The Role of the Regional Economy in Oklahoma Bank Failures

Mohammad Shaaf and Paula A. Smith*

I. Introduction

Bank failures, a relative rarity after the Great Depression years, have risen alarmingly since the collapse of Penn Square Bank in 1982. Following 42 bank failures in 1982, 48 failed in 1983, 79 in 1984, 120 in 1985, 138 in 1986, 184 in 1987 and 200 in 1988.

Data show substantial interstate variation. Between 1977-1988, 837 banks failed nationally. However, there were no bank failures in some states and many other states had only one or two bank failures over the entire period. During the period, well over one-third of the failures occurred in just three states, Texas (216), Oklahoma (92), and Kansas (53). In 1988, nearly three-fourths of the banks failing were in Texas, Oklahoma, and Louisiana; banks Moskowitz characterizes as "oil patch" banks (1988).

As shown in Figure 1, the number of bank failures in Oklahoma followed the national pattern rather closely until 1988. Following the failure of Penn Square, more than 90 Oklahoma banks declared insolvent. These banks comprised approximately fifteen percent of the total number of banks in Oklahoma.

The purpose of this research is to ascertain to what extent deregulation in the banking sector and adverse changes in the energy and agricultural sectors of the economy contributed to the increase in bank failures in Oklahoma. Results from a distributed lag regression model suggest that falling farm, oil, and land prices contributed to the problem, but only land prices were found to be a significant negative factor. Contrary to the literature, the results suggest that deregulation had a significant ameliorating impact in bank failures in the state.

*Both authors are affiliated with Central State University, Edmond, Oklahoma

II. Why Banks Fail

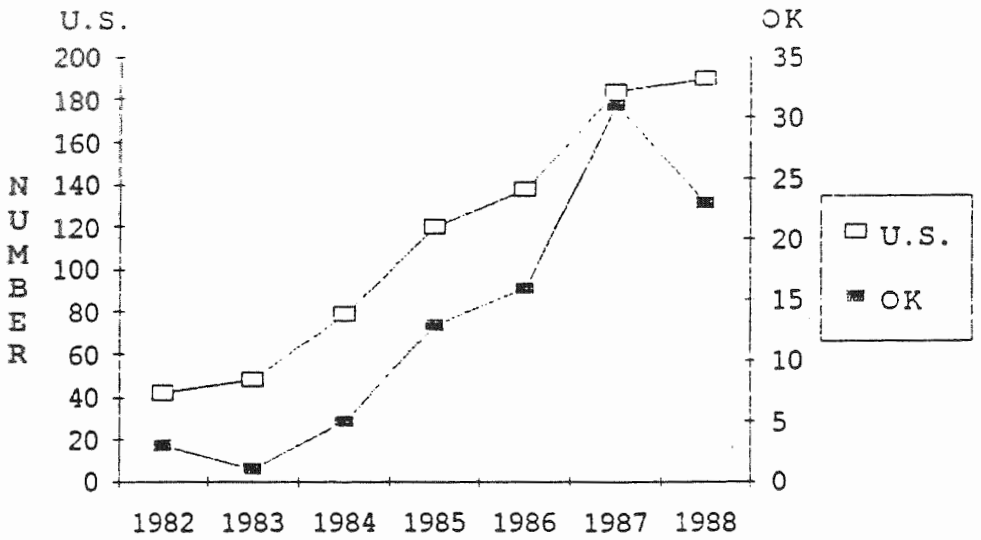
Empirical studies of bank failures using data before the recent rash of failures found relatively few significant predictive variables and these variables changed across studies. Abrams and Huang (1987) formulate a probit model for predicting bank failures. They report that a higher probability of failure for unit banks, small banks, and banks not affiliated with a holding company. They also found failing banks to have relatively more loans and long-term securities in their asset portfolios and to be located in relatively rapidly growing deposit markets. However, after controlling for share of assets in loans, they found farm loans to have no independent effect on failures.

The literature on bank failures identifies four categories of explanatory variables. These variables include (1) economic variables such as recession and problems in certain sectors of the economy, especially energy and agriculture; (2) structural variables, such as the regulatory environment, size, unit vs. holding company; (3) fraud and managerial incompetence; and (4) accounting/financial ratios, such as those indicating a heavy dependence on liability sources of funds.

A. Economic Variables

Banks may fail because the costs of their deposits become greater than the earnings generated by their assets. While significant in explaining the failure of many savings and loans, fewer banks have failed in this way (Dodd, 1987). The second (and primary) reason for the failure of commercial banks is bad loans (Dodd, 1987; Stephens, 1986). Dodd attributes most bank failures to defaults on outstanding farm, oil and real estate loans as economic conditions in these sectors deteriorated.

