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Loan Growth and Loan Quality: Some Preliminary Evidence from Texas Banks

Following the failures of numerous depository institutions in the 1980s, many analysts drew the conclusion that there was a relationship between rapid growth of lending activity and deterioration of loan quality. The relationship between loan growth and loan quality is complex, however, and establishing the relationship between growth and quality requires examining different sources of growth and estimating the actual loan quality with commonly used quality ratios, such as nonperforming loan ratios and charge-off rates.

Preliminary evidence based on data from Texas banks indicates that loan growth through additional lending to new or existing customers (internally generated growth) initially improves measured credit quality but lowers quality after a lag. This result is completely consistent with the charge that some banks grew too quickly and were unable to maintain credit quality. The positive initial effects and the lag in the relationship between loan growth and quality deterioration suggest that early detection of decline in quality is difficult and a challenge to bank managers, directors, and examiners.

The relationship between loan growth and loan quality deterioration appears to depend on a bank's equity position. Rapidly growing banks with high levels of equity did not show evidence of a deterioration in loan quality. This result supports current programs of capital-based supervision of banks.

Loan growth through the acquisition of other banks (externally generated growth) has different effects on loan quality, depending on the type of acquisition. The acquisition of failed banks with assistance from the Federal Deposit Insurance Corporation (FDIC) typically improves credit quality. In contrast, loan growth through mergers and acquisitions of banks without any FDIC assistance typically lowers loan quality. The benefits of FDIC assistance in bank acquisition may be slowing the rate of consolidation of the banking industry by encouraging banks to delay acquisitions of troubled banks until the FDIC provides assistance.

Theoretical link between loan growth and loan quality

Logical arguments can be made relating loan growth to future loan quality. For example, a bank seeking to increase its market share might lower its underwriting standards to attract more loan customers. The underwriting standards are embodied in the nonprice terms of a loan, including collateral requirements, personal guarantees of borrowers, and loan covenants. If a bank lowers nonprice terms to attract new loan customers, then it is increasing the risk exposure of the bank by lowering loan quality.

Even if a bank attempts to maintain the same credit standards, the new borrowers it attracts may be of lower average quality as a result of adverse selection. If a bank is attempting to gain the business of borrowers that have established banking relationships, it is arguable that the lowest-quality customers will be easiest to attract. Banks

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will work hardest to keep their highest-quality borrowers. Lower-quality borrowers, on the other hand, will be bid away from their existing bank more easily. The bank attempting to grow will more likely attract lower-quality borrowers on average and, therefore, experience lower loan quality in the future.

Alternatively, a bank that fails to provide sufficient resources for credit administration during periods of rapid growth may have higher nonperforming loans in the future. If the bank pursues more rapid loan growth but fails to increase resources devoted to credit administration, the new loans may not be properly monitored over time. Close monitoring is needed to spot troubled credits early, before they grow in size. The misallocation of inputs can result in lower loan quality even if the bank has not lowered its underwriting standards.

It has been suggested that the collapse of the Bank of New England is a possible example of these problems. According to a report by the General Accounting Office, the Bank of New England more than quadrupled in size from 1985 to 1989. Bank examiners cited as problems a lack of independent loan review and out-of-date credit documentation (*American Banker*, September 20, 1991, p. 14). During this period, the bank made many loans that ultimately defaulted. These loan losses might have been significantly reduced if credit administration and monitoring had increased in proportion to lending.

Analyses of thrift failures suggest that some depository institutions consciously adopted high-risk, high-growth strategies after their capital positions had fallen to near or below zero. Some banks have found themselves in a similar position. If bank equity holders have little to lose because their capital has eroded, they may undertake a high-risk strategy in an effort to grow out of their troubles. In the event that the new loans default, the loss will be borne primarily by the FDIC. If these loans are repaid, the bank equity holders may reap sufficient income to recapitalize the bank. This strategy is possible only because federal deposit insurance allows the bank to raise whatever deposits are needed to fund the strategy. This is a classic example of moral hazard—that is, the provision of insurance changes the behavior of the insured (Kane 1985).

It is fully possible, however, for loan growth to have no effect on loan quality or even positive effects. During the recovery and expansion phases of a business cycle, lending increases because of strong loan demand. The strength of the economy also increases loan quality. Consequently, loan growth may be correlated with an improvement in loan quality, as nonperforming loans are likely to decline in a strong economy.

The effect of the economy on loan demand and loan quality is not limited to business cycles. Structural changes in the financial markets could also generate a positive relationship between loan growth and loan quality. For example, removing restrictions from banks that limited their ability to serve the needs of borrowers could increase loan growth at banks. At the same time, it might open access to new customers for banks that are, on average, higher-quality borrowers or that permit greater diversification.

