The Rate of Return on Savings and Loan Assets

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ABSTRACT

Using Cointegration Tests, Granger-Causality Tests, and OLS, this study empirically investigates the determinants of the rate of return on savings and loan assets over the 1965-1991 period. It is found that it is determined by the mortgage rate, the capital/asset ratio, the price of imported crude oil, the cost of deposits, and the ceiling on federal deposit insurance.

I. Introduction

The failure rate of savings and loan institutions (S&Ls) has received widespread attention in recent years, not only in the media but also in the scholarly literature. The media have focused extensively on the number of failures, the aggregate cost of S&L closings to the taxpayers, and allegations of fraudulent behavior on the part of certain S&L directors and officers. The scholarly literature has focused more on the resolution costs of the failures and on apparent causes of those closings--at least in part with the objective of helping to avert future failures.

Much of the scholarly research literature has focused on the role of federal deposit insurance in S&L failures. In a widely acclaimed study by Barth (1991, p. 101), it is argued that "...federal deposit insurance was the unifying cause of the savings and loan disaster." Barth (1991, pp. 100-101) argues that the system of federal deposit insurance has encouraged the S&Ls to take on additional risk and thusly has significantly contributed to the rate of S&L closings. Barth (1991, p. 100) charges that "...the very availability of such insurance enabled many inadequately capitalized savings and loans to engage in high-risk activities and to gamble for resurrection." Other studies, including those by Barth and Brumbaugh (1992), Brumbaugh (1988), and Kane (1982), have made similar arguments.

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Of course, federal deposit insurance is not viewed as the only significant cause of S&L closings over time. Such factors as the rising cost of deposits, declining capital-to-asset ratios, declining crude oil prices, and the Tax Reform Act of 1986 are all viewed as contributing to the S&L failures. And, in point of fact, the recent study by Belton and Cebula (1995) provides empirical support that all of these factors impacted on the S&L failure rate.

Yet another dimension of the S&L failure problem is the geographic variation in the S&L failure rate. The useful study by Amos (1992) has recently investigated the determinants of interstate differentials in the commercial bank closing rate, focusing principally on interstate differences in the growth rate of gross state product, the volatility of gross state product, the percentage of gross state product deriving from manufacturing, from agriculture, or from oil and natural gas extraction, and other factors. Cebula (1994) expands the scope of inquiry into interstate differentials in commercial bank closings to include a variety of money market and other factors, such as the cost of funds and capital-to-asset ratios and the extent to which interstate banking is permitted. Finally, Chou and Cebula (1996) use the heteroskedastic-TOBIT model to investigate determinants of geographic differentials in S&L failures over the 1982-1988 period.

The present study seeks to extend the inquiry into the S&L crisis by identifying, at the industry level, the determinants of the rate of return on S&L assets over time. This is a subject that has been essentially ignored in the literature, except perhaps for a study of interstate differentials in the rate of return on S&L assets (at the industry level) for the year 1988 by Cebula (1996). In particular, whereas the relevant literature, except for the cross-section study by Cebula (1996), provides arguments regarding the "economic health" of the S&L industry and empirically deals extensively with S&L failure rate determinants and other issues such as resolution costs (Barth (1991), Barth and Bartholomew (1992), Barth and Brumbaugh (1992), Belton and Cebula (1995), Chou and Cebula (1996), Kane (1982), Saltz (1995)), it does not expressly deal empirically with identifying determinants of the rate of return on S&L assets at the industry level over time.

Clearly, however, if the rate of return on S&L assets declines sharply and becomes negative, as it so often has over the years since 1980, then an extended experience of such negative rates of return will increase the incidence of S&L insolvencies and hence the resolution costs that must be ultimately borne by taxpayers. In seeking to identifythe key factors determining the rate of return on S&L assets at the industry level, it is hoped that further insights into the factors that influence S&L economic health will be gained so that poor rates of return on S&L assets (as well as the rate of S&L failures) can perhaps be mitigated in the future. The empirical analysis applies the techniques of cointegration, Granger-causality tests, and OLS.

Section II provides a simple model of constrained profit maximization for S&Ls. Based on this model and a literature that indirectly makes reference to S&L industry rates of return, the empirical analysis in section III applies cointegration techniques to provide evidence as to the identity of potential determinants of the rate of return on S&L assets. The cointegration analysis is based on the studies by Johansen (1988) and Johansen and Juselius (1990). Section IV addresses the variables in the model using Granger-causality tests, whereas the model is investigated in section V using OLS. Finally, section VI provides conclusions.

