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Loan Performance in the S&L Industry: Policy Lessons from Current Economic Downturn

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Persistent mortgage defaults and massive loan losses have become a regular feature of the US savings and loan industry since the 1980s. This paper investigates the determinants of loan performance in the S&L industry over the period 1978-2009. It tests this hypothesis that poor loan performance is associated with decreasing profits and diminishing net worth of the enterprise (as a proxy for financial leverage). An equation of loan performance is forwarded using an ADF test for the "stationarity" of time-series and least squares trend fitting. The results of our analysis indicate that S&Ls are operating with more financial leverage and less net worth. This suggests that financial policy should be rationalized to put limitations on loan growth and increase the repayment ability of borrowers, which could then reduce non-performing loans in the savings and loan industry.

JEL Codes: G21; B15; C50; E50; P16

1. Introduction

The recent US financial crisis exposed the fragility of the savings and loan industry once again. During this downturn, financial losses have been largely concentrated in the housing market. Banks have failed, non-performing loans are on the increase, and customers default on their mortgages. Institutions of all types experienced massive loan default, especially those offering high-risk subprime and Alt-A mortgages. With the advent of private securitization in the mid-1990s, asset quality declined dramatically while lending standards were reduced. Reflecting the current economic downturn, non-performing and impaired loans ("loans in nonaccrual status" and "repossessed assets") have increased to a degree not seen since the early 1990s (US Treasury Department, 2010). The takeover of IndyMac, a California based S&L, led to the third largest bank collapse in FDIC's history after Continental Illinois in 1986 and First Republic Bank in 1988, costing FDIC "more than 10% of the FDCI's $53 billion deposit insurance fund" (Palette & Enrich, 2008). Before it was taken over in 2008, IndyMac speculated in Alt-A loans, one level up from subprime loans (Hudson, 2008).

Various explanations have been put forward for the cause of this crisis, including deregulation of asset powers and interest rates, lack of supervision, extensive fraud and mismanagement, moral hazard, and adverse incentives created by previous bailouts. As noted by Balderston (1985) and Curry and Shibut (2000), S&Ls were restructured radically in the 1970s and early 1980s under the impact of the Depository Institutions Deregulation and Monetary Control Act of 1980 and the Garn-St Germain Act of 1982. With their new freedoms, they were able to offer a wider range of services that they were not allowed before, such as commercial lending, consumer lending, direct real estate equity investments, trust services, stock

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ownership. There has also been a transformation from the mutual to the stock form ownership with shareholders preempting depositors and displaying more risk-taking behavior (Mester, 1993; Cebenoyan et all, 1995; Fraser & Zardkoohi, 1996). Although these reforms were designed to increase the efficiency of the market place, they did not improve the overall performance of S&L institutions. A more volatile period ensued with the closing of the Resolution Trust Corporation (RTC) in mid-1995—a government agency responsible for resolving 747 S&Ls with total assets of $394 billion. From January 1986, to December 1995, the US S&L industry lost nearly 50 percent of its total institutions—a period during which number of federally insured S&Ls declined from 3,234 to 1,645 (Curry & Shibut, 2000).

As borne out in the next section, many studies of the causes and consequences of S&L failures were published during the S&L crisis and early 1990s. These studies examined a number of factors contributing to bank failures, the government bailout of the S&L industry, and the impact of deregulation, re-regulation and ownership structures on profitability and efficiency (Belderston, 1985; Mester, 1993; Cebenoyan et all, 1995; Fraser & Zardkoohi, 1996; Curry & Shibut, 2000). Yet, the implications of these studies for research on current economic downturn are still under discussion. The need to prevent the problem from recurring requires a re-examination of the factors that contributed to S&L performance during this downturn.

Accordingly, this paper examines the determinants of loan performance in the S&L industry over the period 1978-2009. An equation of loan performance ratio is forwarded using first-order differences of time-series values in OLS regression. We use ADF test (Augmented Dickey-Fuller) that offers useful tools for least squares trend fitting and correction for auto-regression in control variables. Using ROA (return on assets) as a proxy for profits, we test how an industry's assets and its net worth can generate superior loan performance based on the financial ratio analysis in the conventional literature, including Berger (1995) and Benston (1985). Literature on the savings and loan performance replicated the Benston study for the period of the 1980s (especially see Ragas & Harrison, 1995) using time series and cross-sectional data. Because of the time-series nature of our work, this research uses loan performance as a proxy for financial performance rather than replicating the previous models.

The expectation of this study is based on the null hypothesis that profitable industry with strong net worth avoids or minimizes bad loans whereas decreasing net worth leads to poor loan performance. Therefore, it is hypothesized that an increase in loan defaults is associated with decreasing net worth and poor credit quality of borrowers. Overall, the results of our analysis confirm the null hypothesis that higher return on assets and lower ratio of total liabilities to net worth lead to a lower ratio of impaired loans to total loans. Conversely, higher ratio of consumers to default on their loans leads to lower return on assets and hence less bank profits. In addition, while the leverage ratio has a significant negative coefficient on loan performance, the net worth of the industry is positively correlated. This is explained by the indirect effect of omitted variables bias, which cannot be quantified due to hidden leverage (or unreported items on balance sheet). By and large, our analysis is consistent with earlier studies that decreasing net worth and under-performing loans have the potential to render S&Ls vulnerable to risks, thus contributing to financial instability.

