Bank Loan Loss Provisions: A Reexamination of Capital Management, Earnings Management and Signaling Effects

Anwer S. Ahmed•
Department of Accounting
School of Management
Syracuse University
Syracuse, NY 13244

Carolyn Takeda and Shawn Thomas
Department of Finance, Insurance & Real Estate
College of Business Administration
University of Florida
Gainesville, FL 32611

November 1998

Abstract

This paper exploits the 1990 change in capital adequacy regulations to construct more powerful tests of capital and earnings management effects on bank loan loss provisions. We find strong support for the hypothesis that loan loss provisions are used for capital management. We do not find evidence of earnings management via loan loss provisions. We also document the reasons for the conflicting results on these effects observed in prior studies. Additionally, we find that loan loss provisions are negatively related to both future earnings changes and contemporaneous stock returns contrary to the signaling results documented in prior work.

Key words: Discretionary Accruals, Loan Loss Provision, Regulatory Capital, Signaling, Capital Markets

JEL classification: C23, G14, M41

We gratefully acknowledge the comments from and/or conversations with Ray Ball, Mark Flannery, Bob Holthausen (the editor), S.P. Kothari, Susan Moyer, Jim Wahlen, Jerry Zimmerman, workshop participants at Syracuse University and, especially, the JAE referee. Anwer Ahmed acknowledges summer support for this project from the William E. Simon Graduate School of Business, University of Rochester.

• Corresponding author. Address: School of Management, Syracuse University, Syracuse, NY 13244. Telephone: 315-443-3357, EMAIL address: asahmed@syr.edu.

1. Introduction

Loan loss provisions are a relatively large accrual for commercial banks and, therefore, have a significant impact on banks' earnings and regulatory capital.[1] In principle, the purpose of loan loss provisions is to adjust banks' loan loss reserves to reflect expected future losses on their loan portfolios [see the AICPA Guide *Audits of Banks* (1983)]. However, bank managers also have incentives to use loan loss provisions to manage earnings and regulatory capital as well as to communicate or "signal" private information about future prospects. This study investigates the use of loan loss provisions by bank managers to manage regulatory capital and earnings and to signal information about future earnings.

Prior studies document mixed evidence regarding capital and earnings management via the loan loss provision. Moyer (1990) and Beatty, Chamberlain, and Magliolo (1995) find evidence of a negative relation between loan loss provisions and capital ratios which is consistent with the use of loan loss provisions to reduce expected regulatory costs associated with violating capital requirements. However, Collins, Shackelford and Wahlen (1995) do not find support for capital management. Furthermore, while Collins, Shackelford and Wahlen (1995) find evidence of a positive relation between loan loss provisions and earnings which is consistent with smoothing earnings via loan loss provisions, Moyer (1990) and Beatty, Chamberlain, and Magliolo (1995) do not find evidence of earnings smoothing.

The 1990 change in bank capital adequacy regulations substantially alters banks' incentives to manage capital and earnings via loan loss provisions and allows us to construct more powerful tests of the capital and earnings management hypotheses. In

particular, the new capital requirements limit the use of loan loss reserves as regulatory capital in two ways. First, loan loss reserves do not count as part of Tier I or primary capital under the new regulations. Second, loan loss reserves only count as part of Total capital up to 1.25% of risk-weighted assets.[2] These changes imply a *less* negative relation between capital (measured before loan loss reserves) and loan loss provisions in the new regulatory regime relative to the old regime because low capital banks have less incentive to increase loan loss provisions under the new capital regulations. In addition, the new regulations make it less attractive for low capital banks that have exceeded the upper bound on loan loss reserves to increase loan loss provisions.

The change in capital regulations also reduces the costs of earnings management or smoothing. In general, enhancing earnings by reducing loan loss provisions results in a greater reduction in capital under the old regulatory regime compared with the new regime. This implies that smoothing earnings via loan loss provisions is more attractive in the new regime.

Previous papers have also examined managers' use of loan loss provisions to signal private information about future earnings changes. Beaver, Eger, Ryan and Wolfson (1989) suggest that investors interpret an increase in loan loss provisions as a sign of strength. Consistent with this signaling hypothesis, Wahlen (1994) documents a positive relation between (unexpected) loan loss provisions and future pre-loan loss earnings changes as well as contemporaneous stock returns. Beaver and Engel (1996) document that the valuation coefficients on the "discretionary" and "non-discretionary" components of loan loss provisions are positive and negative, respectively, consistent

[1] The median ratio of loan loss provisions to earnings before provisions and taxes is 19% in our sample.
[2] Section 2 presents a more detailed description of the new capital regulations.

with the signaling hypothesis. We reexamine the signaling hypothesis to see if it holds in a more recent time period after controlling for potentially important economic determinants of loan loss provisions not incorporated in prior work.

Using a sample of 113 bank holding companies that file Y-9 reports with the Federal Reserve over 1986-1995, we find that in the new capital regime the strength of the negative relation between loan loss provisions and capital is significantly diminished consistent with a reduction in capital management incentives. Further, the relation between loan loss provisions and capital is *less* negative among banks with loan loss reserves exceeding the upper bound consistent with these banks facing diminishing incentives to use loan loss provisions in capital management. Finally, the relation between loan loss provisions and capital is *more* negative for banks with above average loan growth (or frequency of acquisitions) consistent with these banks benefiting more from capital management than other banks. Collectively, these results provide strong evidence that bank managers use loan loss provisions to manage regulatory capital.[3]

With respect to earnings management, we find that the relation between earnings (before taxes and loan loss provisions) and loan loss provisions is insignificant except when we use the particular model of expected or non-discretionary provisions used in Collins, Shackelford and Wahlen (1995).

With respect to the signaling hypothesis, we don't find evidence of a positive relation between loan loss provisions and one-year ahead future change in earnings contrary to Wahlen (1994). Furthermore, even though market value tests indicate a positive valuation of discretionary loan loss provisions consistent with the signaling

results documented in Beaver and Engel (1996), returns based tests indicate a significant *negative* relation between bank stock returns and discretionary loan loss provisions. Taken together, these findings suggest that Wahlen's (1994) results are likely to be specific to the time period examined in his study.[4]

We contribute to the literature on bank loan loss provisions in several ways. First, we utilize the change in capital adequacy regulations to construct more powerful tests of the capital management and earnings management hypotheses. In particular, we study the *change* in the relation between loan loss provisions and regulatory capital in response to significant changes in capital adequacy regulations. Furthermore, we test for differences in the relation between loan loss provisions and capital (i) across banks that are likely to differ in terms of costs of violating capital requirements and (ii) across banks that have differing incentives to use loan loss provisions for capital management in the new regime.