II. A Simple Model

The S&L is treated as a profit-maximizing, price-taking firm. In this simple model, the S&L generates revenues principally through the issuance of mortgage loans to the general public. The S&L obtains funds to support these mortgage loans principally through the deposit markets. The S&L's total costs in this simple model consist of its total interest payments for deposits and its operating costs. Each S&L is constrained in that its total volume of mortgage loans outstanding cannot exceed the sum of its excess reserves plus net worth; in addition, its required capital-to-asset ratio may not fall below the regulatory minimum.

In simple terms,the S&L's profit maximization is described as:
MAXIMIZE:

(1) PROF = rM*MORT*(1-PML) - rE*DEP - C(MORT, DEP, REGQ)

SUBJECT TO:

(2) MORT = (1 - RR)*DEP + NW, 1 > RR > 0

(3) $NW/ASSET \geq Z, \quad 1 > Z > 0$

where:

PROF	= net profit for the S&L
MORT	= outstanding S&L mortgage loans
rM	= the average interest rate payable on outstanding mortgage loans at the S&L
PML	= the percentage of the S&L's mortgage loans that is not "performing"
DEP	= the S&L's deposit liabilities
rE	= the average explicit interest rate on the S&L's deposit liabilities
RR	= reserve requirement
C( )	= the S&L's factor and implicit cost function
REGQ	= the ceiling interest rate on rE imposed under Regulation Q
NW	= the S&L's net worth
ASSET	= value of the S&L's assets
Z	= the required ratio of net worth-to-assets

Despite the effects of deregulation under the Depository Institutions Deregulation and Monetary Control Act of 1980 and the Garn-St. Germain Depository Institutions Act of 1982 and increased diversification of assets and sources of income in the S&L industry in recent years, mortgage loans have remained the major form of S&L assets and the predominant revenue source for S&Ls. Hence, this analysis focuses on mortgages as the revenue source affecting the S&L profit rate, where the latter is measured here by the rate of return on S&L assets. Also, since deposits are the predominant source of funds for S&Ls, this study focuses on the S&L cost of deposits as the most relevant cost consideration for S&Ls.

Accordingly, on the revenue side, it is clear that S&L profits should significantly depend on the mortgage interest rate charged (rM) and the proportion of S&L mortgage loans that is <u>not</u> performing (PML). For a given level of PML, a higher mortgage rate (rM) implies higher revenues and hence a higher rate of return, <u>ceteris paribus</u> (see also Cebula (1996)).

The factors that influence PML are largely those that reflect risk dimensions of the mortgage loans outstanding. There are a number of quantifiable factors that have been argued in the literature to influence this basic dimension of mortgage portfolio risk. Based on arguments in Amos (1992), Barth (1991), Cebula (1996), and Chou and Cebula (1996), we would expect that PML may be a function of, among other things, (1) the propensity for S&L directors and officers to pursue low-risk lending strategies and (2) the viability of the housing market and hence S&L assets.

Barth (1991) and Cebula (1996) stress that the higher the ratio of tangible S&L net worth (capital)-to-assets (NW/ASSET), the greater the likelihood that the S&L will adopt prudent and risk-averse lending and other related practices. This is because the higher the capital-to-asset ratio, the greater the incentive to protect the owners' capital. Therefore, the higher the capital/asset ratio, the greater the likelihood that mortgage loans will perform, i.e., the lower will be PML and therefore the higher will be the rate of return on S&L assets, ceteris paribus.

Despite findings in Saltz (1995) to the contrary, the role of increases in the ceiling level of federal deposit insurance in inducing S&Ls to undertake greater risk is widely recognized (Barth (1991), Barth and Bartholomew (1992), Brumbaugh (1988), and Johansen and Juselius (1990)). Since increased riskiness resulting from increased ceiling levels of federal deposit insurance is argued in these studies to have increased the likelihood of S&L failures, it is argued further here that this experience is also reflected in lower rates of return on S&L assets. Accordingly, this study argues that the higher the real ceiling level of federal deposit insurance (FDI), the greater the degree of S&L risk taking and hence the lower the rate of return on S&L assets, ceteris paribus.

