INCREASING RISK BY REGULATING RISK-TAKING:

DIRECT INVESTMENT REGULATIONS IN THE SAVINGS & LOAN INDUSTRY

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Abstract: This paper empirically examines the effect of direct investment regulations on S&L profitability, risk and the probability of failure. Current regulations restricting investment in equity assets are found to constrain S&L's to strictly inferior investment portfolios. Simulation analyses suggest regulated portfolios may increase the probability of S&L failure.

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Introduction

The rash of recent S&L failures has moved regulators to take actions designed to buttress the safety and soundness of the industry. Among these have been proposals to increase restrictions on the types of highly risky assets which may be held by S&L's -- notably direct investments in real estate and equity securities. There is substantial uncertainty, however, over the relationship between direct investment and the financial well-being of S&L's. An FHLBB study (Mckenzie, Besenius 1986) of 37 S&L's with direct investments exceeding 10% of assets suggested that these institutions had significantly higher failure rates than did similar institutions with a smaller proportion of their portfolios in equity assets.[1] Other FHLBB studies (Barth 1986,1987) contend that among failed institutions FSLIC costs were increased by 60 -80 cents for each dollar of direct investment. Hence, regulators have dimly viewed real estate and equity investment activities as a source of increased risk and greater burden on the already over-extended insurance fund.

Restricting equity and real estate investment, however, severely limits potential diversification in S&L portfolios. Conventional S&L's hold primarily long-term nominal assets -- e.g. fixed rate and pseudo-

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[1] Benston (1986) presents contradictory evidence. Estimating a multivariate failure prediction model, he finds no significant relationship between the level of direct investment and the probability of financial distress.

adjustable-rate mortgage loans. As the proportion of nominal assets increases, so does the volatility of a firm's profit stream[2]. By precluding a potential real asset, direct investment (DI) restrictions will eliminate one option for hedging interest rate risks. Furthermore, real estate investments have, historically, earned higher returns than conventional S&L assets. The low rates of return earned on conventional S&L assets has retarded the recapitalization of solvent thrifts.[3] In sum, limiting DI would potentially lead to an increase in the risk borne by S&L's, a rise in the probability of S&L failure and an increased burden on the FSLIC insurance fund.

This study will address the issue of direct investment (DI) regulation in two parts:

(1) Estimation of the set of potentially optimal S&L portfolios. Portfolio theory is used to derive the efficient frontier of risky assets. Unconstrained portfolios containing various forms of DI are compared to portfolios constrained to contain traditional S&L assets. The opportunity cost of the regulation is evaluated by examining the price of risk in under-diversified S&L investments.

(2) Simulation of failure rates and changes in S&L net worth under

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[2]See E. Fama and W. Schwert, "Asset Returns and Inflation", J. Financial Economics 1977; C. James, "The Effects of Interest Rate Changes on Stock Returns of Financial Institutions",J. of Finance 1984; and K. French, et.al. "The Effects of the Nominal Contracting Hypothesis", J. of Political Economy, 1983 for empirical tests of the nominal contracting hypothesis.

[3]For the sample of S&L's examined by Benston(1986) DI was positively related to an institution's net worth. Furthermore, the "vast majority" of S&L's earned profits on their direct investments.

alternative investment strategies.

A Little Regulatory Background

Direct investment is defined by the FHLBB as investment in "equity securities, real estate service corporations or operating subsidiaries". In practice, equity participation in real estate projects has constituted the majority of S&L direct investments. Real estate was the principal vehicle by which thrifts increased portfolio risks in the late 70's and early 80's. Note that real estate construction loans and "acquisition, development and land" loans are not restricted under DI regulations.[4] Also excluded are investments in speculative grade "junk" bonds.

In February 1987 the FHLBB voted new regulations governing allowable levels of DI for thrifts insured by the FSLIC. Briefly, the bank board limited DI to a maximum 3% of assets or two and one-half times tangible capital.[5] For the average S&L in 1986, this effectively limited DI to approximately 5-6% of assets.[6]

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[4] In 1986 direct investments accounted for 3.3% of thrift assets, construction loans made up 2.9% of the portfolio and ADL loans were at 3.4%. Approximately two thirds of federally insured institutions engaged in some level of DI or construction lending, while only about one-fifth of the industry had ADL loans on their books. In general, real estate activities increased with the size of the institution. See J. Corgel and R. Rogers, "Do Thrifts Take Excessive Risks?" Real Estate Review Fall 1987 for descriptive statistics on real estate development activities of thrifts.

[5] For well capitalized institutions -- i.e. those with tangible capital exceeding 6% of total liabilities -- the limit was set at 3 times tangible capital.