The rest of the article is organized as follows. Section 2 reviews the literature on S&L

performance and asset quality in relation to financial ratios used in this study. Section 3 discusses methodology and data sources, whereas Section 4 yields the results of the empirical analysis. Section 5 reviews policy responses for the prudential regulation of S&Ls that have sought to help households in foreclosure and prevent delinquency. Section 6 presents the conclusion and draws strategic lessons from this experience for future researchers and practitioners in the field of risk management.

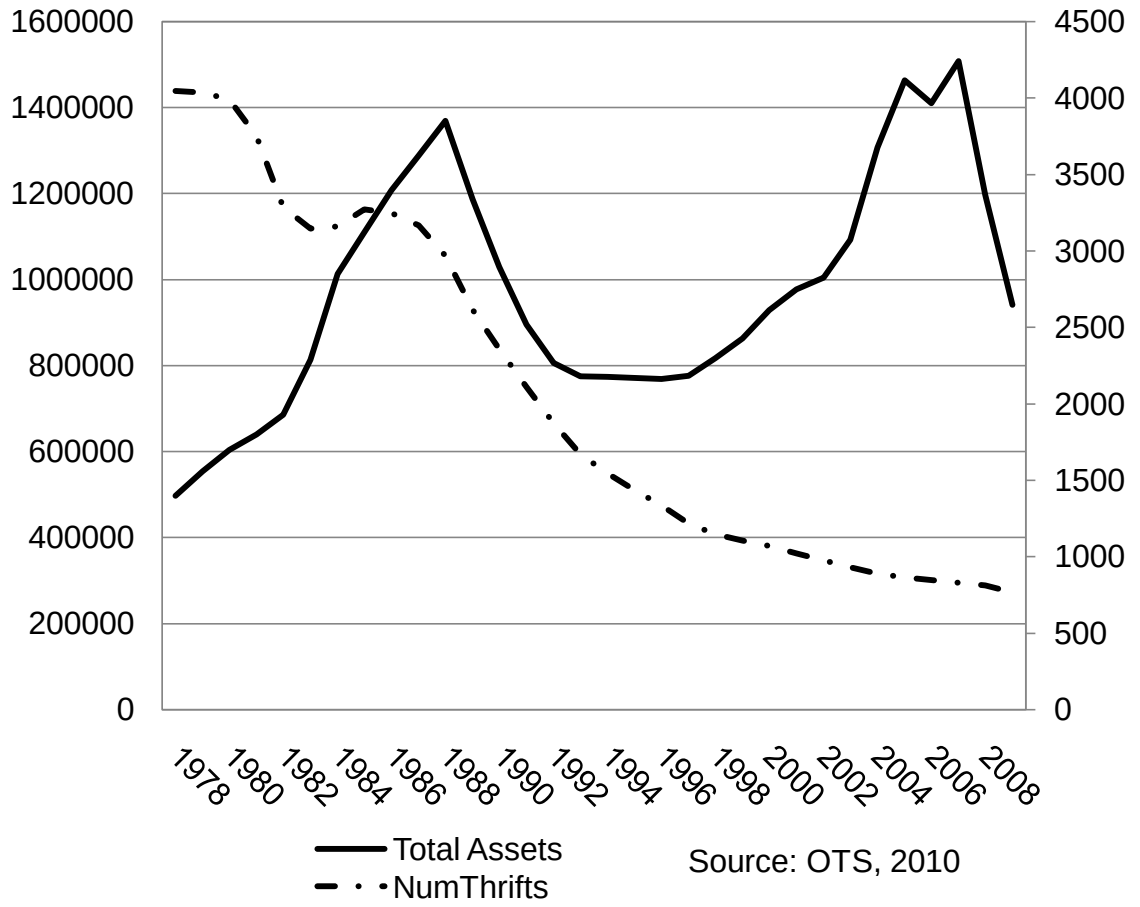
2. Literature Review

Throughout American history S&Ls have been key providers of home mortgages and savings deposits. However, the financial performance of S&L industry has been studied far less frequently than commercial banks (Brigham, 1964; Benston, 1972; Verbrugge, Shick & Thygerson, 1976; Geehan & Allen, 1978; Mester, 1993, Bradley, Gabriel & Wohar, 1995; Kaushik & Lopez, 1996; Jahere, Page & Hudson, 2006). While the bulk of the research has concentrated on the causes and consequences of the S&L crisis, savings and loan studies have drawn largely from US banking research (Benston, 1972; Berger, 1995; Rasiah, 2010). Since the S&L crisis, research has shifted away from this topic. However, the collapse of Indy Mac in July 2008, the largest S&L in California specializing in Alt-A loans, has once again raised concerns about the viability of S&Ls in their present form.

In research into the performance of S&L industry, Benston (1972) investigated the existence of scale economies in a panel study of 83 commercial banks and 3159 S&Ls. Deposit and loan structure were used as proxies for bank size. His findings indicate that greater operating costs are accompanied by larger size, but marginal cost increase at a decreasing rate for branch banking. Diminishing marginal cost illustrates the benefits of scale economies, especially in demand deposit and real estate loans. A similar analysis of that period by Verbrugge, Shick and Thygerson (1976) shows the effects of bank-specific and financial regulation variables on bank performance measured as return on net worth (RONW). The result of the study indicated that usury laws decreased fee income in S&Ls purchasing rather than servicing loans, leading to decreasing profits yet diminishing marginal costs. The authors also find evidence that loan composition (“multi-family and other higher-risk non-single family”) is positively correlated with operating costs.

