forms. In one study of Indian commercial banks, I found evidence of excessive centralization of decision making which was partly a result of fear of experiencing losses.[14] To be sure about the observed relation between risk taking and size, further analysis of the relation between decision making structure and size is desirable.

Third, the questions of what are risks in the minds of individuals and what the firm maximizes have been troublesome throughout this paper. This has been especially serious when growth enters the picture. A clear theoretical understanding of what a firm or a firm's management knows or believes, what it attempts to achieve, and what it attempts to avoid are essential if empirical analysis is to prove more successful.

Finally, a related question is how important are the various measures of risk? Of the measures considered above, illiquidity seems to be of very limited interest given the high rate of growth in the industry. Similarly, reacquired real estate is very small in relation to total assets or capital and probably

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14. Hester, Donald, Indian Banks: Their Portfolios, Profits, and Policy, Bombay: Bombay University Press, 1964.

is a symptom of risk taking behavior, but not itself a cause for concern about the safety of an association. Conventional foreclosures, high borrowing, and low capitalization are probably the most significant. A useful statistical study would be an analysis of how extreme values of these measures on a date are related to subsequent bankruptcies and the subsequent operations of an association.

What do the results of this paper suggest for regulatory policies involving savings and loan associations? Very significant regional variations exist in rates of growth of savings deposits, mortgage interest rates, and rates of return paid on savings deposits. The market appears to cause the flow of funds into capital deficit areas. Stock associations appear to be causing funds to flow even faster than mutual associations; they also have higher values of most risk measures. Policies which discourage the formation of stock associations represent a choice of low risk over fast growth. Estimates of the relation between organizational form and growth and various measures of risk indicate that a little less risk costs a lot of growth at the association level.