Strong loan demand may not always result in improved loan quality. If the driving force behind strong loan demand is a speculative bubble, then the relationship between loan growth and loan quality is distorted. Stiglitz (1990) casually defines a bubble as occurring when "the reason that the price is high today is *only* because investors believe that the selling price will be high tomorrow—when 'fundamental' factors do not seem to justify such a price" (p. 13). Shiller (1989) has shown evidence that speculative bubbles may exist for stocks, bonds, and residential real estate. The decade of the 1980s saw an increase in asset-based lending in both real estate and corporate loan transactions. Because repayment of asset-based loans depends primarily on the future selling price of the asset being financed, the collapse of a speculative bubble could lead to deterioration of loan quality, especially among asset-based loans, such as real estate loans and loans for corporate restructuring.

It is unclear if loan growth should be blamed for the decline in loan quality following the bursting of a speculative bubble. Certainly, if the loan growth had been more moderate, the bubble might have been smaller or might never have been formed. On the other hand, the driving force behind the bubble was the expectations of the borrowers. Furthermore, the bursting of a speculative bubble often results in an economic downturn that will

likely cause deterioration in the loan portfolios of all banks, regardless of their growth rates.

From an analytical point of view, it is difficult to separate speculative bubbles from other factors that cause business cycles. Furthermore, some economists argue that bubbles do not exist. They argue that what appears to be the bursting of a bubble is really a market reaction to new information causing the sharp decline in prices. I will not attempt to separate the effects of speculative bubbles from other movements in the business cycle.

The cyclical movements in loan demand and loan quality could result in the erroneous conclusion that loan growth and loan quality are necessarily related. Loan growth could result from strong economic growth, and loan quality could deteriorate from an economic downturn. Consequently, a business-cycle boom followed by a bust will create a pattern of loan growth followed by deteriorating loan quality. Loan growth and loan quality may appear causally related when, in fact, they are both just correlated with the business cycle driven by other forces. A statistical analysis designed to explain the changes in loan quality needs to adjust for business-cycle effects.

Of course, fraud could be a special case of loan growth being correlated with declines in loan quality. Extremely rapid loan growth was observed at many savings and loan associations before their failures. In some of these cases, criminal fraud was the driving force behind the loan growth.[1] Ely (1990) estimated that the Federal Savings and Loan Insurance Corporation incurred losses of $5 billion from criminal fraud at insolvent thrifts, representing a small share of its total losses, estimated to be $147 billion. Low loan quality in these cases is the result of the fraudulent intent of the lenders and, in all likelihood, the borrowers also. The rapid loan growth is a possible symptom of the fraud, but it is not the cause of the poor loan quality.

Method of loan growth

The specific method utilized to increase the loan portfolio could have an effect on the relationship between loan growth and future loan quality. Loan growth could be generated by increasing lending to existing customers or to new customers. Alternatively, the loan portfolio could be increased by acquisition or merger. The acquisition might be a healthy bank or a failed bank with the assistance of the FDIC. Again, the impact on loan quality might be quite different, depending on the source of loan growth.

In this article, growth is separated into three categories: growth through acquisition of a failed bank with FDIC assistance, growth through an unassisted acquisition or merger, or internally generated growth. In some cases, the effect of each type of growth on loan quality can be suggested, but in other cases, it is difficult to hypothesize.

Loan growth through the acquisition of a failed bank with the assistance of the FDIC is unlikely to affect loan quality adversely. In most of these transactions, the FDIC removes the low-quality credits from the loan portfolio and agrees to take back loans that decline in quality after the acquisition is executed. In some other cases, the FDIC does not take any of the low-quality loans but, instead, provides the acquiring institution with sufficient resources to charge off the nonperforming loans.

Alternatively, a bank could increase its loan portfolio through acquisition of other banks. The acquiring bank can limit its exposure to low-quality loans on the acquired bank's books. Often, the acquired bank is required to charge off troubled credits before the acquisition is executed. In other cases, the acquired bank establishes a collecting bank to hold the troubled credits. The collecting bank is capitalized by the shareholders of the acquired bank to isolate the effects of the problem credits from the acquiring bank or bank holding company.

Of course, not all bank mergers can be characterized as one bank acquiring another. In

[1] *For example, a Ponzi scheme is premised on rapid growth to generate sufficient cash flows to cover up the lack of investment results. Ponzi promised to double investors' money in a short period. He then used the inflow of new deposits to give initial investors the promised doubling of funds, all the while extracting substantial management fees. Ponzi could keep the scheme going so long as the rapid growth of new investors provided sufficient cash flows to pay off the earlier investors (Kaufman 1986).*

the case of a merger between equals, the loan quality of the combined bank will be the average of the loan quality of the two banks, weighted by their relative sizes. In this case, loan quality is less likely to change substantially.

The effect of internal growth on loan quality is the most difficult to predict. If a bank were to restrict itself to loan growth from the growth of existing borrower relationships, it would be limiting its growth potential to that of its borrowers. Its diversity could also be limited. Seeking out new borrowers, however, has the hazards described above, such as adverse selection.

