EVIDENCE ON US SAVINGS AND LOAN PROFITABILITY IN TIMES OF CRISIS

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ABSTRACT

In 2008, market disturbances and unexpected price volatility besieged the US financial system. Since then weak balance sheets have heightened risk, thus resulting in an unprecedented rise in non-performing loans and credit-related write-offs in mortgage lending related sectors. This paper examines the determinants of US Savings and Loan (S&L) profitability in the time period 1978 and 2009. We use the recently developed unit root econometrics for time-series data analysis. Using ADF as a statistical test by estimation of least squares trend fitting, the study highlights that high leverage and large non-performing loan to total loan ratio leads to a lower rate of return on capital. In addition, the loan ratio has a significant negative coefficient on return on asset and equity capital. While macroeconomic factors such as low interest rates have a negative effect on bank earnings, the effects of interest rates can vary depending on the profit indicator used. By and large, there is evidence that the quality of loan portfolio rather than size (economies of scale) affects profitability negatively. Our results are confirmed by earlier studies that over-leveraging and under-performing loans have the potential to render S&Ls vulnerable to financial shocks, thus contributing to financial instability.

JEL: G21; B15; C50; E50; P16

KEY WORDS: S&L crisis, bank profitability, economic development, subprime mortgage crisis, mortgage-backed security (MSB), IndyMac

INTRODUCTION

This paper presents evidence on US savings and loan profitability in the period 1978-2009. The S&L industry has changed extensively over the last several decades. Firms are generally fewer and bigger today and offer wide-ranging services and operate in increasingly global markets. While home mortgages and savings deposits have always remained a staple of thrifts since the passage of the Federal Home Loan Bank Act in 1932, S&Ls assumed new roles beyond facilitating home ownership. During the late 1970s and early 1980s, they began marketing a new array of financial products and services like those offered by larger banks. As their new roles reflected a changing financial environment and deregulatory interventions, unique measures were taken to improve performance. Following the S&L debacle in 1989, the OTS was established as the primary regulator of S&Ls. Yet over the period 1986-1995 "1043 thrifts with total assets of over $500 billion failed" (Curry and Shibut, 2000:26). Prior to the subprime mortgage meltdown in mid-2007, more borrowers looked toward mortgage lenders, even if they lacked qualifications for obtaining loans. In 2010, the Wall Street Reform and Consumer Protection Act decided to restructure OTS by distributing some of its functions among the existing regulators—OCC, FDIC, and the Federal Reserve. Under the new rules, all S&Ls are regulated by the OCC, which also regulates federal banks and the US branches and agencies of foreign banks.

This paper examines the determinants of US Savings and Loan profitability in times of crisis. We use yearly aggregated industry data covering a 31-year period from 1978 to 2009, observing 11 variables (financial ratios) before the start of the crisis as well as those that followed. The aim of this analysis is to establish which of these potential determinants of profitability prevail in the US S&L industry. For this purpose, an ADF unit root test is conducted for least squares trend fitting by first-order differences of variables.. The results of the study indicate that high leverage and large non-performing loan to total loan

ratio lead to a lower rate of return on capital. This means that higher the probability of consumers to default on their loans, the lower the return on assets and hence less bank profits. While macroeconomic indicators such as a decline in interest rates have a negative effect on profitability, the effects of interest rates are inconclusive depending on the profit indicator used. Everything remaining equal, there is evidence that loan quality problems rather than size (economies of scale) affect profitability negatively. Overall, our analysis is confirmed by earlier studies that over-leveraging and under-performing loans have the potential to render banks vulnerable to financial shocks, thus contributing to financial instability.

The rest of the article is organized as follows. Section 2 briefly discusses the relevant literature and background. Data selection, research methodology and empirical models are described in Section 3. Section 4 provides analysis and interpretation of the empirical findings. Section 5 concludes the paper and draws strategic lessons for future researchers and practitioners in the field of risk management.

LITERATURE REVIEW AND BACKGROUND

In this section we present a brief overview of studies that examine the bank profitability-microeconomic/macroeconomic nexus. We begin by discussing the most recent and sophisticated studies, employing panel country studies, to older, less complex, historical studies. In extending the research on savings and loan profitability, the starting point has been the pioneering literature as well as previous studies on bank performance (Brigham, 1964; Benston, 1972; Berger, 1995).

