DO SEVENTH DISTRICT BANKS USE THE PROVISION FOR LOAN LOSSES TO SMOOTH INCOME?

MIKE SINGER

Proceedings of Regional Committee NCT-173
"Financing Agriculture and Rural America: Issues of Policy, Structure and Technical Change"
Louisville, Kentucky
October 5-6, 1998

Department of Economics
College of Agriculture
Iowa State University
174 Heady Hall
Ames, IA 50011-1070

April 1999

DO SEVENTH DISTRICT BANKS USE THE PROVISION FOR LOAN LOSSES TO SMOOTH INCOME?

Mike A. Singer*

Introduction and summary

Income smoothing is defined as actions taken by managers to reduce fluctuations in their firms' reported net income (Trueman and Titman, 1988). These actions can be based upon real activities related to production and investment decisions as well as accounting decisions. Some examples include a switch in depreciation methods, choosing between expensing or capitalizing R&D expenditures, timing advertising expenditures, and adjusting reserves for losses. An effective smoothing mechanism does not tie the firm to a future course of action, is based on a judgmental approach, and can produce a significant leveling of income across years (Greenawalt and Sinkey, 1988). Furthermore, it can be accomplished internally and be used over consecutive time periods. This flexibility and availability for repeated use is essential if a firm is to use a given mechanism to smooth out income fluctuations over several time periods without raising questions from auditors or regulators.

The motivation for income smoothing is not well-documented. One explanation rests upon the idea that managers act in their own self-interest; the other on the supposition that a smooth income stream has a beneficial impact on a firm's stock price. Healy (1985) provides evidence that the impact on performance-based compensation encourages managers to shift income and expense items across time periods. Furthermore, managers with little or no ownership control of a firm might shift income across time periods to minimize the impact of a

---

* Agricultural Economist, Federal Reserve Bank of Chicago, ph. 312-322-5923, e-mail: msinger@frbchi.org. The author acknowledges helpful comments on earlier drafts from Daniel Sullivan, David Marshall, and Helen Koshy. The views expressed in this paper are the author's and do not necessarily reflect the views of the Federal Reserve

poor year and project an image of competency that helps insure their continued employment (Moses, 1987). Trueman and Titman (1988) developed a framework in which smoothing may reduce market estimates of the volatility of a firm's earnings, which in turn lowers outsiders' assessment of the probability of bankruptcy and has a positive effect on stock prices. But Hand and Hughes (1990) found that stock prices reacted negatively to announcements of debt-equity swaps and defeasances that the authors believed were motivated by the desire to smooth income.[1] In contrast, Bitner and Dolan (1996) concluded that equity markets do value smooth income streams, but also found that specific smoothing actions can have a negative impact on a firm's stock price. However, the net effect of the benefit and cost could not be determined within the context of their study.

Managers at commercial banks might be encouraged to smooth income in the hope that it will improve compensation, increase their tenure, or have a positive impact on stock prices. In addition, avoiding large fluctuations in income may be a way to avoid the unwanted attention of regulators and establish a more favorable risk perception (Moses, 1987). For example, the importance of steady earnings to regulators is reflected in the FDIC examination manual, which states that "The first step in the analysis of any bank is to measure the level of earnings; the second step is to measure the trend of earnings (p. 5.1-2)". In particular, smaller, privately held banks that are free of the stock market discipline that might see through their manipulations could look upon income smoothing as a way to increase the confidence of regulators and lessen their scrutiny. Furthermore, in an era of consolidation, the owner of a smaller bank may desire to make the firm look as attractive as possible to potential acquirers. From the purchaser's

---

Bank of Chicago or the Federal Reserve System.

[1] An example of an insubstance defeasance is when a firm purchases U.S. government securities with cash payouts that are similar to the firm's own debt. The government securities are held by a trustee who services the company

viewpoint, the appearance of high-quality management and steady earnings could help convince regulators to approve the acquisition.

For commercial banks, the provision for loan losses appears to be ideally suited as an income smoothing device. The provision is the amount charged against earnings to establish or build a reserve to absorb expected loan losses. Expected loan losses tend to fall during economic expansions and rise during downturns, reinforcing the cyclical pattern of bank earnings. But since the provision for loan losses incorporates management's judgement regarding future losses, the size of the provision is subject to considerable discretion. Consequently, a bank's income stream can be smoothed or made less variable over time by increasing the provision for loan losses during good years and lowering it when times are bad.

However, the use of the provision for loan losses to smooth income is in conflict with regulatory guidelines. These guidelines indicate the provision for loan losses should be used to maintain the allowance for loan losses at a level consistent with the amount of credit risk and expected losses inherent in a bank's loan portfolio. In particular, regulators do not accept the availability of income as an appropriate consideration in setting the provision for loan losses. Moreover, the guidelines for administering loss reserves suggest several factors for consideration, including economic conditions, concentrations in certain types of lending, and trends in past due and nonaccrual loans.