Alternatively, internal loan growth could result from increased lending activity in the loan participation market. A bank might be able to increase loans outstanding without lowering its underwriting standards.[2] Furthermore, the loan participation market could offer a bank the ability to diversify its loan portfolio across geographic regions and across industries in a manner that lowers overall credit risk. If, however, the loan participation market is driven by loans to finance a speculative bubble, then using the vehicle for loan growth could lead to lower loan quality in the future. Many of the highly leveraged transactions of the 1980s that are now in default or are being renegotiated were financed by large pools of banks.

Measuring loan quality

The analysis utilizes two standard measures of loan quality: the ratio of charge-offs to total loans and the ratio of nonperforming loans to total loans. These measures are proxies for the actual probability of a loan defaulting. A charge-off is the amount of a loan that a bank determines is unlikely to be repaid and counts as a loss. Nonperforming loans are defined as loans that are 90 days or more past due or have nonaccrual status.

Two measures gauging different stages of loan quality deterioration were used because any single measure may be inadequate in determining loan quality. Banks have some discretion to shift problem loans from the first stage to the second stage. In the first stage of deteriorating loan quality, loans become nonperforming—the borrowers fail to make timely payment of interest and principal. If the loan appears unlikely to be repaid in full, then in a second stage of deterioration, the loan or a portion of the loan is charged off. A bank can lower its nonperforming loan ratio by charging off more of its nonperforming loans. Consequently, both the charge-off rate and the nonperforming loan ratio were used to assess loan quality.

These financial ratios, however, can be distorted by growth if there are lagged relationships between financial variables. As a result, the ratios are imperfect proxies for the actual probability of a loan defaulting. Loans are rarely charged off in their first year. It is far more likely for a loan to default and be charged off long after the loan was first extended. Consequently, there is a lagged relationship between the measure of loan quality and total loans.

These loan quality measures do not adjust for the lag in the relationship between extending loans and loans defaulting. Consider the charge-off rate, for example; it is the ratio of charged-off loans, which are loans extended in previous years that are only now being recognized as a loss, to total current loans, which include loans that were made only recently and, therefore, are unlikely to have defaulted as yet. Essentially, the rate measures yesterday's mistakes relative to today's base. Consequently, growth in total loans can distort this ratio. If, as stated above, today's base is growing, yesterday's mistakes appear smaller in comparison with the current base. Loan growth would lower the charge-off rate for as long as the growth could be maintained, and the charge-off rate would be lower than the actual probability of default.

A numerical example can illuminate this point and is presented in Table 1. Suppose Bank A starts with $100 of loans and its growth rate is 1 percent per year; the probability of a loan loss is only 0.01. Assume that all loans have a three-year maturity and uncollectible loans are charged off in the third year. In the case of Bank A, its charge-off rate would become stable at 1 percent, exactly equal to the probability of loan loss. Suppose

[2] *This argument is based on the notion that the elasticity of the supply of loans in the participation market is very high and a large amount of loans can be added to the bank's books without reducing its underwriting standards.*

Table 1
Simulation of the Effect of Temporary Increases in Loan Growth Rates on the Measured Charge-off Rate

	Bank A		Bank B		Bank C		Bank D	
Period	Loans	Charge-off Rate	Loans	Charge-off Rate	Loans	Charge-off Rate	Loans	Charge-off Rate
1	100		100		100		100	
2	101		110		110		110	
3	102		121		121		121	
4	102	.98	132	.76	132	.76	132	.76
5	102	.99	144	.76	144	.76	144	.76
6	102	1.00	157	.77	157	.77	157	.77
7	102	1.00	171	.77	171	.77	171	.77
8	102	1.00	187	.77	204	.71	204	.71
9	102	1.00	204	.77	223	.70	223	.70
10	102	1.00	223	.77	244	.70	244	.70
11	102	1.00	243	.77	266	.77	266	1.53
12	102	1.00	265	.77	290	.77	290	.77
13	102	1.00	289	.77	317	.77	317	.77
14	102	1.00	315	.77	346	.77	346	.77

Bank A: 1-percent growth of loans and constant probability of default equal to .01.

Bank B: constant loan growth of 10 percent and constant probability of default equal to .01.

Bank C: one-time increase in growth rate from 10 percent to 20 percent in Period 8 and constant probability of default equal to .01.

Bank D: one-time increase in growth rate from 10 percent to 20 percent and one-time increase in probability of default from .01 to .02 in Period 8.

Bank B is identical to Bank A except it grows at a 10-percent annual rate; then its charge-off rate would stabilize at 0.77 percent. Bank B can maintain this lower charge-off rate as long as it can maintain the 10-percent growth rate.