Using a flexible econometric model, Goldstein, McNulty and Verbrugge (1987) examined the impact of bank size on cost elasticity among different sized S&Ls prior to deregulation. The combination of a large sample data (all insured S&Ls between 1978-1981) with (“translog cost function”) allows an easier estimation of “U shaped cost curves”. This type of modeling allows more flexibility with respect to scale economies throughout all ranges of bank output. It is different from earlier studies that observed no scale economies for large US banks. Since S&Ls display more specialized asset structure than commercial banks, asset size (large concentration of mortgage loans and deposit accounts) can explain variations in cost elasticity (Goldstein, McNully & Verbrugge, 1987:205).

FIGURE 1: NUMBER AND ASSETS ($ MILLIONS)



Mester (1993) used the "stochastic econometric cost frontier approach" to study efficiency in S&Ls of different ownership types—mutual versus stock ownership. Her methodology relies on the use of likelihood ratio with an unrestricted model that takes into account "firm-specific inefficiency measures". This model is based on the assumption that efficient mutual and stock S&Ls utilize different production technologies. Examining whether efficiency (higher-capital asset ratio) differ between two ownership types on average, her research finds that stock S&Ls are more efficient than mutual S&Ls. This result relates to earlier research indicating long-standing "agency problems" in mutual S&Ls, which might have been exacerbated by deregulation of interest rates and increased competition.

In another study, Fraser and Zardkoohi (1996) tested both the ownership and deregulation hypothesis concerning risk-taking behavior in the S&L industry. The results indicate greater risk taking activity in stockholder owned S&Ls than mutual organizational forms, highlighting the impact of the change in the regulatory environment. Used as a proxy for risk, 9 risk-related variables (financial leverage, operating leverage, liquidity, profitability, etc.) are statistically significant in explaining post-deregulation trends predicted by the deregulation hypothesis, such as "decline in single-family residential real estate loans, an increase in relatively risky investment in service corporations and in real estate owned, an increase in financial and operating leverage, and a decline in profitability" (Fraser & Zardkoohi, 1996:68). It further appears that the deregulation of the early 1980s offered greater incentives

("regulatory laxity") for managers to take larger risks, which is associated with decline in corporate accounting standards.

Ten years after the Fraser and Zardkoohi study, one by Jahera, Page and Hudson (2006) finds little relationship between ownership type and financial performance within the S&L industry. While conversion into stock form certainly affects the incentive structures or long-standing agency problems in the firm, it does not seem to affect financial performance directly. This might be due to the fact that a number of the institutions under study might have already undergone some changes prior to conversion that might have impacted their financial performance.

In research into the effect of S&L crisis on "mortgage-credit intermediation", Bradley, Gabriel and Wohar (1995) examined the causes of housing market cycles. Their results indicate that there is a significant correlation between deposit outflows and S&L intermediation of mortgage credit. Additionally, there is evidence that disintermediation occurs as a result of customer flight in the context of deposit rate ceilings and regulatory barriers to competition. This has led to sharp reductions in the provision of mortgage credit (and liquidity), serving to increase the mortgage-Treasury interest rate spread and facilitating the crash. Policy lessons are drawn for the impact of the crisis on the housing sector. Their results cast doubts on fixing the S&L crisis through bailouts of remaining S&Ls.

The most recent study by Hermalin and Wallace (2001) examines the relationship between the executive pay structure and firm performance in the savings and loan industry. Their methodology applies agency theory by allowing "inter-firm heterogeneity" in compensation packages of firms. Finding a strong pay-performance relationship in a regulated industry not anticipated by previous research, the study highlights that even the firms in the same industry use different compensation packages. Overall, the heterogeneity in pay-performance reflects differences in "firm size" (scale economies), "managerial ability" and firm information about "managerial performance".

Blair and Kushmeider (2006) investigated the impact of federal regulatory structure on S&L industry performance. Unlike other countries, the US financial system is marked by deference to competition, a dual banking system, and the choice of charter. In this system, a bank can designate which agency serves as its primary regulator through its selection of a chartering source (federal or state) and choosing to join the Federal Reserve System (Matasar & Pavelka 1998:57). This competition in laxity can be attributed to an effort by federal chartered S&Ls to become state-chartered institutions that enjoy more liberal legislation, thereby reducing state regulatory roles. Figure 1 illustrates the relationship between total industry assets, total number of institutions and market consolidation over the period 1978-2009. At the same time, since the data only includes OTS-regulated thrifts (and federally chartered S&Ls), the decline in the number of total institutions can be attributed to the conversion of federal-to-state charters aimed at exploiting more liberal legislation at the state level.