Yet the door is left open to practice income smoothing because banks retain such considerable leeway in establishing loan loss reserves. Banks are not required by regulators to adopt any single methodology for identifying expected losses, and estimates of credit risk can vary depending on the approach the bank chooses to follow. Moreover, the FDIC bank

---

bonds using the cash flow from the government securities. See Hand and Hughes (1990) for more detail.

examination manual notes that reserves are required to cover losses that are "probable and estimable", an imprecise term at best. In addition, the reserves for impaired collateral-dependent loans must be based on the fair market value of collateral. Even though the collateral may be evaluated by an accredited appraiser, estimating the proceeds of a "liquidation" sale adds more uncertainty and room for variation. Banks are also encouraged to maintain a "margin" in their reserves because of the imprecision involved in estimating credit losses. In sum, regulators acknowledge that a considerable amount of judgement must be exercised in evaluating the expected losses within a loan portfolio.

Previous research on income smoothing at commercial banks is limited and the results are mixed. Greenawalt and Sinkey (1988) used a regression model to examine smoothing behavior among large regional and money center banks because of concerns that smoothing affected the ability of investors and regulators to discern the anticipated risks of expanded banking powers. They concluded that the banks in their sample practiced income smoothing. Bhat (1996) also found that banks use the provision for loan losses to smooth income in a regression analysis designed to identify characteristics of banks that engaged in income smoothing. The results of these studies indicated that smaller, privately held banks are more likely to engage in this behavior than large banks, and that large regional banks are more likely to smooth income than are large money center banks. It may be that larger, publicly traded banks receive greater scrutiny from investors and are unable to fool the market with income manipulations of this type. Wetmore and Brick (1994) also used a regression model to evaluate whether large regional and money center banks were practicing income smoothing and following regulatory criteria to determine loan loss provisions. They found no evidence that the banks in their sample were smoothing income. Using simple correlation analysis, Scheiner (1981) also concluded that banks

did not smooth income. It is worth noting that neither Scheiner (1981) nor Wetmore and Brick (1994) accounted for the impact of external economic conditions in their studies. The latter believed that including nonperforming loans in their analysis adequately accounted for economic conditions, but it is likely that nonperforming loans are more representative of past conditions rather than current.

It is not clear whether banks use the provision for loan losses to smooth income, nor is it clear whether smoothing interferes with proper administration of loan loss reserves. In addition, the results from prior research are not easily generalized. The sample of banks varied across studies, as did the time period used, and the researchers utilized differing formulations for their regression models. Furthermore, these studies were limited to large, urban-based banks. In particular, Greenawalt and Sinkey (1988) recognized that their results were not applicable to other types of banks and that other groups needed to be examined for additional insight into the concept of income smoothing as well as other factors that have an impact on a bank's provision for loan losses.

The primary objective of this study is to determine whether commercial banks in the Seventh Federal Reserve District utilize the provision for loan losses to smooth income. If so, an appropriate question is to ask how smoothing compares in importance to other factors believed to affect the provision for loan losses. For example, it would undoubtably be of concern to regulators if income smoothing has a relatively greater impact on setting the provision than does the overall condition of the loan portfolio. In addition, differences in bank location and credit concentration are examined for an impact on smoothing and the provision for loan losses. Banks in the sample are segregated into rural and urban subsamples to evaluate the difference in location, and banks with a concentration in agricultural loans are evaluated for differences from

non-agricultural banks. Rural and agricultural banks were among the first to exhibit problems during the economic downturn of the early 1980s. In view of the large number of these types of banks in the Seventh District, and given the current downturn in the agricultural sector and fears of an overall economic slowdown, it is important to increase our understanding of these groups.

A regression model was used to evaluate the impact of several factors on the provision for loan losses. The results showed a significant positive correlation between bank income and the provision for loan losses. This indicates that the sample of Seventh District banks did use the provision to reduce fluctuations in income over the 1990-95 period. Furthermore, this was true for both rural and urban banks, as well as those with a concentration in agricultural lending. In addition, other factors suggested by regulators as important determinants of the provision for loan losses were found to be significant within the regressions, including past due and nonaccrual loans, recent trends in loan losses, the concentration in short-term lending, and local economic conditions. In addition, there are differences between the bank types with respect to administration of the provision for loan losses. For example, urban banks tend to be more forward looking in setting the provision, concentrating on the quality of the existing loan portfolio, while the evidence suggests that rural banks are more inclined to assume recent trends in loan quality will continue when setting the provision.

