Did U.S. Bank Supervisors Get Tougher During the Credit Crunch? Did They Get Easier During the Banking Boom? Did It Matter to Bank Lending?

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Abstract

We test three hypotheses regarding changes in supervisory "toughness" and their effects on bank lending. The data provide modest support for all three hypotheses — that there was an increase in toughness during the credit crunch period (1989-1992), that there was a decline in toughness during the boom period (1993-1998), and that changes in toughness, if they occurred, affected bank lending. However, all of the measured effects are small, with 1% or less of loans receiving harsher or easier classification, about 3% of banks receiving better or worse CAMEL ratings, and bank lending being changed by 1% or less of assets.

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1. Introduction

The main goals of bank supervision are generally to act as a delegated monitor on behalf of insured depositors or other stakeholders, to protect the safety and soundness of the financial system, and to counteract the moral hazard incentives created by the government safety net. However, changes in supervisory policy also may have significant effects on macroeconomic or regional economic health if banks respond by altering their lending behavior. These additional effects may be intended or unintended. For example, supervisors may intend that some risky institutions reduce their lending. However, if too many institutions reduce their supplies of credit simultaneously, this may create an unintended credit crunch or recession. Supervisors alternatively may try to stimulate lending through supervisory easing. We discuss below some reasons to suspect that supervisory changes over the last decade or so may have had significant effects on the overall lending of the U.S. banking industry.

The purpose of this research is to investigate this possibility by testing three hypotheses about whether supervisors changed their policies and whether these policy changes affected bank lending behavior:

H1: U.S. bank supervisors got "tougher" on banks during the "credit crunch period" of 1989-1992, treating banks of a given financial condition more harshly than in previous years.

H2: U.S. bank supervisors got "easier" on banks during the "boom period" of 1993-1998, treating banks of a given financial condition less harshly than in prior periods.

H3: Changes in supervisory toughness, if they did occur, changed bank lending behavior in the predicted directions.

If these hypotheses are true, they may help explain part of the observed wide swings in aggregate bank lending to business during the 1990s, and may imply a larger role for financial supervision in the performance of the economy than was previously thought. We test these hypotheses using information on the supervisory process, confidential data on classified assets and CAMEL ratings from bank examinations, bank balance sheet and income data, and other variables for the condition of the bank, its state, and its region over the period 1986-1998.

Although we test these hypotheses separately, they are all intertwined in the overall question of the effects of changes in supervision. Hypotheses H1 (increase in toughness during the credit crunch) and H3 (it mattered to bank lending) are both necessary conditions for changes in bank supervision to have played a major role in causing the decline in lending and recession during credit crunch period. Similarly, H2 (decline in toughness during the boom) and H3 (it mattered to bank lending) are necessary for changes in bank supervision to have played a major role in causing the increase in lending and economic expansion during the boom period. Finally, if all three hypotheses are true, this may imply that supervisory actions have greater effects on the macroeconomy than is generally recognized.

To put these issues into context, we note that the period around 1989-1992 is often referred to as a "credit crunch" in the U.S., in which commercial banks substantially reduced their lending to business customers, although some researchers choose slightly different dates for the credit crunch period. From 1989 to 1992, domestic commercial and industrial (C&I) loans held by U.S. banks fell by about 23% in real terms. This decline may have been particularly difficult for bank-dependent small and medium-sized businesses, which often have few alternatives for external finance. Rough estimates based on a sample of banks responding to the Federal Reserve's Survey of Terms of Bank Lending are consistent with this presumption, suggesting declines in business loans to borrowers with bank credit less than $1 million on the order of 38% (Berger, Kashyap, and Scalise 1995). Surveys of small business owners also suggest that it was more difficult for these firms to obtain credit during the credit crunch period (e.g., Dunkelberg and Dennis 1992, Avery, Bostic, and Samolyk 1998).

A number of hypotheses for the decline in bank credit during the credit crunch period have been tested — including changes in bank capital requirements and other regulations - and the results are reviewed below. Here we test one theory that has been suggested by the popular press, supervisory agencies, and academic researchers — that a combination of Hypotheses H1 (increase in supervisory toughness) and H3 (this toughness mattered to lending) may be at least partly responsible for the reduced lending (e.g., Bacon and Bleakley 1991, Syron 1991, Bizer 1993, Peek and Rosengren 1995a).

An increase in supervisory toughness could explain a reduction in lending as follows. An unfavorable examination rating may be burdensome to a bank because supervisors may require poorly rated institutions to take costly actions to improve their condition (e.g., raising additional equity capital) or to pay higher deposit insurance premiums (during the boom period), or because poorly rated banks may be prohibited from engaging in some profitable activities by prompt corrective action rules or supervisory discretion. Banks may try to reverse the supervisory burdens of an unfavorable rating by reducing their perceived risk, and one way to do so is to reduce lending.

This explanation may be broader than it first appears because it incorporates the changes in capital requirements and other regulatory changes during the credit crunch period to the extent that they were enforced through the supervisory process. That is, to the extent that risk-based capital requirements, leverage capital requirements, and other regulatory changes were enforced through the supervisory process by assigning worse CAMEL ratings for the same risk-based capital ratios, leverage capital ratios, or other balance sheet or income ratios, they may be captured by our tests.

In addition, more classified assets or more serious classifications from an unfavorable examination may force a bank to shift funds from equity to its allocation for loan and lease losses (ALLL). Since equity counts in full as Tier 1 equity under risk-based capital guidelines and ALLL counts as only as Tier 2 capital up to 1.25% of risk-weighted assets, the shift may directly reduce regulatory capital and require the bank to reduce lending or shrink to comply with capital regulations.

There may also have been a reduction in supervisory toughness during the banking boom period of 1993-1998, consistent with Hypothesis H2. In 1993, the main federal supervisors of banks and thrifts (Office of the Comptroller of the Currency, Federal Deposit Insurance Corporation, Federal Reserve Board, and Office of Thrift Supervision) formally recognized a problem of credit availability and began a joint program directed at dealing with this problem. The program focused on five areas in which agencies would take actions designed to alleviate the apparent reluctance of the institutions to lend. The program 1) removed impediments to lending to small and medium-sized businesses; 2) reduced appraisal requirements for real estate lending; 3) eased the appeals of examination decisions; 4) streamlined examination processes and procedures; and 5) reduced paperwork and regulatory burden associated with the supervisory process (Interagency Policy Statement on Credit Availability, March 10, 1993). As a specific example of the implementation of this program, banks that were well- or adequately-capitalized with satisfactory CAMEL ratings of 1 or 2 (most banks) were allowed to make and carry some loans to small- and medium-sized businesses (loans to borrowers with bank credit less than $900,000) with only minimal documentation, exempt from examiner criticism for doing so up to some limits (e.g., up to 20% of the bank's capital). Beyond these limits and for institutions not qualifying because of insufficient capital or CAMEL ratings, deviations from standard documentation could be made without examiner criticism for loans to some customers with past experience with the bank (Interagency Policy Statement on Documentation of Loans, March 30, 1993). This policy may be interpreted as an easing of supervision that may increase lending to relationship-type small and medium-sized business borrowers. In 1993, bank Call Report forms were also amended to begin collecting data each June on small business loans.

From 1993 through the end of our sample in 1998, lending by the U.S. banking industry increased substantially, and the industry enjoyed record profitability. Total domestic C&I loans rose by about 50% in real dollars, more than recovering from its 23% drop during the credit crunch period. However, small business loans may not have recovered quite as well, with business loans to borrowers with bank credit less than $1 million (as collected on the June Call Reports) rising only about 14% in real terms, and falling as a percentage of bank gross total assets from about 4.4% to about 3.8%.[1]

A number of hypotheses for the improvements in bank profitability during the 1993-1998 boom period have been advanced, including favorable macroeconomic conditions, exercise of market power in pricing, a shifting toward higher risk-higher expected return investments, and improvements in the quality of banking services (Berger and Mester 1999, Berger, Bonime, Covitz, and Hancock 2000). However, little attention has been paid to the possible role of changes in the supervisory process on bank lending behavior. The increase in lending may have occurred in part because of the supervisors' joint program or because supervisors became easier in their assessments of bank condition in other ways. If banks were assigned more favorable CAMEL examination ratings and lower classified assets for a given financial condition, this may have encouraged banks to increase their lending. To our knowledge, Hypotheses H2 (decline in toughness during the boom) and H3 (it mattered to bank lending) have not previously been tested using data from the boom period. We test these hypotheses below and also investigate the effects of the supervisory ratings on other measures of bank risk taking.