This article addresses the question of whether the default rate changes in response to rapid loan growth. A comparison of two more simulations shows the distinction of the difference. Suppose both Bank C and Bank D experience a temporary increase in the growth rate of loans from 10-percent growth to 20-percent growth in the eighth period before returning to a steady 10-percent growth rate. In the case of Bank C, assume the probability of a loan defaulting remains constant at 0.01, while in the case of Bank D, assume the probability of default rises from 0.01 to 0.02 for the period of high growth and returns to 0.01 after the high growth. In Bank C's case, the charge-off rate will temporarily fall from 0.77 percent to 0.70 percent and then return to 0.77 percent. In Bank D's case, the charge-off rate declines initially to 0.70 percent, as in the case of Bank C, but then it rises sharply in the third period after the growth to 1.53 percent when the lagged effects of extending credit to riskier borrowers are realized.

Because of this lagged relationship, sustained rapid growth can mask changes in the probability of default by driving the charge-off rate in the opposite direction. For example, more rapid growth could drive the probability of default up only a small percentage relative to the percentage increase in the rate of growth. As a result, total charge-offs would rise in absolute magnitude, but charge-offs relative to total loans would fall.

Of course, maintaining rapid loan growth

forever is impossible. Eventually, some shock to economic growth limits loan growth. In Texas, for example, these shocks were the decline in oil prices and the collapse of real estate values. When loan growth rates fall, the effects of growth on charge-off rates are reversed and magnified. A slowdown in loan growth causes the charge-off rate to rise temporarily, even though the probability of default may be unchanged.

The model

As the dependent variables, the nonperforming loan ratio and the charge-off rate were regressed on a series of independent variables that measure the effects of loan growth by method of growth, bank financial characteristics, and business conditions. To capture the dynamic relationship between loan quality, as measured by the nonperforming loan ratio and the charge-off rate, and loan growth rates, multiple lags of the loan growth rates were used in the regression to determine the relationship between loan growth and loan quality. The estimation used data from Texas banks for 1976 through 1990.

Loan growth is separated into three categories: growth through FDIC-assisted merger, growth through unassisted merger, and internal growth. Growth through FDIC-assisted merger of a failed bank is defined as the total loans transferred to the surviving bank as a percentage of the total loans at that bank at the end of the previous period. Similarly, growth through unassisted merger is defined as the total loans transferred to the surviving bank as a percentage of the total loans at that bank in the previous period. Internal growth is measured as the residual growth after growth through assisted and unassisted mergers is removed—that is, total loans in time period t less loans acquired through assisted and unassisted mergers, stated as a percentage increase over total loans in time period $t - 1$.

The composition of the loan portfolio may also affect loan quality. During the period under study, oil prices dropped sharply, and the commercial real estate market was devastated by overbuilding and high vacancy rates. Consequently, a bank that was heavily exposed to energy or real estate borrowers would likely have higher nonperforming loan ratios or charge-off rates than a bank whose loan portfolio was better diversified. To account for the effect of differences in loan composition on loan quality, the proportion of commercial and industrial loans to total loans and the proportion of real estate loans to total loans were included.

A bank scale variable (logarithm of total assets) was also included to capture any effects of bank size, such as minimum efficient scales of operations or important reputational effects. It is possible that large banks may be able to achieve efficient scales of workout operations that are not feasible for smaller banks. As a result, large banks may keep nonperforming loans on their books while they work out repayment schedules. Smaller banks may find it more efficient to charge off the loss. Conversely, large banks are more likely to be raising funds in the money markets, and these markets appear to respond more favorably when banks charge off troubled loans rather than carry them as nonperforming assets. Therefore, large banks, if they have sufficient reserves, may have greater incentive to charge off troubled loans to gain more favorable terms in the money markets.

Loan quality will also be a function of the current state of the economy. Business conditions are introduced into the model by including the growth rate of Texas nonagricultural employment in the regressions.[3] Texas employment data are published by the Texas Employment Commission.

The structure of the model is as follows. The dependent variables measuring loan quality—the nonperforming loan ratio and the charge-off rate—are regressed on the following independent variables:

GROWTH0	Internal loan growth
GROWTH1	and three lagged values
GROWTH2	
GROWTH3	
GRO-MRG	Loan growth through bank merger

[3] *Measures of economic conditions at the county level, including county employment and gross taxable sales in the county, were tested but were dropped from the regressions for lack of significance.*

GR1-MRG *GR2-MRG* *GR3-MRG*	and three lagged values
GR0-FL *GR1-FL* *GR2-FL* *GR3-FL*	Loan growth through acquisition of failed banks and three lagged values
TA	Log of total bank assets
CMLRAT	Business loans as a percentage of total loans
RLRAT	Real estate loans as a percentage of total loans
EMPGROW	Rate of Texas nonagricultural employment growth
EQUITY	Total equity capital as a percentage of total assets

A logit-type transformation was performed on the dependent variables because their values were limited in the range of 0 to 1.[4]