[6] The ruling replaced regulations imposed in 1985 which permitted S&L's to hold up to 10% of assets in DI. Federally chartered thrifts were not affected by the ruling since other bank board regulations prevented them from holding more than 3% of assets in DI. The '85 and '87 regulations

The Costs and Benefits of Risky Assets

Lying at the heart of the problem of S&L failure is the FSLIC's lack of risk-adjusted insurance premiums. Uniform insurance premia subsidize risk-taking. Recognition of this problem is neither new nor is it contested. Uniform insurance premia, however, remain the sacred cows of the S&L industry. With rent-seeking powers so well entrenched, debate has turned to potions for easing the symptoms of S&L failure -- rather than addressing its cure.

S&L managers have incentives to excessively invest in risky assets. This can be viewed from 2 common perspectives. The first results from the absence of risk-adjusted deposit insurance premia. The value of deposit insurance is analogous to that of a put option sold to the S&L by FSLIC, exercisable at the face value of deposits[Merton, 1977]. Like deposit insurance, a common stock put effectively guarantees a minimum return to its holder. The value of the put increases monotonically with the variance of the value of the underlying asset. By selling deposit insurance at a constant dollar cost, FSLIC presupposes a given level of risk which is independent of the actual composition of S&L portfolios. A standard moral hazard problem arises as the S&L manager can increases expected profits by selecting riskier assets - enjoying subsidized insurance against down-side risks.

Alternatively, consider that S&L depositors face an "agency cost of debt". Given imperfect monitoring on the part of fixed claim holders,

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affected S&L's chartered in states that had more lenient DI restrictions -- notably, California, Texas, Ohio, New York,and Florida. In 1987, 46% of all thrifts and 37% of thrift assets were held in state-chartered institutions.

shareholder's wealth can be increased by raising the riskiness of the firms assets [Galai and Masulis 1976, Jensen and Meckling 1976, Green 1984, and Golbe 1983]. As Jensen and Meckling contend ' the agency costs associated with the existence of debt ... are composed mainly of value reductions in the firm and monitoring costs caused by the manager's incentive to reallocate wealth from the bondholders to himself by increasing the value of his equity claim'[p. 345, 1976]. The primary means of reallocating wealth are managerial decisions which affect the risk of the firm. Equity is isomorphic to a call option on the firm, its value is increasing, cet. par., in the risk of the underlying asset. Fixed claim-holders will price their claims in accordance with expected levels of risk when contracting with the firm. Once fixed claims are established, shareholders have an incentive to induce managers to shift into higher risk projects[7]. The incentive to increase risk rises as the value of the equity capital which owners place at risk falls. Of particular concern to regulators is the incentives of financially distressed firms -- i.e. those with no appreciable equity capital -- to "go for broke" on projects with negative net present values, but low probabilities of high rewards.

The benefits of "risky" direct investments accrue from the higher returns afforded by DI and the potential diversification DI lends to S&L portfolios.

Savings and Loans hold the majority of their assets in the form of long

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[7]An efficient managerial labor market will mitigate the incentives to risk-shift. The managers of financially distressed firms frequently find themselves in search of new employment. To the extent that excessive risk-taking adversely affects a managers reputation, the agency costs of debt are likely to be overstated. Monitoring in the external labor market will substitute for internal monitoring.

term loans[8]. Fixed rate mortgage loans still comprise over 50% of S&L mortgage portfolios. Interest rate caps and lagged adjustment mechanisms reduce the adjustability of ARM's.[9] The nominal contracting hypothesis asserts that the interest rate sensitivity of a firm's assets depends directly on the duration of its nominal contracts. Since unanticipated inflation affects the value of nominal, but not real assets, price level shocks have redistributive effects. The effect of an unanticipated change in inflation will be greater the longer the maturity of a firm's nominal assets relative to its nominal liabilities (Fama 1975,1976, French, et.al. 1983).

The mismatch of the maturities between the assets and liabilities of financial institutions is a corollary of the nominal contracting hypothesis. Empirical research has documented a strong direct relationship between maturity mismatch and the interest-rate sensitivity of banks and S&L's (Flannery and James, 1984, Booth and Officer 1985).

Direct investments in real estate and common stock will reduce the relative proportion of nominal assets in S&L portfolios, hence, tempering exposure to adverse price level changes. In particular, diversified real estate holdings have been documented as a good hedge against inflation[Fama and Schwert ,1977].

Methodology

The set of potentially optimal investment portfolios for an investor is defined as its "efficient frontier". Given the variance and expected return

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[8]To qualify for significant tax credits S&L's must hold over 60% of assets in "mortgage-related" assets -- a reduction from the 82% level which held up until 1984.

[9]In 1987 mortgage loans made up over 60% of S&L assets, Mortgage-backed securities accounted for another 10-15%, and consumer loans totaled just under 10% of assets.

of each investment alternative, investors find potentially optimal portfolios by allocating funds among the investment alternatives such that overall portfolio risk (S_p^2) is minimized for a given portfolio expected return ($E[R_p]$). Formally, the process can be stated as follows:

$$\text{minimize} \quad S_p^2 = \sum_i \sum_j W_i W_j S_{ij}$$

subject to the constraint that

$$E[R_p] = \sum_i W_i E[R_i]$$

$$\sum_i W_i = 1 \quad (i = 1, \ldots, n)$$

where:

S_p^2 = variance of the portfolio return

$E[R_p]$ = expected return on the portfolio

S_{ij} = covariance of the returns of investments "i" and "j"

W_i = weight equal to the proportion of "i" in the portfolio

n = number of investment alternatives

S&L portfolios are restricted to the following five categories of investment opportunities: (1) conventional fixed-rate residential mortgages; (2) adjustable-rate residential mortgages (ARMs); (3) commercial mortgages; (4) real estate ownership; and (5) common stock issued by corporations trading on a national exchange. Categories (4) and (5) include assets which are restricted under direct investment regulation.