Second, we investigate and document the specific reasons for the inconsistent results observed in prior studies.

Third, we reexamine the signaling hypothesis in a different time period and show that the support for the signaling hypothesis in a more recent time period is considerably weaker than previous studies suggest.

Finally, we use more refined proxies for economic determinants of changes in default risk [including the change in implied volatility of banks' asset values following Ronn and Verma (1986)] that, in principle, should be reflected in loan loss provisions. The finding that loan loss provisions are significantly related to these proxies is important

[3] We also document that the result in Collins, Shackelford and Wahlen (1995) which is inconsistent with capital management is driven by the assumption in their tests that the target variable for capital management is the bank-specific time-series mean capital ratio.

in light of the controversy over adequacy of existing accounting guidance on choosing loan loss provisions. For example, a report by the US General Accounting Office (GAO 1994) concludes that loan loss reserves for these institutions *"did not result in meaningful assessments of the risk of loss due to uncollectible loan balances"*. Furthermore, the report states that *"until more specific standards are established by authoritative accounting bodies, incomparable and potentially unreliable reserves will continue to hamper the usefulness of financial reports of depository institutions"*.[5] On the other hand, the Federal Reserve Board, the Federal Deposit Insurance Corporation and the Office of Thrift Supervision in their responses to the report indicate that existing accounting and regulatory guidance is generally sufficient to address the concerns of the General Accounting Office. Our findings support the position of the bank regulatory agencies that existing accounting guidance on choosing loan loss reserves is sufficient to address the concerns of the General Accounting Office about the meaningfulness of loan loss reserves.

The next section presents the hypotheses tested in the study. Section 3 presents the evidence and the conclusion is presented in section 4.

[4] Liu, Ryan, and Wahlen (1997) show that signaling results hold for the 4th quarter for certain types of banks. We use annual data because regulatory examinations tend to focus on annual data. Thus, we cannot shed any light on variation in signaling effects across quarters.

[5] See the U.S. *General Accounting Office* report entitled "Depository Institutions: Divergent Loan Loss Methods Undermine Usefulness of Financial Reports", October 1994.

2. Hypotheses

This section begins with a discussion of the 1990 change in capital adequacy regulations for bank holding companies and its implications for bank managers' incentives to use loan loss provisions in managing regulatory capital. Next, we discuss managers' incentives to use loan loss provisions in earnings management. Finally, we discuss the use of loan loss provisions to signal information about future prospects as forwarded in the literature by Beaver, Eger, Ryan and Wolfson (1989) and Wahlen (1994).

2.1 Capital Management Hypotheses

Bank capital regulation is intended to mitigate moral hazard problems that arise from the provision of deposit insurance, lender-of-last resort facility, and other guarantees by the government [Greenbaum and Thakor (1995) and Berger, Herring & Szego (1995)].

Over the period 1985-1989 (which we refer to as the old regime), regulators required banks to hold primary capital and Total capital exceeding 5.5% and 6% of total assets, respectively. Primary capital included book value of equity, loan loss reserves, perpetual preferred stock and mandatory convertible debt. Total capital was defined as the sum of primary capital, subordinated debt and limited life preferred stock. The inclusion of loan loss reserves in defining regulatory capital implied that a one dollar increase in the loan loss provision increased regulatory capital by the tax rate times one dollar [Moyer (1990)]. Thus, managers of banks with low regulatory capital had incentives to increase loan loss provisions. Moyer (1990), Collins, Shackelford and

Wahlen (1995) and Beatty, Chamberlain and Magliolo (1995) examine the relationship between loan loss provisions and capital before the new capital regulations.

The Federal Deposit Insurance Corporation Improvement Act of 1991 introduced new risk based capital standards to address problems with the old capital requirements. In particular, the old capital requirements made no distinction between banks with different levels of asset risk and did not incorporate off balance sheet activities. Under the new capital requirements, banks are required to classify their assets and off-balance sheet activities into five categories with designated risk weights. The new rules divide Total regulatory capital into Tier I and Tier II capital.

Tier I capital is defined as the sum of book value of equity, qualifying non-cumulative perpetual preferred stock, and minority interest in equity accounts of subsidiaries less goodwill and other intangible assets. Tier II capital is the sum of loan loss reserves (up to a maximum of 1.25% of risk-weighted assets), perpetual preferred stock, hybrid capital instruments, perpetual debt, mandatory convertible debt securities, term subordinated debt, and intermediate preferred stock.[6]

Under the new rules, Tier I capital must exceed 4% of risk-weighted assets and Total capital must exceed 8% of risk-weighted assets.[7] In addition, Tier I capital must exceed 3% of total assets. Furthermore, the amount of Tier II capital cannot exceed Tier I capital. In other words, at least 50% of Total capital must consist of Tier I capital.

For the purposes of this study, the most important changes in the capital regulations are (i) the elimination of loan loss reserves from Tier I capital and (ii) the

[6] For a more detailed definition and explanation of the various components of regulatory capital see *Capital Adequacy Guidelines* published by the Board of Governors of the Federal Reserve System.
[7] See Greenbaum and Thakor (1995) for a more detailed explanation of the computation of risk-weighted assets.

limitation on the use of loan loss reserves in meeting Total capital requirements. The elimination of loan loss reserves from Tier I capital implies that a dollar increase in loan loss provisions *decreases* Tier I capital by the after-tax amount of the provision. However, since loan loss reserves still count as Tier II capital up to 1.25% of risk-weighted assets, a dollar increase in loan loss provision increases Total capital by the tax rate times one dollar (provided loan loss reserves don't exceed the upper bound). Thus, increasing loan loss provision has opposing effects on Tier I and Tier II capital.

We focus on testing two implications of the change in capital adequacy regulations. First, we expect that given the limitations on the use of loan loss reserves as regulatory capital in the new regime, the relation between loan loss provisions and capital will be *less* negative in the new regime relative to the old regime.[8] Second, in the new regime, the relation between loan loss provisions and capital will be *less* negative for banks with loan loss reserves exceeding 1.25% of risk-weighted assets relative to other banks since, for these banks, increasing loan loss provisions provides minimal capital benefits.