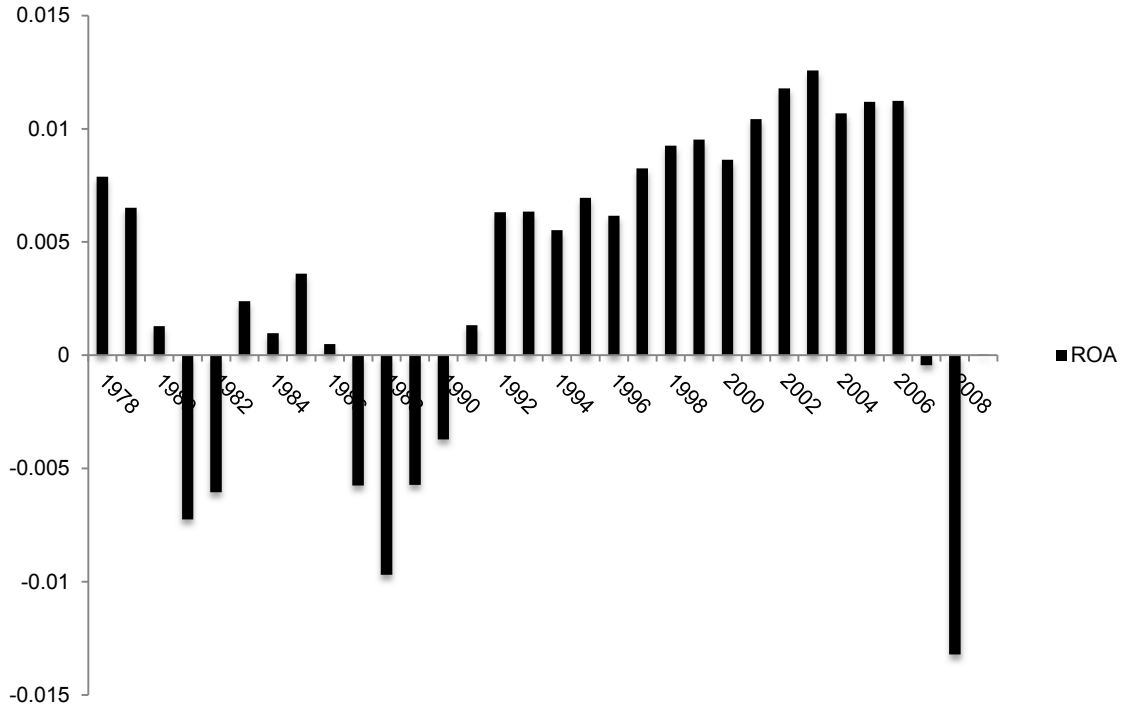
S&Ls have always played an important role as facilitators of home mortgages and savings deposits. Unlike commercial banks, however, they mainly provided low-cost funding for long-term mortgage loans, consumer loans, small business, and regional development lending. In acknowledgment of the need to diversify the asset structure and improve earnings, Congress passed the Garn-St. Germain Depository Institutions Act in 1982 phasing out Regulation Q and allowing the use of adjustable interest rates. Federal deregulation was designed to wean thrifts from borrowing-short and lending-long. They would now be put on a competitive footing with new financial institutions (Sherman, 2008:809-810). In 1989, Congress removed barriers between commercial banks and S&Ls.

As a result, much of the thrift industry was deregulated through "outright mergers as well as bank holding company acquisitions of S&Ls" (Ely, 2008). Since then, research has shifted towards the broader financial industry, generating discussions on the causes and consequences of the S&L crisis (Strunk and Case, 1988; Kane, 1989; Barth 1991; White, 1991; Curry and Shibut, 2000). Although S&Ls have become defunct institutions since the original crisis, the collapse of Indy Mac in July 2008 (the largest S&L in California specializing in Alt-A loans) have once again raised discussions about the viability of thrifts in their present form.

The demise of Indy Mac was the fourth biggest bank failure in US history and the second largest failure of a regulated thrift (Shalal-Esa, 2008; Veiga, 2008). Studies on savings and loan performance have drawn largely from US banking literature (Brigham, 1964; Benston, 1972; Verbrugge, Shick and Thygerson, 1976; Geehan and Allen, 1978; Berger, 1995; Kaushik and Lopez, 1996). While pioneering research was conducted in the US, researchers from other countries compiled data based on previous studies and extended the existing literature several ways. With better access to sectoral data and the use of more sophisticated models, panel country studies have highlighted the importance of bank-specific (internal), industry-specific (external) and macro-economic variables. It is impossible to review each study here but would refer readers to the research of Short (1979), Bourke (1986) and Molynex and Thorthon (1992) that developed more sophisticated models for analyzing the relationship between concentration, market structures, and bank profitability. As Berger (1998) notes, this line of research has progressed almost separately from a "microeconomic theory of banking" and has given banking studies a new direction. Under the purview of structural-conduct-performance (SCP) hypothesis, for example, a

group of researchers investigated the effects of market structures on productivity change and performance in European and US banking (Gilbert, 1984; Goldberg and Rai, 1996; Casu, Girardone and Molynuex, 2004). Further studies in banking have been critical in orienting methodology towards "single country studies" and "panel country studies" (Naceur, 2003).

Figure 1: US Savings and Loan Profitability



This figure shows the changes in S&L return on assets (ROA) as the ratio of net income to total assets, indicating the vulnerability of bank profits to financial shocks and housing cycles in 1988 and 2008 respectively. Ratios are calculated from OTS (2009) database.

Rasiah (2010) divides the literature into three parts that deal with external determinants, internal determinants, and the relationship between bank profitability and market structures. In an extensive review of empirical work in this area, Bourke (1986) indicates that internal factors are company specific variables, which may not be available in international surveys. They are capital and liquidity ratios, the loan/deposit ratio (equivalent of the liquidity ratio), loan loss expenses and operating expenses on the income statement. External determinants are outside of managerial control, such as financial regulations, competitive conditions, market growth, ownership type, inflation, concentration level, and interest rates (Bourke, 1986:66). In Rasiah's (2010) extensive review, which draws on Bourke's classification, bank-specific variables are internal to the operation of a bank such as "financial statement" and "non-financial statement" variables. Holding external factors constant, internal variables are responsible for explaining institutional variations in profitability and reflect on the quality of managerial decisions. Specifically, financial statement variables relate to the items on "balance sheet" and "profit & loss account". They include asset and liability management (ie., managing margin; loan loss provisions; net charge-offs), cost or expense management (ie., interest paid on deposits, capital ratios, wage and salary payments), bank management policies, loan composition (ie., the ratio of commercial, real estate, consumer loans to total loans) and non-performing loans. Non-financial statement variables, on the other hand, indirectly affect the balance-sheet performance. The examples of items in this category are number of bank branches, bank

size (total assets as a proxy for size) and economies of scale, bank location and status of the branch (unit or multiple branches) (Rasiah, 2010:23-49).