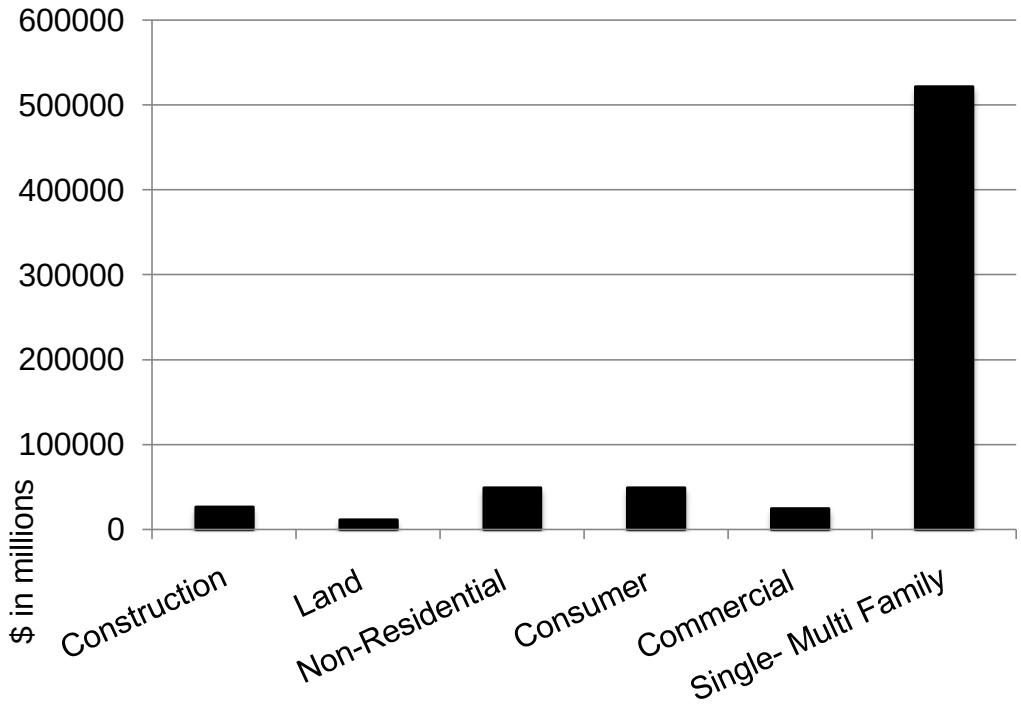
3. Methodology

3.1 Sample Data and Variables

In most bank performance studies, profitability is measured as a function of overall efficiency and other firm-level indicators. While this research associates performance with a number of internal and external variables, savings and loan studies give less attention to the mortgage loan. However, loan performance is difficult to measure due to heterogeneity of banks' assets and credit exposure to different business and regional cycles. Since S&L associations are technically speaking providers of loan and deposit accounts, they are "specialized mortgage lenders with considerable expertise in evaluating potential borrowers, establishing long-term relationships with customers and designing loan agreements that minimize adverse selection" (Bradley, Gabriel and Wohar, 1995:478). Although S&L institutions were largely deregulated in the early 1980s, they have historically remained as providers of home mortgages. As Figure 2 illustrates, from 1978 to 2009, single and multifamily loans remained as the largest category of loans—$521.7 billion—representing nearly 76% of all loans (OTS, 2010).

Therefore, mortgage loan performance appears as one of the most important proxies for the financial condition of this industry. As the main component of loan portfolio, it is associated with an increase or decrease of the average credit quality. Accordingly, to measure the potential determinants of loan performance in this study, we put forward an equation that consists of 7 variables observed from 1978 to 2009, over a 31-year period. The Office of Thrift Supervision (OTS), a bureau of the Department of the Treasury, is the federal regulator of S&Ls (federally chartered) and the financial companies that own savings and loan associations. A variety of financial ratios are calculated using 217 observations from the OTS, *2009 Fact Book: A Statistical Profile of the Thrift Industry*. Time-series for macroeconomic variables are obtained from the Pen World Table of the University of Pennsylvania (1978-207) and World Development Indicators & Global Development Finance (2008-2009) of the World Bank database.

FIGURE 2: AVRG. ASSETS BY LOAN TYPE, 1978-2009



Source: OTS, 2010

The following variables in equation Y_{DML_TLOANS} are hypothesized as affecting the industry's loan performance and thus are held constant. Below is a list of the *cateris paribus* variables accompanied by a brief description and hypothesis for their inclusion in the model.

Explanatory Variables and Null Hypotheses:

ROA: Return on assets is computed by dividing net income over total assets. ROA is the main profitability indicator showing how profitable an industry's assets are in generating better credit quality and loan performance. This is based on the null hypothesis that more profitable industry avoids or minimizes bad loans.

LEV: Leverage, defined as debt-to-equity ratio or capital ratio (total equity/total assets) (Papanikolaou & Wolff, 2010). In this study, debt is calculated as the ratio of debt-to-equity, where debt is calculated by subtracting equity from total liabilities. LEV is a risk factor, indicating capitalization of the industry and the portion of total funds provided by creditors versus by owners. Besides borrowing, one of the common ways of leveraging is to securitize loans. The more a bank leverages the less equity capital it owns, so any profits or losses can be greatly magnified under turbulent market conditions.

NW_TA: This is a risk indicator or financial leverage defined as the ratio of net worth to total assets, where net worth is calculated by the difference between total assets and total liabilities (Ragas & Harrison, 1995; Benston, 1985; Fraser & Zardkoohi, 1996; Berger, 1995). The null hypothesis is that higher ratio of net worth to total

assets is associated with lower risk exposure to bad loans, signifying the amount of debt a company has.

TLI_NW: This variable is used as both net worth and financial leverage indicator. Computed by the ratio of total liabilities to new worth, TLI_NW is an indicator of long-term debt since it reflects the extent to which the net worth of the enterprise can offset its liabilities—the higher the ratio, the lower the ability of the enterprise to retain net worth or balance its debt.

Exogenous variables: Represented by a matrix of Z in regression equation, macroeconomic variables of real GDP per capita income (RGDPL) and the annual growth rate of Real GDP (GROWTH_RATE_GDP) are exogenous variables that might affect the long-run performance of the industry. This is based on the assumption loan performance is pro-cyclical.

3.2 Model Specification

What are the determinants of mortgage loan performance as measured by the ratio of non-performing loan to total loans? Our analysis seeks to evaluate whether the specified ratios since 1978 have led to a loss of credit quality or poor loan performance in the S&L industry. Within a time-series analysis, 7 variables are observed over a 31-year period without missing values. Our data has a temporal reference, *t,* in this case for a year, and *i* for parameter estimates, variables, with autoregressive model of order; ε_t captures the random error in time denoted by *white noise* (residual) and *Y*, *X* and *Z* are the observed value of time-series at time *t*. The dependent variable of loan performance is measured in terms of Y_{DML_TLOANS} followed by a matrix of *X* and *Z*, as control variables, and their coefficients, β and γ.