In addition to providing evidence on the implications of the changes in capital adequacy regulations, we also test whether the extent of capital management via loan loss provisions varies cross-sectionally with the expected costs of violating capital requirements. In particular, banks that face higher costs of violating capital requirements are likely to have greater incentives to engage in capital management. For example, banks that choose to grow via mergers and acquisitions must obtain approval for the transactions from regulators. Capital adequacy is an important consideration in the

merger approval process and regulators are thought to impose higher regulatory capital standards for banks that are actively involved in growth via mergers and acquisitions. Similarly, capital requirements constrain banks' ability to grow more generally in the sense that if a bank's capital is at or below the minimum capital level, the bank cannot issue more deposits or invest in additional loans. Based on the above arguments, we expect banks with relatively higher costs of violating capital requirements to engage in more capital management.

Our capital management hypotheses are summarized as follows:

H1.1: The relation between loan loss provisions and capital will be less negative for banks in the new capital regime relative to the old regime.

H1.2: Within the new regime, the relation between loan loss provisions and capital will be less negative for banks that have loan loss reserves in excess of 1.25% of risk-weighted assets relative to other banks.

H1.3: The higher the cost of violating capital constraints, the more likely it is that banks will manage capital via loan loss provisions.

2.2 Earnings Management

Several prior studies hypothesize a positive relation between loan loss provisions and earnings (before loan loss provisions) [Greenawalt and Sinkey (1988), Beatty, Chamberlain and Magliolo (1995) and Collins, Shackelford and Wahlen (1995)]. This

[8] The sign of the relation between loan loss provisions and capital in the new regime depends on the relative amounts of Tier I and Tier II capital. We discuss this further under the results. However, in all

hypothesis assumes that managers have incentives to smooth earnings. Thus, when earnings are expected to be low, loan loss provisions are deliberately understated to mitigate the adverse effects of other factors on earnings. However, in the old regime such earnings management was costly because understating loan loss provisions also resulted in a reduction of primary regulatory capital. In other words, managers faced conflicting incentives in choosing loan loss provisions.

In the new capital regime, the effect on regulatory capital resulting from earnings smoothing via the loan loss provision has been reduced. That is, understating loan loss provisions (i) does not reduce Tier I capital and (ii) reduces Tier II capital, only when loan loss reserves do not exceed the limits for capital inclusion. Thus, if smoothing earnings is an important determinant of loan loss provisions, we ought to observe a stronger positive relation between earnings (before loan loss provisions) and loan loss provisions consistent with the reduced costs of earnings management under the new regime.

H2: The relation between loan loss provisions and earnings (before loan loss provision) will be more positive in the new capital regime than in the old regime.

2.3 Signaling Future Earnings

Another motive for the choice of loan loss provisions that has been forwarded in the literature is to signal financial strength. Beaver, Eger, Ryan and Wolfson (1989) suggest that loan loss provisions can indicate that "*management perceives the earnings power of the bank to be sufficiently strong that it can withstand a 'hit to earnings' in the*

cases the relation between loan loss provisions and capital should be less negative in the new regime.

form of additional loan loss provisions".[9] Wahlen (1994), Beaver and Engel (1996) and Liu, Ryan and Wahlen (1997) investigate this hypothesis. We reexamine this hypothesis to see if it holds in a different time period after controlling for important economic determinants of loan loss provisions not included in prior studies. If signaling is an important incentive in choosing loan loss provisions, then we should observe a positive relation between loan loss provisions and changes in future pre-loan loss earnings [Wahlen (1994)]:

H3.1: Loan loss provisions are positively related to one-year ahead changes in earnings (before loan loss provisions).

2.4 Signaling Market Value

The signaling hypothesis has also been tested by examining the stock market's valuation of loan loss provisions. For example, Wahlen (1994) documents a positive relation between discretionary or unexpected loan loss provisions and bank stock returns. Beaver and Engel (1996) document a positive coefficient on the discretionary component of loan loss provisions in a regression of market value of equity on earnings (before provisions), loan loss provisions, discretionary component of loan loss provisions, and non-performing loans. Such signaling use of loan loss provisions implies the following hypothesis:

H3.2: Discretionary loan loss provisions will be positively valued by the stock market.

[9] Note that the signaling effects in the loan loss provision studies are opposite to the signaling effects hypothesized in studies on discretionary accruals more generally such as Subramanyam (1996) and Ahmed (1997).

3. Evidence

3.1 Sample and Descriptive Statistics

We use a sample of 113 bank holding companies with annual data available over the period 1986-1995. To be included in the sample, a bank holding company must satisfy the following requirements:

- Financial data available on the Y-9 Consolidated Financial Statements filed with the Federal Reserve
- Price and Return data available on the CRSP tape
- Geographical loan composition data available from the Thompson Bank Directory or Moody's Bank and Finance manuals.[10]

These criteria result in 113 bank holding companies each with 10 years of data. We lose one year's data due to differencing and four observations because of missing data yielding 1,013 bank-year observations that are used in the tests.

Table 1 presents descriptive statistics for the sample banks for 1987-1995. The mean and median ratio of loan loss provision to average loans outstanding (LLP) is 0.8% and 0.5%, respectively. The median ratio of loan loss provisions to earnings before provision and taxes is 19%. Thus, loan loss provisions are a relatively important accrual for banks.[11]

We use three variables as proxies for the non-discretionary component of loan loss provisions: (i) the change in non-performing loans (ΔNPL), (ii) the change in implied

[10] The banks not listed in the Thompson Bank Directory operated in only one state. For these banks, Moody's manuals were used to determine the state of operation.

[11] Loans are banks' major assets. The median ratio of loans to total assets is 63% for our sample. The median ratio of loan loss reserves to outstanding loans is 1.8% and the median ratio of loan loss reserves to book equity is 13%.

standard deviation of bank asset values (ΔSDA), and (iii) the change in business failures in a bank's market (ΔBFI).

The change in non-performing loans has been used as a measure of default risk in prior studies. The median change in non-performing loans is -0.02% of average loans outstanding.