It is possible that the negative relationship between loan growth and loan quality may not exist for banks growing at relatively normal rates but only for rapidly growing banks. High-growth banks were identified and tested separately from the rest of the sample to examine this hypothesis. Banks with internal loan growth rates exceeding four times the growth rate of Texas personal income were classified as high-growth banks. Banks with internal loan growth rates less than four times the income rate were classified as normal.[5]

Similarly, to measure the possible effects of moral hazard on bank behavior, the sample of rapid-growth banks was split into high and low capital categories. A bank was classified as a high-capital bank if its equity capital-to-asset ratio exceeded the average for its peer group. The three peer groups used were based on total asset size: banks with less than $100 million in assets, banks with at least $100 million in assets but less than $1 billion, and banks with more than $1 billion in assets.[6]

The regressions were run with annual data from the Reports of Condition and Income filed by Texas banks for 1976 through 1990. Texas personal income data were obtained from the U.S. Bureau of Economic Analysis. The regressions using the nonperforming loan ratio as the dependent variable were estimated for 1984 to 1990, the period for which data were available. The charge-off rate regressions were estimated with data for the entire period.

Regression results

The empirical results do provide evidence that rapid loan growth will result in a deterioration of loan quality. As expected, internal loan growth worsened measured loan quality with a lag. These empirical results support the popular notion that rapid loan growth results in low-quality loan portfolios that can lead to bank failure.

All the regressions utilizing nonperforming loan ratios and charge-off rates as the dependent variables were statistically significant. The regression results for the nonperforming loan ratio are presented in Table 2. The adjusted R^2 values indicate that even in the best-fitting equation, less than 20 percent of the total variation is explained. Low R^2 values, however, are common in regressions using cross-section data. The regressions for the charge-off rate are presented in Table 3 and fit the data slightly better than the nonperforming loan ratio regressions.

[4] *If the dependent variable is X, then the logit transformation of that variable is ln[X/(1 – X)]. This procedure monotonically transforms the values of X, constrained to be between 0 and 1, to range from negative to positive infinity.*

[5] *The relationship may not be symmetric for both loan growth and loan contraction, and some formulations restricting the observations to positive loan growth were estimated. Some versions of the model were estimated with observations limited to positive internal loan growth banks only. The results were essentially the same as the estimate for the full sample.*

[6] *Examining the moral hazard hypothesis is not the focus of this article. It is important to note that just because a bank has a capital ratio below the peer group average, the bank is not necessarily going to exhibit moral hazard behavior. To examine moral hazard behavior more fully, a sample of banks operating with little if any capital would be needed. It is possible that a sample of savings and loan associations would offer a sufficient number of observations to study the moral hazard problem.*

Table 2
Regression Results for Nonperforming Loan Ratio, 1984–90

	All Texas Banks	High-Growth Banks[1] Total	High-Growth Banks[1] High-Equity	High-Growth Banks[1] Low-Equity	Normal-Growth Banks
GROWTH0	−.01766 ***	−.00574 ***	−.00723 ***	−.00546 ***	−.02926 ***
GROWTH1	−.00695 ***	−.00251 ***	−.00360 *	−.00235 **	−.00765 ***
GROWTH2	−.00086 *	−.00072	−.00238	−.00044	−.00004
GROWTH3	.00006	.00040	.00045	.00043	.00003
GR0-MRG	.00092	.00421 *	.00415	.00441	−.00125
GR1-MRG	.00155	.00090	.00258	−.00159	.00131
GR2-MRG	.00342 ***	.00288	—	.00264	.00154
GR3-MRG	.00101	−.00445	—	−.00479	.00095
GR0-FL	−.01383 ***	—	—	—	−.02150 ***
GR1-FL	−.00695 ***	−.00233	−.00453	.00262	−.00832 ***
GR2-FL	−.00059	−.00026	—	−.00355	.00007
GR3-FL	−.00290	−.00686	—	−.00627	−.00284
TA	.05992 ***	.09393 ***	.02410	.13085 ***	.07774 ***
CMLRAT	.00865 ***	.00186	.00777 *	−.00107	.00906 ***
RLRAT	.00985 ***	.00278	.00837 **	−.00041	.00896 ***
EMPGROW	.00513	−.05209 ***	−.05562 ***	−.05061 ***	.02097 ***
Intercept	−5.08019 ***	−5.52885 ***	−5.06423 ***	−5.73915 ***	−5.28745 ***
Adjusted R^2	.1610	.0625	.0801	.0530	.1763
F statistic	143.702 ***	10.479 ***	5.750 ***	6.715 ***	131.719 ***
Observations	11,903	2,133	601	1,532	9,770

[1] Banks were classified as high-growth banks if their rate of internally generated loan growth exceeded four times the growth rate of Texas personal income.
* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