To test for changes in supervisory toughness, we control for bank financial condition and other information that might be used by supervisors. To test H1, we run weighted least squares regression equations for classified assets and ordered logit equations for CAMEL ratings, and test whether supervisors classified more assets or assigned worse CAMEL ratings during the credit crunch period for a given bank financial condition and other factors describing its economic environment. Similarly, to test H2, we test whether supervisors gave better treatment for given bank condition and other factors during the boom period.

To perform these tests, it is necessary to understand the supervisory process, particularly the procedures by which information is gathered and used by examiners. In controlling for bank condition, our econometric models mimic as closely as possible the information used in the supervisory process at the time of the ratings assignment,

[1] These numbers may slightly overstate the growth in small business lending. Although we are able to deflate the dollar values of

including the levels, trends, and peer group percentile ranks of all the key balance sheet and income variables specified in the off-site and on-site procedures. It is important to include these variables, since if any of important Call Report items used by supervisors in setting the ratings is excluded from the econometric analysis, the test results may be biased. For example, if a key balance sheet variable worsened during the credit crunch period and this were excluded from the ordered logit equations for CAMEL ratings, this may give a false reading of a toughening of supervisory treatment, since the CAMEL rating may have changed because of the excluded balance sheet ratio rather than a change in supervisory toughness. This is especially important for the risk-based capital and leverage capital ratios, given the regulatory changes that apply to these ratios.

To test whether changes in supervisory toughness, if they occurred, affected bank lending behavior, we again control for bank conditions and economic environment. To test H3, we run ordinary least squares regression equations for changes in the proportions of bank assets invested in different types of loans and test whether these were affected by changes in classified assets and CAMEL ratings. We also include dependent variables for nonperforming loans, charge-offs, and the total capital ratio to determine whether any possible changes in supervisory toughness affected bank risk taking in ways other than the change in lending. The regressors include three years of past changes in classified assets, changes in CAMEL ratings, changes in bank financial conditions, and changes in other factors.

By way of preview, we find that the data provides some statistically significant support for all three hypotheses, as well as supporting the argument that supervisory assessments affect bank risk-taking behavior. However, our evaluation of economic significance suggests that all of these effects are likely to be quite small. The data suggest that changes in supervisory toughness likely do not explain much of the dramatic changes in overall bank lending over the last decade or so.

Section 2 describes the supervisory process, including descriptions of the classified assets and CAMEL ratings assigned by supervisors and the off-site and on-site procedures used to arrive at these assessments. Section 3 looks at the raw data from bank examinations, illustrating how supervisory ratings have changed over time, and pointing out some sample selection issues. Section 4 briefly reviews the literatures on the credit crunch and prior uses of supervisory data. Section 5 presents the data and methodology employed. Section 6 contains results and

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loans to put them in real terms, the cutoff of bank credit less than $1 million remains in nominal terms on the Call Report form.

their implications, and Section 7 concludes.

2. The Supervisory Process

Current supervisory practice based on the FDIC Improvement Act of 1991 requires that banks be examined at least once every 12 months for most banks or at least every 18 months for some small banks in good condition, although prior practice often resulted in significantly lower frequency (Gilbert 1993, 1994). Examination frequency is generally higher for troubled banks — those that are perceived to be in poor condition based on off-site monitoring of their balance sheet ratios, past examination ratings, etc. Supervisors also speed up the examination schedule when there are indications of fraud, embezzlement, or other criminal activity. Most examinations are of the full-scope type, an in-depth evaluation of all areas of a bank's operation. A limited-scope exam is less intensive than a full-scope but reviews the same areas, while a targeted exam focuses on one or two areas intensively. In most cases, banks receive advance notification so that they can have the necessary documents and information prepared.

After the on-site examination, supervisory assessments in the form of CAMEL ratings and classified assets are determined. However, much of the information used in the evaluation of the bank is gathered in advance off-site. In this section, we first describe the CAMEL ratings and classified assets, followed by discussions of the off-site tasks and on-site procedures.

2.1 CAMEL ratings and classified assets

Based on their assessments of information collected both off-site and on-site, supervisors assign each bank a composite CAMEL rating, which reflects their overall assessment of bank condition. CAMEL ratings are integers ranging from 1 to 5, with 1 being the strongest condition and 5 being the weakest. Most banks have ratings of 1 or 2 and are considered to be in satisfactory condition. Banks with ratings of 3, 4, or 5 are generally encouraged or required to take actions to improve their conditions. Table 1 gives more complete descriptions of the composite ratings. The CAMEL ratings are confidential, although some of the research reviewed below suggests that the information in ratings changes becomes incorporated into market prices.

For most of our sample, the composite CAMEL rating was based on five components of supervisory concern, each of which also receive a rating on the 1 to 5 scale. These are capital adequacy (C), asset quality (A), management (M), earnings (E), and liquidity (L). Since 1997, supervisors have added a component for sensitivity to market risk (S), and altered the acronym to CAMELS. While we do use the CAMELS rating for the end of our data set, we continue to refer to the CAMEL acronym throughout for convenience. Table 2 gives some of the details about these components.

The other main assessment made by supervisors is the determination of classified assets. In order from highest quality to lowest quality, C&I and commercial real estate loans are rated as “pass,” “special mention,” “substandard,” “doubtful,” or “loss.”. Assets in the three most severe categories are often referred to as “classified assets,” although this term is sometimes meant to include the special mention category. Table 3 gives definitions of the special mention, substandard, doubtful, and loss categories.

Examiners use the following formula to determine the minimum required level of the allocation for loan and lease losses (ALLL), which is based on probability of default for each asset classification:

15%*substandard assets + 50%*doubtful assets + 100%*loss assets + (discretionary %)*(pass + special mention),

where the discretionary percentage the bank is required to hold against nonclassified assets is usually about 1% to 2%. If this minimum level exceeds the bank's actual reserve, the bank must add to its reserve from equity capital. Thus, the greater the fraction of assets classified as substandard, doubtful, or loss, and the more serious the classification, the more the bank may have to shift funds from equity to ALLL. This may require the bank to reduce lending, shrink, or raise capital to comply with capital regulations.

In our empirical analysis, we use both total classified assets (substandard + doubtful + loss) and weighted classified assets (15%*substandard assets + 50%*doubtful + 100%*loss). An increase in supervisory toughness may occur by supervisors shifting loans from pass or special mention to substandard, doubtful, or loss, which would raise total classified assets. Alternatively, supervisors might get tougher by shifting already-classified assets into more serious classifications, such as from substandard to doubtful or from doubtful to loss, which would raise weighted classified assets. We include both measures of classified assets in our analysis to allow for these possibilities.

2.2 Off-site supervisory tasks

In general, one individual is named "Examiner-in-Charge" (EIC) responsible for coordinating most aspects of an exam, and has a number of assistants depending on the size and complexity of the bank. Prior to an on-site visit, examiners perform several analyses off-site. These include review of past examination reports and the correspondence file for that bank, as well as its Call Report and Uniform Bank Performance Report (UBPR). The

UBPR, produced for every U.S. commercial bank by the Federal Financial Institutions Examination Council, summarizes several years of Call Report data for a bank and presents both dollar amounts and financial ratios for most areas of bank operations. The UBPR also includes information on the trends of these variables as well as the peer group average for each variable and the bank's rank within its peer group for that variable. Peer groups are based on bank asset size, number of offices, and location in a metropolitan or non-metropolitan area. Analysis of the UBPR provides initial evaluations of the individual components of the CAMEL rating (although no preliminary rating is given for the management component), which may be changed during the on-site examination if conditions are not consistent with what was reported or expected (Commercial Bank Examination Manual 1020.1 p.1). Generally, the off-site monitoring is helpful in determining potential problems that examiners should scrutinize during the on-site visit, allowing on-site resources to be allocated more efficiently. Off-site monitoring is also useful for identifying troubled banks or those with indications of criminal activity to speed up the examination schedule for these institutions.