Historic information on asset return, risk (variance) covariance was collected for 1979 through 1986. This information was analyzed for the entire period and for three separate subperiods consisting of the years

1979-81, 1982-83, and 1984-86. Focusing on the three subperiods allows one to compare the performance of alternative portfolios over varying macroeconomic conditions. The period 1979-81 was a period of high inflationary expectations and a declining rate of real economic growth, while the period 1984-86 was one of stable to declining inflationary expectations coupled with sustained economic growth.

Data

Information on the historic risk (variances) and returns of the five investment assets were constructed as follows:

A. Conventional (Fixed-Rate) and Residential Mortgages

Publicly available data on the returns from holding conventional fixed-rate residential mortgages are not available. Hence a proxy was constructed. Returns on fixed-rate residential mortgages are computed from the total return (price appreciation plus interest income) on GNMA mortgage-backed securities. Price appreciation is computed from changes in the end-of-week average bid price quoted by GNMA dealers.[10] Interest income (to mortgage holders) is proxied by (1) the stated coupon rate on GNMA securities plus (2) 1/2% for the administration and collections fee retained by GNMA plus (3) .06% -- the monthly insurance premium charged by GNMA[11]. All returns are converted to a monthly basis.

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[10] Mortgage Commentary Publications, Bethesda, MD.

[11] Default insurance provided by GNMA reduces the risk borne by security holders as well as the expected return. To proxy the returns on uninsured mortgage pools it is assumed that insurance is provided at actuarially fair rates. Hence the cost of insurance is added back to the expected return. The variance of the return is adjusted as well. Using historic information on the "price of risk" -- i.e. the slope of the capital market line -- the change in risk that corresponds to a .06%/month reduction in expected return-- is computed. For the period 1970-1986 δ(return/δ(risk)= .38, using annual data. Hence, a .06% monthly risk premium implies a marginal increase in risk (std.deviation) equal to .0054.

There are some limitations to the use of GNMAs for estimating returns to holding fixed rate mortgages. The default insurance provided by GNMA will decrease the return and risk borne by the mortgage security holder. Provided the rate is assumed to be actuarially fair in the sense that GNMA does not subsidize risk, then appropriate adjustments can be made (see note above). Most of the risk "premium" (defined as the difference between the yield on GNMAs less the yield on Treasury Instruments of similar maturities) in GNMA securities is more likely attributable to prepayment risks, which is the risk that a loan will be repaid before its full term and yield a lower return. This risk is similarly borne by S&Ls and the holders of pass-through securities.

B. Adjustable Rate Mortgages (ARMs)

There is no directly comparable secured instrument to use as a proxy for returns on ARMs. A two-stage approach is used to estimate ARM returns:

1. Estimate inflation risk on an instrument with similar interest rate adjustment provisions. The total returns on two-year, constant-maturity Treasury notes were used to estimate the returns on ARMs. Typically, the extent to which the rates on ARMs can adjust are limited. According to annual reports of the FHLBB on the condition of S&Ls, most mortgage contracts limit the adjustments to one or 2% per year, while some allow only one or 2% over two or three years. In recent years, these limitations would have prevented ARMs from adjusting fully within one year, although two years would probably have been sufficient. As a result, two-year notes are chosen to avoid overstating the speed of ARM adjustment and thus understating the volatility of ARM returns with

respect to changes in interest rate levels[12].

2. The combined risk and prepayment premiums were estimated to be from 0.84 to 0.86% per year. These premiums were estimated from (1) the yield spread between 10-year Treasury bonds and GNMA mortgages[13] plus (2) .06%/month -- the stated GNMA default insurance premium. The estimated premiums likely slightly overstate the true risk with respect to prepayments (GNMA estimates average maturities to have been about 12 years historically), but it may understate default risk.

The variance associated with the returns on ARMs ia constructed as the sum of the variance the return series for 2 year Treasury Notes, plus the variance implied by the combined default and prepayment premia defined above.

The limitations associated with using Treasury bills to serve as a proxy for returns on ARMs are similar to those discussed above in connection with fixed-rate mortgage.

C. Commercial Real Estate Mortgages and Real Estate Direct Investments

The expected return and risk for commercial mortgage and real estate direct investments were estimated by decomposing the returns on publicly traded real estate investment trusts (REITs). In general, REITS hold well diversified portfolios of residential and commercial real estate plus commercial real estate mortgages. The total return on the REIT portfolio was decomposed into its respective asset-types using a hedonic analysis and information on the relative composition of REIT portfolios. The steps in the analysis were as follows.