Figure 1
Bank Failures, 1982-1988



B. Structural Variables

Abrams and Huang (1987) argue that bank structure has also played an important role in banking failures. They argue that unit banks are more concentrated geographically and, therefore less able to diversify their loan portfolios than other banks. At the other end of the spectrum holding companies and larger banks are able to hire better qualified personnel. Moskowitz (1988) also emphasizes that nearly all of the failed banks since 1982 have been small.

Dodd maintains that "in the era of increased economic volatility, the effect of banking deregulation has been decisive" (p., 61). The phase-out of Regulation Q was accompanied by higher interest rates on deposits as many banks pursued ambitious growth strategies. Higher deposit costs, in turn led banks to pursue riskier, higher yield investments including loans to developing countries and risky domestic ventures in oil, farming and real estate. The extension of FDIC/FSLIC coverage encouraged such risk taking.

C. Fraud and Managerial Incompetence

Regulatory accounts of the causes of individual bank failures cite fraud and insider abuse in almost one-third of the cases. Bank officials typically contend that instances classified as fraud by the regulators are more accurately described as "honest mistakes" brought about by the difficult task of adhering to a mirage of complicated state and federal regulations.

As Moskowitz and others have pointed out, some banks fail under adverse economic conditions and others do not. Generally, those that fail are poorly managed. A Comptroller of the Currency report examining bank failures from 1979 to 1987 found that most had inadequate or poorly enforced loan policies, inadequate supervision of key bank officials or departments and inadequate systems for identifying bad loans.

D. Accounting/Financial Ratios

Managing assets, liabilities and interest rate risk is a crucial task of any bank. How to allocate the uses and diversification of funds among cash, securities, loans and other assets in addition to the composition of each in terms of the degree of liquidity, risk and terms to maturity are vital to the performance of banks. Similarly liability management, including recognition and optimum diversification of different sources of funds and borrowing is important. Relying heavily on one source of funds, as the case of Continental

Illinois National Bank proved, could result in disaster. Furthermore, managing the size and duration of fixed interest rate *vis-a-vis* flexible interest rate assets and/or liabilities is crucial to the profitability and the safety of banks.

Traditionally, managers of banks have used accounting measures and ratios for their asset, liability and interest rate risk management. Usually these measures must fall within some acceptable, targeted values, otherwise the condition of the bank deteriorates. In this study, it is assumed that these vital measures were managed according to the conventional rules up to the point when they began to deteriorate due to changes in other variables beyond the institution's control. In other words, changes in these measures are assumed to be the effect, rather than the cause, and are therefore treated as endogenous.

III. Oklahoma's Economy, 1982-1988

Oklahoma's economic performance is highly dependent on the performance of its agricultural and oil sectors. The lack of diversification in the state's economy is reflected in the lack of loan diversification in state banks. A major economic problem confronting Oklahoma banks was the unexpected turnaround in oil prices, which began in 1982.

The reduction in oil prices resulted in slower income growth and reduced the value of property and real estate in the region. The depression in the state's oil industry was transmitted to other sectors of the economy and the rate of business failure began to rise.

At the same time, the worldwide recession of 1982-83 and the strong U.S. dollar caused a reduction in the demand for and prices of agricultural products. At the same time, changes in farm program benefits contributed to lower farm income. These effects on top of the Soviet grain embargo previously imposed combined to exacerbate farm loan defaults.

IV. Methodology

Different models could be used to determine the impact of economic and regulatory factors on bank failure in Oklahoma. The second-degree polynomial distributed lag model in Equation (1) appeared to be most appropriate.

$$BF_t = a + bR_t + \sum_{i=0}^{1} c_i PO_{t-i} + \sum_{i=0}^{1} d_i PL_{t-i} + \sum_{i=0}^{1} e_i PC_{t-i} + \mu_t. \quad (1)$$

Where,

BF = the number of bank failures in Oklahoma[1]

R = a dummy variable measuring the phase-in of the Depository Institutions Deregulation and Monetary Decontrol Act

PO = the price of West Texas intermediate crude oil

PL = the price of irrigated land in Oklahoma

PC = the price of heifers, as a proxy for agricultural prices

μ = the disturbance term.