As predicted, the initial effects of internal growth improved loan quality when measured by the current nonperforming loan ratio and the charge-off rate. The coefficient on the variable *GROWTH0* is negative and significant in every regression for both the nonperforming loan ratio and the charge-off rate. The lagged effects of loan growth, however, increase the charge-off rate. In the charge-off rate regression for all Texas banks, the coefficient on *GROWTH3* is significant and positive, indicating that in this case the lagged effect of loan growth was to raise the charge-off rate. A temporary increase in the growth rate of loans, beginning at time *t*, will cause the charge-off rate to move in the pattern depicted in Figure 1.[7] The regression coefficients indicate the same

[7] *The movement in the charge-off rate presented is based on the regression results. Because of the logit transformation, the coefficients indicate the qualitative direction of the effect but cannot be interpreted quantitatively.*

Table 3
Regression Results for Loan Charge-off Rate, 1980–90

	All Texas Banks	High-Growth Banks[1]			Normal-Growth Banks
		Total	High-Equity	Low-Equity	
GROWTH0	–.01860 ***	–.00496 ***	–.00738 ***	–.00428 ***	–.03231 ***
GROWTH1	–.00640 ***	–.00348 ***	–.00669 ***	–.00296 ***	–.00651 ***
GROWTH2	.00017	–.00113	–.00472 **	–.00064	.00142 ***
GROWTH3	.00013 **	–.00064 **	–.00004	.00124 ***	.00010 *
GR0-MRG	.00252 ***	.00474 ***	.00464 **	.00441	.00015
GR1-MRG	.00296 ***	.00524 *	.00421	.00539	.00246 ***
GR2-MRG	.00275 **	.00138	—	.00155	.00230
GR3-MRG	.00012	–.01563 **	—	–.01540 *	.00012
GR0-FL	–.01469 ***	—	—	—	–.02375 ***
GR1-FL	–.00504 ***	–.00251 *	–.00495 **	–.00218	–.00644 ***
GR2-FL	.00158	–.01233	—	–.01198	.00276 **
GR3-FL	–.00125	–.01937 **	—	–.01857 **	–.00062
TA	–.06761 ***	–.02123	–.04370	–.01221	–.04907 ***
CMLRAT	.00038	–.00646 ***	–.00030	–.00891 ***	.00075
RLRAT	.00019	–.00683 ***	–.00539 *	–.00794 ***	–.00458 **
EMPGROW	–.04209 ***	–.05284 ***	–.04641 ***	–.05271 ***	–.03067 ***
Intercept	–3.76497 ***	–4.31454 ***	–4.07762 ***	–4.37177 ***	–3.93773 ***
Adjusted R^2	.1837	.0995	.1197	.0883	.2274
F statistic	182.432 ***	16.634 ***	8.328 ***	10.863 ***	199.285 ***
Observations	12,902	2,123	594	1,529	10,779

[1] Banks were classified as high-growth banks if their rate of internally generated loan growth exceeded four times the growth rate of Texas personal income.
* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.

pattern of improvement followed by deterioration that is presented in the simulation of the fictional Bank D.

The empirical results also indicate that a sustained increase in the growth rate of lending could create the appearance that credit quality has improved. If the internal loan growth rate rises and remains at a new higher level, the effect on the charge-off rate would be the sum of the coefficients estimated for the internal growth rate variable and its lagged values. The hypothesis that the sum of the coefficients is equal to zero was tested with an *F* test and rejected, indicating that a steady-state increase in the growth rate of internal lending would result in a lower measured charge-off rate. The pattern of the movement in the charge-off rate resulting from sustained growth would be much different than occurred with temporary growth. As shown in Figure 2, the charge-off rate would fall beginning at time *t* and remain below the original charge-off rate for as long as the higher growth rate could be maintained.

There is strong evidence that growth through bank merger lowers asset quality, based on the

Figure 1
Effect on Charge-off Rate of Temporary Increase in Loan Growth Rate

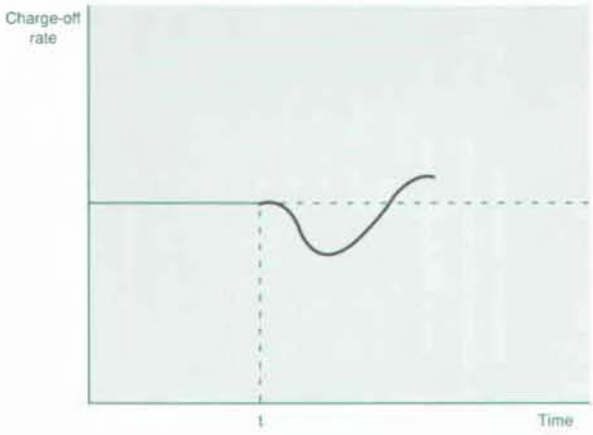
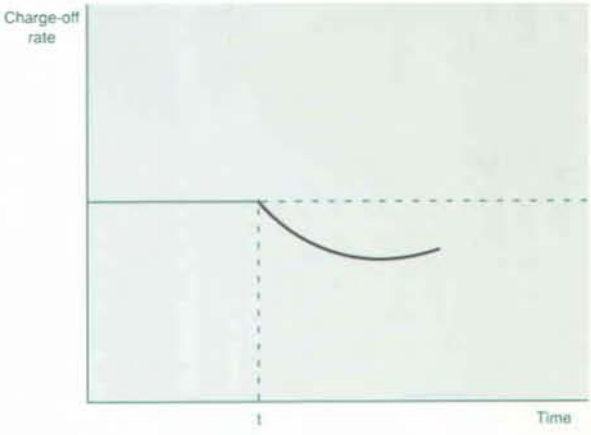