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[12]Using a one-year T-bill as the proxy does not appreciably change the results. As might be expected, as ARM's become more akin to floating rate instruments the optimal proportion of ARM assets rises.

[13]As reported in the Federal Reserve Bulletin.

1. A sample of thirty-four (34) REITs meeting the following criteria was selected:

   (a) The REIT was traded on the NYSE or the AMEX stock exchanges;

   (b) Information on composition of REIT assets was available in annual reports, Moody's Bank & Finance Manual or Valueline.[14]

Sample REITs are listed in Table 1, which also shows the years for which portfolio data were available for each.

2. Daily stock returns (price appreciation plus dividends) were obtained from the Center for Research in Security Prices (CRSP) Monthly Stock tapes.

3. The composition of each REIT portfolio was categorized according to the share of mortgage and real estate assets using annual reports, Moody's, Valueline, and/or REIT Handbooks 1979-85 (published by the National Association of REITs).

4. A hedonic analysis of real estate versus mortgage returns was then performed, using cross-section regression analyses. The specifications were as follows:

$$R_{reit} = \beta_0 W_m + \beta_1 W_{re}$$

$$S^2_{reit} = \gamma_0 (W_m^2) + \gamma_1 (W_{re}^2) + \gamma_3 (2 W_m W_{re})$$

where

W_m = share of REIT in mortgages

W_{re} = share of REIT in real estate equity.

The coefficients on the first regression provides an estimate of the average returns earned on real estate and mortgage assets respectively. The

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[14] Only a couple of REITs which met the first criteria failed to meet the second.

γ coefficients in the second regression provide point estimates of the variance and covariance of real estate and mortgage holdings. Estimates were derived using ordinary least squares (OLS), with the intercept constrained to equal zero. The regressions were performed cross-sectionally, with separate estimates obtained for each period (1979-86, 1979-81,1982-83,1984-86). The regression results are presented in Table 2.

The results in Table 2 were validated by comparing them to the risk and return characteristics of those REITs with 100% of the portfolio in either mortgages or real estate (see Table 3). The equality of the return and variance estimates obtained using the different methods can not be rejected at the 5% confidence level. The results of the hedonic estimation were used as inputs for computing the efficient frontiers discussed below

D. Stock Returns 1979-85

The expected return and variance for stocks was estimated using the value weighted market portfolio (price appreciation plus dividend) from the CRSP monthly tapes.[15]

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[15]The sources of this information were the CRSP stock tapes and Ibbotson and Sinquefield, op. cit.

TABLE 1

LIST OF THIRTY-FOUR SAMPLE REAL ESTATE INVESTMENT TRUSTS

Firm Name	Years Data Available
American Realty Trust	1979-81, 1984-86
BankAmerica	1982-86
BRT	1979-86
California (REIT)	1982-86
Cenvill	1979-86
Countrywide	1984-86
Eastgroup	1979-86
Federal Realty (First Realty Investment)	1979-86
First Union	1979-86
Gould	1979-86
Hoel Invs	1979-86
HRE Properties (Hubbard)	1979-86
IRT (Investors Realty Trust)	1979-86
MONY	1979-86
MTG Growth	1979.86
MTG & Realty	1979-86
New Plan	1979-86
Pennsylvania	1979-86
Property Capital	1979-86
Realty Refund	1979-86
Realty Income	1979-86
Royal Palm Beach	1979-86
B.F. Saul	1979-86
Transamerica Realty Investment (Mortgage Trust America)	1979-86
Unicorp (Institutional Investors Corp.)	1979-86
Washington	1979-86
Wells Fargo	1979-86
Western Investment	1986
VMS S-T Mtg.	1984-86
Johnstown	1986
ICM Property	1986
Hotel Prop.	1986
Health Care REIT	1986
Conn General Mortgate Realty	1979-81

TABLE 2
REIT HEDONIC REGRESSION RESULTS
OF MONTHLY RETURNS AND VARIANCES

	Coefficient	t-ratio
I. 1979-86: Full Sample		
A. Average Return		
mortgage	.0180	2.53
real estate	.0201	4.41
		adjusted R^2 = .209
B. Variance		
mortgage	.00661	3.3
real estate	.00288	1.93
COV(mortgage, real estate)	.00298	2.71
		adjusted R^2 = .198
II. 1979-81 Subsample		
A. Returns		
mortgage	.0192	1.26
real estate	.0197	2.51
		adjusted R^2 = .173
B. Variance		
mortgage	.00774	1.65
real estate	.00958	2.73
COV(mortgage, real estate)	.00172	1.90
		adjusted R^2 = .119
III. 1982-83 Subsample		
A. Returns		
mortgage	.0223	1.50
real estate	.0232	1.79
		adjusted R^2 = .094
B. Variance		
mortgage	.00469	1.60
real estate	.00312	2.53
COV(mortgage, real estate)	.00141	2.00
		adjusted R^2 = .111
IV. 1984-86 Subsample		
A. Returns		
mortgage	.0164	3.01
real estate	.0135	2.14
		adjusted R^2 = .217
B. Variance		
mortgage	.00753	1.74
real estate	.00252	2.28
COV(mortgage, real estate)	.00226	2.39
		adjusted R^2 = .156