Using cost efficiency as a proxy for profits, earlier studies investigated the effects of bank specific variables—especially firm size and scale economies. These studies compare economies of scale among different ownership forms, charter types and in different geographic areas. Although the overall measure of profitability is not estimated in these studies, a positive relationship is expected between size and profits. Size is used to capture the fact that banks with large size (total assets as a proxy for bank size/output) enjoy scale economies because they are able to produce services more cheaply and therefore obtain a higher level of profits than smaller banks. Against this background, Brigham (1964) examines the relationship between operating cost (dependent variable), bank size and rate of growth (independent variables) for two cross-sectional samples of California S&Ls in the period 1956-1962. Bank size is measured as log of assets; rate of growth is measured as growth in new loans, set up costs, new facilities and personnel, and operating characteristics include ratio of offices and equipment to total assets and average deposit size (ie., the cost of servicing savings accounts). Regressing output levels with unit costs, the study concludes that none of the "size-generated" variables is significantly related to economies of scale (Brigham, 1964:20).

In a study of the operating costs of 83 commercial banks and 3159 S&Ls, however, Benston (1972) finds significant economies of scale for both types of institutions, especially in demand deposit and real estate loans. He uses deposit structure (demand and time deposits) and loans as size variables and regresses them against the operating cost as dependent variable. Although it is found that larger size is associated with greater costs, operating cost increases at a decreasing rate in branch banking. Unlike unit banking, branch banks enjoy the "economies of larger scale operation" that reduces marginal cost of branching. This relationship, however, does not seem to hold true for S&Ls because size is not always associated with greater number of branches (Benston, 1972:313).

Verbrugge, Shick and Thygerson (1976) are among the early researchers to develop a comprehensive model for analyzing S&L performance for a sample of 478 associations over the period 1971 and 1972. Using return on net worth (RONW) as a proxy for profit, their study identifies different components of performance across different categories of variables— asset management (liquidity (LIQ), loan yield (YLD), fee income (FEEI); non-operating activity (NOPI)), liability management (certificates (CERT); borrowing (BOR); risk (NWS)) and operating expense management (OPEXP) and other variables (form of organization and size). The study highlights that S&L performance is associated with FEEI (fee income/total income), YLD (interest on mortgage loans/mortgage loans), OPEXP (operating expenses/average assets), CERT (certificates/total savings) and risk (new worth/savings). Their results reveal the importance of bank-specific and regulation variables in profitability performance; for example, fee income tends to be less in S&Ls operating in states with usury laws; such associations purchase rather than service loans although they have marginally less operating costs. In addition, loan composition ("multi-family and other higher-risk non-single family") is a primary influence on profits but positively correlates with operating costs (Verbrugge, Shick, Thygerson, 1976:1440).

Benston (1972) and earlier researchers did not clearly link firm size to profit rates. Instead they correlated output levels to unit costs. Gallick (1976) emphasized the degree to which bank size was linked to profitability as a rate of return on capital—ratio of net income before taxes to total capital. His results appear to confirm earlier studies for a sample of all insured commercial banks (1954-1974) classified by deposit size. On the other hand, Heggestad (1977) regressed bank size (deposit composition) and external/industry-specific factors (three bank concentration ratio) with profitability for a sample of 238 independent banks in 60 medium-size metropolitan areas, but found no clear association. The study indicates rather that rate of return on assets (profitability) tends to decrease as ratio of time and savings deposits to total deposits increases. This supports his argument that banks with high deposit ratio generate

considerably lower returns. There is also evidence that risk and market structure has a significant relationship with profitability; monopolistic banks are more risk averse in their lending decisions and tend to choose safer portfolios than banks in more competitive markets (Heggestad, 1977:1213).
In another study, Benston and Hanweck and Humphrey (1982) do not find major evidence for scale economies across a broad range of variables among US domestic banks. Tschogel (1983) reaches similar conclusions about the relationship between size and transnational growth for a sample of the world's 100 largest banks in 1969-1977. Drawing upon the US experience for European banking, Berger and Humphrey (2003) also show that larger banks do not necessarily experience lower average costs than middle-size banks.

Goldstein, McNulty and Verbrugge (1987), however, discovered that there were significant variations in cost elasticity among S&Ls of different sizes prior to deregulation. The use of a large sample data (all insured S&Ls between 1978-1981) and flexible econometric model ("translog cost function") allow "U shaped cost curves" to be estimated. Translog's flexibility facilitates the observation of scale economies throughout all ranges of bank output. Their findings are different from those estimated by earlier studies that observed the absence of scale economies for large US banks. Since S&Ls are more specialized than commercial banks, asset size can explain variations in cost elasticity (Goldstein, McNully and Verbrugge, 1987:205). For example, large concentration of assets in mortgage loans and savings deposits makes S&Ls more receptive to scale economies than those of commercial banks.

In research into the effect of capital requirements using Granger causality test, Berger (1995) shows that a higher capital-to-asset ratio is not correlated with lower rate of return on equity. Capital requirement determines how much capital banks should aside as a percentage of risk-weighted assets. Capital requirement for long-term viability has become a critical issue following the financial crisis in 2008. Berger's panel analysis of US banks for the 1983-1992 period reveals that there is a "positive Granger causality from earnings to capital". The relationship between higher capital and higher earnings is especially true for banks with low interest rate offerings on uninsured funds; these banks have better management of risk portfolio. Risk management explains a significant variation in higher earnings for banks that also pay "lower uninsured debt rates" (Berger 1995:433).