The viability of the housing market and S&L assets has been argued by Barth (1991), Barth and Bartholomew (1992), and Saltz (1995) to have been influenced by the Tax Reform Act of 1986 and declining crude oil prices during the 1980s. As Barth (1992 p. 45) observes, the Tax Reform Act of 1986 "...adversely affected real estate values, thereby weakening the financial conditions of savings and loan instititions." According to Barth (1991, p. 45), this statute contributed to S&L problems because it "...reduced the depreciation benefits from investing in commercial and residential property, limited the offsetting losses on passive investment that affect limited partnership syndications, and eliminated the favorable capital gains treatment." In addition, Barth (1991, p. 40) observes that S&Ls experienced a sharp decline in asset quality and that some of this decline was attributable to "...sharply falling energy prices (especially crude oil and natural gas) in the 1980s..." The decline in energy prices (ENERGYPR) brought reductions in employment and incomes, especially in the Southwest. This circumstance led to increased mortgage delinquency and foreclosure rates, and to sharply falling housing prices. Thus, the rate of return on S&L assets is hypothesized to be an increasing function of energy prices, ceteris paribus.

Barth (1991, p. 38), Barth and Bartholomew (1990, pp. 38-39), Brumbaugh (1988), Cebula (1996), and Saltz (1995) observe that, especially during late 1979 and the earlier 1980s, the cost of deposits at S&Ls, rE, rose substantially. As Barth and Bartholomew (1992, p. 39) state it, "The higher [interest] rates in the early 1980s drove up deposit costs..." Based on profit equation (1), it follows that the rate of return (profit) on S&L assets should be a decreasing function of rE, ceteris paribus (Cebula, 1996).

Regulation Q was implemented for S&Ls in September, 1966 and phased out under provisions of the Depository Institutions Deregulation and Monetary Control Act of 1980 by March 31, 1986. During the period it was in effect, REGQ presumably acted to restrain the rise in deposit rates for S&Ls and thus to elevate the rate of return for S&Ls, although it may have also caused problems for S&Ls in terms of disintermediation (Saltz, 1994).

Thus, it follows that the rate of return on S&L assets (RET), the proxy for the S&L profit rate, can be described by:

$$(4)\ \text{RET} = f(\text{rM}, \text{NW/ASSET}, \text{FDI}, \text{ENERGYPR}, \text{rE}, D_1, D_2)$$

where it is hypothesized that:

$$(5)\ f_{rM} > 0,\ f_{NW/ASSET} > 0,\ f_{FDI} < 0,\ f_{ENERGYPR} > 0,$$
$$f_{rE} < 0,\ f_{D1} < 0,\ f_{D2} > 0$$

where:

RET = the average rate of return on S&L assets in period t, as a percent per annum; RET is average S&L net income after taxes divided by average assets (Office of Thrift Supervision, 1989, p. E-6);

rM	=	the average residential mortgage interest rate at S&L institutions in period t, expressed as a percent per annum;
NW/ASSET	=	the ratio of tangible net worth to assets at S&Ls in period t, as a percent;
FDI	=	the ceiling level per account of federal deposit insurance, expressed in 1987 dollars, in period t;
ENERGYPR	=	the price per barrel of imported crude oil in period t, expressed in 1987 dollars;
rE	=	the average cost of deposits at S&Ls in period t, expressed as a percent per annum;
D_1	=	a binary (dummy) variable indicating whether the Tax Reform Act of 1986 was in effect in period t; $D_1 = 1$ if the Tax Reform Act was in effect during the period and $D_1 = 0$ otherwise;
D_2	=	a binary (dummy) variable indicating whether Regulation Q was in effect in period t; $D_2 = 1$ if Regulation Q was in effect in period t and $D_2 = 0$ otherwise.

The data are semi-annual; the study period covers from 1965, first half (1965.1), through 1991, second half (1991.2). This study period reflects availability of all the needed data for this analysis. After 1991, some of these data are available on an annual basis but not on a semi-annual basis. In addition, after 1991, major new regulations regarding federal deposit insurance premiums and S&L (as well as bank) operations were implemented under the Federal Deposit Insurance Corporation Improvement Act. As Madura and Bartunek (1995, p. 191) observe, "The FDIC Improvement Act mandated key provisions that affect the potential performance and risk of financial institutions." Consequently, it seems preferable not to include post-1991 observations with the earlier observations.