Figure 2
Effect on Charge-off Rate of Sustained Increase in Loan Growth Rate



effect on the charge-off rate. The initial and the lagged effects of growth through bank mergers were significant and positive, indicating higher charge-off rates. The nonperforming loan ratio, however, was not initially affected by growth through merger. The lagged effect of growth through mergers raised the nonperforming loan ratio in the second year after the merger.

Growth through mergers does not generate the initial improvement effect because the acquiring bank is acquiring loans extended by the acquired bank in previous years. As a result, there is no lag between when these loans are placed on a bank's books and when the loan might default.

Growth through the acquisition of failed banks appears to be highly successful in improving asset quality only in the short run. The initial and one-year lagged effects of growth through failed-bank acquisition were to lower both the nonperforming loan ratio and the charge-off rate. The longer lagged effects were not significantly different from zero.

Bank size appears to affect loan quality differently, depending on whether quality is measured by the nonperforming loan ratio or the charge-off rate. The positive and significant coefficients on the total assets variable (*TA*) indicate that larger banks had higher nonperforming loan ratios, and these banks had significantly lower charge-off rates. This result suggests that larger banks may not be as aggressive in charging off nonperforming loans as are small banks. One reason would be that large banks may have a competitive advantage in working out troubled credits and, consequently, carry such loans as nonperforming longer and charge off fewer of these loans.

The effect of loan portfolio concentrations on loan quality suggests that banks concentrated in business and real estate lending were slow to charge off nonperforming loans. Troubled real estate and business loans may be more likely to be successfully rescheduled and ultimately collected. If this is the case, these loans should be reported as nonperforming and need not be charged off.

Credit quality, when measured by the charge-off rate, moved with the business cycle, as expected. Declines in the growth rate of Texas nonagricultural employment correlated with higher charge-off rates. In the nonperforming ratio regression, however, the business-cycle variable was not significant.

The regression results are also consistent with the premise that moral hazard contributes to asset quality problems. If moral hazard were prevalent, then banks with low equity would be more likely to have pursued risky strategies. The sample of high-growth banks was split into two groups: banks with above-average equity-to-assets ratios and banks with below-average ratios. Both high-equity and low-equity banks showed the

Table 4
Regression Results for Moral Hazard Test Using the Charge-off Rate, 1980–90

GROWTH0	−.019935 ***	*GR0-FL*	−.014355 ***
GROWTH1	−.006667 ***	*GR1-FL*	−.005046 ***
GROWTH2	.000110	*GR2-FL*	.002012
GROWTH3	.000813 ***	*GR3-FL*	−.000019
EQUITY	−.176713 ***	*GR0-FL × EQUITY*	.000086
GROWTH0 × EQUITY	.004849 ***	*GR1-FL × EQUITY*	−.000602
GROWTH1 × EQUITY	.000010	*GR2-FL × EQUITY*	−.004156
GROWTH2 × EQUITY	−.002458 **	*GR3-FL × EQUITY*	−.003980
GROWTH3 × EQUITY	−.000793 ***		
		TA	−.056514 ***
GR0-MRG	.003305 ***	*CMLRAT*	−.000836
GR1-MRG	.003181 ***	*RLRAT*	−.000930
GR2-MRG	.002248 *	*EMPGROW*	−.042943 ***
GR3-MRG	−.000068	Intercept	−3.745804 ***
GR0-MRG × EQUITY	−.001337	Adjusted R^2	.1920
GR1-MRG × EQUITY	−.000765	*F* statistic	106.720 ***
GR2-MRG × EQUITY	.001060	Observations	12,902
GR3-MRG × EQUITY	.003831		

* Significant at the .10 level.
** Significant at the .05 level.
*** Significant at the .01 level.
NOTE: EQUITY = 1 for above-average equity banks and 0 for below-average equity banks.

same initial effect of improvement in the charge-off rate. The charge-off rate at the low-equity banks rose with a lag effect. At the high-equity banks, however, there was no significant effect that raised the charge-off rate.