Aside from some internationally significant panel studies, the most comprehensive evidence on bank performance can be found in the recent work of Demirguc-Kunt and Huizingha (2000) and Athasanoglou, Delis and Staikouras (2006). Based on the panel data for seven Southern European countries for the period 1998-2002, Athasanoglou, Delis and Staikouras (2006) investigate the effects of bank-specific, industry-related (microeconomic) and macroeconomic determinants of bank profitability. Industry-related variables include concentration ratio of 3 largest banks, HHI index and EBRD index of banking system reform whereas macroeconomic indicators include inflation, financial crisis dummy and real GDP per capita. Overall, the study concludes that structure-conduct-performance (SCP) paradigm explains the performance of Southern European banking sector. Concentration measured by HHI and inflation positively affects performance while GDP is unrelated.

Using a multi-country panel of banks for the period 1990-1997, Demirguc-Kunt and Huizinhga also present evidence on the effect of financial structure and economic development on bank performance. Specifically, banks with less developed financial systems are shown to have higher profits and net interest margins. Greater bank development (or transition to a more developed financial system) is correlated with lower profits (through tougher competition and high efficiency). The study also finds that stock market activity leads to higher bank profits in less developed financial systems through the availability of equity financing to firms. Yet such "complementarities" are insignificant in advanced financial systems or at higher levels of economic development (Demirguc-Kunt and Huizingha, 2000:15).

One major difficulty with most of the studies above is the complexity of measuring bank profitability. This is due to the diversity of bank output and the heterogeneous services being offered. Therefore significant relationships may appear because of the researchers' use of aggregate data, which downplays sectoral differences. Another problem is the difficulty of measuring policy interventions. Post-crisis deregulation has encouraged S&Ls to offer a broad spectrum of services ranging from mortgage loans on residential property to consumer loans, credit cards, and checking accounts. Yet, as Benston noted, S&Ls asset structure is more specialized than commercial banks, largely concentrated in real estate loans and savings accounts (Benston, 1972:331). The current study corrects for sectoral differences by analyzing uniform asset structure (mortgage loans) and using yearly aggregated data covering a 31-year period from 1978 to 2009. The financial ratios are in accord with previously published studies in the field. The methodology used in this analysis incorporates many of the recent developments in the literature, namely time-series unit root tests, which may uncover the nature and depth of industry performance.

DATA AND METHODOLOGY

Data Sources and Variables

The current study uses yearly aggregated, time-series data covering a 31-year period from 1978 to 2009. The data is extracted from the Office of Thrift Supervision (OTS) database as well as World Bank, Board of Governors of the Federal Reserve System and Pen World Table of the University of Pennsylvania. The data set consists of variables for S&Ls for which a variety of financial ratios are calculated for each year (see below). S&Ls refer to private savings associations, state or federal charter, supervised by the Office of Thrift Supervision (OTS). Although there are sizable indicators of industry performance going far back to 1964, this paper only analyzes the period for which data on profitability was found—from 1978 to 2009—thus covering both the years before the start of the crisis as well as those that followed. The source for the financial ratios is Office of Thrift Supervision (OTS), *2009 Fact Book: A Statistical Profile of the Thrift Industry*. Time-series for macroeconomic indicators 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.

Model Specification

The objective of this study is to assess the potential determinants of S&L profitability during the period 1978-2009. In the structure-conduct-performance (SCP) paradigm, bank profitability tends to be related to a wide number of factors whose relationship has been well established in the literature (Berger, 1995; Demirguc-Kunt and Huizinga, 2000). This relationship is recognized in research that associates bank profitability with a variety of internal and external factors. Drawing on the existing empirical literature in this area, we specify a standard profitability function that may take the following two forms:

$$Y_{ROA} = \alpha + \beta X_{it} + \gamma Z_{it} + \varepsilon_t$$
$$Y_{ROE} = \alpha + \beta X_{it} + \gamma Z_{it} + \varepsilon_t$$

Since there are no missing values, our data is a balanced time-series with 11 variables observed over a 31-year period. It has a temporal reference, *t,* in this case for a year, and *i* for parameter estimates with autoregressive model of order. The random error captures the time dimension, where *e* is *white noise* and *Y, X, Z* are the observed values of time-series at time *t*. The equation seeks to empirically ground the determinants of industry profitability separately measured in terms of return on assets (ROA) and return on equity (ROE). Bank risk ratio (BRISK), liquidity risk ratio (LIQ), leverage ratios (LEV & LEV1), and ratios of non-performing loans to total loans (NPL_MLO) and total assets (NPL_TA) are proxies for industry performance, represented by a matrix of *X*. Meanwhile, the fixed rate conventional home

mortgages (IR), Real GDP capita income (RGDPL), growth rate of Real GDP (GROWTH_RATE_GDP) are macroeconomic indicators, represented by a matrix of *Z*. Macroeconomic ratios are obtained from the work of Demirguc-Kunt and Huizinga (2000). Industry endogenous ratios are calculated from the works of financial industry experts (Verbrugge, Shick, and Thygerson, 1976; Gallick, 1976; Berger, 1995; Pervan, Pervan and Guadagnino, 2009; Papanikolaou and Wolff, 2010).