The variable reflecting Regulation Q is a binary variable, D_2. Although data are readily available on ceiling levels under Regulation Q for passbook and other types of time deposits at S&Ls for the period from September, 1966 through March, 1986, there are no Regulation Q ceilings that apply to S&Ls for the periods prior to September, 1966 and subsequent to March, 1986; as a result, there exists no clear way to "measure" Regulation Q provisions for these periods. Consequently, the decision was made to simply adopt a dummy variable for this factor. In addition, it is noted that given the impracticality of attempting to create a variable that quantifies all the basic features of the Tax Reform Act of 1986, the latter is also represented by a dummy variable, D_1.

The data sources were: Office of Thrift Supervision (1989, esp. Tables A-3, A-16), (1990), and (1991), The Federal Home Loan Bank Board (1990) and (1991), Barth (1991) and (1990), and various issues of the Statistical Abstract of the United States (1965-92).

III. Cointegration

The empirical analysis first examines each time series to determine the order of integration, i.e., to determine whether each series is stationary in levels or in first differences. The results of both the Augmented Dickey-Fuller (ADF) test and the Phillips/Perron (1988) test for the non-dummy variables in the model are provided in Table 1. The both sets of test results reveal that the variables RET, rM, NW/ASSET, ENERGYPR, rE, and FDI are all non-stationary in levels but stationary in first differences for the period studied. Clearly, the results of the Phillips and Perron (1988) test are essentially indistinguishable from the ADF results.

After determining the order of integration for each of the non-dummy time series, the test for cointegration can now be performed. There are a number of cointegration tests available. We adopt the Johansen (1988)/Johansen-Juselius (1990) test, which produces consistent results in both the bivariate and multivariate cases. To implement the Johansen/Johansen-Juselius test, we estimate the following:

$$(6)\ X_t = B_0 + B_1 X_{t-1} + B_2 X_{t-2} + B_3D_{1t} + B_4D_{2t} + e_{it}$$

$$(7)\ X_{t-1} = B_0 + B_1 X_{t-1} + B_2 X_{t-2} + B_3D_{1t} + B_4D_{2t} + f_{it}$$

where X_t is a sequence of random vectors with components RET, rM, NW/ASSET, ENERGYPR, rE, FDI, and VONE,[1] and where D_{1t} and D_{2t}, correspond to the binary variables D_1 and D_2, respectively, reflecting the Tax Reform Act of 1986 and Regulation Q. The canonical correlations of the two sets of residuals, e_{it} and f_{it}, are calculated. Eigenvalues generated from this process, which are squared canonical correlations, are employed in the maximum eigenvalue and trace tests developed by Johansen (1988) and Johanson-Juselius (1990).

Table 2 provides the results of the cointegration tests for equation (6). The maximum eigenvalue and trace test statistics are reported to determine the number of cointegrating vectors. The trace test allows evaluation of the null hypothesis whether there are r or fewer cointegrating vectors against a general alternative. In this case, to test H_0: $r \leq R$, we calculate:

$$(8)\quad -n \sum_{i=R+1}^{v+1} \ln(1-\pi_i)$$

where v is the number of variables in the model; v+1 is the number of eigenvalues, $\pi_1,\ldots,\pi_{v+1}$ (so ordered that $\pi_1 > \pi_2 > \ldots > \pi_{v+1}$), produced from the squared canonical correlations of e_{it} and f_{it}; and n is the number of observations (n=54). The maximum eigenvalue test evaluates the null hypothesis whether there are exactly r cointegrating vectors against the alternative hypothesis of r+1 cointegrating vectors. In this case, to test H_0: $r=R$, we calculate:

$$(9)\quad -n \ln(1-\pi_{R+1})$$

Turning first to the trace tests results, the nulls $r \leq 0$, $r \leq 1$, $r \leq 2$, and $r \leq 3$ are rejected at the 99 percent confidence level, whereas the null $r \leq 4$ is rejected at the 95 percent confidence level. The maximum eigenvalue test provides an alternative check to the trace test for the number of cointegrated variables; indeed, according to Johansen and Juselius (1990), the maximum eigenvalue test is more reliable than the trace test in identifying the number of cointegrated variables. Turning to the maximum eigenvalue test results reported in Table 2, the nulls $r=0$, $r=1$, $r=2$, and $r=3$ are rejected at the 99 percent confidence level, whereas the null $r=4$ is rejected at the 95 percent level. Accordingly, these trace and maximum eigenvalue test results strongly imply that a long-term relationship exists among the variables in equation (6) for the study period 1965.1-1991.2. In other words, there is strong evidence that the rate of return on S&L assets is cointegrated with the residential mortgage rate, the tangible capital/asset ratio, the real price of imported crude oil, the cost of deposits, and the real ceiling level of federal deposit insurance.