An additional test of the moral hazard hypothesis also shows evidence of this behavior. A binary variable was defined as equal to 1 for above-average equity banks and 0 for the below-average equity banks for the total sample. In the new regression, the dependent variable—the charge-off rate—was regressed against the independent variables from the previous regressions and the product of the binary variable with the current and lagged values of the growth rate variables. The results of this estimation are presented in Tables 4 and 5. The initial effect significantly lowered the charge-off rate at both the high-equity banks and the low-equity banks. The lagged effect, however, significantly increased the charge-off rate for the low-equity banks. At high-equity banks, the longest lagged effect was insignificant. This result further supports the moral hazard hypothesis. If a bank has a large amount of its own equity exposed to risk, it is careful not to lower its credit standards, even during periods of strong growth.

Policy implications and conclusions

The evidence from Texas banks presented here indicates that a statistically significant relationship exists between loan growth and loan charge-off rates after a lag. These empirical results are in agreement with specific examples of rapidly growing banks that experienced declines in loan quality and eventually failed. Even after allowance for business-cycle effects and bank financial structure, the systematic relationship between loan growth and deteriorating loan quality held among Texas banks during the 1980s.

Table 5
Effect of Loan Growth on Charge-off Rates, 1980–90

	High-Equity Banks[1]	Low-Equity Banks
Period 1	– ***	– ***
Period 2	– ***	– ***
Period 3	– ***	n.s.
Period 4	n.s.	+ ***

[1] The effect of loan growth on high-equity banks is determined by adding the coefficient from the *GROWTH* variable and the coefficient from the cross product of *GROWTH* and *EQUITY*. An *F* test is used to determine if the sum is significantly different from zero.
*** Significant at the .01 level.
n.s.—Not significant.

Of course, it would be an overgeneralization to state that any increase in the loan growth rate will lead to higher charge-off rates. Loan growth during an economic expansion is to be expected as loan demand increases. Furthermore, the evidence indicates that this relationship may not hold for banks with above-average equity–asset ratios. Therefore, as stated above, increases in loan growth rates are only a signal of possible declines in loan quality, and such declines will not necessarily occur in every case.

The relationship between growth and quality places an additional burden on bank officers and directors to manage growth carefully. The usual measures of loan quality are distorted when growth rates change. Managers and directors need to adjust for these distortions and explore new methods to measure and control risk. Furthermore, determining the source of the loan growth is especially important in assessing risk. A growing economy, a speculative bubble, a shift in market share, or a perpetration of fraud can all generate loan growth, but the results are quite different. Finally, the resources devoted to marketing and credit administration need to be carefully balanced to prevent even good loans from becoming troubled assets.

Because the preliminary evidence suggests that loan growth is a determinant of loan quality, bank examiners could use this information to be more effective in the examination process. Growth may be one factor among several to consider when scheduling the frequency of examinations. Furthermore, growth may be a red flag that indicates which areas of a bank's portfolio are most in need of examination for credit quality issues.

The different approaches to generating loan growth had different effects on loan quality. As shown above, expanding the loan portfolio through increased lending to new or existing customers tends to improve the charge-off rate initially, but eventually it has a negative effect. Growth through the acquisition of failed banks with FDIC assistance tends to improve loan quality, measured by either nonperforming loan ratios or charge-off rates. Growth through mergers with other banks lowers loan quality when measured by the charge-off rate, but its effect on the nonperforming ratio is less certain. If a bank wishes to grow and to improve loan quality, growth through the acquisition of failed banks appears to be superior to growth through merger. Of course, this result is based on Texas banking data for a period of rapid bank growth followed by numerous bank failures.

The cause of this difference between bank merger and failed-bank acquisition is likely to be the assistance given by the FDIC to the acquirer of a failed bank. Typically, the FDIC is liberal in removing low-quality assets from the books of failed banks or in allowing the acquiring bank to return low-quality assets to the FDIC after the

acquisition. If bankers are averse to risk, the credit quality certainty provided by the FDIC would be considered highly valuable.

These results suggest that there may be a bias toward banking consolidation to take place through the acquisition of failed banks, rather than through mergers of solvent banks. Even after an acquiring bank has decided on an acquisition target, it may delay the acquisition if, in its assessment, the target bank is likely to fail and can be acquired with the FDIC removing the troubled loans from the current loan portfolio. The acquiring bank will trade off the benefits of current acquisition with the benefit of greater credit quality certainty in the future with an FDIC assistance package. Of course, the acquiring bank also takes the risk of possibly not submitting the winning bid to the FDIC.

Such a bias could slow the rate of much-needed consolidation in the banking industry. The U.S. banking industry needs banking consolidation, because it offers one of the best approaches to increasing the diversity of bank portfolios and increasing the efficiency in the provision of banking services (Clair, Tucker, and Siems 1991). It is possible that the rate of consolidation may be slowed by the rate at which the FDIC can close failed banks. If FDIC resolution procedures for failed banks are slowing the rate of consolidation, these procedures need to be reexamined. The nation's interests are unlikely to be served by drawing out the process of consolidation.

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