Used as the proxy for possible loan default, the dependent variable of loan performance ratio is computed by dividing the amount of delinquent loans by total loans. It is hypothesized that better loan performance is distinguished by lower ratio of non-performing loans to total loans, which depends on profitability and net worth of the industry. This is based on the null hypothesis that profitable industry with strong net worth avoids or minimizes bad loans. By contrast, bad performance is associated with deterioration in credit quality, which then increases the probability of risk exposure. Delinquent mortgages are a form of non-performing loans for which the borrower has failed to make payments as specified in the loan agreement. In this study, they are defined as overdue loans. When loans are past due by 30-60-90 days, they indicate the borrower's failure to pay monthly mortgages on time and therefore are classified as delinquent. The lender can start foreclosure proceedings if the borrower fails to pay the mortgage within this time frame. Foreclosure ensues when the borrower has completely defaulted on his or her payments. As a result of this lag between delinquency and foreclosure, mortgage foreclosures were omitted from the analysis and only delinquency rates were included.

According to the insights of unit root econometrics, certain macroeconomic variables such as Real GDP and interest rates have unit roots in levels. As a result, they exhibit trending or non-stationary behavior leading to spurious relationships between predictor and outcome variables. According to Dickey and Fuller (1979), in circumstances where data series are non-stationary, an ADF (Augmented Dickey

Fuller) test is applied to the regression residuals of auto-correlated time-series to make the time-series stationary. This is done by inclusion of lagged values of *Y* where ΔY is the first difference of the variable Y, or first difference operator, indicating Y minus its one period prior value: $\Delta Y_t = \Delta Y_t - \Delta Y_{t-1}$. Before transforming *Y* into ΔY, our regression equation takes the following forms. In the second equation, variables are transformed by including the lagged values of time-series.

$$Y_{DML\_TLOANS} = \alpha + \beta_1 LEV_t + \beta_2 ROA_t + \beta_3 NW\_TA_t + \beta_4 TLI\_NW_t + \beta_5 RGDPL_t + \beta_6 GROWTH\_GDP_t + \varepsilon_t$$

$$\Delta Y_{DML\_TLOANS} = \alpha + \beta_i \Delta X_{i(t-1)} + \gamma_i \Delta Z_{i(t-1)} + \varepsilon_t$$

3.3 Testing Procedure

The data analysis is based on a least squares regression involving two steps. In the first equation, we check the existence of a unit root in levels for control variables that are used to estimate mortgage loan performance. We plot all variables against time in their level form in order to see how they behave as time progresses. If unit roots exist in levels, however, it is necessary to filter the effects of variables with unit roots before undertaking any estimation. Inter-temporal factors might misrepresent variables in a time-series analysis. When data is observed over a defined time frame, autocorrelation may occur where the preceding and successive values of time-series are highly correlated and display trending behavior that cause “serial correlations” over time (Cromwell, Labys & Terraza, 1994:23). Conventional econometric methodologies, however, assume that time-series values are stationary while they are, in real world, can be non-stationary. Therefore, checking for the “stationarity” of each data series is essential before undertaking any estimation.

Following a procedure advanced by Dickey and Fuller (1979) available in the *EViews* statistical software, we de-trend the data with a proper statistical technique. An Augmented Dickey-Fuller (ADF) test is a well-known co-integration procedure that tests the existence of a unit root in a time-series data. Since much of econometric theory is concerned with stationary time-series, we employ the ADF test, which is based on the null hypothesis of a unit root tested against the alternative hypothesis of no unit root.

The unit root test gives the researcher an opportunity to re-estimate the slope coefficients of variables in order to make the time-series stationary. When variables with unit roots are identified, we apply the first or second difference operator to each series. If the first operator shows the differenced time-series to be stationary, then one can apply ordinary least squares to these variables in order to estimate the slope coefficients. Using this procedure, the ADF test confirmed that first level was required for all variables in order to induce stationary. In a series of unit root tests, the coefficients did not show the expected sign in the level. Accordingly, it was proven that our data was non-stationary and required transformation. A regression equation was then re-estimated (below) taking first difference of variables that had unit roots in levels. The re-estimated regression model (with ARMA) is presented in the next section, where D (Δ) stands for the first difference operator.

4. Results and Discussion

This section discusses loan performance in the US Savings and Loan Industry over the period 1978-2009. A review of variables shows some variations in our data. Trends in asset quality, earnings and profitability reflect the continuing US business cycle and economic downturn. From 1978 to 2009, non-performing loans increased by 506.06 percent against an increase of 89.369 percent in total industry assets. This indicates that debt/loan component of assets has increased much faster than total assets. On the other hand, total industry assets decreased by 21 percent over the period 2007-2008, from $1.51 trillion to $1.20 trillion, reflecting the loss of one big S&L that failed during the period (OTS, 2009). During the same period, the average ratio of loan performance stood at 0.024 while the amount of non-performing loans increased from $3.8 billion in 1978 to $23.1 billion in 2009. At the same time, max amount was $41.5 billion and minimum amount was $3.8 billion. Figure 3 shows trends in non-performing loans as measured by the ratio of delinquent loans to total loans, capturing the impact of economic downturn on loan performance. The cyclical component of time-series indicates that non-performing loans reached the highest levels at the peak of the S&L and sub-prime mortgage crises, and then started to level off but has not recovered. According to a linear trend line, it seems that this trend might continue over time, at least for the foreseeable future.