The implied standard deviation of banks' asset values is based on option pricing theory following Merton (1977) and Ronn and Verma (1986). The implied standard deviation of banks' asset values represents a stock market based estimate of the risk inherent in banks' loan portfolios. The procedure to estimate the implied standard deviation is described in more detail in Appendix A. The mean estimated implied standard deviation is 0.028 and the mean change in implied standard deviation is 0.001. These magnitudes are similar to those reported in Ronn and Verma (1986).

As a measure of economic conditions in banks' product markets, we use the weighted average of the per capita liabilities of failed businesses in a bank's market where the weights are the fraction of bank assets in a particular state.[12] State by state business failure data is obtained from Dun & Bradstreet's *Business Failure Record*, state population figures are from the U.S. Department of the Census data, and the distributions of banks assets across states are from the Thompson Bank Directory. For a given year t, the business failure index (BFI) for bank i which operates in states j is given by:

$$BFI_i = \sum (LFB_j/POP_j) \times (A_j/\sum A_j)$$

where LFB_j is the total liabilities of failed businesses in state j, POP_j is the population of state j, A_j are the assets of the bank in state j, and the summations are over all states j.

The mean and median change in the business failure index (ΔBFI_{it}) are -0.013 and -0.02 respectively.

A bank's capital position before loan loss reserves (CAPB) is measured by the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital. In order to be consistent with prior studies, we measure CAPB using primary or Tier I capital. However, in testing for the effects of the upper-bound constraint on loan loss reserves in the new regime, we also use a capital measure based on Total capital as discussed below. The mean CAPB is 2.07 suggesting that, on average, banks in the sample are well capitalized. The minimum ratio of 0.51 suggests that there are some banks in the sample that are undercapitalized. The mean and median ratio of book value of equity to total assets is 7%. This also suggests that on-average banks are well capitalized.

The mean return on assets (net income deflated by average assets) for the sample banks is about 1%. The mean ratio of income before taxes and provisions to average assets is 1.8%. These values are consistent with magnitudes observed in other studies.

3.2 Evidence on capital management

In Table 2 column (i), we present the results of the following multivariate regression:

$$LLP_{it} = \beta_0 + \beta_1 \Delta BFI_{it} + \beta_2 \Delta SDA_{it} + \beta_3 \Delta NPL_{it} + \beta_4 CAPB_{it} + \beta_5 EBTP_{it} + \beta_6 CAPB_{it} \times REG + \beta_7 EBTP_{it} \times REG + \varepsilon_{it}$$

[12] This is a refinement of the business failure index in Moyer (1990). She uses the number of reported business failures in Dun and Bradstreet's *Business Failure Record* divided by the total listed firms.

The coefficients on ΔBFI_{it}, ΔSDA_{it}, and ΔNPL_{it} are all expected to be positive since an increase in business failures, implied standard deviation of asset values, or non-performing loans implies an increase in default risk. All three estimated coefficients are positive and significant at conventional levels. This suggests that, at least for the banks in our sample, reported loan loss provisions reflect meaningful assessments of changes in the relative quality of banks' loans. The reported t statistics are based on the White (1980) heteroscedasticity-corrected covariance matrix.

If low capital banks use loan loss provisions to boost their capital, then we expect to see a negative coefficient on CAPB. Furthermore, if this incentive has declined in the new capital regime, we expect to see a positive coefficient on the interaction term $CAPB_{it} \times REG$ where REG stands for a regime dummy that takes on the value of one for the new regime (1991-1995) and zero otherwise (1987-1990). The estimated coefficient on CAPB is −0.009 which is significant at conventional levels. The negative sign is consistent with the use of loan loss provisions for capital management in the old regime. Furthermore, the coefficient on the interaction term, which represents the difference between the coefficient on CAPB in the new regime and in the old regime, is positive and significant. This suggests that capital management via loan provisions has declined which is consistent with the hypothesized change in capital management incentives.

The coefficient on the capital variable in the new regime (i.e., the sum of the coefficients on CAPB and $CAPB_{it} \times REG$) is significantly negative.[13] In the old capital regime, loan loss provisions affected primary capital and Total capital in the same way, i.e., both forms of capital benefited from an increase in loan loss provisions. However,

this is not true in the new capital regime. In the new regime, increases in loan loss provisions are most valuable to a bank with insufficient Total capital when its Tier II capital limits have not been reached. However, an increase in loan loss provisions also decreases Tier I capital. This suggests that a negative coefficient on Tier I capital in the new regime could be interpreted as inconsistent with capital management. To shed some light on this issue, we examined the frequency of observations with less than 120% of the required capital in the new regime (where 100% is the point at which actual capital exactly equals minimum required capital). Out of 560 bank-years in the new regime, Tier I capital (before loan loss provisions) is less than 120% of the required amount for only 3 bank-years. In contrast, Total capital (before loan loss provisions) is below 120% of the required Total capital for 30 bank-years. This suggests that the banks in our sample are not capital constrained with respect to Tier I capital. Furthermore, since Tier II capital is limited to the amount of Tier I capital, a negative coefficient on primary capital also implies a negative coefficient on Total capital. To confirm this, we repeated our tests with Total capital and found very similar results. Thus, the negative coefficient is consistent with managers using loan loss provisions to manage Total capital in the new regime.

In Table 2 column (ii), we investigate whether banks that are likely to face higher costs of violating capital requirements engage in more capital management. We use two proxies for the costs of violating capital requirements: a loan growth proxy (LGD) and a proxy for growth via acquisitions (ACQNGD). LGD takes on the value of one if a bank has above-median percentage change in loans in a given year and zero otherwise. If banks with high growth are engaging in more capital management via loan loss

[13] An F test that the sum of the coefficients on CAPB and CAPBxREG equaled zero was rejected at the 1% level.

provisions, then we expect to observe a negative coefficient on the variable interacting capital with loan growth (CAPB×LGD). The estimated coefficient is negative and significant which is consistent with this hypothesis.

As an alternative proxy for higher costs of violating capital requirements we define a dummy variable ACQNGD that takes on the value of one for banks that have above-median number of acquisitions in a year and zero otherwise.[14] The acquisition data is obtained from the Securities Data Corporation's Mergers and Acquisition Database. The results (not reported) using ACQNGD are very similar to the results based on LGD alone.