To test the model further, the likelihood ratio test recommended by Johansen and Juselius (1990) is applied to examine the impact of each individual non-dummy, time-series variable in the system. The likelihood ratio test has a Chi-Square distribution and compares the eigenvalues associated with a restricted model to those of the unrestricted model. Table 3 provides the results of the likelihood ratio test for the existence of a linear trend and for each time-series variable in the cointegrated system. The model was estimated allowing for a linear trend. The test results reported in Table 3 reveal that the null hypothesis of no difference between the model with and without a linear trend cannot be rejected at even the 90 percent confidence level; hence, including a linear trend is not important to the specification of the model. By contrast, as Table 3 also indicates, for each and every time-series variable in the model, the null hypothesis of no significant difference between the restricted and unrestricted models is rejected at the 99 percent confidence level. These likelihood ratio test results imply that all of the variables employed in the model do indeed make a significant contribution. Thus, to eliminate any of the variables in the system would introduce omitted-variable bias.

V. Granger-Causality Tests

In the above section, cointegration analysis reveals the existence of dependable long-term relationships between the rate of return on S&L assets and the other variables in the model. In this section of the study, we test the model for causal relationships per se. Specifically, the Granger-causality test is implemented for each of the right-hand-side variables in the model, rM, NW/ASSET, ENERGYPR, rE, and FDI. Given that the variables in the model are stationary in first-differences, the Granger-causality test is implemented in all cases in terms of first-differences.

The results of the Granger-causality test are provided in Table 4 for symmetric lags of half-year periods. As shown in Table 4, there are F-statistics for each of the variables, rM, NW/ASSET, ENERGYPR, rE, and FDI, that are statistically significant at the five percent level. These findings imply that there is a Granger-causal relationship between: the rate of return on S&L assets and the mortgage rate at S&Ls; the rate of return on S&L assets and the tangible S&L capital/asset ratio; the rate of return on S&L assets and the real price of imported crude oil; the rate of return on S&L assets and the S&L

cost of deposits; and the rate of return on S&L assets and the ceiling real level of federal deposit insurance.

V. OLS Estimation

To further test the basic model, we now provide the results of an OLS estimate. Based on equations (4) and (5), the following reduced-form equation is considered:

$$(10)\ RET_t = a_0 + a_1\, rM_{t-1} + a_2\,(NW/ASSET)_{t-1} + a_3\, ENERGYPR_{t-1} + a_4\, rE_{t-1} + a_5\, FDI_{t-1} + a_6\, TRA_t + a_7\, REGQ_t + \mu^*$$

where it is expected that:

$$a_1,\ a_2,\ a_3 > 0$$
$$a_4,\ a_5,\ a_6 < 0$$
$$a_7 = \text{unknown}^2$$

Since the time series variables in equation (10) have been shown to be stationary in first-differences, we estimate equation (10) in first differences; we also adopt the White [25] procedure to correct for heteroskedasticity. The OLS estimate is given by:

$$(11)\ \delta RET_t = -.05 + \underset{(+2.33)}{.4\delta rM_{t-1}} + \underset{(+2.04)}{.12\delta(NW/ASSET)_{t-1}}$$
$$+ \underset{(+2.50)}{.05\delta ENERGYPR_{t-1}} - \underset{(-3.77)}{.52\delta rE_{t-1}} - \underset{(-2.37)}{.06\delta FDI_{t-1}} - \underset{(-2.31)}{.49TRA_t}$$
$$+ \underset{(-1.32)}{.21REGQ_t}$$

$$DW=1.88,\ Rho=0.03,\ F=28.22,\ R^2 = 0.91$$

where terms in parentheses are t-values.