Our regression equations estimate industry profitability in terms of return on assets Y_{ROA} and return on equity Y_{ROE} respectively. Defined as return on assets, the ROA ratio is computed by dividing the net income over total assets; ROE ratio is computed by dividing the net income over equity capital. These equations show profitability performance as a matrix of six industry characteristics such as total bank risk (BRISK) as the ratio of equity capital to total assets; liquidity risk (LIQ) as the ratio of mortgage loans outstanding and mortgage backed securities to total assets; leverage ratios as the ratio of debt to equity (LEV) and ratio of total assets to equity (LEV1). Due to lack of debt figures, debt is calculated as the ratio of total liabilities minus equity to equity. Loan ratios are the ratio of non-performing loans to total mortgage loans (NPL_MLO) and to total assets (NPL_TA). Mortgage loans outstanding (MLO) are mortgage originations in the year, including "mortgage refinancing and net mortgage loan purchases, minus any principal repayments." (OTS, 2009:78). Non-performing loans are defined as delinquent mortgage loans for which the borrower has failed to make payments as specified in the loan agreement. If the borrower can't pay the mortgage within a certain time period, the lender can start foreclosure proceedings later on. Foreclosure starts only after the borrower has completely defaulted on his or her payments. As a result of this lag factor, home foreclosures are omitted from the analysis. Macroeconomic variables of real GDP per capita income (RGDPL), interest on mortgage loans (IR), and the annual growth rate of Real GDP (GROWTH_RATE_GDP) are external factors that might affect industry profitability.

Time-Series Unit Root Tests

In a time-series analysis, least squares trend fitting is necessary to capture the significance of variables under consideration. In its simplest form, a time-series analysis is a method of studying data observed over a defined time frame in order to reach meaningful conclusions and temporal characteristics about the variables. Profitability performance and firm specific components are important considerations for theorizing finance. Quantification of these components, however, faces challenges. Time-series of a particular industry is complicated by sectoral differences, caused by changes in types of products, production techniques, service quality, adjustment of cost to changes in output, type of ownership and exposure to different economic and regional cycles.

For example, while one bank may display a positive relationship with performance, another may display an opposite but equal effect so that they balance each other. Panel studies, on the other hand, may exhibit typical problems in cross-sectional data, such as "inconsistent definition of output among firms, differences among firms in accounting costs that reflect the time of purchase of equipment and plant and errors in the establishment of firms or plants of suboptimal size" (Benston, 1972:316). From a statistical point of view, any data with temporal dimension suffers from autocorrelation when the preceding and successive values of time-series are highly correlated. Before proceeding to regression analysis, it is essential to verify that all of the variables are integrated to the same order. For this purpose, we have used the ADF (Augmented Dickey-Fuller) unit root test developed by Dickey and Fuller (1979). This is a well-known co-integration procedure that tests the existence of a unit root in a time-series data. Variables with unit roots can exhibit non-stationary or trending behavior in the mean or variance that cause "serial correlations" over time (Cromwell, Hannan, Labys, Terraza, 1994:23). Since much of time-series theory is concerned with stationary time-series, an ADF test is conducted to filter non-stationary behavior by means of first or second differencing equations.

According to Campbell and Perron (1991), unit root test, as applied in macroeconomics, is a valuable tool that "can be used to impose reasonable restrictions on the data" and "gives the best approximation to the finite-sample distribution of coefficient estimates and test statistics". Given the insights of unit root econometrics, it is well known that certain macroeconomic variables such as Real GDP and interest rates have unit roots in levels. As a result, they exhibit trending behavior that results in high R-Square and t-statistics with little real meaning. To achieve our goal of transforming a non-stationary time-series into a stationary one, an ADF test is applied to the regression residuals of autoregressive model. This is done by inclusion of lagged values of Y where ΔY is the first difference operator, indicating Y minus its one period prior value: $\Delta Y_t = Y_t - Y_{t-1}$. Transforming the series by differencing eliminates the unit root. As displayed in equations 1 and 2 above, an autoregressive model is estimated relating the profitability measures (dependent variables) to a matrix of internal and external factors (independent variables). For this purpose, we have used the least squares regression where ΔY rather than Y is estimated. The next section summarizes the results of re-estimated least squares using ROA and ROE as dependent variables.

EMPIRICAL RESULTS

This section presents evidence on US Savings and Loan profitability over the period 1978-2009. Our sample shows some variations in terms of basic statistics of variables. Trends in earnings and profitability reflect the continuing US business cycle and housing market weakness. The number of S&Ls supervised by OTS was 765 with assets of $941.7 billion at the end of 2009, decreasing from 4048 in 1978 with total assets of $497.3 billion. From 1978 to 2009, however, total industry assets increased by 89.36% against an 81.02% decrease in the number of enterprises. During the same period, the average number of loans and MBSs constituted 43% of total assets while average mortgage loans outstanding accounted for 38%. Given the increase in total assets, one would expect a higher leverage ratio over time, especially prior to the subprime mortgage crisis. The highest leverage ratios, however, were in 1984, 34.29 and 36.29 respectively, during the height of the S&L crisis. For example, LEV1 ratio (total assets/equity capital) has started to decrease since 1984, at a rate of 74.292%, standing at 9.33 in 2009. The industry reached maximum ROA in 2003, indicating the highest profitability but low leverage. Consequently, basic statistics might give the impression that there is no risk associated with leverage. As explained above, sectoral differences and financial regulations play an important role in the degree to which the industry has become leveraged. Although leverage has been one of top causes of bank failures since 2008, OTS *Fact Book* (2009) notes that regulatory capital requirements for the S&L industry continue to be robust and stable, in excess of minimum requirements.