This study adds to previous research on income smoothing among commercial banks by examining the behavior of smaller, privately-owned firms as well as those located in non-metropolitan areas. The finding that banks use the provision for loan losses conflicts with regulatory guidelines that require the allowance for loan losses to reflect the amount of expected loan losses that exist within the loan portfolio. This could cause earnings and loss reserves to be misstated and hinder regulators in meeting their objective of ensuring the safety and soundness of

the banking system and the protection of depositors. In addition, the different tendencies of rural and urban banks in setting the provision for loan losses provides bank examiners a better idea on what factors to evaluate during reviews and improves the efficiency of the examination process.

Loan loss provisioning and regulatory considerations

Banks are required by regulators to maintain a reserve, or allowance, for loan losses, and to include provisions for loan losses in operating expenses. The allowance for loan and lease losses is used to absorb loan losses as they occur. Its balance on a given date represents estimated credit losses that are reasonably *expected* to occur but which cannot be confirmed and so are not formally recognized. These losses stem from the credit risk (the possibility that a borrower will fail to repay the loan as agreed) that a bank bears through extending loans to a variety of borrowers. The allowance for loan losses appears on the asset side of the balance sheet as a deduction from total loans. Compared to total loans, net loans (total loans less the allowance for loan losses) provides a more accurate measure of the realizable value of the loan portfolio, and also provides a better picture of the level of income-earning assets held by the bank. Furthermore, since the allowance reflects the amount of credit risk and expected losses in a bank's loan portfolio, its serves as an important indicator of the financial condition of the bank and its ability to withstand economic fluctuations. History shows that large loan losses can reduce a bank's income and even cause bank capital to fall below acceptable levels.

Banks typically make additions to the allowance for loan losses when a loan is identified as uncollectible or the size of the loan portfolio increases (Walter, 1991). The allowance is increased by the provision for loan losses, an expense item that transfers earnings to the reserve account. The size of the provision depends upon the difference between the current level of the

allowance for loan losses and the amount that is judged adequate to absorb all inherent losses that exist within the loan portfolio as of the evaluation date. Determining the appropriate level of the allowance is a complex task which may involve the separate analysis of large loans, adversely classified loans, delinquent loans, and pools of smaller and/or similar loans. When a loan loss is actually recognized, all or a portion of the loan is charged off, and both the loans account and the allowance for loan losses are decreased by the amount charged off. If a recovery is made against a loan that was previously charged off, an amount equal to the recovery is added back (or credited) to the allowance.

Regulatory interest in the allowance for loan losses and the provision for loan losses is linked to the objectives of maintaining the confidence of bank depositors in the banking system while protecting their deposits and the bank insurance fund. Deposits are only partially backed by reserves (cash on hand and deposits with the Federal Reserve), so deposit protection rests primarily on the quality of bank assets. As loans account for about 60% of bank assets in the aggregate, the ability to withstand the credit risk in loan portfolios is critical to meeting these objectives. The level and trend of the allowance for loan losses is an important indicator of the credit risk within a bank's portfolio. Consequently, a misstated allowance misrepresents both the condition and the earnings of a bank and may constitute a violation of the requirement that banks file accurate reports of condition.

To address various issues involved in administering loan loss reserves, an interagency policy statement was issued by U.S. banking regulators in 1993 that provides banks with guidelines for estimating adequate loan loss reserves. The statement suggests several factors to consider in establishing an adequate level of loss reserves, and by implication, the provision for loan losses. It also points out that historical loss experience provides a reasonable starting point

for analysis but that recent trends alone are not a sufficient basis to determine the adequacy and level of the allowance, and consequently, the provision for loan losses. Other factors deemed to be important included national and local business conditions, the nature and volume of the loan portfolio, the level and trends in the volume and severity of past due and nonaccrual loans, and the impact of concentrations in particular types of loans. The policy statement encouraged banks to be conservative inasmuch as loss reserves should contain an additional margin for the imprecision involved in estimating credit losses. Banks are also encouraged to evaluate the allowance for loan losses on a quarterly basis and to split the portfolio into components that are evaluated separately. Regulatory guidelines also acknowledge that a considerable amount of judgement must be exercised in setting the allowance and provision for loan losses and specifically points out that the availability of income should not be a determinant.

A model to discern income smoothing and compliance with regulatory guidelines

The empirical analysis uses a multiple linear regression model to relate the size of a bank's provision for loan losses to a group of factors that are assumed to affect that decision. The provision for loan losses, which is the dependent variable in the regression model, is the amount charged to the allowance for loan losses on an annual basis. Determining the level of the provision for loan losses is assumed to be driven by:

- ☐ The bank's level of income before taxes and the provision for loan losses
- ☐ Recent net charge-off experience
- ☐ The current level of nonperforming loans contained in the bank's portfolio
- ☐ Recent developments in the bank's external economic environment
- ☐ Specialization in short term lending

- Specialization in lending vs. other types of investments
- Bank size

The first five factors relate to whether banks are following regulatory guidelines in administering the provision for loan losses. The next two factors serve to control for differences between banks. These factors are discussed in more detail below. In addition, a list of data sources and a formal discussion of the regression model is presented in technical appendix 1.