Our econometric models control for bank condition by proxying for the information used by supervisors as well as possible. This includes forming the levels, trends, and peer group percentile ranks of the key balance sheet and income variables specified in the UBPR from the appropriate Call Report quarter. As discussed, failure to include these variables could bias our tests of Hypotheses H1 or H2 that supervisors got tougher or easier, since any change in classified assets or CAMEL ratings may reflect changes in the UBPR variables, rather than changes in supervisory harshness.

2.3 On-site examination procedures

The most important aspect of the on-site examination is the evaluation of the bank's loan portfolio. This process begins with a review of the institution's loan policies, which should include a description of the bank's market, targeted customers, lending guidelines, documentation, and restrictions or requirements on loans to insiders. Examiners also read the minutes of the bank's loan committee meetings, the credit department's procedures and files regarding the acquisition of borrower financial information, and internal reports on past due or problem loans.

Examiners evaluate a certain proportion of the loan portfolio, depending on the bank's most recent composite and asset quality ratings. This proportion ranges from 40% for banks with composite ratings of 1 or 2 and an asset quality rating of 1 up to 60% or more for banks with worse ratings or other areas of concern.

There are several steps in determining the loan sample. Examiners must review all commercial and industrial (C&I) and commercial real estate (CRE) loans that are past due, nonaccrual, restructured, renegotiated, made to an insider, internally classified by the bank or classified at the last exam. "Large" loans, those loans greater than a dollar cutoff determined by the EIC to be appropriate for the bank, must also be reviewed. This set of C&I and CRE loans is considered the "core" group for review. To achieve the desired coverage of the portfolio (i.e., the 40% to 60% or more), additional loans are selected for review in a variety of ways. The dollar cutoff for "large" loans might be lowered; recent loans or specific loan types might be selected; or random sampling or some other technique may be applied, according to examiner discretion.

Examiners assign ratings of pass, special mention, substandard, doubtful, or loss to each loan sampled. Examiners may assign distinct classifications to different parts of a loan depending on the likelihood of collection of each particular part. Examiners may also assign split classifications, such as "substandard/doubtful," in appropriate circumstances. The loan ratings are checked against the bank's own internal ratings as a check of how well bank management is monitoring its own portfolio. Installment loans, residential mortgages, and other consumer credits are classified based as pass, substandard, or loss based solely on the number of days past due, not by examiner discretion.

After the examination, the final supervisory assessments are made. The composite CAMEL rating is based on all the components of supervisory concern — capital adequacy, asset quality, management, earnings, liquidity, and (more recently for the CAMELS rating) sensitivity to market risk — and the information incorporated into the rating comes from the data gathered off-site and on-site. The composite CAMEL rating is not an unweighted mean of these components — an examiner may use personal judgment as to the importance of each component for a particular bank. However, quality of the assets in terms of likely future losses and the ability of the bank's capital to absorb these losses are usually the most important components. The composite rating is generally not supposed to be more than one rank better than the capital (C) or asset quality (A) rank.

3. A Look at the Raw Data from Bank Examinations

Table 4 shows some summary statistics from bank examinations over the entire 1986 to 1998 period. Panel A shows the number of banks with examination data for each year, the mean ratios of total classified assets to loans and weighted classified assets to loans, the mean composite CAMEL rating, and the fractions of banks receiving composite CAMEL ratings of 1, 2, 3, 4, and 5. Panel B of Table 4 summarizes the information for the pre-crunch, credit crunch, and boom periods. The accompanying figure plots the fractions of banks with the different CAMEL ratings over time.

We include exactly one observation for each bank that was examined in each year. Since not every bank is examined in every year, the total number of banks examined in each year is fewer than the number of banks in the nation. In the relatively infrequent cases in which more than one examination was made of the same bank in the same year, we simply include the results of the final examination of the year to avoid double-counting. As will be seen, changes over time in the sample of banks that were selected by supervisors to be examined are important in interpreting the data.

In some respects, the raw data are consistent with expectations, and in other respects, the data are quite surprising. Consistent with expectations, the supervisory assessments are unambiguously the best during the boom periodcommonly assumed. As shown in Panel A, in each of the boom period years 1993-1998, the mean total classified asset ratio, mean weighted classified asset ratio, mean composite CAMEL rating, and fraction of banks receiving CAMEL 1 ratings (the best rating) were better than the corresponding figures for each of the credit crunch years 1989-1992, and better than each of the pre-crunch years 1986-1988 as well. The data in Panel B show that on average during the boom period, the classified asset ratios were on the order of about half, and the fractions of banks assigned CAMEL 1s were on the order of about double, those in the pre-crunch and credit crunch periods. The figure shows a steep increase in CAMEL 1 ratings and steep decreases in CAMEL 3, CAMEL 4, and CAMEL 5 beginning in 1993. These strong improvements in supervisory assessments during the boom period may reflect the improved condition of banks, any supervisory easing that may have occurred, or a combination of the two. The multivariate empirical analysis below will try to disentangle these effects.

Contrary to expectations, the supervisory assessments generally did **not** deteriorate during the credit crunch period. As shown in Panel A, in each of the credit crunch years 1989-1992, the mean total classified asset ratio, mean weighted classified asset ratio, mean composite CAMEL rating, and CAMEL 1 fraction were better than the corresponding figures for each of the pre-crunch years 1986-1988 (although the figures for 1989 are very close to those for 1988 and round to the same three digits for the classified asset ratios). The data in Panel B show that the mean classified asset ratios, mean composite CAMEL, and CAMEL 1 fraction for the credit crunch period are all closer to the pre-crunch period figures than to the boom period figures, indicating a much smaller improvement in credit crunch period than in the boom period. This slight improvement in supervisory assessments or failure to deteriorate is surprising given both the recession of the early 1990s and widespread belief that supervisors may have become tougher, as formulated in our Hypothesis H1.[2]

At first blush, it would seem unlikely that Hypothesis H1 could be supported in our empirical analysis, in which we include controls for bank financial condition and economic environment. Banking industry condition did improve slightly during the credit crunch period in terms of capital ratios and problem loans, but it would not be expected ex ante that controls for bank condition would improve enough to more than offset a substantial increase in supervisory toughness. As seen next, the improvements in supervisory assessments during the credit crunch period may largely be an artifact of changes in the selection of banks that were examined.

Table 5 illustrates the sample selection issue by comparing examined banks with the banking industry as a whole over time. As shown in Panel A, the fraction of banks with examination data rises each year from 1986 to 1993 and then falls each year thereafter to 1998. The changes are quite dramatic, with the percentage of banks with recorded examinations nearly doubling from 42.6% to 85.4%, and then dropping to 62.3%. As shown in Panel B of Table 5, only 49.4% of banks have examination data on average during the pre-crunch years versus 69.5% during the credit crunch years and 75.4% during the boom years. These dramatic changes in the fraction of banks examined may in part reflect changes in supervisory policy, changes in regulation (such as FDICIA, which mandates examinations every 12 or 18 months), or changes in bank condition.