In Table 2 column (iii), we investigate the robustness of our loan growth results to inclusion of the capital and earnings regime variables. The coefficient on CAPB×LGD continues to be negative and highly significant. Additionally, even rapidly growing banks make less use of provisions to manage regulatory capital in the new regime as evidenced by the positive coefficient on CAPB×LGD×REG.

The new regulations limit the amount of loan loss reserves that count as Tier II capital. Thus, banks with high levels of loan loss reserves have weaker incentives to engage in capital management. To test this, we examine whether the coefficient on capital in the new regime for banks that have loan loss reserves exceeding 1.25% of risk-weighted assets is positive. We define a dummy variable BIND equal to one if loan loss reserves exceed 1.25% of risk weighted assets and zero otherwise. For the purposes of this test, we use a capital measure based on Total capital before loan loss provisions (TCAPB) rather than the capital measure based on Tier I capital since loan loss reserves

[14] Ideally, we would have used the fraction (a continuous variable) of the growth in a bank's assets that represented acquired banks but the data on the assets of acquired banks were incomplete

only count as part of Tier II capital. We obtain the following estimated coefficients and t statistics for the new regime:

$$LLP_{it} = \underset{(6.27)}{0.013} + \underset{(3.57)}{0.001}\,\Delta BFI_{it} + \underset{(3.61)}{0.079}\,\Delta SDA_{it} + \underset{(1.23)}{0.04}\,\Delta NPL_{it}$$

$$\underset{(-3.86)}{-0.005}\,TCAPB_{it} + \underset{(0.02)}{0.01}\,EBTP_{it} + \underset{(6.04)}{0.002}\,TCAPB_{it}\times BIND$$

$$\underset{(-2.78)}{-0.001}\,TCAPB_{it}\times LGD + \varepsilon_{it}$$

As expected under the capital management hypothesis, the coefficient on the interaction term TCAPB×BIND is positive and significant at the 1% level. This suggests that the relation between loan loss provisions and TCAPB is *less* negative for banks that have reserves exceeding the upper-bound, which is consistent with these banks facing weaker capital management incentives.

Collectively, these results provide strong support for the capital management hypothesis. However, they don't shed light on why prior studies find conflicting evidence on capital management. We provide evidence on this issue after discussing the evidence on earnings management.

3.3 Evidence on earnings management or smoothing via loan loss provisions

If banks use loan loss provisions to smooth earnings, then we would expect a positive relation between earnings before taxes and loan loss provisions (EBTP) and loan loss provisions. The estimated coefficient on EBTP in column (i) of Table 2 is positive but not significant at conventional levels in the old regime. Furthermore, if earnings smoothing is an important driver of loan loss provisions, we would expect to see a larger

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for many banks.

positive coefficient on earnings before taxes and loan loss provisions in the new regime since the costs of managing earnings in terms of adverse effects on regulatory capital have declined. The estimated coefficient on the earnings and regime interaction variable (EBTP×REG) in Table 2, column (i) is negative. This is inconsistent with the smoothing hypothesis.

3.4 Reconciliation of results with prior studies

The capital management and earnings management results in table 2 are consistent with the results in Moyer (1990) and Beatty, Chamberlain, and Magliolo (1995) but inconsistent with the results in Collins, Shackelford, and Wahlen (1995). We therefore perform tests to provide evidence on potential explanations for the inconsistency. Our tests differ from those of Collins, Shackelford, and Wahlen (1995) in three important respects: (i) we use a different definition of capital, (ii) we use a different model of non-discretionary provisions, and (iii) we assume that the target variable for capital management is the minimum ratio specified by regulators rather than the time-series, bank-specific mean capital ratio.

We repeated the tests in Table 2 with two alternative definitions of capital: (i) the definition used by Collins, Shackelford, and Wahlen (1995) and (ii) primary or Tier I capital (before loan loss reserves) deflated by total assets rather than risk-weighted assets. The results (not reported) are very similar to those discussed above.

Next, we used a model of non-discretionary provisions similar to the model employed by Collins, Shackelford, and Wahlen (1995) to see if this explained the inconsistency. The three variables that they use are loans outstanding, change in non-

performing loans and beginning of year non-performing loans. Since we are deflating loan loss provisions by loans outstanding, we only need to use the remaining two variables as determinants of non-discretionary loan loss provisions to replicate their tests. Using this model, we obtain the following regression estimates (t statistics reported in parentheses):

$$\underset{}{LLP_{it}} = \underset{(5.4)}{0.006} + \underset{(11.40)}{0.32\,\Delta NPL_{it}} + \underset{(14.00)}{0.22\,NPL_{it-1}} - \underset{(-4.4)}{0.005\,CAPB_{it}} + \underset{(2.60)}{0.13\,EBTP_{it}}$$

$$+\underset{(2.55)}{0.003\,CAPB_{it}\times REG} - \underset{(-1.8)}{0.10\,EBTP_{it}\times REG} + error_{it}$$

The capital management effects remain the same as those reported in Table 2. Thus, the difference in capital management effects is not driven by the difference in the model of non-discretionary provisions. However, the coefficient on the earnings variable remains positive but becomes statistically significant. This suggests that the earnings smoothing results in Collins, Shackelford and Wahlen (1995) are driven by the use of NPL_{t-1} in modeling the non-discretionary component of loan loss provisions. Interestingly, in the new regime earnings management declines.

We also repeated our tests assuming that banks' targets for capital and earnings management are the time-series bank-specific mean capital ratio and net income, respectively. We replaced the capital variable (CAPB) in Table 2 with the ratio of actual primary or Tier I capital to the time-series mean capital ratio (after loan loss reserves), hereafter referred to as CAPRATIO2, and the earnings variable with the ratio of EBTP to the time-series mean net income (deflated by average total assets), hereafter referred to as

ENGRATIO2. We obtained the following regression estimates (t statistics reported in parentheses):

$$\underset{}{LLP_{it}} = \underset{}{0.002} + \underset{(1.40)}{0.0005}\,\Delta BFI_{it} + \underset{(2.51)}{0.06}\,\Delta SDA_{it} + \underset{(4.34)}{0.20}\,\Delta NPL_{it} + \underset{(5.00)}{}$$

$$+ \underset{(2.33)}{0.003}\,CAPRATIO2_{it} + \underset{(0.75)}{0.00001}\,ENGRATIO2_{it}$$

$$- \underset{(-0.26)}{0.0003}\,CAPRATIO2_{it}\times REG - \underset{(-1.03)}{0.006}\,ENGRATIO2_{it}\times REG + \varepsilon_{it}$$

The coefficient on CAPRATIO2 is positive consistent with the result in Collins, Shackelford, and Wahlen (1995). Thus, the difference between our capital management results reported earlier and their results is driven by the use of different targets for capital management. They assume that banks manage capital to be closer to the time-series mean capital ratio. Our tests assume that the target for capital management is the minimum ratio specified by the bank regulators. In our view, since bank capital requirements apply to all banks, the appropriate target for regulatory capital management is the minimum specified by bank regulators rather than the time series bank-specific mean capital ratio.