Reflecting the degree of contraction in money supply of the market, mortgage originations began to decrease at an increasing rate since the beginning of the subprime financial crisis. In 2008, total industry mortgage originations (multifamily and nonresidential mortgages) were $404.9 billion, decreasing by 43 percent from $716.2 billion in 2007. In the fourth quarter of 2008, total mortgage originations decreased to $63.2 billion from $166.6 billion in the fourth quarter one year ago. Since they represent the largest category of loans in the S&L industry, single family (1-4) loans were impacted the worst. In the fourth quarter of 2008, 1-4 family mortgage originations by S&Ls were $52.4 billion, down 64 percent from $143.9 billion in the fourth quarter of one year ago (OTS, 2009:4).

Table 1: Basic Statistics of Variables

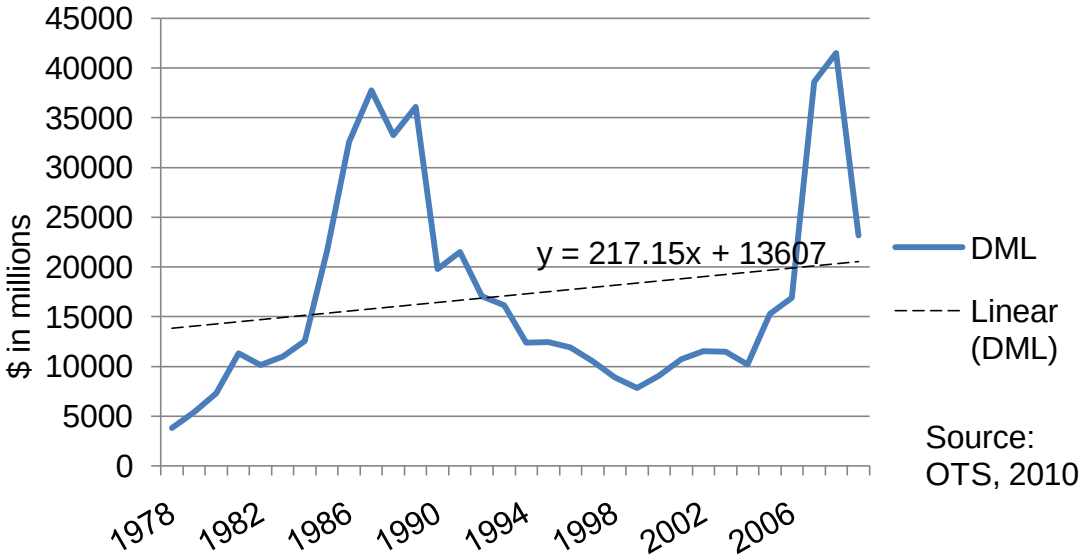
Var.	DML_ TLOANS	LEV	ROA	RGDPL	GROWTH_ GDP	NW_ TA	TLI_ NW
Mean	0.024	15.533	0.003	33057.61	2.875	0.067	16.558
Max.	0.051	34.294	0.012	42897.42	7	0.107	35.294
Min.	0.008	7.328	-0.013	24160.93	-3	0.027	8.313
Std. Dev.	0.011	7.905	0.006	6013.277	2.121	0.024	7.976

Descriptive data indicates that average net charge-offs by loan type reflect the impact of gross loans written off as “bad debt”. In 2007-2009, single and multi-family charge-offs constituted 55 percent of total charge-offs. Net-charge offs in consumer and commercial loans were also considerable (45 percent), highlighting the increasing significance of non-collectible loans in non-mortgage category. Charge-offs arise when a bank is unable to collect some of its loans and are subsequently written-off or reported as a “bad debt expense” on a company’s financial statement. Net-charge off appears as a form of debt or impairment of assets, negatively affecting bank earnings and resulting in a “write-down” of some of the bank’s assets. Since the aggregate

data goes back to 1998 only, we could not use net charge-offs for estimating loan performance. In addition, net charge-offs are form of non-collectible loans so they are not essentially different from delinquent or non-performing loans. Therefore, including this variable might have caused multi-collinearity problem (very high R Square) essentially measuring the same variable as DML_TLOANS.

Table 2 shows ADF unit root test results. Removing the trend in the mean, first difference operator transforms the series into stationary. By and large, the unit root test indicates all the variables in the model are integrated of order one. Table 3 summarizes regression results for the key components of loan performance. In the specification, there is a low level of negative serial correlation (autocorrelation) with Durbin-Watson statistic of 2.27. The regression model, however, is significant at 2 percent level based on Probability (F Statistic). Overall, these measure the mutual relationship between the control variables and dependent variable. Based on R and Adjusted R-Squared values, the right hand side variables explain the dependent variable by almost 44 percent and 30 percent and the F statistic supports the regression. Probability (F-Statistic) suggests that our regression model is significant at a 1 percent level, so we can be reasonably confident that the good fit of the equation is not due to chance.