The bank income variable is specified as the level of pretax net earnings before taking the provision for loan losses. If banks adjust the provision to smooth out income fluctuations, there should be a positive correlation between the provision for loan losses and the income variable. But while this would provide evidence that income smoothing had occurred, one could not conclude whether smoothing was relatively more important than the other variables in determining the provision for loan losses because some of the explanatory variables are measured in different units. One way to shed more light on this question of relative importance is by a comparison of a unitless measure, *standardized beta coefficients*, for each variable. For example, if the income variable had the largest standardized beta coefficient, it supports the claim that banks place more importance on income smoothing than, say, the quality of the loan portfolio, when determining the size of the provision for loan losses. The method used to calculate standardized beta coefficients is shown in technical appendix 1.

The inclusion of bank income in the regression model is necessary to evaluate whether income smoothing has occurred. But other variables which are not directly related to the smoothing issue must also be included in the model to control for and separate out additional influences on the provision for loan losses. For example, the credit risk within the loan portfolio is expected to affect the size of the provision. Other studies have used the concentration in short

term commercial loans as a proxy for credit risk because of the heterogeneous nature of these loans and lack of secondary markets. But neither Greenawalt and Sinkey (1988) nor Wetmore and Brick (1994) found a significant correlation between the provision for loan losses and commercial lending. This study proposes the concentration of short term loans of all types, rather than just commercial loans, as an alternative measure of the riskiness of a bank's loan portfolio. Banks with a relatively greater focus on short-term lending may experience larger losses over time and thus require more substantial additions to the allowance for loan losses. The recognition and experience of losses on shorter vs. longer-term loans can easily vary due to differences in borrower attitudes, payment schedules, quality and availability of collateral, opportunities for resale, etc. In addition to acting as a control in the model, inclusion of the ratio of short-term loans to total loans in the model will demonstrate whether it is an adequate indicator of portfolio risk.

Keeton and Morris suggested that the banks that are the most likely to invest their funds in loans are also the banks with the greatest tolerance for risk. They proposed the loan-to-asset ratio as a proxy for the risk preferences of the bank's management. Accordingly, the loan-to-asset ratio is included in the regression model to control for willingness of the bank to accept risk. It is expected that a bank with a higher loan-to-asset ratio will hold a loan portfolio with relatively greater credit risk and thus make higher provisions for loan losses. In addition, since larger banks typically hold larger loan portfolios than small banks and would require proportionately larger loss reserves, the log of total assets is included in the model to control for bank size.

Average net loan charge-offs (charge-offs less recoveries) over the prior three years is used to control for the impact of recent history on the provision for loan losses. Prior research

indicates the bank's decision regarding its provision for loan losses is affected by its recent historical experience in charge-offs as well as its current level of problem loans. However, it is not clear whether this relationship will be positive or negative. It would depend on the extent to which past provisions were based on management's assessment of future losses and the time at which those losses were actually realized. Greenawalt and Sinkey suggest a positive correlation exists between past net charge-offs and the provision for loan losses because banks "extrapolate" their historical experience in net charge-offs into the future. Their rationale was this: if the bank experienced an increase in charge-offs in the past, management expectations will be affected and they will be more aggressive in establishing loss reserves today. The reverse would be true if recent charge-offs were on a decline. The validity of this hypothesis will be tested for the sample of banks under study.

In addition, it is highly likely that a positive correlation exists between the provision for loan losses and the current level of nonperforming loans in the portfolio. To incorporate the impact of current delinquencies and problem loans, the sum of loans that are at least 90 days past due and loans that have been placed in nonaccrual status is incorporated into the model. A loan may be classified as nonaccrual because of 1) deterioration in the financial condition of the borrower, 2) payment in full is not expected, or 3) the loan has been in default for an extended period and is not adequately secured.

Lastly, two variables are used to control for the impact of the external economic environment on the bank's decision on funding its allowance for loan losses. Personal income from farming and manufacturing capture the impact of these two important sectors on commercial banks. Both industries are relatively more important for the Midwest than for the U.S. as a whole (Testa, et al, 1997), and have a significant impact on commercial banks through

their effect on local income and employment, which in turn translates into deposits and loans for the bank. In addition, the output and/or employment of each of these sectors also tends to follow a cyclical pattern. It is assumed the county in which the bank is located represents the relevant market area, and the personal income data is collected at the county level. A negative correlation is expected between the provision for loan losses and the farm and manufacturing personal income measures. A higher income level suggests better repayment performance, fewer loan defaults, a higher-quality loan portfolio, and expectations of fewer loan charge offs.