3.5 Evidence on Signaling Future Earnings

Next, we examine whether loan loss provisions are related to future earnings changes after controlling for economic determinants of loan loss provisions using regressions similar to those in Table 2 augmented by the change in one-year ahead earnings before taxes and loan loss provisions. If signaling of this type is an important determinant of loan loss provisions, then we should observe a positive relation between the one-year ahead change in earnings and loan loss provisions.

Table 3 column (i) presents the results of the augmented regression. The coefficient on the one-year ahead change in earnings is *negative* and significantly different from zero at the 1% level. This is inconsistent with the signaling hypothesis. Furthermore, it is contrary to the results reported in Wahlen (1994). There are several potential explanations for the difference between our results and Wahlen's (1994) findings: (i) we use a different model for non-discretionary provisions, (ii) we use a different specification for testing the signaling hypothesis, and (iii) we are examining a different time-period.

To shed some light on what might be driving the difference, we reexamined the signaling hypothesis using Wahlen's model for non-discretionary provisions and empirical specification.[15] Column (ii) of Table 3 presents the results of a specification similar to the one reported in Table 3 of Wahlen's (1994) study. The only difference between these results and his is that our results are based on a more recent time period and a slightly larger sample. Wahlen (1994) examines 106 banks over 1977-1988 whereas we study 113 banks over 1987-1995. The results in column (ii) show that the relation between future earnings changes and the discretionary component of loan loss provisions remains negative and significantly different from zero. This suggests that the signaling results in Wahlen (1994) are specific to the time period examined in his study.

As an additional robustness check on our signaling results, we used an alternative model for non-discretionary provisions. For each bank we regressed loan loss provisions

[15] The Wahlen (1994) model of non-discretionary provisions is the predicted value in a regression of loan loss provisions (deflated by beginning of year market value of equity) on expected change in non-performing loans, beginning of year loan loss allowance, beginning of year non-performing loans, and five loan composition variables all deflated by beginning of year market value of equity. The expected change in non-performing loans is the predicted value in a regression of change in non-performing loans, on lagged change in non-performing loans and the five loan composition variables all deflated by beginning of year market value of equity.

on the average loan loss provision for all banks in a given year. The residual from this regression, which captures the bank-specific component of the provision, was used as a proxy for the discretionary component. The results (not reported) were similar to those reported above.

3.6 Market valuation of Discretionary Loan Loss Provisions

In Table 4, we present tests of signaling using a valuation approach as in Beaver and Engel (1996). They regress market value of equity on loan loss provisions, the discretionary component of loan loss provisions, non-performing loans, and earnings before taxes and provisions (partitioned into periods with positive and negative net income, respectively). We report results of a replication of this regression in column (i). Under the signaling hypothesis, a positive coefficient is expected on the discretionary component of loan loss provisions. The discretionary component is measured by the residuals in a regression of LLP on ΔBFI, ΔSDA, and ΔNPL.

Consistent with Beaver and Engel (1996), we find that the estimated coefficient on discretionary loan loss provisions (DPROV) is positive and significant in the valuation regression. Table 4 column (ii) includes the loan charge-offs as an additional explanatory variable since Beaver and Engel (1996) also use charge-offs in some specifications. The coefficient on discretionary provisions is not affected by the inclusion of this variable. In Table 4 column (iii) we use the non-discretionary portion of the loan loss provision instead of the total provision as an explanatory variable. The coefficient on the discretionary component of the provision now becomes negative. This suggests that an increase in the discretionary component of the loan loss provision has a *negative* impact

on equity which is opposite to the positive impact on equity suggested by the signaling hypothesis. However, the magnitude of the coefficient on discretionary loan loss provisions is smaller than the magnitude of the coefficient on the non-discretionary component. This is consistent with discretionary component of loan loss provisions containing good news *relative* to the non-discretionary component.

A potential problem with levels tests of the type used by Beaver and Engel (1996) is that they are more likely to be affected by correlated omitted variables bias [see Kothari and Zimmerman (1995) for evidence]. To assess the seriousness of the bias in this context, we perform tests using annual market-adjusted buy and hold returns instead of market value of equity as the dependent variable.

Table 5 column (i) presents the regression of annual market adjusted buy and hold returns on earnings (before taxes and provision) and loan loss provision. The coefficient on earnings is positive and significant at conventional levels consistent with the information content literature. The coefficient on loan loss provisions is negative consistent with investors viewing the loan loss provision as an expense rather than as a signal of future profitability.

Table 5 column (ii) presents the results of the regression of market adjusted buy and hold returns on earnings before taxes and provision, non-discretionary loan loss provision, discretionary loan loss provision (measured as discussed above), change in non-performing loans and loan charge-offs. All independent variables are deflated by beginning of year market value of equity.

The coefficient on earnings remains positive and significant. The coefficient on non-discretionary provision is negative but not significant. The coefficient on

discretionary provision is negative and significantly different from zero at conventional levels. This is inconsistent with discretionary provisions signaling good news about future prospects.[16] The change in non-performing loans also has a negative and significant coefficient. However, loan charge-offs are not significant in explaining returns.

3.6 Additional sensitivity analyses

We perform a number of additional tests to check the robustness of our results. First, the t statistics in the pooled time-series cross-sectional regressions could be overstated due to cross-sectional and time-series dependence in the residuals. We use a fixed-effects model to allow for bank specific as well as period specific components in the residuals [Hsiao (1986)]. The tenor of our results is not affected by this alternative estimation method suggesting that the reported significance levels are not driven by cross-sectional or time-series dependence in residuals.