TABLE 3

COMPARISONS OF ESTIMATED MONTHLY RETURNS AND VARIANCES:

HEDONIC METHOD VS. REITs WITH PORTFOLIOS

CONSISTING ENTIRELY OF MORTGAGES OR REAL ESTATE

(1984-1986)

A. "100% Mortgage" REIT Subsample[a]

	Monthly Mean Return (%)[c]	Monthly Standard Deviation[c]
1. Hedonic analysis projection	1.64	8.68
2. Subsample average	1.48	9.19

B. "100% Real Estate" REIT Subsample[b]

	Monthly Mean Return (%)[c]	Monthly Standard Deviation[c]
1. Hedonic analysis projection	1.35	4.92
2. Subsample average	1.40	4.11

Notes: [1]Sample of 3 REITs with 100% of portfolios in mortgate holdings.

[2]Sample of 8 REITs with 100% of portfolios in real estate holdings.

[3]Estimates are not significantly different at the five percent confidence level.

Estimates of the Efficient Frontier

The efficient risk and return frontier for fifteen different S&L portfolios containing various categories of investments was computed using quadratic optimization techniques.

Separate frontiers were computed for the entire 1979-1986 period and the subperiods 1979-81, 1982-83, and 1984-86. The results of these computations for various portfolios are reported in Tables 4 through 7. The second and third columns of these Tables show the monthly returns and standard deviations of particular portfolios with asset compositions shown in the remaining columns, given the expected return ($E[R_i]$) and standard deviations (S_i) for each investment type. These results explicitly assume that there are no constraints on investors' abilities to purchase investments in any proportion although short sales have been ruled out. For example, as seen in Table 5, during the period 1979-81 it would have been optimal for a S&L to have none of its portfolio in fixed-rate mortgages regardless of the combination of risk and return it chose.

TABLE 4

REPRESENTATIVE INVESTMENT PORTFOLIOS ON

THE EFFICIENT RISK AND RETURN FRONTIER:

FIVE-ASSET CASE

1979-1986

			Proportion of Investment "i" in Portfolio (%)				
Portfolio Number	Return ($)	Standard Deviation	Fixed Rate Mortgages	Real Estate	Commercial Mortgages	Stocks	ARMs
1	1.03	1.02	9.72	0.45	0.0	7.08	82.67
2	1.04	1.02	8.22	1.20	0.00	7.44	83.07
3	1.05	1.02	7.71	1.51	0.00	7.54	83.06
4	1.06	1.03	5.72	2.60	0.00	8.01	83.43
5	1.08	1.04	3.76	3.66	0.00	8.50	83.38
6	1.09	1.05	3.05	4.01	0.00	8.64	84.21
7	1.10	1.07	1.11	5.02	0.00	9.04	84.83
8	1.12	1.09	0.00	5.50	0.08	9.44	84.99
9	1.13	1.11	0.00	6.66	0.58	9.60	83.25
10	1.14	1.12	0.00	6.74	0.68	9.63	83.27
11	1.16	1.17	0.00	8.06	1.79	9.93	80.20
12	1.21	1.28	0.00	10.01	3.84	10.34	75.28
13	1.26	1.55	0.00	14.11	5.95	11.85	69.79
14	1.47	2.54	0.00	21.54	10.23	13.26	55.12
15	1.63	5.72	0.00	37.55	20.56	17.17	24.88
Expected Return ($E[R_i]$) of Investment "i":			0.99	2.01	1.80	1.53	1.02
Standard Deviation (S_i) of Investment "i":			2.66	5.37	8.13	3.75	1.10

Note: Because the estimates of monthly return and standard deviation are rounded to two decimal places, distinctly different portfolios may appear to have identical risk or returns.

TABLE 5

REPRESENTATIVE INVESTMENT PORTFOLIOS ON

THE EFFICIENT RISK AND RETURN FRONTIER:

FIVE-ASSET CASE

1979-1981

			Proportion of Investment "i" in Portfolio (%)				
Portfolio Number	Return ($)	Standard Deviation	Fixed Rate Mortgages	Real Estate	Commercial Mortgages	Stocks	ARMs
1	1.04	1.07	0.00	0.00	1.61	5.94	94.45
2	1.04	1.07	0.00	0.00	2.09	6.44	91.46
3	1.05	1.08	0.00	0.00	2.38	6.80	90.81
4	1.06	1.08	0.00	00.00	2.55	7.03	90.40
5	1.06	1.09	0.00	0.00	2.87	7.41	89.78
6	1.07	1.11	0.00	0.00	3.43	8.08	87.99
7	1.08	1.12	0.00	0.00	3.65	8.36	88.01
8	1.09	1.13	0.00	0.00	3.87	8.65	87.48
9	1.10	1.15	0.00	0.00	4.18	9.37	86.86
10	1.11	1.18	0.00	0.00	4.56	9.49	85.93
11	1.12	1.21	0.00	0.00	4.99	10.00	85.00
12	1.14	1.30	0.00	0.00	5.87	11.03	83.10
13	1.16	1.45	0.00	0.00	7.00	12.48	80.51
14	1.18	1.82	0.00	0.00	9.02	14.97	76.01
15	1.22	3.12	0.00	0.94	13.32	20.23	65.50
Expected Return ($E[R_i]$) of Investment "i":			0.29	1.97	1.92	1.37	1.04
Standard Deviation (S_i) of Investment "i":			4.52	9.79	8.80	4.38	1.13

Note: Because the estimates of monthly return and standard deviation are rounded to two decimal places, distinctly different portfolios may appear to have identical risk or returns.

TABLE 6

REPRESENTATIVE INVESTMENT PORTFOLIOS ON

THE EFFICIENT RISK AND RETURN FRONTIER:

FIVE ASSET CASE

1982-1983

			Proportion of Investment "i" in Portfolio (%)				
Portfolio Number	Return ($)	Standard Deviation	Fixed Rate Mortgages	Real Estate	Commercial Mortgages	Stocks	ARMs
1	1.36	0.91	11.25	4.11	0.00	2.68	81.96
2	1.39	0.91	12.25	5.25	0.00	1.46	81.03
3	1.40	0.92	13.11	6.22	0.00	0.44	80.24
4	1.42	0.93	14.46	7.55	0.00	0.00	78.06
5	1.43	0.94	15.06	8.64	0.00	0.00	76.30
6	1.44	0.94	15.54	9.21	0.00	0.00	75.35
7	1.44	0.95	15.76	9.51	0.00	0.00	74.74
8	1.45	0.95	16.01	9.81	0.00	0.00	74.80
9	1.46	0.96	16.70	10.67	0.00	0.00	72.62
10	1.47	0.99	17.64	11.86	0.00	0.00	70.50
11	1.50	1.02	18.54	13.56	0.48	0.00	67.92
12	1.51	1.08	19.48	14.96	1.17	0.00	63.69
13	1.53	1.10	19.75	16.29	1.38	0.00	62.58
14	1.60	1.30	21.97	21.07	3.07	0.00	53.81
15	1.81	2.08	27.20	32.70	7.05	0.00	33.05
Expected Return ($E[R_i]$) of Investment "i":			1.71	2.32	2.23	1.67	1.29
Standard Deviation (S_i) of Investment "i":			2.54	5.54	6.84	4.23	1.06

Note: Because the estimates of monthly return and standard deviation are rounded to two decimal places, distinctly different portfolios may appear to have identical risk or returns.

TABLE 7

REPRESENTATIVE INVESTMENT PORTFOLIOS ON

THE EFFICIENT RISK AND RETURN FRONTIER:

FIVE-ASSET CASE

1984-1986

			Proportion of Investment "i" in Portfolio (%)				
Portfolio Number	Return ($)	Standard Deviation	Fixed Rate Mortgages	Real Estate	Commercial Mortgages	Stocks	ARMs
1	0.84	0.90	6.07	4.83	0.00	9.99	79.18
2	0.85	0.90	6.30	5.01	0.00	10.91	77.79
3	0.86	0.91	6.68	5.22	0.00	12.40	75.71
4	0.87	0.92	7.04	5.55	0.00	13.77	73.64
5	0.88	0.92	7.16	5.79	0.00	14.04	73.02
6	0.89	0.94	7.47	6.04	0.00	15.21	71.26
7	0.93	0.95	7.70	6.23	0.00	16.13	69.94
8	0.96	0.98	8.02	7.01	0.00	16.87	68.09
9	0.99	1.02	8.53	7.51	0.00	18.64	65.32
10	1.08	1.10	9.55	7.80	0.00	21.95	60.70
11	1.15	1.30	10.04	8.00	0.00	29.54	51.46
12	1.24	1.48	10.98	9.23	0.00	35.10	44.69
13	1.30	1.81	10.67	10.82	0.77	44.54	33.20
14	1.38	2.09	10.23	12.12	1.60	52.32	23.73
15	1.49	2.52	10.59	12.98	2.80	63.43	10.20
Expected Return ($E[R_i]$) of Investment "i":			0.96	1.35	1.64	1.85	0.81
Standard Deviation (S_i) of Investment "i":			1.95	4.92	8.68	3.36	1.03

Note: Because the estimates of monthly return and standard deviation are rounded to two decimal places, distinctly different portfolios may appear to have identical risk or returns.