FIGURE 3: NON-PERFORMING MORTGAGE LOANS



The regression analysis in Table 3 supports the null hypothesis of bank profitability and net worth but does not recognize the importance of exogenous variables and the ratio of net worth to total assets. Variables except RGDPL, GROWTH_RATE_GDP and NW_TA are significant in explaining loan performance at 1 percent and 5 percent respectively. This seems to indicate that macroeconomic variables are not related to deterioration of credit quality in the savings and loan industry. This result is unexpected given that income per capita is pro-cyclical, especially when loss of income reduces demand for homes and at the same time makes loan defaults more likely (hence rise in non-performing loans). The impact of GDP on financial sector performance is given explicit attention in Demirguc-Kunt and Huizinga (2000) who have presented an important link between economic growth, financial development and bank profitability. Banks in well-developed markets face tougher market

competition but lower profitability. Yet, greater financial market development is correlated with higher bank profits and net interest margins in less developed financial systems. Applying this interpretation to our analysis, it is plausible to say that higher profits lead to higher mortgage originations because it allows lenders to borrow more capital in order to generate more mortgages; in other words, greater economic growth generates lucrative financial industry through higher market capitalization as shown in Demirguc-Kunt and Huizinga (2000). In this study, it was inconvenient to quantify the impact of market capitalization on GDP. For example, market capitalization information for S&Ls—dollar market value of all of a company's outstanding shares—was unavailable in our database.

Confirming the null hypothesis for each variable, table 3 presents the results of the effects of leverage (LEV), return on assets (ROA) and ratio of total liability to net worth (TLI_NW) on loan performance. The coefficient signs indicate the statistical significance of the relationship. While LEV and ROA have a negative coefficient sign, TLI_NW is positively correlated with poor loan performance. The most statistically significant variables are LEV and TLI_NW at 1 percent with p values of 0.0032 and 0.0041 respectively. Leverage varies in significance depending on the loan performance used but in this model carries negative sign, indicating inverse relationship with respect to poor loan performance. This seems to indicate that higher the non-performing loans as a share of total loans, the lower the leverage and vice versa. While one can expect leverage to be positively associated with poor performance, the results point in the opposite direction. This is explained by leverage's inverse relationship with profitability or as a result of hidden leverage obtained through off balance sheet.

Table 2: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variables	ADF t-statistic (level)	Variables	ADF t-statistic
DML_TLOANS	-1.865 (0.343)	∆DML_TLOANS	-5.028 (0.0003)
LEV	-2.008 (0.281)	∆LEV	-5.509 (0.0001)
ROA	-1.743 (0.3996)	∆ROA	-5.113 (0.0003)
RGDPL	-1.342 (0.596)	∆RGDPL	-3.373 (0.0201)
GROWTH_ RATE_GDP	-3.376 (0.019)	∆GROWTH_RATE_GDP	-6.739 (0.0000)
NW_TA	-0.033 (0.948)	∆NW_TA	-3.843 (0.0067)
TLI_NW	-1.992 (0.288)	∆TLI_NW	-5.181 (0.0003)
ADF indicates the Dickey and Fuller (1979) t-test for time-series unit root tests. This test examines the null hypothesis of unit root (non-stationary) at 5 percent critical value. The figures in parenthesis are the p-values.			

The results are confirmed by the null hypotheses of bank profitability and net worth as evident in coefficient signs and correlation coefficient. Given that profits are integral part of bank earnings, we expect non-performing loans to decrease as profits

increase. Similarly, high ratio of DML_TLOANS leads to lower return on assets (ROA), in other words less bank profits, as supported by the correlation coefficient of -0.55. This is also confirmed by the null hypothesis of bank profitability. Since banks generate income by writing loans, the price of these loans cover operating costs and generates a profit. If a borrower fails to make payments for a long period of time, the bank loses income and categorizes the debt as delinquent or non-performing loan. The overall implication of this relationship for financial performance is important because it indicates that S&Ls are operating with a higher ratio of non-performing loans that can lead to a profit decline, a contraction in mortgage lending, and falling share prices.

Table 3: Regression Results for the Key Components of Loan Performance

Dependent Variable: D (DML_TLOANS)
Method: Least Squares (NLS and ARMA)
Sample (adjusted): 1979 2009
Included observations: 31 year after adjustments, 217 observations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001572	0.000977	1.609487	0.1206
D (LEV)	-0.011189***	0.003416	-3.275475	0.0032
D (ROA)	-0.627385**	0.269874	-2.324735	0.0289
D (RGDPL)	-0.000000	0.000000	-1.611253	0.1202
D (GROWTH_RATE_GDP)	-0.000000	0.000385	-0.016149	0.9872
D (NW_TA)	-0.366793	0.251581	-1.457953	0.1578
D (TLI_NW)	0.010067***	0.003177	3.168480	0.0041
R-squared	0.440618	F-statistic		3.150752
Adjusted R-squared	0.300773	Prob (F-statistic)		0.020116
Durbin-Watson stat	2.272113			

***Significant at 1 percent level or 0.01; ** Significant at 5 percent level or 0.05; *Significant at 10 percent level or 0.1. Based on the critical value of 2, Durbin-Watson statistic of 2.27 indicates a low negative autocorrelation.

Everything else remaining equal, there is evidence that the ratio of total liabilities to net worth (TLI_NW) affects loan performance positively. Measuring the net worth of the enterprise to offset its liabilities (debt), TLI_NW reflects on the relationship between assets and liabilities. Higher ratio is an indicator of higher debt and thus less net worth. Hence, a positive sign indicates that S&Ls, *cateris paribus*, operate with more financial leverage, as expected by the null hypothesis of net worth. An industry with higher debt is also likely to display a higher ratio of non-performing loans to total loans. As DML_TLOANS increases, the ratio of total liabilities to net worth increases, consistent with positive coefficient sign of TLI_NW in Table 3. Overall, our analysis is coherent with the view that diminishing net worth of the enterprise and under-performing loans render S&Ls vulnerable to credit risks, thus contributing to financial instability.