Importantly, a change in the fraction of banks examined may change the quality pool of the banks examined relative to the industry as a whole. As discussed above, the selection of which banks are examined in a given year depends in part on the perceived quality of the institutions. Banks that are perceived to be in worse condition based on off-site monitoring of their balance sheet ratios, past examination ratings, etc., are more likely to be examined in a given year. As a consequence, if the fraction of banks examined rises over time it may be expected that average quality of the pool of banks that are examined will rise relative to the industry as a whole, as better-quality institutions are added to the examination pool. That is, there may be no improvement or even a deterioration in

[2]The classified assets figures may have been held down temporarily for some banks during the high-bank-failure years in the late 1980s and early 1990s in order to allow for orderly bank closures, since high classified assets may have reduced capital to below closure levels for too many banks at the same time.

supervisory assessments on average relative to prior examinations, but the addition of better banks to the examination pool make it appear from the raw data that assessments have improved. This may help explain why the classified asset ratios and CAMEL ratings of examined banks improved during the credit crunch period. The substantial expansion in the fraction of banks examined may have added better-quality banks that typically receive better supervisory assessments, as opposed to improved assessments of the same pool of banks.

Additional data in Table 5 are designed to examine this issue further. The table shows the mean total capital ratio and mean nonperforming loan ratio calculated from the Call Report for the year prior to the examinations versus these same ratios for the industry as a whole. For the total capital ratio, the difference between the mean for examined banks and the mean for the industry narrows considerably during the credit crunch period. As shown in Panel A, the capital ratio for examined banks is 2.4 percentage points lower on average than the industry as of 1986, and this difference narrowed to below 1 percentage point by 1990. As shown in Panel B, the average difference fell by about one-half from 1.9 percentage points during the pre-crunch years to 0.9 percentage points during the credit crunch years, consistent with the argument that examinations during the credit crunch period tended to cover a higher-quality cut of the industry than did examinations during the pre-crunch period, which may explain the slightly improved supervisory assessments. Similar results hold for other capital ratios (not shown in table).[3] Perhaps surprisingly, there is much less support for this argument from the nonperforming loan data — examined banks had only slightly higher nonperforming loan ratios than the industry as a whole during the pre-crunch period, and the difference disappeared during the credit crunch period.[4] Thus, the examination pool seemed to have improved substantially relative to the industry in terms of capital, but much less so in terms of nonperforming loans.

Table 6 rearranges the raw data in a way that should at least partially offset the changes in sample selection over time. For each examination, we show the **changes** in composite CAMEL ratings, total classified asset ratio, and weighted classified asset ratio since the previous examination. If a bank did not have an examination in the year or if there are no prior examinations available, the data are excluded (this is for illustrative purposes only – we include

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[3] The mean Tier 1 and leverage capital ratios for examined banks improved from 0.149 and 0.082, respectively, during the pre-crunch years to 0.160 and 0.087 during the credit crunch years. For the industry, the corresponding ratios increased from 0.168 and 0.086, respectively, to 0.170 and 0.089. Again, the percentage point difference in capital ratios between examined banks and the industry as a whole dropped by about one-half in the credit crunch period.

[4] A potential problem with the nonperforming loan data is that the definition may have changed slightly over time due to changes in supervisory policy in which loans in which no repayments had been missed were recorded as nonperforming. Similarly, there may have been a change in the reported data for C&I and real estate loans, as supervisors became more vigilant in requiring that

banks with missing past examinations in our empirical analysis below). This procedure should partially offset the sample selection problem, since each examination is paired with exactly one prior examination of the same bank, with no additions or subtractions to the data set. As shown, there are very few observations at the start of the sample, since we have data on only a very small number of examinations prior to the start of the pre-crunch period in 1986. The data are roughly consistent with the expectations that supervisory assessments deteriorated during the credit crunch period and improved during the boom period. As shown in Panel A, CAMEL downgrades exceed upgrades in the first three years of the credit crunch period from 1989 through 1991, and CAMEL upgrades exceed downgrades in every year from 1992 through 1997 (upgrades, downgrades, and constant CAMEL ratings fractions sum to 1 by construction). Similarly, the percentage of examinations with increases in classified assets is relatively high in 1989 through 1991 and then falls off sharply in the immediately following years (classified asset ratio decreases and increases fractions sum to 1 by construction). The summary data in Panel B confirm this. During the credit crunch period, composite CAMEL downgrades slightly exceed upgrades, whereas upgrades slightly exceed downgrades during the pre-crunch years and upgrades greatly exceed downgrades during the boom years. Similarly, the fractions of examinations with increases in the classified asset ratios are greatest during the credit crunch years, whereas the fractions with decreases in these ratios is highest during the boom years. The data in Table 6 suggest that supervisory assessments began to be somewhat harsher just before the onset of the credit crunch and began to be somewhat less harsh just before the onset of the banking boom. These data are also consistent with our arguments about sample selection. It may be the case that on average banks of a given quality received worse supervisory assessments in the credit crunch period than in the pre-crunch period, but that the average assessments given improved because the increased examination frequency resulted in a better-quality cut of the industry being examined during the credit crunch period.

There are several other sample selection issues as well. There may be some missing observations — examinations that took place but were not on the electronic files — particularly at the beginning of our data set. Prior to 1986, the files are very incomplete, making lagged examination data an issue. Some of the data may also be missing for 1986 or other early years. We also may be missing some examinations from 1998 that were not finalized at the time we extracted the data set in the latter part of 1999. In addition, some banks drop out of the sample due to

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commercial loans secured by real estate were reported as real estate loans.

mergers and failures, and others enter the sample through the creation of new charters.

We deal with these sample selection issues in the empirical analysis in several ways. First, we include a large number of controls for bank quality, which may help compensate for changes over time in the quality of the cut of the industry that is examined. Second, we include observations in the regressions even when data for lagged supervisory assessments are missing, and include a dummy variable flagging these observations to account for the average difference of these banks from other banks. This increases representation for new entrants and for banks near the beginning of the data set when examination data are sparse. Third, we try a Heckman correction for sample selection bias, although we acknowledge that there are identification problems with this procedure in our case.

4. Literature Review

In this section, we first briefly review the literature on the causes for the decline in bank lending during the credit crunch period. Very little of this research has used supervisory data, despite the widespread belief discussed above that an increase in supervisory toughness may be responsible for the reduced lending. We then review prior research that has used the supervisory data to test the timeliness and accuracy of supervisory assessments. To our knowledge there have been no prior tests of whether a decline in supervisory toughness may have contributed to changes in bank lending behavior during the banking boom.

4.1 Prior research on the causes of the credit crunch

A number of hypotheses of the decline in bank credit to business during the credit crunch period have been tested. A few studies have explicitly investigated forms of Hypotheses H1 and H3, i.e., that supervisors got tougher and this toughness reduced business lending. In the study closest in approach to the current paper, Bizer (1993) ran ordered logit equations for composite CAMEL ratings on a limited number of Call Report items, regional dummies, and primary supervisor dummies. He found that the model predicted tougher CAMEL ratings during the quarters of the credit crunch period than in a single-quarter control period of 1988Q4. He also regressed lending on lagged CAMEL ratings and a few control variables and found that worse CAMEL ratings were associated with reduced lending.

While this was an excellent early attempt, a more comprehensive approach is needed in our opinion. As discussed above, it is important to control for as much of the information used in the supervisory process at the time of the ratings assignment, including the levels, trends, and peer group percentile ranks of the key balance sheet and income variables explicitly used to form the CAMEL ratings, or else biases may be created. Bizer's CAMEL equations include very few of the specified levels, and none of the trends or peer group percentile ranks. For example, he excluded the risk-based capital ratios, so the effects of enforcing these regulatory requirements through the supervisory process may not be captured. Similar criticisms also apply to the lending regressions, which do not control for problem loan categories. As indicated below, our strongest results for the lending equations are generated by changes in classified assets, which are excluded from Bizer's analysis. As shown below, we also include much more information about the condition of banks in the same state and use a three-year pre-crunch base period in place of a single quarter.

Another study that used supervisory assessments was Peek and Rosengren (1995a). These authors tested a form of Hypothesis H3 by evaluating the effects of supervisory enforcement actions in New England during the credit crunch period. They found that banks under enforcement actions reduced lending more than other banks in the same region with the same capital-to-asset ratios, supporting the hypothesis that supervisory actions contributed to the reduction in lending. Again, the conclusions may be somewhat limited, because there were very few control variables specified for bank condition, making it difficult to disentangle supervisory actions from the effects of the condition of the banks' portfolios.