Table 1: Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variables	ADF T-Statistic (Level)	Variables	ADF T-Statistic (First Differences)
roa	-1.74 (0.39)	Δ roa	-5.11 (0.0003)
roe	-3.41 (0.018)	Δ roe	-4.53 (0.0012)
brisk	-0.03 (0.94)	Δ brisk	-4.16 (0.0031)
liq	-2.13 (0.23)	Δ liq	-4.87 (0.0005)
lev	-2.00 (0.28)	Δ lev	-5.50 (0.0001)
lev1	-2.00 (0.28)	Δ lev1	-5.51 (0.0001)
npl_mlo	-1.84 (0.35)	Δ npl_mlo	-5.42 (0.0001)
npl_ta	-2.12 (0.23)	Δ npl_ta	-5.3 (0.0001)
rgdpl	-1.34 (0.59)	Δ rgdpl	-3.37 (0.02)
growth_rate_gdp	-3.37 (0.019)	Δ growth_rate_gdp	-6.73 (0.000)
ir	-1.59 (0.46)	Δ ir	-3.97 (0.0047)

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). The figures in parenthesis are the p-values.

The starting point of our inferential statistics is to check whether the 11 variables included in equations contain unit roots. While there are several unit root tests available for time-series analysis, this study uses the test developed by Dickey and Fuller (1979). Unit roots test gives the researcher an opportunity to re-estimate the slope coefficients of variables in the presence of a unit root in levels. The procedure of applying the ADF test requires the null hypothesis of unit root $\gamma = 0$ tested against the alternative hypothesis of no unit root $\gamma < 0$. If the computed t-value value/statistic is less than the critical value, then the null hypothesis of unit root is rejected and no unit root is present. If a unit root is present, however, we need to apply the first or second difference operator to the auto-correlated variables. If one of these operators shows the differenced time-series to be stationary, then one can apply ordinary least squares to these variables to re-estimate the slope coefficients. In a series of unit root tests below, the coefficients did not show the expected sign in the level.

Based on MacKinnon one-sided p values, they required de-trending. The results of the ADF test indicate that first level is the appropriate difference operator in this particular case (Table 1). First difference operator removes the trend in the mean and transforms the series into stationary. Overall, the unit root test indicates all the variables in both the ROA and ROE models are integrated of order one. A regression equation is then re-estimated taking first difference of 11 variables that had unit roots in levels. Table 2 shows the results of the autoregressive model where ROA is measure of profitability. Two other variables, annual growth rate of GDP and LEV1, also appear in the parameter estimates of Table 3 where ROE is measure of profitability.

Both specifications are significant at 1% level based on Prob. (F Statistic). Overall, these measure the joint relationship between the explanatory variables and dependent variable in each model. Based on R Square values, the right hand side variables explain the dependent variable by almost 63% and 53% and the F statistic supports the regression. Prob. (F-Statistic) suggests that both regression models are significant at a 1% level, so we can be reasonably confident that the good fit of the equation is not due to chance.

Table 2: Parameter Estimates of Model Using ROA as Dependent Variable

Method: Least Square Regression; first difference operator Number of Observations: 31 (1978-2009)	
Variable	**Coefficient**
Constant Term	-0.001 (1.820)
Δ BRISK	-0.026 (0.300)
Δ LIQ	-0.027* (1.718)
Δ LEV	-0.000* (1.976)
Δ IR	-0.001*** (2.862)
Δ NPL_MLO	-0.209** (2.796)
Δ RGDPL	0.000** (2.092)
R-squared	0.634815
Adjusted R-squared	0.539549
Durbin-Watson stat	1.924476
F-statistic	6.663618
Prob. (F-statistic)	0.000347

****Significant at 1% level or 0.01; ** Significant at 5% level or 0.05; *Significant at 10% level or 0.1 The figures in parenthesis are absolute values of t-statistics. Based on the critical value of 2, Durbin-Watson statistic of 1.92 indicates a very insignificant or no positive autocorrelation.*

In Table 2, regression analysis indicates that all variables except bank risk (BRISK) are significant in explaining ROA at 1%, 5%, and 10% levels. In addition to net interest margin, ROA is the most commonly used ratio in bank performance studies (Naceur, 2003). It measures the return a firm is generating on its assets and determines how well a company is using investment funds to produce

earnings growth. In the second equation REO is used as a proxy for performance instead of ROA. As Table 2 indicates, industry specific and macroeconomic variables are insignificant except for ratio of non-performing loans to total assets (NPL_TA) and debt to asset ratio (LEV1), which are negatively correlated with ROE. This seems to be consistent with the first model where both loan and leverage ratios reveal how much profit a company generates on its assets (ROA) or with the money shareholders have invested (ROE).As seen in Table 2, liquidity ratio (LIQ), leverage ratio (LEV), fixed mortgage interest rates (IR), and ratio of non-performing loans to mortgage loans outstanding (NPL_MLO) are negatively related with ROA. While Real GDP per capita income (RGDPL) is somewhat significant, its significance is almost trivial when considering how close its p value (0.0477) is to 5% level. Liquidity ratio (LIQ) is hardly significant in the first regression with p value of 0.0991. Similarly, in the second equation, the growth rate of real GDP is found to be insignificant, confirming previous studies that economic growth does not have a major impact on bank profits.