In equation (11), aside from the case of the REGQ variable, all of the estimated coefficients exhibit the expected signs. In addition, aside from the REGQ variable, whose coefficient is statistically insignificant, all of the estimated coefficients are statistically significant at the five percent level or beyond. The F-ratio is significant at the one percent level. In addition, the model explains over 90 percent of the variation in the dependent variable.

In equation (11), the findings imply that the rate of return on S&L assets is an increasing function of the S&L mortgage rate, the tangible S&L capital/asset ratio, and the real price of imported crude oil, whereas it is a decreasing function of the S&L cost of deposits, the real ceiling level of federal deposit insurance, and the Tax Reform Act of 1986. The Regulation Q variable appears to exhibit no significant impact in equation (11).

VI. Conclusion

This study has endeavored empirically to identify the determinants of the rate of return on S&L assets at the industry level over the 1965-1991 time period. With the limited exception of the study of interstate differentials in the rate of return on S&L assets for the year 1988 by Cebula (1996), previous studies have not expressly addressed this specific issue empirically, although they have entensively investigated the somewhat related issue of S&L failures. Three empirical approaches were adopted: cointegration; Granger-causality tests; and OLS estimation. All three approaches produced results that were mutually consistent.

Using the Johansen (1988)/Johansen-Juselius (1990) cointegration procedure, this study has found, after using dummy variables for Regulation Q and the Tax Reform Act of 1986, that the rate of return on S&L assets is cointegrated with (a) the interest rate yield at S&Ls on residential mortgages, (b) the tangible S&L capital/asset ratio, (c) the real price of imported crude oil, (d) the cost of deposits at S&Ls, and (e) the real ceiling level of federal deposit insurance per account. Thus, the evidence in section III of this study implies that there is a long-term relationship involving the rate of return on S&L assets and these five other variables. The results of the Granger-causality tests, provided in section IV of this study, imply that each of these same five variables acted to Granger-cause the rate of return on S&L assets over the study period. Finally, the OLS, first-differences estimate provided in section V of this study implies that the rate of return on S&L assets over the study period is an increasing function of the S&L mortgage rate, the tangible S&L capital/asset ratio, and the real price of imported crude oil; in addition, it appears that the rate of return on S&L assets is a decreasing function of the S&L cost of deposits, the real ceiling level of federal deposit insurance, and the Tax Reform Act of 1986. Regulation Q, on balance, was shown to exercise no significant impact on the rate of return on S&L assets.

The three sets of results described above are entirely consistent with one another. Thus, consistent with arguments in Barth (1991) regarding S&L economic health and the cross-section study of S&L failures by Chao and Cebula (1996), as well as the cross-section study of interstate S&L rate of return differentials for 1988 by Cebula (1996), a higher S&L mortgage rate appears to raise the S&L rate of return. Also consistent with arguments in Barth (1991) regarding S&L economic health and the cross-section findings in Chao and Cebula (1996) and Cebula (1996), the tangible S&L capital/asset ratio appears to raise the rate of return on S&L assets. Consistent with arguments in Barth (1991) and Barth and Bartholomew (1992) regarding the economic health of S&Ls and--in principle--with the time-series findings for S&L failures found in Saltz (1995), the rate of return on S&L assets is an increasing function of the real price of imported crude oil.

Consistent with arguments regarding S&L failures and S&L economic health in Barth (1991), Barth and Bartholomew (1992), Brumbaugh (1988), Cebula (1996), and Saltz (1995), the higher the S&L cost of deposits the lower the rate of return on S&L assets. Consistent with arguments in Barth (1991) regarding the economic well being of S&Ls but in contrast to the findings regarding S&L failures/well-being found in Saltz (1995), this study finds that the higher the real ceiling on federal deposit insurance the lower the rate of return on S&L assets. Consistent with arguments regarding the economic health of S&Ls found in Barth (1991) and Barth and Bartholomew (1992), it also appears that the Tax Reform Act of 1986 may have adversely affected the rate of return on S&L assets. Finally, in apparent contrast to the findings for banks by Saltz (1994), Regulation Q is not found to impact on the rate of return on S&L assets at the industry level.

Thus, these findings indicate, among other things, that the rate of return on S&L assets and hence general S&L industry financial viability were significantly affected by the pre-FDICIA federal deposit insurance system, along with deregulation[3] that authorized S&Ls to reduce their capital requirements. Hopefully, the findings in this study will help shed further light on the spectrum of factors that affects the economic health of the S&L industry and can serve as a point of departure for further inquiry, including for the post-1991 period.