A number of studies tested whether implementation of tougher capital standards contributed to the decline in U.S. bank lending to business during the credit crunch period. Some tested the effects of implementation of the Basle-Accord risk-based capital standards (e.g., Haubrich and Wachtel 1993, Berger and Udell 1994, Hancock and Wilcox 1994a, Wagster 1999). Others tested whether supervisors or regulators implemented higher explicit or implicit regulatory capital standards based on leverage ratios (e.g., Berger and Udell 1994, Peek and Rosengren 1994, 1995b, Hancock and Wilcox 1994a, Hancock, Laing, and Wilcox 1995, Shrieves and Dahl 1995). Although there is not full consensus, the empirical results generally do not support risk-based capital as a major contributor to the lending slowdown, but do provide some support for the effects of tougher explicit or implicit leverage capital requirements.

As noted above, to the extent that capital requirements or other regulatory changes are enforced through the supervisory process by assigning worse CAMEL ratings for the same capital ratio or other balance sheet or income ratios, they may be captured in our tests of supervisory toughness below. That is, if supervisors are enforcing higher capital ratios, then there should be a worse CAMEL rating assigned for the same capital ratio, all else equal. In our empirical analysis, we include the Tier 1 and Total risk-based capital ratios as well as the leverage ratio to capture these effects, although identifying these individual capital effects is quite difficult and is not a goal of this paper.

A notable advantage of our tests is that by including actual supervisory assessments, we can better distinguish between supervisory-induced changes in bank behavior and voluntary changes in bank behavior. It is possible that a reduction in lending during the credit crunch period by banks with capital below the regulatory minimums represents a voluntary retrenchment of risks by banks, rather than the effects of changes in regulation/supervision, and our tests may help distinguish among these alternatives.

Similarly, some studies found that during the credit crunch period, banks facing greater portfolio risks — such as those with more nonperforming loans or those in nations with more banking system risk — also tended to cut back their lending more than other banks (e.g., Berger and Udell 1994, Wagster 1999). Without supervisory information, it is not possible to distinguish whether this represents supervisory versus voluntary reactions to risk. Our tests, which control for measures of portfolio risks, may help distinguish between supervisory and voluntary changes.

Other studies tested whether demand or supply factors other than regulatory/supervisory changes contributed significantly to the change in lending during the credit crunch period. Tests have been performed of the effects of the depletion of bank capital from loan loss experiences of the late 1980s (e.g., Peek and Rosengren 1994, 1995b, Hancock and Wilcox 1994a, 1997, 1998), potential choices of lower risk profiles by bank managers (e.g., Hancock and Wilcox 1993, 1994b), reduced loan demand because of macroeconomic or regional recessions (e.g., Bernanke and Lown 1991, Hancock and Wilcox 1993, 1997), or a secular decline in the demand for bank loans because of the growth of alternative sources of credit (e.g., Berger and Udell 1994). All of these hypotheses were supported to at least some degree.

4.2 Prior research on supervisory timeliness and accuracy

Previous research on bank examinations or bank holding company inspections has usually focused on either the timeliness or accuracy of supervisory assessments of banking organization condition measured relative to market assessments. Studies of timeliness generally tested whether changes in supervisory assessments — changes in CAMEL, changes in BOPEC (the corresponding rating for bank holding companies), or identification of problem banks — occurred before or after changes in market assessments of banking problems — equity or debt price changes, changes in bond ratings, or changes in share ownership by institutions or insiders.

Most of the early studies of timeliness found that supervisors did not have information in a more timely fashion than market participants. Pettway (1980) performed event studies for six large banks that were placed on the "problem bank list" during 1972-1976, and found significantly negative cumulative abnormal stock returns before the examination that first recognized the banks' problems, suggesting a timeliness advantage for investors over supervisors. Hirschhorn (1987) investigated whether CAMEL rating changes pre-date stock price changes, using data on examination ratings of the lead banks of the 15 largest BHCs during 1978-1987. He found that CAMEL ratings were approximately contemporaneously correlated with abnormal returns, suggesting that supervisors generally have little if any economically significant informational advantage over equity market participants. Cargill (1989) examined cross-sectional variation in the rates on large certificates of deposit for 58 large banks during 1984-1986. He found that CAMEL ratings added no significant explanatory power beyond Call Report financial ratios, again implying that supervisors did not have substantial information prior to market participants.

In contrast, more recent studies generally found that supervisors did have some valuable information on a more timely basis than market participants. Simons and Cross (1991) identified 22 BHCs whose lead banks had their composite CAMEL rating lowered to the problem ratings of 4 or 5 during 1981-1987. They found that the company's weekly abnormal stock returns for the year preceding the downgrade were equally likely to be positive or negative, and that few news stories chronicled the firms' problems, suggesting that supervisors may have known about problems before market participants. Berger and Davies (1998) used event study methodology to identify abnormal BHC stock returns after 390 lead bank examinations during 1985-1989. They separated out the three types of information that may be generated by the examination — private information about bank condition, certification information about the quality of audited financial statements, and supervisory discipline information about whether the bank may have greater or fewer restrictions placed on it. They found that the only type of private information that was transferred to the market was unfavorable private information about bank condition, suggesting that supervisors force the release of unfavorable information. Jordan (1999) found results consistent with these when investigating the effects of examinations of banks in 35 BHCs in New England over the period 1988:Q1 – 1990:Q3. He found statistically significant negative abnormal stock returns (below the mean returns of these 35 BHCs) in the quarter after CAMEL downgrades involving at least one-third of the BHCs' banking assets, but no significant change in market prices for examinations overall. DeYoung, Flannery, Lang, and Sorescu (1998) investigated whether national bank examiners' private information significantly predicted changes in the risk premia on large BHCs' subordinated debentures during 1989-1995. They found that debenture yield spreads changed after the examination information, suggesting that examiners uncover relevant information before the market. Consistent with Berger and Davies (1998), this predictive effect occurred only for negative supervisory assessments. Flannery and Houston (1999) evaluated the correspondence between market and book valuations for a sample of BHCs in the fourth quarters of 1988 and 1990, and found that investors evaluated financial information differently when the BHC had recently received an on-site inspection, particularly in the relatively "normal" 1988 period. Inspected BHCs showed a closer correspondence between market and book values, consistent with the hypothesis that investors view examiners as credibly certifying of the financial statements' accuracy. Finally, Berger, Davies, and Flannery (2000) used quarterly data from inspections of 184 large bank holding companies over the period 1989:Q4-1992:Q2, and found that BHC supervisors and bond rating agencies both have some timely prior information that is useful to the other. However, supervisory assessments and equity market indicators were not strongly related to each other, presumably because of differences in incentives regarding risks and expected returns.[5,6]

Studies of supervisory accuracy generally tested whether changes in supervisory assessments added to the predictions of changes in bank condition (e.g., bank failure, book-value insolvency, changes in nonperforming loans or equity capital) or macroeconomic performance beyond other public or private sources of information (e.g., market assessments, Call Report information, or Federal Reserve staff forecasts). This literature found mixed results. Davies (1993) tested whether CAMEL or BOPEC ratings versus market/book ratios better helped predict future book-value insolvency (bank's capital ratio below either 2% or 3% of assets) during 1986-1991 and found that unsatisfactory bank CAMEL ratings helped predict a higher probability of book-value insolvency, but that

[5] Consistent with this conclusion, Hall, Meyer, and Vaughan (1997) found that supervisors and shareholders responded differently to balance sheet measures of BHC condition.