Examining the results for 1979-1986 we find that over the low to moderate risk segments of the efficient frontier S&L's will hold the majority of their assets (70-85%) in ARM's. Hence, even in the absence of incentives to service the housing industry a profit-maximizing thrift will hold a portfolio dominated by mortgages. The 2 direct investment categories -- common stock and real estate -- enter in increasing proportions as the S&L trades off low risk for a higher return.. Over all ranges the optimal level of direct investment exceeds 7%. Current regulations would prevent all but the most highly capitalized institutions from reaching efficient levels of diversification.

Shifts in the frontier over time can be detected by comparing Tables 5 through 7, which show the efficient frontiers in the subperiods 1979-81, 1982-83, and 1984-85. In general the optimal investment policies are reasonably stable. ARM's dominate all the subperiod portfolios. Over highly inflationary/low growth periods (1979-81) fixed rate mortgages were strictly inferior to all other investment options. Common stock investments dominate real estate investments. During this period common stock and real estate offered similar diversification potential against conventional S&L assets, but stocks afforded a superior trade off between return and risk.[16] In the period 1984-86 -- where we find declining inflationary expectations and increased real economic growth -- there is a recovery in the optimal holdings of fixed mortgage assets, and a significant substitution away from ARM's and into the Direct Investment categories. However, fixed-rate mortgages never approach levels consistent with current S&L lending

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[16]The inclusion of commercial mortgages during this period is due to the low correlation with the ARM series. The estimates, however, may be suspect. The distribution of returns for REITs with a large proportion of assets in commercial mortgages was distinctly bi-modal for this period. Some REITs earned high returns -- other earned very low returns. Clearly, further disaggregation of the REIT mortgage assets is warranted.

practices. Direct investment in real estate alone generally reaches or exceeds the constrains imposed by current regulation.

These efficient investment frontiers can be used to estimate directly the "pure" or "Pareto" benefits potentially available to savings and loans from being allowed to include direct investments in their portfolios. To estimate the "pure" benefits from allowing savings and loans to make direct investments, a three-asset "efficient frontier" for fixed-rate mortgages, commercial loans, and ARMs is estimated over the period 1979-86. Table 8 shows 13 representative portfolios along this frontier. These portfolios were chosen to correspond as closely as possible to those shown in Table 4, the five-asset scenario for the same period of time.

As would be expected, a comparison of the two tables shows that the five-asset frontier is superior to the three-asset frontier.[17] Estimates of the annual "pure" gain from direct investment, which can vary depending on the point at which the measurement is made, is shown in Table 9 for the portfolios in Table 4 and Table 8 with roughly the same standard deviations. On an annual basis, these estimates range from 1.08% per year for a portfolio with 12.65% direct investment, to 1.44% per year with a portfolio with 20.35% direct investment.

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[17]The first portfolio in each table represents the minimum-risk portfolio an investor could achieve given the expected returns and variances of the different investment alternatives. Thus, investors limited to the three-asset frontier could never achieve portfolios with variances as low as the lowest available on the five-asset frontier.

TABLE 8

REPRESENTATIVE INVESTMENT PORTFOLIOS ON

THE EFFICIENT RISK AND RETURN FRONTIER:

THREE-ASSET CASE

1979-1986

			Proportion of Investment "i" in Portfolio (%)		
Portfolio Number	Return (%)	Standard Deviation	Fixed Rate Mortgages	Commercial Mortgages	ARMs
1	0.99	1.05	13.60	0.00	86.40
2	1.00	1.05	13.00	0.00	87.01
3	1.01	1.06	11.20	0.00	88.81
4	1.02	1.07	8.30	0.24	91.46
5	1.03	1.09	5.76	1.52	92.72
6	1.04	1.11	3.66	2.59	93.76
7	1.05	1.13	2.02	3.41	94.57
8	1.05	1.16	0.05	4.41	95.54
9	1.07	1.20	0.00	5.79	94.21
10	1.09	1.28	0.00	7.58	92.41
11	1.12	1.43	0.00	10.31	89.69
12	1.15	1.79	0.00	14.84	85.16
13	1.22	3.08	0.00	23.83	76.17
Expected Return ($E[R_i]$) of Investment "i":			0.99	1.81	1.02
Standard Deviation (S_i) of Investment "i":			2.66	8.13	1.10

Note: Because the estimates of monthly return and standard deviation are rounded to two decimal places, distinctly different portfolios may appear to have identical risk or returns.

TABLE 9

ESTIMATES OF THE "PURE" OR "PARETO"

GAINS FROM DIRECT INVESTMENT

1979-1986

Common Standard Deviation	5-Asset Case: Port. No.	% Mon. Return	3-Asset Case: Port. No.	% Mon. Return	Annual Diff. in Expected Returns (%)*	Base Case Direct Investment
1.05	(6)	1.09	(2)	1.00	1.08	12.65
1.09	(8)	1.12	(5)	1.03	1.08	14.94
1.11	(9)	1.13	(6)	1.04	1.08	16.26
1.12	(10)	1.14	(7)	1.05	1.08	16.37
1.17***	(11)	1.16	(8)***	1.05	1.32	17.99
1.28	(12)	1.21	(10)	1.09	1.44	20.35

Notes: *Difference in expected monthly returns times 12.