The coefficients a, b, c's, d's, and e's are the parameters of the model to be estimated. According to Equation (1), the number of bank failures depends on the phasing out of bank regulation (deregulation), R, the price of crude oil, PO, the price of land, PL, and the price of agricultural products, PC. Their expected signs are as follows:

$$\begin{aligned} \partial BF/\partial R &> 0 \\ \partial BF/\partial PO &< 0 \\ \partial BF/\partial PC &< 0 \\ \partial BF/\partial PL &< 0 \end{aligned}$$

Deregulation of financial institutions began in 1981 and continued through 1986. A dummy variable was used to capture this effect. In each period that a new phase of the deregulation went into effect, the value of the dummy variable increased. It is, of course, likely that some banks

[1] The number of bank failures regardless of the size of the failed banks was used, although some failed banks were very small and some were relatively large.

took actions anticipating the new regulations before they officially took effect.

A number of methodological issues entered into the decision to use cattle rather than wheat prices as proxies for agricultural prices. First, government intervention plays a much larger role in the market for wheat, with some program payments varying inversely with the price of wheat and other payments not linked to wheat prices at all. The inclusion of wheat prices would have necessitated developing a methodology to deal with these complicated interrelationships. Second, cattle sales consistently represent over half of the state's agricultural product, while wheat sales represent less than one fifth.

The model does not contain a control variable for fraud and mismanagement although they have been cited as contributing factors in about one-third of bank failures. Eliminating observations for failures involving fraud would have dramatically reduced the sample size and necessarily involved eliminating cases where fraud and mismanagement are thought to have played only minor roles. The construction of an aggregate, continuous variable measuring the degree of fraud was beyond the scope of this research.

Furthermore, it is widely known that the failure of smaller banks, such as Penn Square, have had an impact on larger banks such as Continental Illinois and vice versa. This model did not attempt to determine how bank failures were interrelated.

Two aspects of the model require further explanation. First, the parameters of the model were estimated with the impact of three variables in the polynomial model (PO, PL, and PC) beginning one period back and terminating at the end of the current period. Increasing the length of lag did not change the results. Second, the most appropriate degree of polynomial in the model for each of the last three variables (PO, PL, PC) appeared to be a second degree polynomial. The method used is based on the assumption that the effect of each of those three variables on the number of bank failures increases, reaches a peak, and declines, in an inverse "U" shape. In sum, the parameters of each lagged variable were constrained to lie on a second degree polynomial. In addition, both endpoint parameters were constrained to equal zero.

For example, consider the case for one quarter. Suppose there were BF_t bank failures in the current quarter t. Under the assumptions of the model, these failures are due to the current level of deregulation of the banking industry, R_t, the current price of oil, PO_t, the current price of land, PL_t, and the current price of farm products, PC_t, in that quarter. In addition, these failures are due to the past quarter price of oil, PO_{t-1}, the past quarter price of land, PL_{t-1}, and the past quarter price of agricultural products, PC_{t-1}.

V. Empirical Results

Data from the first quarter of 1982 to the second quarter of 1988 were collected for each of the variables in Equation (1). Quarterly data were used to estimate the short-run impact of each of the independent variables on the number of bank failures in Oklahoma. The model was also estimated with semiannual data to determine longer run effects.

A. Short-Run Impact

The prices of oil, PO, land, PL, and heifers, PC, were seasonally adjusted using the moving average method. Smoothing out seasonal variation reduced the autocorrelation problem substantially. However, to further reduce autocorrelation, the Cochrane-Orcutt method using a two-stage iteration was employed for the quarterly data.[2]

The parameters shown in Table 1 were estimated using Equation (1) and quarterly data. Unexpectedly, the parameter estimated for the deregulation variable, R, is negative and statistically significant. This empirical outcome suggests that taking other factors into account, deregulation of financial institutions has ameliorated rather than exacerbated bank failures.

[2]This approach estimates rho from ordinary least squares residuals, transforms the dependent and independent variables so that the residuals from the transformed equation are roughly serially uncorrelated. The regression results use the transformed variables.

Table 1
Polynomial-Distributed Lag Estimated Results of Equation (1) for Bank Failures in Oklahoma; 1982-88 Data (Ordinary Least Squares)