5. Housing Policy Implications

We can make some recommendations at the industry and country level that will help improve the safety and soundness of loan portfolios at remaining S&Ls. While some of these recommendations are external to institutions such as financial regulations, some of them are internal, particularly industry-specific. Return on Assets and ratio of total liabilities to net worth are important internal factors since they were found to be

complementary with loan performance. Internal factors reflect on managerial decision-making and the efficiency of operating policies and procedures. Another variable to consider is loan loss provision that represents the reserves set aside for potential loan defaults. One possible way to maintain S&L safety and soundness is to increase loan loss reserves in interest bearing assets, especially high-risk assets like subprime mortgage loans. Keeping average reserves higher than historical standards is necessary to cushion the effect of risky assets.

The quality of loan portfolio reflects the degree of credit risk associated with an asset and maps to the overall riskiness of an institution. Reinforcement of the regulatory standards is therefore necessary for the supervision of loan quality. Persistently regulating the ratio of non-performing loans to total loans and monitoring the size of leverage are essential in controlling risk. It is necessary to monitor the adequacy of Loan Loss Provisions concomitantly with risk management practices and internal regulations at financial institutions.

In addition to regulating loan performance and fiscal soundness at S&Ls, an intervention geared towards defaulting borrowers might be appropriate. Since the start of the housing crisis in 2008, the US government introduced a number of loan modification plans that were favorable to borrowers, such as changing the terms of loan agreement, reducing the interest rate, extending the payment term and using “forbearance plans”. Under the Home Affordable Modification Program (HAMP), for example, the US Department of the Treasury, Fannie Mae, and Freddie Mac were called on to use up to $75 billion in loan modification. These plans were aimed at delaying foreclosure and making mortgage payments more affordable, especially in the non-prime category (GAO, 2009:13).

While lenders and borrowers must work together to improve loan performance and help reduce potential home foreclosures, it is a challenge for policy makers to determine loan modification eligibility. The need for loan improvement faces challenges from borrowers and lenders, especially when there are difficulties identifying defaulting borrowers. As the GAO noted, the US Treasury has estimated that up to 3 to 4 million borrowers with high risk profile (at risk of default or foreclosure) could be part of the loan modification plan under HAMP. However, as GAO noted again in July 2009, “Treasury’s estimate reflects uncertainty created by data gaps and the need to make numerous assumptions, and therefore may be overstated” (GAO, 2009:13-14).

6. Summary and Conclusions

Persistent mortgage defaults and massive loan losses have become a regular feature of the savings and loan industry since the 1980s This paper investigated the determinants of loan performance in the S&L industry over the period 1978-2009. In particular, we sought to test the hypothesis that non-performing loans are associated with decreasing profits and diminishing net worth of the industry as a proxy for financial leverage. Furthermore, the paper discussed the significance of recent market and financial innovation and assessed the role of regulation in light of historical trends. In the final section, we briefly discussed the implications of policy interventions for industry performance in order to draw strategic lessons for future researchers and practitioners in the field of risk management.

We obtained the data from the Office of Thrift Supervision (OTS) database between 1978 and 2009, using 217 observations over a 31-year period. Despite the sizable indicators of loan performance going far back to 1964, this paper only included the period for which information on loan performance was found. Before undertaking any estimation, we employed Augmented Dickey Fuller (ADF) unit root test, which is based on the inclusion of lagged values of variables for checking stationary. To apply the test, we accepted the null hypothesis of a unit root assuming that time-series variables were non-stationary. After applying the first difference operator to the series in the evidence of a unit root, we were able to observe meaningful trends in the performance of the S&L industry.

Overall, the results of our analysis confirmed the null hypothesis that S&Ls are operating with more financial leverage and less net worth. In addition, industry characteristics explain a considerable part of the variation in loan performance measured by the ratio of non-performing (delinquent) loans to total loans. The most statistically significant variables are return on assets, leverage ratio and ratio of total liabilities to net worth. Poor loan performance tends to be associated with industry holding less profits and net worth. Put differently, this indicates that lower return on assets (ROA) and higher ratio of liabilities to net-worth lead to a higher ratio of poor loan performance. Hence, the positive sign of net worth ratio indicates that S&Ls operate with more financial leverage, which also increases the risk exposure and adversely affects profits—higher the ratio of consumers to default on their loans, the lower the return on assets.

Furthermore, the negative sign of leverage is not supportive of null hypothesis that higher leverage contributes to deteriorating credit quality. The unexpected direction of the relationship probably indicates hidden leverage obtained through off-balance sheet. By and large, our analysis is confirmed by earlier studies that decreasing net worth and under-performing loans have the potential to render S&Ls vulnerable to credit risks, thus contributing to financial instability.

One of the limitations of this study is the exclusion of bank-specific data for examining loan performance, such as loan loss provisions, different sizes of S&Ls, net-charge offs. While this type of data is largely available for US commercial banks, it only goes back to 1991 for S&Ls, making it difficult to generalize from a small sample. Although time-series analysis neglects variations across different types of institutions, the co-integration statistical procedure (ADF test) was able to filter some of the trending behavior in our data.

Future research can benefit from the correction for “endogeneity” problem (“omitted variables” bias) and the inclusion of other exogenous variables such as policy interventions and regulatory capital requirements that can affect the long-run performance of the S&L industry at the country level. Structure-conduct-performance (S-C-P) theory highlights the contribution of market structures and financial system variables to financial institution performance. This theory is used to analyze the relationship between banking sector performance and financial market structures. With an industrial organization approach, it has led to useful modeling of financial performance, technological innovations, merger analysis, and analysis of market power. If properly integrated into the S-C-P paradigm, the policy reforms discussed above can be the starting point for regulators to design long-term policies that can enhance the soundness and stability of US financial institutions.

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