[6] Studies of bank "early warning" systems (e.g., Sinkey 1978, Whalen and Thompson 1988, O'Keefe and Dahl 1997) tested how well supervisory ratings can be predicted from publicly available information, generally Call Report data. These may be viewed as tests of whether supervisors have information not already in the publicly available data, although this was not the main purpose. These studies generally found that the supervisory ratings were far from perfectly predictable from Call Report information, consistent with the supervisors adding timely information. However, these studies are less useful for evaluating timeliness than studies using stock and bond market data, since market data presumably incorporate much more information than the Call Report.

unsatisfactory holding company BOPEC ratings had little or no additional predictive power. Cole and Gunther (1998) compared supervisory ratings with Call Report information in predicting future bank failures during 1988:Q2-1992:Q1, and found that CAMEL ratings improved forecast accuracy, but only if the examination was in the most recent two quarters. Berger, Davies, and Flannery (2000) similarly found that supervisory assessments are much less accurate overall than both bond and equity market assessments in predicting future changes in performance, but that supervisors may be more accurate when inspections are recent. Finally, Peek, Rosengren, and Tootell (1999a,b) used quarterly data from 1978:Q1-1996:Q2 and 1978:Q1-1994:Q4, respectively, and found that the proportion of the nation's banking assets in banks with composite CAMEL ratings of 5 (the worst rating) added information in predicting macroeconomic performance beyond what was incorporated in the predictions of private-sector forecasting firms and Federal Reserve staff.

A fundamental problem with tests of supervisory accuracy is that accuracy in predicting future performance may not be the primary goal of supervisors. Supervisors may be more concerned with accurately describing the **current** condition of a BHC in order to exert pressure on institutions to resolve problems, and be less concerned with predicting future condition. Supervisors may be very accurate in assessing current condition while appearing to be very inaccurate at predicting future condition, particularly if supervisors are successful at pressuring institutions to resolve problems. For example, a CAMEL downgrade or an increase in classified assets may encourage an institution to stop making risky loans, eventually reducing its nonperforming loan ratio. The finding in Cole and Gunther (1998) and Berger, Davies, and Flannery (2000) that supervisors may be more accurate than market participants in predicting short-run future performance and less accurate than market participants in predicting long-run future performance is consistent with this argument, since any change in problem loans caused by supervisory pressure is likely to take several quarters to appear in full in the data. Because of these difficulties, we do not try to determine whether any increase or decrease in supervisory toughness in the data represents a change in accuracy.

5. Methodology and Data

In this section, we first discuss the method and data used to test Hypotheses H1 and H2, which address whether banks received harsher or less harsh supervisory assessments for a given set of bank conditions. We then review our procedures and information used in testing Hypothesis H3, which addresses the effects of changes in supervisory harshness on bank lending behavior.

5.1 Tests of changes in supervisory harshness (Hypotheses H1 and H2)

As indicated above, to test for changes in supervisory toughness, we model two types of supervisory assessments — classified assets and composite CAMEL ratings — as functions of measures of bank financial condition and other factors representing the economic environment of the bank. The econometric models mimic as closely as possible the information used in the supervisory process at the time of the supervisory assessments. Of course, it is not possible to include all of the information available to supervisors at the time they set the classified assets and CAMEL ratings, but we address this issue as well as we can by:

1. Including the key balance sheet and income variables specified in the supervisory procedures in their level, trend, and peer group percentile ranks, as discussed above;

2. Including a large number of other control variables for bank condition and economic environment;

3. "Bracketing" the information set used by supervisors by running the models with and without information on the future performance of the bank, which is more information than the supervisors could have access to at the time of the supervisory assessments;

4. Running large numbers of robustness checks on the models.

Our models for classified assets and CAMEL ratings are very similar. We first review our classified assets model in detail and then discuss how the CAMEL model differs. The classified assets model takes the form:

ln(CLASS/(1-CLASS)) = f (TIME DUMMIES, LAGGED SUPERVISORY ASSESSMENTS, SUPERVISORY AGENCY DUMMIES, BANK SIZE, BANK BALANCE SHEET AND INCOME ITEMS, STATE AVERAGES OF BALANCE SHEET AND INCOME ITEMS, OTHER ECONOMIC ENVIRONMENT INDICATORS, [FUTURE PERFORMANCE])

These variables are shown in various degrees of detail in Table 7. There are between 190 and 199 coefficients estimated in each of the classified assets equations, depending upon whether the future performance variables (described below) are included.

The dependent variable is in log-odds form, the natural log of the proportion of loans classified as substandard, doubtful, or loss divided by one minus this proportion. The equation may be interpreted as a log-odds grouped logit model for the probability that a dollar of loans will be classified. It is estimated by weighted least squares in order to avoid heteroskedasticity problems and the adjusted R^2s are corrected.[7] As shown in Table 7, we specify models for both total classified assets and weighted classified assets.

The TIME DUMMIES are also specified in several alternative ways to insure robustness of the results. In some equations, we include dummies for each of our three main time periods, pre-crunch (1986-1988), credit crunch (1989-1992), and boom (1993-1998). In other equations, we specify dummies for each individual year to allow for the data more freedom to “choose for themselves” when changes in supervisory toughness occurred. We use the coefficients of the TIME DUMMIES to establish the changes in supervisory toughness. That is, after controlling as well as we can for the supervisors’ information in the rest of the equation, we test the coefficients of these dummies to see if classified assets tend to be higher in the credit crunch period as predicted by Hypothesis H1, and lower during boom period as predicted by Hypothesis H2.

As an additional specification, we drop the TIME DUMMIES and simply run the model separately for the pre-crunch, credit crunch, and boom periods, allowing the coefficients of all of the other regressors to change in an unrestricted manner. This gives an alternative way of calculating economic significance by assessing whether the predicted values for classified assets differ substantially for a given set of conditions (e.g., the median from one of the time periods) using the coefficients from two different time periods.

We also include LAGGED SUPERVISORY ASSESSMENTS to account for “stickiness” in assessments or additional information inherent about bank or portfolio quality in past assessments. We include the lagged total classified assets ratio in the total classified assets regressions and the lagged weighted classified assets ratio in the weighted classified assets equation. We include in both models lagged dummy variables for the last previously recorded composite CAMEL rating (lagged CAMEL 4 or 5 is excluded as the base case). The time since last recorded examination may help predict supervisory outcomes because problem banks are typically examined more frequently, although a shorter lag may also predict less change in condition, since there is less time for changes in condition to occur. Importantly, we also include data for banks without previous examination records to avoid sample selection problems as discussed earlier. For these observations, we set the dummy for “No lagged examination data” to 1, and set the values of the other LAGGED SUPERVISORY ASSESSMENT variables to zero. In effect, we account for the average difference of these banks from other banks.

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[7] Each observation is divided by a number proportional to the estimated standard error of its error term [{(1/CLASS)) + [1/(1-

We also include SUPERVISORY AGENCY dummies in the models. These account for the possibility of systematic differences in supervisory standards across government agencies. They may also reflect systematic differences in the quality of banks with different charter types or Federal Reserve membership for which we do not otherwise adequately control.

The BANK SIZE variables include a continuous measure of bank assets, as well as dummies for different size classes. These control for many differences between large and small banks that may not be otherwise controlled for in the model, including the degree of industrial and geographic diversification in the loan portfolio, risks from off-balance sheet or international exposures, and any systematic differences in supervisory treatment.

The BANK BALANCE SHEET AND INCOME ITEMS are the levels, trends, and peer group percentile ranks of the nine key balance sheet and income variables specified in the UBPR and taken from the appropriate Call Report quarter. These are the Total Capital Ratio, Tier 1 Capital Ratio, Leverage Capital Ratio, Real Estate Loans/Total Loans, Nonperforming Loans/Total Loans, Off-balance Sheet Items/Total Loans, Other Real Estate Owned/Total Loans, Return on Assets, and Volatile Liability Dependence. All of these variables are specified in both first- and second-order terms and interactions, so that each actually appears nine times in the regressor list to allow for a very flexible functional form. That is, for i=1,…,9, we specify x_{it}, $(x_{it}-x_{it-1})$, $xrank_{it}$, $(x_{it})^2$, $(x_{it}-x_{it-1})^2$, $(xrank_{it})^2$, $x_{it} \bullet (x_{it}-x_{it-1})$, $x_{it} \bullet xrank_{it}$, and $(x_{it}-x_{it-1}) \bullet xrank_{it}$, where x_{it} represents the current value of the variable computed from the Call Report, $(x_{it}-x_{it-1})$ is the trend, and $xrank_{it}$ is the current peer group percentile rank, for a total of 81 variables specified (means, standard deviations, coefficients not shown in tables).