Bank classification

The model described above is a means to evaluate whether District banks use the provision for loan losses to smooth income, and to evaluate bank compliance with certain regulatory guidelines regarding the administration of loan losses. An additional objective of this study is to determine whether differences exist between certain types of banks. While the banking studies described earlier dealt with large, urban-based banks, this study includes and looks for differences between both urban and rural banks of all sizes. In addition, rural banks are examined separately for differences between those that specialize in agricultural lending and those that do not. Rural and agricultural banks experienced severe financial problems resulting from a decline in loan quality in the 1980s. Much of this decline stemmed from problems in the manufacturing and agricultural sectors, mainstays of the Midwest economy. These two sectors are experiencing adversity today as a result of weakened export demand that stems from economic problems in other nations. The existence of differences between these groups of banks would provide useful information to those responsible for allocating resources towards planning and conducting bank examinations. Two regression models are developed in addition to the base

model. The first uses binary variables to form special interaction variables that capture the differences between urban and rural banks, while the second model uses interaction variables to break out the differences between rural banks that have a concentration in agricultural lending and those which do not. Additional information on the definition of the bank types listed above as well as the two additional regression models is available in technical appendix 2.

Empirical results

Base model results

The base model examines the relationship between the provision for loan losses and a group of factors believed to affect the size of the provision (the equation is shown in technical appendix 1). In general, these factors represent regulatory guidelines and controls for bank differences. Column 1 in Table 1 represents the base model, while column 2 represents the base model with additional interaction variables added to capture the differences between rural and urban banks. The first group of estimated coefficients in column 2 represent urban banks, while the second group (for the interaction variables) shows how rural banks differ from urban banks. Similarly, column 3 adds interaction variables to the base model to distinguish between agricultural and nonagricultural banks. The first set of estimated coefficients in column 3 represent nonagricultural banks and the coefficients on the interaction variables describe how the agricultural banks differ from the nonagricultural banks. A description of how the interaction variables are calculated and included in the regression model is shown in technical appendix 2.

Each factor in the base model except farm income had an impact on the provision for loan losses. In particular, it appears that Seventh District banks use the provision for loan losses to smooth out fluctuations in income. The positive sign on the income variable shows that banks,

on average, adjust their provision for loan losses upwards as income rises, and lower it as income falls. This conflicts with regulatory guidelines and suggests that banks are able to smooth income without attracting the attention of supervisory officials.

The controls included to account for lending concentration and size were also meaningful. The coefficient on short-term lending concentration was positive, supporting the hypothesis that banks with a relatively larger concentration of short-term loans require a larger provision for loan losses. In addition, the sign on the loan-to-asset ratio was positive. For a given loan volume, banks with higher loan-to-asset ratios make larger provisions for loan losses. In addition, for a given loan volume, larger banks tend to make relatively smaller provisions for loan losses than do smaller banks. This supports Bhat's observation that larger banks place greater emphasis on loan workouts and reschedulings than smaller banks and are slower to recognize expected losses.

The evidence also suggests that banks pay attention to regulatory guidelines and incorporate information from historical charge-offs, the current condition of the loan portfolio, and the current state of the economy when determining the size of the provision for loan losses. Past net charge-offs are inversely correlated with the provision for loan losses. This contradicts Greenawalt and Sinkey's belief that banks "extrapolate" from their past experience when determining their provisions for loan losses. However, it is consistent with the notion that larger charge-offs in the past improve the quality of the loan portfolio, leading to a smaller provision for loan losses today. Nonperforming loans were positively related to the provision, as expected, showing that the current level of nonperforming loans is a significant consideration in determining the provision for loan losses. Personal income from farming and manufacturing represent the impact of the external economic environment. Both were found to be inversely related to the provision for loan losses. Higher levels of personal income lead to better credit

quality, fewer expected losses, and a smaller provision. However, the sign on the farm income coefficient was not significantly different from zero in a statistical sense, suggesting farm income did not have a meaningful impact on a bank's decision to fund the provision for loan losses when the other factors were controlled for.

The results show that banks use the provision for loan losses to smooth income, yet attempt to follow other regulatory guidelines. But which has the larger impact? Standardized beta coefficients, described in technical appendix 2 and shown in Table 2, provide some insight to this question. They represent a measure of the relative impact of each factor on the provision for loan losses. The three largest, in order of size, were associated with nonperforming loans, income, and average net charge-offs. In particular, the beta coefficient for nonperforming loans was nearly four times the size of the coefficient for the bank income variable. This underscores the idea that banks evaluate their loan portfolios and use expectations of future losses as the primary driver of the provision for loan losses. Income smoothing, while important, is a secondary consideration in establishing the provision for loan losses. But the relatively small beta coefficients for personal income from manufacturing and farming indicate that banks do not place a great weight on current economic conditions when setting the provision for loan losses. It may be that the resources required to evaluate the direction in which the economy is going and the impact on loan quality is greater than what banks are willing or able to make available.