Second, we use an alternative proxy for the non-discretionary components of loan loss provisions following Wahlen (1994) to check for the robustness of our capital management and earnings management effects. He uses the beginning balances in six loan categories as determinants of loan loss provisions. We add the beginning balances of consumer, commercial and industrial, real estate, foreign, and agricultural loans as additional determinants of loan loss provisions. Our capital and earnings management results are not affected by the use of this modified proxy for non-discretionary provisions.

[16] A potential explanation of the difference in the magnitudes of coefficients on discretionary and non-discretionary portions is that the information in the non-discretionary component is anticipated to a greater extent by outsiders than the information in the discretionary component.

Third, we repeat our tests on partitions of the sample based on prior studies. Greenwalt and Sinkey (1988) document that regional banks engage in income smoothing to a greater extent than large money center banks. We therefore divide our sample into two sub-samples based on total assets and repeat the tests for each sub-sample. Our results (not reported) hold for both sub-samples. Liu and Ryan (1995) document that the valuation of loan loss provisions depends on the proportion of large and frequently renegotiated loans held by the bank. We split our sample according to their classification of timely versus untimely loan loss provisions. Our results (not reported) hold for both partitions.

Finally, we repeated our tests with a relatively less restricted sample (banks with a minimum of 6 years of available data). This increased the sample size to 185 banks.[17] The results on the capital management and earnings management hypotheses for this larger sample are essentially the same as those reported. However, using Wahlen's model of non-discretionary provisions and specification, we did find a positive effect of discretionary provisions on one-year-ahead earnings changes. But this result was not robust to alternative models for non-discretionary provisions or alternative specifications. For example, it did not hold when (i) we used the residuals from bank-specific regressions of loan loss provisions on the average loan loss provisions for all banks, or (ii) when we used our empirical specification for the signaling test [Table 3 column (i)]. Furthermore, the returns-based tests did not support the signaling hypothesis.

[17] The median book value of equity of our original sample of 113 banks is $296m which is closer to the median book value of equity for Wahlen's (1994) 106 banks ($261m). The median book value of equity of the banks in our larger sample is $214m.

In summary, our inferences are not sensitive to estimation method, partitioning of the sample based on bank size, timeliness of loan loss provisions, or restrictions on the sample.

4. Conclusion

This paper reexamines the capital management, earnings management and signaling explanations for banks' choices of loan loss provisions in light of the 1990 change in capital adequacy regulations. Overall, we find evidence that: (i) loan loss provisions reflect meaningful changes in the expected quality of banks' loan portfolios, (ii) capital management is an important determinant of loan loss provisions, (iii) earnings management is not an important determinant of loan loss provisions, and (iv) the desire to signal private information to outsiders is not an important determinant of loan loss provisions in our sample.

Our study also provides explanations for the conflicting results on the use of loan loss provisions to manage capital and earnings observed in prior studies. In particular, we document that the lack of support for the capital management hypothesis in Collins, Shackelford, and Wahlen (1995) is driven by the assumption that the target for capital management is the bank-specific mean capital ratio rather than the minimum ratio required by regulators. Furthermore, the earnings management result in Collins, Shackelford, and Wahlen (1995) is driven by their particular model for non-discretionary provisions.

The lack of support for the signaling hypothesis using a sample that is similar to Wahlen's (1994) sample obtains even when we use his model for non-discretionary

accruals and empirical specification suggesting that the signaling results in Wahlen's (1994) study are specific to the period examined in his study.

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Table 1

Descriptive statistics for the sample of 113 Bank Holding Companies over 1987-1995 that (i) file Y-9 reports with the Federal Reserve, and (ii) have returns data on CRSP.

Variable	Mean	SD	Min	25%	Median	75%	Max
LLP	.008	.008	-.02	.003	.005	.010	.080
ΔNPL	-.0001	.013	-.08	-.0046	-.0002	.004	.073
SDA	.028	.016	.003	.019	.025	.034	.165
ΔSDA	.001	.012	-.122	-.005	.001	.006	.111
ΔBFI	-.013	.86	-2.8	-.60	-.02	.50	4.48
CAPB	2.07	.91	.51	1.29	1.82	2.71	4.97
BVE/TA	.07	.016	.03	.06	.07	.08	.15
ROA	.009	.006	-.026	.007	.01	.012	.026
EBTP	.018	.005	-.02	.015	.018	.021	.035
Returns	.17	.31	-.61	-.038	.13	.33	1.69
Net Returns	.044	.28	-.75	-.12	.004	.17	1.50

Variable Definitions

LLP	Loan Loss Provisions/Average Loans Outstanding
ΔNPL	Change in Non-Performing loans/Average Loans Outstanding
SDA	Implied Standard Deviation of Assets
ΔBFI	Change in per capita dollar liabilities of failed businesses (by region) weighted by the regional distribution of banks' loans
CAPB	Ratio of Actual Regulatory Capital before Loan Loss Reserves to Required Capital
BVE/TA	Book Value of Equity/Total Assets
ROA	Net Income/Average Total Assets
EBTP	Earnings before Taxes and Loan Loss Provision/Average Total Assets
Returns	Annual buy and hold returns
Net Returns	Returns - the contemporaneous buy and hold returns on the CRSP value-weighted market index

Table 2

Evidence on the Effects of Changes in Capital Regulations on Capital Management and Earnings Smoothing via Loan Loss Provisions

Dependent Variable = LLP
N = 1,013

Independent Variables	(i)	(ii)	(iii)
Intercept t	.019 13.95	.013 14.52	.018 14.30
ΔBFI t	.0004 1.70	.0004 1.44	.0004 1.51
ΔSDA t	.071 3.64	.081 4.24	.065 3.61
ΔNPL t	.13 4.22	.15 4.70	.15 4.85
CAPB t	-.009 -6.36	-.002 -6.22	-.007 -5.35
EBTP t	.036 .69	-.004 -.15	.047 .91
CAPB×REG t	.005 3.68		.003 2.80
EBTP×REG t	-.072 -1.16		-.07 -1.16
CAPB×LGD t		-.0014 -7.76	-.003 -6.41
CAPB×LGD×REG t			.002 4.21
Adj-R^2	.20	.20	.24

Variable Definitions

LLP Loan Loss Provisions/Average Loans Outstanding

ΔSDA Change in Implied Standard Deviation of Assets

ΔBFI Change in per capita dollar liabilities of failed businesses weighted by geographic distribution of loans

ΔNPL Change in Non-Performing loans/Average Loans Outstanding

CAPB Actual Regulatory Capital before Loan Loss Reserves/Required Capital

EBTP	Earnings before Taxes and Loan Loss Provision/Average Total Assets
REG	A dummy variable which equals one in the new capital regime (1991-1995) and zero in the old regime (1987-1990)
LGD	A dummy variable which equals one if a bank has above median percentage change in loans in a given year, and zero otherwise.