**The variance of portfolio 8 is actually 1.16.

Source: Tables 4 and 8.

Simulation of Failure Rates

An overriding objective of the FHLBB is to promote the safety and soundness of the thrift industry -- i.e. to minimize the probability of S&L failure. As demonstrated above, permitting low levels of DI (7-10%) results in an absolute increase in attainable return for even the lowest levels of risk. Permitting levels of DI in excess of 7-10% involves a tradeoff between the raising expected return and the raising risk borne by the institution -- or more precisely, the insurance fund. In this section a simple monte carlo simulation model is developed to explore the effects of alternative levels of DI on the probability of S&L failure.

Consider the following highly simplified model of an S&L's net worth over time:

$$NW_t = NW_{t-1} + \gamma_t TA_t - \delta_t(TA_t - NW_t)$$

where: NW = net worth

TA = total assets

γ = the gross monthly return on assets

δ = the cost of funds, incurred on total liabilities

The simulation begins with 1000 stylized firms, each with a beginning level of net worth = 5.0 and total assets of 100.0. This makes our S&L industry approximately 30% better capitalized the average 'real life' S&L.[18] The key variable in the analysis is the return on total assets, γ. The parameter γ_t is modeled as a random draw from a normal distribution of potential returns. The mean and standard deviation of the distribution is taken from distinct portfolios along the 1979-86 efficient frontier.

For simplicity, each firm in the industry is assumed to face the same distribution of potential returns. Again for simplicity, returns are

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[18]The failure minimizing portfolio is not sensitive to initial values of net worth between 3.0 - 8.0.

assumed to be independent and identically distributed across firms and across time. This rules out endogenous changes in risk-taking behavior as a function of the S&L's net worth. The simulation covers 300 months (25 years). Failure is defined as negative net worth for 12 consecutive months. Again, the failure-minimizing investment strategy is not sensitive to alternative definitions of failure in the range of 6-20 months. Reported failure rates, however, do change significantly as the definition of failure changes. Finally, the definition of failure adopted here is designed to capture firms for which the future probability of **positive** net worth is low. This is an economic definition of failure. Judging from recent experience it is more conservative than operational regulatory definitions.

The cost of funds is set constant at 0.96%/month. This is an average of the median cost of funds reported for S&L's over the period 1979-86 plus the average ratio of non-interest operating costs/liabilities (.09%). These are highly simplified assumptions. In particular, future analyses will permit contemporaneous correlation between the returns across firms and between the cost of funds and the return on assets.

Results are presented in Table 10. For both the 10 year horizon and the 20 year horizon the failure-minimizing portfolio contains approximately 15% of assets in direct investments. Recall, from Table 4, this corresponds to 9% of assets in a portfolio of well-diversified common stocks and 6% of assets in real estate. The remaining 85% of the portfolio is invested in adjustable-rate mortgages.

Summary and Conclusions

This paper has examined the potential effects of direct investment on the risk and return charactersitics of S&L portfolios. Preliminary evidence suggests that moderate levels of direct investment in diversified portfolios

TABLE 10

SIMULATION OF CUMULATIVE SURVIVAL RATES

ALTERNATIVE 'OPTIMAL' PORTFOLIOS

1979-86 DATA

Portfolio Characteristics			Percentage Solvent at:	
DI Percentage	Expected Return	Standard Deviation	10 Years	20 Years
7.45	1.03	1.02	85.8	62.7
10.61	1.06	1.03	89.0	70.1
15.04	1.12	1.09	93.4	83.2
20.35	1.21	1.28	81.2	58.5
25.96	1.30	1.55	78.9	52.6
34.80	1.57	2.54	66.0	43.1

of common stocks and real estate can lead to higher expected returns without the imposition of greater risks. The gains come from diversification afforded by real assets coupled with higher historic returns on stock and real estate investments. Current regulations limit direct investment by to strictly inferior levels.

Results must be viewed with a healthy dose of skepticism. In particular, returns on many of the key S&L portfolio assets are proxied by "similar" traded assets. Additional sensitivity analysis must be conducted to evaluate the robustness of the results with respect to alternative proxy variables. Also, real estate holdings are assumed to be well diversified. While this assumption is in accordance with prudent business policy ,small S&L's may be unable to amass large, well-diversified real estate portfolios.

Finally, this paper makes no claims regarding the potential costs of permitting unrestricted investment in DI assets. As the portfolio study shows, even well diversified holdings of common stock and real estate are risky. Subsidized deposit insurance encourages excessive risk-taking. In some sense, permitting direct investments enlarges the menu of options for shifting risk to the FSLIC. However, good , risky ,substitutes for DI remain unregulated -- i.e. junk bonds, construction loans, etc.. Poor industry performance is likely to remain a critical problem as long as poor economic decisions are rewarded. DI regulations will penalize well-managed institutions -- ultimately increasing, not reducing, industry risk.

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