ENDNOTES

1. VONE is a vector of one which appears as a dependent variable in equation (7). This variable does not appear in equation (6).

2. The argument that the impact of Regulation Q is a priori unknown is based on the idea that while Regulation Q helped to keep the cost of deposits lower for S&Ls it also appears to have led to disintermediation as well (Saltz, 1994).

3. The deregulation is principally that introduced under the Depository Institutions Deregulation and Monetary Control Act of 1980 and the Garn-St. Germain Depository Institutions Act of 1982. The discussion in Barth (1991, pp. 48-50) is very useful and relevant here.

TABLE 1

Tests for a Unit Root

Augmented Dickey-Fuller:

Variable 2 lags	$t\mu$	$t\tau$	2 lags	$t\mu$
RET	-1.8	-2.87	δRET	-4.24*
rM	-1.57	-1.75	δrM	-3.22*
rE	-1.72	-1.37	δrE	-3.31*
NW/ASSET	-1.42	-1.30	δNW/ASSET	-4.89*
FDI	-2.15	-1.88	δFDI	-7.18*
ENERGYPR	-1.86	-1.65	δENERGYPR	-5.54*

Phillips/Perron Test:

RET	-1.72	-2.35	δRET	-3.75*
rM	-1.45	-1.82	δrM	-3.16*
rE	-1.63	-1.35	δrE	-3.20*
NW/ASSET	-1.39	-1.24	δ(NW/ASSET)	-4.25*
FDI	-1.97	-1.82	δFDI	-5.99*
ENERGYPY	-1.70	-1.81	δENERGYPR	-4.53*

*Indicates rejection of the null hypothesis at the 95% confidence level.
Critical Values: $t\mu(n=50)=-2.89$; $t\tau(n=50)=-3.51$.

TABLE 2

Trace and Maximum Eigenvalue Test Results

Trace Test				Maximum Eigenvalue Test			
Trace Test		Critical Values		Maximum Eigenvalue Test			
		(0.99)	(0.95)			(0.99)	(0.95)
	for Trace			for Max Eigenvalue			
r≤0	504.621*	111.007		r=0	221.941*	46.816	
r≤1	282.693*	84.446		r=1	152.173*	39.788	
r≤2	130.512*	60.159		r=2	87.732*	33.240	
r≤3	42.784*	41.066		r=3	33.284*	26.807	
r≤4	19.993#	24.60	19.96	r=4	19.481#	20.196	15.672
r≤5	2.018	12.971	9.24	r=5	2.018	12.971	9.243

*Indicates rejection of the null hypothesis at the 99% confidence level.
#Indicates rejection of the null hypothesis at the 95% confidence level.

TABLE 3

Likelihood Ratio Test Results

Variable∞	Test Statistic	Critical Value (0.99)	(0.95)
Linear Trend	0.081	13.30	7.78
RET	255.9*	13.30	
rM	291.15*	13.30	
NW/ASSET	315.08*	13.30	
ENERGYPR	303.48*	13.30	
rE	258.01*	13.30	
FDI	287.29*	13.30	

∞The variables were tested with:
the degrees of freedom = r(vunr-vres) = 4,
where r = the number of cointegrating vectors
vunr = the number of non-deterministic variables in the unrestricted model
vres = the number of non-deterministic variables in the restricted model

*Indicates rejection of the null hypothesis at the 99% confidence level.

TABLE 4

F-Statistics for Granger-Causality: δRET

Independent Variable	Lag Length [half-years, i=j]	F-Statistic	df
δrM	1	5.45*#	2, 51
	2	4.32*	2, 49
δ(NW/ASSET)	1	3.44*	2, 51
	2	3.56*#	2, 49
δENERGYPR	2	4.12*	2, 49
	3	4.15*#	2, 47
δrE	1	4.55*#	2, 51
	2	3.38*	2, 49
δFDI	2	3.24*	2, 49
	3	4.15*#	2, 47

*Rejects null hypothesis at 95 percent confidence level (critical value: 3.23)
#Lag length determined by Schwartz-Bayesian Criterion; lags are expressed in terms of half-year periods.

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