We also include a number of variables to control for the economic environment of the bank. The STATE AVERAGES OF BALANCE SHEET AND INCOME ITEMS are the same 81 variables as are specified for the bank itself, except that they are state averages to help control for the economic environment of the bank (data not shown in tables). OTHER ECONOMIC ENVIRONMENT INDICATORS include regional dummies for the Federal Reserve District (which may capture systematic differences in regional economic conditions or supervisory treatment) as well as state income growth and unemployment rate. Although the local economic environment is not explicitly specified in the examination procedures, it is nonetheless important to control for the environment to account for exogenous changes in bank condition that may be reflected in supervisory assessments. For example, supervisors may be more

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CLASS))]} / total loans]$^{1/2}$.

likely to find problems in the loan portfolio and assign more classified assets and a worse CAMEL rating for a bank in a state with low income growth, a high unemployment rate, and poor state-average bank balance sheet and income items, even after taking into account the bank's own balance sheet and income items. To the extent that there are changes in the macroeconomic or regional environment that affect all banks in the nation or region, these effects may be mostly captured by these state-level variables, since banks were generally legally restricted to have full-service banking offices only in their home state for almost all of our sample.[8] That is, conditions outside the home state are likely to be much less important than those in the state.

Finally, we alternately exclude and include the FUTURE PERFORMANCE variables, which are leads of 1, 2, and 3 years of nonperforming loans, charge-offs, and the total risk-based capital ratio. As noted above, it is not possible to include all of the information available to supervisors at the time of the supervisory assessments, although the variables reviewed thus far represent our best attempt. One of the ways we attack this problem is to include these future values of nonperforming loans, charge-offs, and capital, which capture more information than the supervisors could have had access to at the time of the assessments and represent fairly well the future condition of the bank that supervisors are interested in predicting or altering. In effect, we try to "bracket" the information set used by supervisors by running the models alternately with less information and with more information than supervisors have. If the same qualitative result for changes in supervisory toughness holds when we specify both less and more information than supervisors have, then we will feel more confident in drawing conclusions about what occurred with their actual (unobserved) information set. We recognize that the FUTURE PERFORMANCE variables are endogenous, that their coefficients are unreliable, and that the model is underidentified with their inclusion, but our purpose is to check the robustness of the main model which excludes these variables, rather than to rely on equations with the endogenous variables. Fortunately, the results are robust to the inclusion or exclusion of the FUTURE PERFORMANCE variables, supporting our interpretation of the time dummies as reflecting changes in supervisory toughness, rather than important excluded variables.

We also run the classified asset model (as well as the CAMEL model below) using a Heckman correction to deal with potential sample selection problems. We first run a probit equation for the probability that a bank has an

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[8] Interstate bank branching was essentially prohibited prior to the implementation of the Riegle-Neal Act in 1997. Bank holding companies were permitted to own banks in different states prior to this time, but our data are on the individual banks, not their holding companies.

exam in a given year, and then include the resulting inverse Mills ratio as a regressor in the equations for the classified asset ratios and CAMEL ratings. We specify a separate probit model for each year to take account of the apparent significant changes over time in the probability of an examination. The variables in these models include the same past values of key balance sheet and income variables, past supervisory ratings, etc. that that should affect the decision to examine a bank, just as they affect the supervisory rating on a bank. This creates a problem of identification for the Heckman correction, as we have no variables in the first stage for the probability of an examination that are not also in the second stage for the supervisory assessments at the examinations. Since we do not have any “true” exclusion restrictions, our sample selection correction is identified by 1) the fact that we run separate probit equations for each year, letting all the coefficients vary to take account of changes over time in the probability of an examination, and 2) the nonlinearity inherent in the inverse Mills ratio. The use of the same underlying variables cannot be helped, since all of the variables that supervisors use in off-site monitoring in selecting banks to be examined are also used in their determination of the supervisory assessments at the end of the examination. Fortunately, our main results regarding Hypotheses H1 and H2 are robust to including or excluding the Heckman correction.

The model for the composite CAMEL ratings is very similar and takes the form:

Probability(CAMEL) = g (TIME DUMMIES, LAGGED SUPERVISORY ASSESSMENTS, SUPERVISORY AGENCY DUMMIES, BANK SIZE, BANK BALANCE SHEET AND INCOME ITEMS, STATE AVERAGES OF BALANCE SHEET AND INCOME ITEMS, OTHER ECONOMIC ENVIRONMENT INDICATORS, [CLASSIFIED ASSETS], [FUTURE PERFORMANCE])

This equation is specified as an ordered logit of the choice among composite CAMEL 1, 2, 3, and (4 or 5). As indicated in Table 7, CAMEL 5 is grouped with CAMEL 4 because CAMEL 5 is so rare. As a robustness check, we try running the model with the management (M) component of CAMEL rating in place of the composite rating, since the supervisors have a significant amount of discretion in assigning a management rating, with results very similar to those for the composite CAMEL. As an additional check, we rerun the composite CAMEL model as a binomial logit for the probability of a satisfactory versus unsatisfactory rating, i.e., a CAMEL rating of 1 or 2 versus 3, 4, or 5.

The regressors specified are identical to those in the classified assets model with one exception. We run the CAMEL model three ways — with current total classified assets included as a regressor, with current weighted classified assets included, and with no current classified assets included. The purposes are to allow the data to describe different types of changes in supervisory toughness, and to check robustness of the results. One way that changes in supervisory toughness may affect CAMEL ratings is that supervisors may simply assign a higher or lower composite CAMEL grade after an on-site examination for a given evaluation of the loan portfolio, which may be described by model with current classified assets specified in total or weighted form. That is, supervisors may take as given the set of classifications for the loan portfolio and assign a harsher or laxer rating. Alternatively, supervisors may assign a harsher or laxer rating CAMEL as part of the same process in which loans are classified more or less harshly. In this case, the specification with no current classified assets specified is correct and the models with classified assets specified have endogenous regressors and the associated problems these create. Fortunately, the results are robust to the inclusion or exclusion of the current classified assets variables.

5.2 Tests of changes in supervisory toughness on bank lending behavior (Hypothesis H3)

To test for the effects of changes in supervisory toughness on bank lending behavior, we model changes in bank lending and other measures of performance as functions of three years of past changes in supervisory assessments, and include control variables for three years of other past changes in bank condition and economic environment. Three years of lagged changes are included because it may take a considerable amount of time for a bank to change the composition of its loan portfolio.

Our model for change in performance takes the form:

ΔPERFORMANCE = h (TIME DUMMIES, ΔSUPERVISORY ASSESSMENTS (3 years of lags), ΔBANK BALANCE SHEET AND INCOME ITEMS (3 years of lags), ΔSTATE AVERAGES OF BALANCE SHEET AND INCOME ITEMS (3 years of lags), ΔSTATE AVERAGES OF SUPERVISORY ASSESSMENTS (3 years of lags), ΔOTHER ECONOMIC ENVIRONMENT INDICATORS (3 years of lags))

The ΔPERFORMANCE variables include two types of variables – 1) direct quantitative measures of the changes in lending behavior and 2) measures of changes in bank risk. The direct measures of changes in lending behavior are the one-year changes in the ratios of C&I loans, real estate loans, installment loans, and U.S. Treasuries to gross total assets (e.g., $C\&I_t/GTA_t$ - $C\&I_{t-1}/GTA_{t-1}$) as well as the proportional change in gross total assets ((GTA_t-GTA_{t-1})/GTA_{t-1}). Our main tests of Hypothesis H3 are tests that CAMEL downgrades and increases in classified assets predict reductions in lending and assets and increases in Treasuries, and vice versa for CAMEL upgrades and decreases in classified assets.