Rural vs. urban banks

Column 2 in Table 1 contains the results for Model II, which captures the differences between rural and urban banks in the relationship of the provision for loan losses to other factors. With respect to income smoothing, one might argue that rural-based banks tend to be smaller

and more conservative than urban banks, and would be more likely to follow regulatory directives to use the provision for loan losses to reflect expected losses and are less likely to engage in accounting manipulations to smooth income fluctuations. On the other hand, rural banks face relatively smaller and less diversified local economies that are more subject to variation in output and employment than that faced by urban banks. Potentially greater fluctuations in income would give rural banks more incentive to engage in smoothing. However, the regression model results indicate that rural banks do not differ from their urban counterparts in the extent to which they use the provision for loan losses to practice income smoothing. In particular, the estimated coefficient for the income interaction variable in column 2 is not significantly different from zero in a statistical sense. Furthermore, there was no significant difference between rural and urban banks in the impact of the external economic environment.

There were significant differences between rural and urban banks in their response to the control variables that represent lending concentration and size. The provision for loan losses at rural banks is less sensitive to the concentration in short-term lending, loan-to-asset ratio, and total assets than are urban banks. For a given concentration in short-term lending or overall lending, rural banks carry fewer loss reserves than do urban banks. This suggests there may be less credit risk in the loans made by rural banks--perhaps rural bankers are more familiar with local markets and their customers. The urban banking environment is probably more competitive as well and urban banks must accept riskier loans to maintain a given loan volume.

An especially noteworthy difference between rural and urban banks occurred in the impact of past loan charge-offs. In this case, the responses of rural and urban banks are not only different, they go in opposite directions. While there is a negative relationship between the provision for loan losses and the average net charge-offs for urban banks, the relationship turns

positive for rural banks. Greenawalt and Sinkey's hypothesis regarding banks' extrapolating their loan loss experience onto the provision for loan losses thus appears to hold for rural banks, but not for those in urban areas. Furthermore, rural banks were comparatively less responsive to the current level of nonperforming loans in their portfolio. It appears that urban banks are more forward looking when setting the provision for loan losses and have a greater focus on lending concentration and the level of nonperforming loans, while rural banks rely more on historical trends, arguably a more simplistic and lower-resource approach to setting the provision. This is an important aspect for supervisory officials to keep in mind when conducting examinations of rural banking institutions.

Standardized beta coefficients were calculated for both rural and urban banks to show the relative impact of each factor on the provision for loan losses within each group. The results are shown in Table 2. Nonperforming loans, income, and average net charge-offs are ranked as before within each subgroup. Again, income smoothing, while important, had a secondary impact, while the current level of nonperforming loans remains the dominant factor for rural as well as urban banks. However, the level of nonperforming loans was not as dominant within the rural bank subgroup as within the urban subgroup. This is consistent with the idea that rural banks focus less than urban banks on nonperforming loans and more on historical charge-offs when setting the provision for loan losses.

Agricultural vs. nonagricultural banks

The regression results for Model III are shown in column 3 of Table 2. Model III includes only banks located in rural areas, and uses interaction variables to account for differences between banks that specialize in lending to agriculture and those that do not. This

distinction is important because many rural banks have a heavy concentration in agricultural lending, and a downturn in production agriculture can have a serious impact on credit quality and the ability of these banks to remain viable. There were no significant differences between the two bank types in the relationship of the provision for loan losses to lending concentration, nonperforming loans, or farm income. However, farm income was a meaningful determinant of the provision for loan losses, in contrast to the base model and the rural-urban model.

There were significant differences between agricultural and nonagricultural banks with respect to income smoothing, past charge-offs and the external economic environment. Agricultural banks practice income smoothing, but to a lesser degree than the nonagricultural banks. In addition, the provision for loan losses at agricultural banks was less responsive to historical net charge-offs than at nonagricultural banks. The performance of farm borrowers is more subject to random events such as weather, and bankers know that certain events, like drought, are not likely to be repeated in successive periods. In addition, both bank types exhibit a positive relationship between the provision for loan losses and average net charge-offs, suggesting that they "extrapolate" trends in net charge-offs when making the provision. Lastly, the provision for loan losses at agricultural banks is relatively less affected by manufacturing income, consistent with their specialization in farm lending.

Standardized beta coefficients were also calculated for the agricultural and nonagricultural banks and are shown in Table 2. Again, the level of nonperforming loans is the most important determinant of the provision for loan losses, especially for rural banks that possess an agricultural lending concentration. For the agricultural banks, nonperforming loans and lending concentration have the greatest impact on the provision. It seems that agricultural banks are following regulatory guidelines on provisioning more closely than nonagricultural or

urban banks, an encouraging result given the current downturn the agricultural economy is experiencing and the likelihood that the quality of agricultural loan portfolios will deteriorate.