Table 3
Evidence on the use of loan loss provisions to signal good news about future earnings changes

	(i)		(ii)
	Dependent variable = LLP		Dependent variable = ΔEBTPMVE (t+1)
Intercept t	.02 14.50	Intercept t	.04 9.90
ΔBFI t	.001 2.63	ΔEBTPMVE t	–.05 1.40
ΔSDA t	.10 4.87	ULLPMVE t	–.51 –7.78
ΔNPL t	.13 4.10	UΔNPLMVE t	–.03 – 1.76
CAPB t	–0.10 –7.15	ULCOMVE t	.48 6.80
EBTP t	.015 0.28		
CAPB×REG t	.006 4.32		
EBTP×REG t	–.05 – 0.88		
ΔEBTP (1 yr. ahead) t	–0.25 – 3.41		
Adj-R^2	.22		.08

Variable Definitions

LLP	Loan Loss Provisions/Average Loans Outstanding
ΔLEAD	%Change in Index of Leading Macro-economic Indicators
ΔSDA	Change in Implied Standard Deviation of Assets
ΔBFI	Change in per capita dollar liabilities of failed businesses weighted by geographic distribution of loans
ΔNPL	Change in Non-Performing loans/Average Loans Outstanding
CAPB	Actual Regulatory Capital before Loan Loss Reserves/Required Capital
EBTP	Earnings before Taxes and Loan Loss Provision/Average Total Assets

REG A dummy variable which equals one in the new capital regime (1991-1995) and zero in the old regime (1987-1990)

ΔEBTPMVE Change in earnings before provision and taxes (divided by market value of equity at the beginning of year t).

ULLPMVE Unexpected loan loss provision measured by the residuals from a regression of loan loss provisions (deflated by beginning of year market value of equity) on expected change in non-performing loans, beginning of year loan loss allowance, beginning of year non-performing loans, and five loan composition variables all deflated by beginning of year market value of equity. The expected change in non-performing loans is the predicted value in a regression of change in non-performing loans, on lagged change in non-performing loans and the five loan composition variables all deflated by beginning of year market value of equity.

UΔNPLMVE Unexpected change in non-performing loans is the residual from the Wahlen (1994) model for change in non-performing loans (deflated by market value of equity at the beginning of the year) described above.

ULCOMVE Unexpected loan charge-offs is the residual from the Wahlen (1994) model for loan charge-offs (deflated by market value of equity at the beginning of the year). The independent variables in the Wahlen model of loan chargeoffs are the same as the independent variables in the model for loan loss provisions described above.

Table 4
Replication and Modification of Beaver and Engel (1996) for the sample of 113 Bank Holding Companies over 1987-1995

Dependent Variable = Market Value of Equity
N=1,013

Independent Variables	(i)	(ii)	Independent Variables	(iii)
Intercept	.74	.77	Intercept	.77
t	14.81	15.58	t	15.56
PROV	-3.23	-3.13	NDPROV	-3.13
t	-5.46	-5.47	t	-5.47
DPROV	1.93	2.57	DPROV	-.55
t	3.30	4.35	t	-1.83
NPLMVE	-.65	-.45	NPL	-.45
t	-5.76	-3.68	t	-3.68
NI-POS	3.33	3.40	NI-POS	3.40
t	12.35	12.76	t	12.76
NI-NEG	-2.85	-2.70	NI-NEG	-2.75
t	-2.91	-3.31	t	-3.31
LCOMVE		-1.50	LCO	-1.50
t		-4.41	t	-4.41
Adj-R^2	.43	.44	Adj-R^2	.44

Variable Definitions

PROV Loan Loss Provision/Beginning Market Value of Equity

NDPROV Non-Discretionary Provision (measured by the predicted values in a regression of loan loss provisions on economic determinants and change in non-performing loans) deflated by Beginning Market Value of Equity

DPROV Discretionary provision (measured by the residuals in a regression of loan loss provisions on economic determinants and change in non-performing loans) deflated by Beginning Market Value of Equity

NPLMVE Non-Performing Loans deflated by Beginning Market Value of Equity

NI-POS Earnings (before taxes and loan provision) if net income is positive deflated by Beginning Market Value of Equity, otherwise zero

NI-NEG Earnings (before taxes and loan provision) if net income is non-positive deflated by Beginning Market Value of Equity, otherwise zero

LCOMVE Loan Charge-offs/Beginning Market Value of Equity

Table 5
Additional Evidence on the Stock Market Valuation of Discretionary Loan Loss Provisions for a sample of 113 Bank Holding Companies over 1987-1995

Dependent Variable = Net Returns
N = 1,013

	(i)	(ii)
Intercept	-.15	-.16
t	-5.90	-6.78
EBTPMVE	.97	.87
t	7.05	5.37
PROV	-.45	
t	-3.65	
NDPROV		-.10
t		-.26
DPROV		-.62
t		-3.86
ΔNPLMVE		-.18
t		-2.08
LCOMVE		.05
t		.33
Adj-R^2	.22	.25

Variable Definitions

EBTPMVE Earnings (before taxes and provisions)/Beginning Market Value of Equity

PROV Loan Loss Provision/Beginning Market Value of Equity

NDPROV Non-Discretionary Provision (measured by the predicted values in a regression of loan loss provisions on economic determinants and change in non-performing loans) deflated by Beginning Market Value of Equity

DPROV Discretionary provision (measured by the residuals in a regression of loan loss provisions on economic determinants and change in non-performing loans) deflated by Beginning Market Value of Equity

ΔNPLMVE Change in Non-Performing Loans (deflated by Beginning Market Value of Equity)

LCOMVE Loan Charge-offs/Beginning Market Value of Equity