The impact of GDP on bank performance has received attention in Demirguc-Kunt and Huizinga (2000). Their research provides extensive evidence on the significance of economic growth for financial market development in a panel study of developed and developing countries. Banks in well-developed markets face tougher competition and therefore lower profitability. Yet, greater financial market development is correlated with increased bank profits and net interest margins in less developed financial systems. Applying this interpretation to our analysis, the missing link between real GDP growth and S&L performance may indicate that developed countries like the US no longer observe those "complementarities" that are meaningful in less developed countries. In addition, since our data is aggregated rather than on a firm level, sector-related variables were omitted from the analysis, such as explicit and implicit bank taxes, regulatory capital requirements, deposit insurance, general financial structure, stock market capitalization, and several underlying legal and institutional factors.

Table 3: Parameter Estimates of Model Using ROE as Dependent Variable

Method: Least Squares Regression; First Difference Operator Number of Observations: 31 (1978-2009)	
Variable	**Coefficient**
Constant Term	-0.010 (0.786)
Δ BRISK	-0.984 (0.534)
Δ NPL_TA	-5.820** (2.116)
Δ LIQ	-0.565 (1.647)
Δ GROWTH_RATE_GDP	0.005 (0.934)
Δ LEV1	-0.010** (2.492)
Δ IR	-0.025*(2.066)
R-squared	0.532731
Adjusted R-squared	0.410835
Durbin-Watson stat	1.705047
F-statistic	4.370364
Prob. (F-statistic)	0.004363

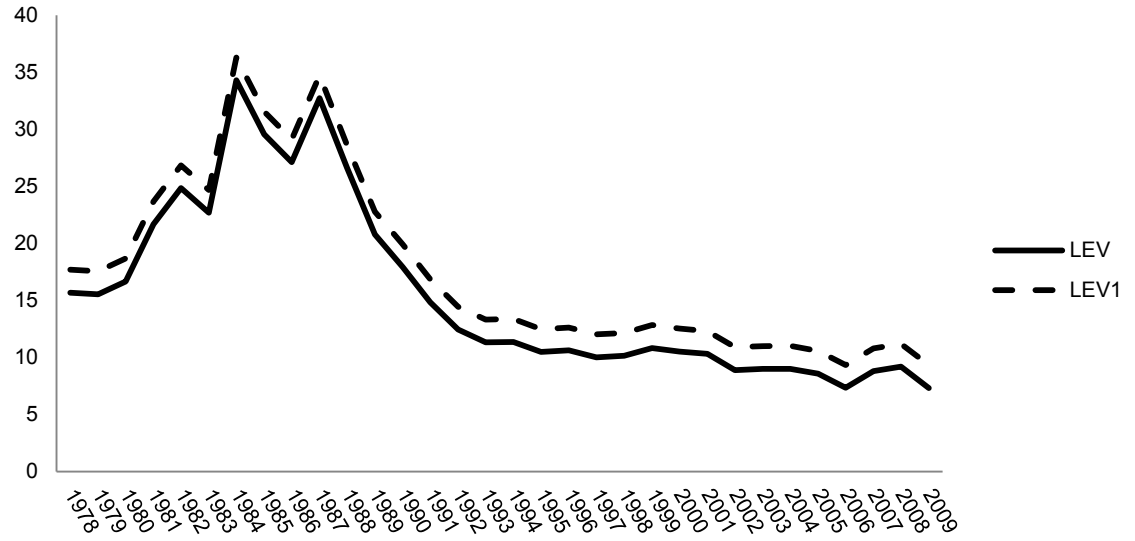
****Significant at 1% level or 0.01; ** Significant5% level or 0.05; *Significant at 10% level or 0.1 The figures in parenthesis are absolute values of t-statistics. Based on the critical value of 2, Durbin-Watson statistic of 1.70 indicates a low positive autocorrelation.*

The statistically significant variables are LIQ, IR, LEV, LEV1, and NPL_MLO and NPL_TA. Although IR, with a negative coefficient value and p value of 0.0088, is significant at a 1% level in the first regression ($p<0.01$), it is also significant at 10% level with a p value of 0.0502 ($p<0.1$). This might suggest that while macroeconomic factors such as low interest rates have a negative effect on bank earnings, the impact of interest rates varies depending on the profit indicator used.

The most statistically significant variables are NPL_MLO and leverage ratios. This indicates that high leverage and large non-performing loan to total loan ratio leads to a lower rate of return on capital. Lower

profitability is associated with NPL_MLO, which is statistically significant at almost 1%--significantly lower than 5% at p value of 0.0102. Pair-wise correlation matrix also confirms that ratio of non-performing loans is negatively correlated with bank profitability, with correlation coefficients of -0.62154 and -0.700294 respectively. Leverage ratios vary in significance depending on the leverage indicator used but in both regressions are negatively correlated with return on assets (approximately -0.55). Everything else remaining equal, there is evidence that loan quality problems and impaired assets rather than size of loans affect profitability negatively. Papanikolaou and Wolff (2010) showed that excessive leverage obtained through "explicit and hidden off-the balance sheet" items were the main determinants of liquidity shortages in the banking industry during the financial crisis of 2007. Our analysis is consistent with the view that over-leveraging and under-performing loans have the potential to render banks vulnerable to financial shocks, thus contributing to financial instability.

Figure 2: S&L Industry Leverage Ratios



This figure shows the trend in industry leverage ratio during the period 1978-2009. Leverage has remained more stable prior to the subprime mortgage crisis than at the height of the S&L debacle. Overall, leverage has decreased during this period. Ratios are calculated from OTS (2009) database.