Summary and Conclusions

The objectives of this study, broadly defined, were as follows. The first was to determine whether commercial banks in the Seventh Federal Reserve District use the provision for loan losses to smooth out fluctuations in net income. Using the provision in this manner conflicts with regulatory guidelines that require that the provision be used to maintain the allowance for loan losses at a level consistent with the amount of credit risk in the bank's loan portfolio. In other words, the allowance for loan losses is to reflect the level of expected losses in a bank's loan portfolio. Given that the provision for loan losses was related to income smoothing, the second objective was to determine the importance of smoothing relative to other factors that affect the provision. The other factors included those recommended by regulators as proper input when determining the provision for loan losses as well as controls that account for differences in risk preferences and size. A secondary objective was to establish whether differences exist across selected categories of banks in determining the provision for loan losses. Banks were classified as rural or urban, with rural banks being further classified as agricultural or nonagricultural. These differences are important because the quality of loan portfolios at rural and agricultural banks is likely to be affected by the current downturn in production agriculture.

The results from the regression models indicate that banks in the Seventh District use the provision for loan losses to adjust income in a manner that is at odds with regulatory guidelines. This is true for banks located in both rural and urban areas, and is also true for agricultural and nonagricultural banks. However, banks also comply with other aspects of the guidelines that

indicate that the current condition of the loan portfolio and local economic trends should be taken into account when setting the provision for loan losses. A comparison of standardized beta coefficients shows that bank income ran a distant second to the level of nonperforming loans held by a bank in its impact on the provision. This is also true for the various bank classifications. While this is encouraging news from a supervisory standpoint, the extent to which banks practice smoothing is still a cause for concern among those responsible for bank examinations, since regulators encourage banks to calculate reserves based on their expectation of future loan losses.

Historical net charge-offs also play an important role on the determination of the loan loss provision, but differences exist across the bank subcategories. Recent net charge-offs have a direct relationship to the provision for loan losses at banks classified as rural, agricultural, and nonagricultural, but exhibit an inverse relationship to the provision at urban banks. When combined with the impact of nonperforming loans, this suggests that urban banks are more forward looking in setting their provision for loan losses than are rural banks. In other words, urban banks tend to set the provision with a greater focus on expected losses within the current portfolio, while rural banks rely to a greater degree on historical trends. Knowing the tendencies of banks in setting the provision gives bank examiners a better idea of what to focus on and would improve the efficiency of the bank examination process.

Considering trends that characterized local economies, the results show the impact of manufacturing is pervasive, if not particularly strong. The provision for loan losses is affected by the level of manufacturing income for rural, urban, agricultural, and nonagricultural banks. The impact does not differ across rural or urban banks, but there is a weak difference between agricultural and nonagricultural banks. In contrast, the impact of farm income was significant

only when evaluating banks located in rural areas, and the relationship was slightly stronger for those banks that specialize in agricultural lending.

TECHNICAL APPENDIX 1

A multiple linear regression model is used to relate the provision for loan losses to variables that represent bank operating income, concentration in lending, condition of the loan portfolio, and condition of the local economy. The base regression model (Model I) is specified as follows:

$$PLL_{i,t} = \alpha + \beta_1\ INC_{i,t} + \beta_2\ STCON_{i,t} + \beta_3\ LARAT_{i,t}$$

$$+ \beta_4\ AVGNCO_{i,t} + \beta_5\ BAD_{i,t} + \beta_6\ FI_{i,t} + \beta_7\ MI_{i,t} + \varepsilon_{i,t}$$

where $PLL_{i,t}$ is the provision for loan losses at bank i during period t, $INC_{i,t}$ is the level of pretax net earnings before taking the provision for loan losses, $STCON_{i,t}$ is the ratio of the volume of short-term loans to total loans, $LARAT_{i,t}$ is the loan-to-asset ratio, $AVGNCO_{i,t}$ is the average net charge-offs (charge-offs less recoveries) over the previous three years, $BAD_{i,t}$ is the sum of nonaccrual loans and loans that have been past due at least 90 days, $FI_{i,t}$ is the county-level (the county in which the bank is located) personal income from farming, and $MI_{i,t}$ is the county-level personal income from manufacturing. The α and the β's are the parameters to be estimated and $\varepsilon_{i,t}$ is the error term. Since the data includes both time series and cross-sections, heteroskedasticity and serial correlation are potentially serious problems that could affect the error term and bias the parameter estimates when using ordinary least squares to estimate the model. Therefore, an error components procedure was used for estimation in order to minimize these problems. This procedure incorporates the assumption that the error term is composed of three mutually independent components--one associated with time, one associated with cross-sectional units, and another component varying across both time and cross sections (Kmenta).

The model was estimated using the TSCSREG procedure in SAS.