Variables	Quarterly Data (SR)* Coefficient	*t*-Values	Semiannual Data (LR)** Coefficient	*t*-Values
Constant	23.7120	4.0000	56.2470	3.2033
R	-1.9535	-2.7476	-3.9243	-2.3795
PO_t	-0.0065	-0.1215	-0.0163	-0.0923
PO_{t-1}	-0.0065	-0.1215	-0.0163	-0.0923
Sum PO	-0.0130	-0.1215	-0.0326	-0.0923
PL_t	-0.0094	-3.7749	-0.0178	-2.6539
PL_{t-1}	-0.0094	-3.7749	-0.0178	-2.6539
Sum PL	-0.0187	-3.7749	-0.0356	-2.6539
PC_t	-0.0007	-0.0359	-0.0145	-0.2466
PC_{t-1}	-0.0007	-0.0359	-0.0145	-0.2466
Sum PC	-0.0015	-0.0359	-0.0290	-0.2466
SE	1.9618		2.1255	
Adj R^2	0.8113		0.8214	
Durbin Watson	1.5258		2.1872	
$F_{(4,19)}$	21.9430			
$F_{(4,7)}$			13.6477	

*SR = Short run; **LR = Long run
R = Measure of Deregulation; PO = Price crude oil
PL = Price of land; PC = Price of farm products

Such a result is contrary to the widespread belief that deregulation has been one of the major causes of the failures. The result may be due to the fact that banks' ability to borrow increased as ceilings on interest rates were gradually phased out.

As the results show both current and lagged prices of oil, current and lagged prices of land, and current and lagged prices of farm products contributed to a higher incidence of bank failure. The table reveals that the most significant variable influencing bank failures, both quantitatively and statistically, was the price of land. The findings indicate that the effect of the other two prices are not statistically significant, although they have negative signs, as expected.

Finally, the statistic measuring the fraction of variation explained, adjusted R^2, shows that 81 percent of the variation in bank failures is explained by the variation of the four variables in the equation. The results of the F-test also confirm the validity of the coefficient of determination.

In sum, the findings seem to suggest that lower prices of oil, land and farm products contributed to bank failures in Oklahoma during the period 1982-1988, while deregulation prevented, or at least postponed, bank insolvency.

B. The Longer-Run Impact

Equation (1) was estimated with semiannual data to examine the effect of deregulation and changes in the prices of oil, land and farm products on bank failures in the longer run. The results are also presented in Table 1. These findings further confirm that lower oil prices, lower land prices and lower farm commodity prices

contributed to the bank failure problem in Oklahoma and that deregulation of banks had an ameliorating effect.

The signs and the t-statistic results are similar to those estimated using quarterly data. The magnitudes of the coefficients are all larger for the equation estimated with semiannual data than for those estimated with quarterly data. This relationship is expected with the longer run *vis-a-vis* the short-run effects of these variables. While the signs of all coefficients were negative as expected, t-statistics indicate only deregulation and land prices are statistically significant.

The adjusted R^2, measuring the fraction of the total variation explained, indicates 82 percent of the variation in the bank failures is explained by declines in prices of oil, land and farm products, and by deregulation of the banking industry. The Durbin-Watson ratio for the longer-run data indicates that serial correlation is not a problem.

Once more, similar to the results from the short-run quarterly data, these findings seem to suggest that lower prices of three major commodities in Oklahoma contributed to the failure of Oklahoma banks. However, only land prices were found to be statistically significant. Despite widespread belief and assertions made in the literature, deregulation did not appear to contribute to the problem.

VI. Summary and Conclusions

The bank failure problem in Oklahoma started with the fall of the Penn Square bank in July, 1982. Since then, bank failures in the state have been widespread and still continue at an alarmingly high rate. Savings and Loan Association failures are even more extensive than those of the banks.

It is widely believed that lower oil prices in the international market started the chain of events that has led to many of the bank failures. It is argued that lower prices of oil first resulted in bankrupting many oil firms. Bankrupted firms laid off workers, some of whom left the state. State government revenues fell and a balanced-budget provision in the state's constitution mandated reductions in government expenditures. Real estate values began to fall and other businesses to fail. Farm problems which had began at least two years earlier contributed to more bankruptcies and the inability to make the loan payments by those failed firms and individuals. The increased volume of bad loans resulted in negative net worth and increased bankruptcies. The bad loan problem was especially severe for banks that were heavily concentrated in the areas of energy, real estate and agricultural lending.

The purpose of this study was to test whether the belief described above could be confirmed by an econometric model and to determine the degree to which deregulation of the banking sector contributed to the problem. The model employed was a polynomial distributed lag of second degree, as an inverse-U shape, with one lag.

Unexpectedly, and contrary to the literature, the short-run as well as the longer run results suggest that the deregulation of banking, which began in 1981 and was phased in through 1986, did not contribute to the bank failure problem in Oklahoma. To the contrary, these results suggest that without deregulation the number of banks failing could have been even greater. As expected, it appeared that lower oil prices, the downturn in land prices, and low prices for farm products all contributed to bank failures in Oklahoma. However, only land prices had a statistically significant direct adverse effect.

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