Leverage indicates the extent to which banks are using debt (borrowings) in financing investments such as securitizing loans; it is thus a good map to the riskiness of assets. However, the decrease in leverage ratio might be misleading because securitized assets are not reported in bank balance sheets. With access to securitization and the development of more sophisticated financial instruments, banks are able to appear less leveraged. Lower leverage makes it difficult to establish whether the growth rate of leverage has to do with hidden, off-balance sheet items or with the strength of capital ratios in the S&L industry. Mortgage-backed securities were certainly profitable for banks when the housing market was booming. As mortgage loans were bought from banks, they were packaged into pools as securitized assets and sold to investors multiple times to increase value. By selling mortgage obligations to investors, banks could therefore remove mortgages from their balance sheets and thus give the impression of being moderately leveraged.

This has allowed them to lower their loan requirements and offer mortgages to borrowers who would not otherwise be able to qualify. The lower the loan requirements the more opportunity to profit by increasing the number of lenders. So long as the housing market was booming and mortgages were paid off on time,

the mortgage-backed securities had value and could generate higher profits. Since the collapse of the housing market, however, they have not been as profitable. Profits started to slowdown after 2005, making a sharp downturn in 2008 when the housing market crashed. While profits have somewhat leveled since then, they have not reached pre-crisis levels.

CONCLUDING COMMENTS

This paper examined US Savings and Loan performance in the period 1978-2009. In particular, it examined the impact of macroeconomic and industry-related variables on industry profitability. Additionally, the paper discussed the recent trends and policy issues facing the industry performance since the start of the S&L debacle in the 1980s until the subprime mortgage crisis in 2008. This was a period of restructuring during which S&Ls were deregulated with the view of diversifying their activities and increasing profits**.** Financial liberalization, however, has made it difficult for S&Ls, with their specialized products and fixed asset structure, to compete effectively with other providers in the financial services industry. Critics claimed that the S&L resolution served as a model to lenders making high-risk loans during the sub-prime financial crisis (Weiner, 2007).

The objective of this paper was to establish which of these likely determinants of profitability prevailed in the US S&L industry. We used yearly aggregated bank data covering a 31-year period from 1978 to 2009, observing 11 variables before the start of the crisis as well as those that followed. Using ADF as a statistical test for filtering unit root effects by estimation of least squares, we were able to establish meaningful trends in the performance of the S&L industry. To apply the test, we accepted the existence of a unit root assuming that variables were non-stationary. After having found consistent evidence of unit root in variables, the model was re-estimated applying the first difference operator to the series and stationary de-trending. The ADF test indicated that all the variables in both models were integrated of order one.The results of our analysis indicated that industry characteristics explain a substantial part of the variation in profitability measured by return on assets and return on equity.

The most statistically significant variables are NPL_MLO and leverage ratios. Low profitability tends to be associated with industry holding high leverage and large non-performing loan to total loan ratio. This indicates that high leverage and large non-performing loans lead to a lower rate of return on capital. The loan ratio has negative and significant coefficients on ROA and ROE. Our results further demonstrated that macroeconomic indicators such as growth rate of GDP have no impact on industry's profitability, confirming earlier studies in this area. While fixed mortgage interest rate, with a negative coefficient value, is significant at a 1% level in the first regression, it is also significant at 10% level in the second regression. This suggests that while macroeconomic factors such as low interest rates have a negative effect on bank earnings, the effects of interest rate changes vary depending on the profit indicator used.
While it is clearly the case that industry leverage (LEV) has been decreasing by 53.273% since 1978, it has been decreasing at a slower rate (41.086 %) since 1992.

The slow growth rate of leverage might give the impression that there is no systemic risk associated with leverage. Leverage ratios vary in significance depending on the leverage indicator used but in both regressions are negatively correlated with return on assets (approximately -0.55). The work of Papanikolaou and Wolff (2010) examined the impact of that excessive leverage obtained through "explicit and hidden off-the balance sheet" items on bank liquidity shortages during the financial crisis of 2007. Our analysis also confirms that over-leveraging and under-performing loans have the potential to render banks vulnerable to financial shocks, thus contributing to financial instability.

In terms of policy implications, we can draw some recommendations at the industry and country level. Loan quality is one of the most important determinants of financial performance, as it was found to be complementary with profitability. The quality of loan portfolio reflects the extent of credit risk in

investment portfolios and maps to the overall riskiness of an institution. Therefore, the improvement of the performance of S&Ls needs to be based on a reinforcement of the supervisory standards and loan examination through national regulation programs. This should be aimed at adequately regulating the proportion of impaired loans and monitoring the size of leverage. It is necessary to frequently monitor the adequacy of Loan Loss Provisions and asset valuation reserves concomitantly with risk management processes and internal regulations at these institutions. One of the limitations of the study is the use of time-series/aggregated data rather than sectoral data. While sectoral data is largely available for US commercial banks, it is not complete for savings and loan associations. Although this has made it difficult to examine the variations in profitability across institutions and posed some autocorrelation problems, the co-integration statistical procedure (ADF test) was able to filter some of the trending behavior in a time-series data. Future research can benefit from the inclusion of exogenous variables in regression analysis, such as policy interventions and regulatory capital requirements that can affect the long-run profitability of the S&L industry at the national level. Structure-conduct-performance (SCP) paradigm highlights the contribution of market structures and financial system variables to banking industry performance. In order to give our findings a stronger basis for prediction, further research is needed on the relationship between bank-specific, industry-related and macroeconomic variables since the start of the S&L crisis.

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