The bank financial data used in the regression model were collected from the *Consolidated Reports of Condition and Income* (Call Reports). Personal income data were taken from the Regional Economic Information System of the U.S. Department of Commerce. In addition, nominal data were adjusted for inflation using the GDP deflator taken from the *Economic Report of the President.*

Often, direct comparison of regression coefficients is misleading if they are in different units. *Standardized beta coefficients* may be used to make statements about the relative importance of the explanatory variables in a regression model (Pindyck and Rubinfeld). One way of calculating the standardized beta coefficients is by using the results from the above regression model and the following formula:

$$\beta^*_j = \beta_j \frac{s_{X_j}}{s_Y}$$

where β^*_j is the standardized beta coefficient for the jth independent variable, β_j is the estimated regression coefficient for the jth variable, and S_{Xj} and S_Y are the standard deviation of the independent and dependent variables, respectively. In the context of this paper, a standardized beta coefficient can be interpreted as the number of standard deviation changes in the provision for loan losses that stem from a one standard deviation change in one of the explanatory variables contained in the regression model.

TECHNICAL APPENDIX 2

The banks used in this study are categorized as follows. Those located in non-metropolitan statistical areas are classified as rural, while banks located within metropolitan statistical areas are classified as urban. In addition, rural banks with a concentration in agricultural lending (agricultural banks) are identified as those with a ratio of agricultural loans to total loans that is greater than or equal to the unweighted average of that ratio for all Seventh District banks at the beginning of 1996. (Agricultural loans are defined as loans for farm production plus loans that are secured by farm real estate.) This ratio was approximately 21.9% for District banks at the beginning of 1996, compared to 15.8% for all U.S. banks. Banks with an agricultural lending concentration below the District average were classified as nonagricultural banks.

To evaluate the differences between urban and rural banks, binary variables were used to form special interaction variables that were added to the base regression model to allow the slope coefficients (the β's) to differ across urban and rural locations. This is shown in the following equation, which represents Model II:

$$PLL_{i,t} = \alpha + \beta_1\ INC_{i,t} + \beta_2\ (D_L * INC_{i,t}) + \beta_3\ STCON_{i,t} + \beta_4\ (D_L * STCON_{i,t}) +$$

$$+ \beta_5\ LARAT_{i,t} + \beta_6\ (D_L * LARAT_{i,t}) + \beta_7\ AVGNCO_{i,t} + \beta_8\ (D_L * AVGNCO_{i,t}) +$$

$$+ \beta_9\ BAD_{i,t} + \beta_{10}\ (D_L * BAD_{i,t}) + \beta_{11}\ FI_{i,t} + \beta_{12}\ (D_L * FI_{i,t}) +$$

$$+ \beta_{13}\ MI_{i,t} + \beta_{14}\ (D_L * MI_{i,t}) + \varepsilon_{i,t}$$

In this case, the binary variable D_L takes on the value of 0 if the bank is located in an urban area

and a value of 1 if one if it is located in a rural area. For example, the product of D_L and $INC_{i,t}$ form the interaction variable $D_L*INC_{i,t}$ in the above equation. The value of the interaction variable is zero for any observation on an urban bank (because D_L is 0 for an urban bank) and its value is $INC_{i,t}$ for any observation on a rural bank. Thus, the slope coefficient for $INC_{i,t}$ is B_1 for urban banks and is $\beta_1 + \beta_2$ for rural banks. β_2 is the difference in response between urban and rural banks. To emphasize this idea, the previous equation may be rewritten as:

$$PLL_{i,t} = \alpha + (\beta_1 + \beta_2 D_L) INC_{i,t} + (\beta_3 + \beta_4 D_L) STCON_{i,t}$$

$$+ (\beta_5 + \beta_6 D_L) LARAT_{i,t} + (\beta_7 + \beta_8 D_L) AVGNCO_{i,t}$$

$$+ (\beta_9 + \beta_{10} D_L) BAD_{i,t} + (\beta_{11} + \beta_{12} D_L) FI_{i,t}$$

$$+ (\beta_{13} + \beta_{14} D_L) MI_{i,t} + \varepsilon_{i,t}$$

Again looking at the $INC_{i,t}$ variable, if β_2 is significantly different from zero in a statistical sense, one may conclude that the provision for loan losses at rural banks responds to income in a different fashion than at urban banks. The direction and magnitude of the difference between rural and urban banks depends on the sign and size of the coefficient β_2. The same holds for the other variables and estimated slope coefficients.

Similarly, Model III used binary variables to create special interaction variables to evaluate the differences between agricultural and nonagricultural banks. Model III uses only banks located in rural areas, since over 85% of the agricultural banks in the sample were located in rural areas. The interaction variables were added to the base model to allow the slope coefficients to differ across agricultural and nonagricultural banks. The formulation is identical to that of Model II, except the binary variable D_L now takes on the value of 0 for a nonagricultural bank and the value of 1 for an agricultural bank. Following the previous example