The measures of changes in bank risk that we include in the ΔPERFORMANCE variables are the ratios of nonperforming loans and charge-offs to gross total assets and the total capital ratio. These are changes in the current values of essentially the same variables alternately included and excluded in the supervisory assessment regressions to "bracket" the supervisory information set because these represent fairly well the future condition of the bank that supervisors are interested in predicting or altering. To the extent that changes in supervisory toughness affect risk-taking in the predicted direction, then a supervisory downgrade should result in smaller nonperforming and charge-off ratios and higher capital ratios, as downgrades are expected to encourage institutions to reduce risks (and vice versa for upgrades). However, to the extent that a supervisory downgrade reflects an accurate prediction that existing loans will become nonperforming or be charged off, the predicted signs are in the opposite direction. Similarly, a supervisory downgrade in the form of an increase in classified assets may reduce capital as discussed above. This tension between supervisory assessments as intended to change behavior versus predict outcomes is difficult to disentangle, as indicated in the literature review. The results of these regressions should yield some interesting information on the net effect of these opposing forces. However, because of these opposing forces, we do not view the results of the nonperforming, charge-off, and capital regressions as tests of Hypothesis H3.

The regressors included in the ΔPERFORMANCE model are essentially analogous to those in the classified assets and CAMEL models, with some exceptions. One exception concerns the TIME DUMMIES. We include the year dummies, rather than the period dummies to allow maximum flexibility, since these variables are not the main focus of attention here. Data for the year 1986 are dropped and the dummy for 1987 is the base case, since the data did not go back far enough to cover the lags needed for 1986. The remaining variables are measured as 3 years of lagged changes to allow time for the bank to adjust its portfolio in reaction to the change in supervisory assessments and other changes in bank condition and economic environment. As additional variables, we include state averages of changes in supervisory assessments (average change in classified assets and composite CAMEL for banks in the state). We exclude peer group percentile ranks of the balance sheet and income items, since we are investigating the bank's behavior rather than the supervisor's behavior. We also exclude the measures of future performance sometimes included in the supervisory assessment equations because issues of supervisory information and sample selection are not relevant here.

In the specification of the ΔSUPERVISORY ASSESSMENTS variables, we specify 3 lags of dummies for CAMEL upgrades and downgrades, leaving "no change" as the base case. This allows for an asymmetric response of banks to upgrades and downgrades. We also run the model alternately with 3 lags of changes in total classified assets and with 3 lags of changes in weighted classified assets. In the interest of brevity, we show only the former specification, but the results are robust to this difference in specification. Finally, classified assets are measured here as proportions of assets, rather than as proportions of loans as in the supervisory regressions. In our view, the proportion of assets that are classified is a better indicator of the supervisory pressure on banks to change their behavior.

6. <u>Empirical Results</u>

In this section, we first review the results of the classified assets and CAMEL models that test Hypotheses H1 and H2 that supervisory toughness may have changed during the credit crunch and boom periods. We then review the results of the performance models that test Hypothesis H3 that changes in supervisory toughness, if they occurred, changed bank lending behavior in the predicted directions.

6.1 Results of tests of changes in supervisory harshness (Hypotheses H1 and H2)

Table 8 presents the weighted least squares regression equations for classified asset ratios and ordered logit regressions for the composite CAMEL rating. These models include dummies for the main time periods, the credit crunch (1989-1992), and boom (1993-1998) periods, with the pre-crunch (1986-1988) period excluded as the base case. Other models include dummies for each individual year to allow the data more freedom to "choose for themselves" when changes in supervisory toughness may have occurred. These models yield similar results, but are not shown in the tables. We also do not show the coefficients for most of the control variables to save space. As indicated above, there are nearly 200 coefficients estimated in each supervisory equation. The bold-faced type indicates statistical significance at the 5% level, two-sided.

To test Hypothesis H1 that supervisors got tougher on banks during the credit crunch period, we test the coefficients of the time dummies to see if classified assets tend to be higher and composite CAMEL ratings tend to be worse in the credit crunch period than in the pre-crunch period after controlling as well as we can for the supervisors' information in the equations. We find that the coefficients of the credit crunch dummy (1989-1992) in the total classified assets equations in Table 8 are small and statistically insignificant. For the weighted classified assets equations, we find that the coefficients of the credit crunch dummy are larger and statistically significant. These findings hold whether or not the future performance variables (leads of 1, 2, and 3 years of nonperforming loans, charge-offs, and total capital) are included in the estimation. Note that observations from the last three years of the sample have to be dropped when the future performance variables are specified.

To evaluate whether the classified asset results are **economically** significant, we evaluate the contributions of the credit crunch dummy to the probability that dollar of loans is classified. Recall that the dependent variable in these equations is in log-odds form [ln(CLASS/(1-CLASS))], and may be interpreted as a log-odds grouped logit model for the probability that a dollar of loans will be classified. Since the equation is nonlinear, the measured effect will depend on the point of evaluation. We choose the means of total and weighted classified asset proportions during the credit crunch as the most relevant points of evaluation, .072 and .018, respectively (see Table 4, Panel B). Increasing the dependent variable of the total classified assets equation by .005211 (the coefficient on the credit crunch dummy) increases the predicted proportion of classified loans from 7.2% to 7.235%, an economically small effect.[9] Similarly, increasing the dependent variable of the weighted classified assets equation by .046267 increases the predicted weighted classified proportion from 1.8% to 1.884%, which is larger, but would still appear to be a small economic influence. Thus, the data suggest at most a relatively modest effect of examiners getting tougher during the credit crunch period in terms of requiring that banks of a given condition classify more loans or shifted loans into more serious classifications (e.g., from substandard to doubtful or from doubtful to loss, which would raise weighted classified assets). The economic significance results are consistent with on the order of magnitude of about 1% or less of the loan portfolio being additionally classified or classified more seriously.

We turn next to the measured effects on the composite CAMEL rating. The way the ordered logit equations are set up, the negative, statistically significant coefficients on the dummy for the period of 1989-1992 indicate that the probability of receiving a favorable CAMEL rating is lower than during the pre-crunch period, all else held equal.

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[9]Letting P_1 be the new probability of a dollar of loans being classified, the formula for the figure in the text is given by $\ln(P_1/(1-P_1)) = \ln(.072/(1-.072)) + .005211$.

Again, the effects are comparable, whether or not the future performance variables are included. The ordered logit models shown in Table 8 control for the current level of total classified assets. The results are also robust with respect to using current weighted classified assets or to excluding current classified assets altogether.

It is more difficult to evaluate the economic significance of the CAMEL results because of the multiple choices in the ordered logit equations. To do so, we compare the predicted values of CAMEL 1, CAMEL 2, CAMEL 3, and CAMEL 4 or 5 with and without the coefficient of the credit crunch dummy variable. That is, we evaluate the predicted CAMEL ratings as if the coefficients reflect the pre-crunch supervisory regime versus the credit crunch supervisory regime. The point of evaluation is the median of all the variables for the credit crunch period except that the dummy variables are set to one or zero. We assume that the lagged CAMEL rating is a 2 (the modal rating), the region is 1 (New England), the size class is 1 (assets below $100 million), and that the bank was examined by a state supervisory agency (OCC, FDIC, FRB = 0). As we will see, the lagged CAMEL rating dominates the other exogenous variables in determining the current CAMEL rating. The predicted percentages of CAMEL 1, CAMEL 2, CAMEL 3, and CAMEL 4 or 5 are [9.37%, 88.91%, 1.70%, 0.001%], respectively, without the credit crunch dummy coefficient and [6.89%, 90.74%, 2.36%, 0.002%], respectively, with the credit crunch dummy coefficient. Notably, these results suggest that CAMEL ratings are relatively “sticky” — banks rated as CAMEL 2 in the prior examination are close to 90% likely to receive a 2 during the next examination. These results are consistent with only a modest increase in supervisory harshness during the credit crunch period, moving the CAMEL ratings for on the order of magnitude of about 3% of banks. Consistent with the classified asset results, the CAMEL results suggest at most a relatively modest increase in supervisory toughness.

As noted above, we also rerun the CAMEL model as a binomial logit for the probability of a satisfactory versus unsatisfactory rating, i.e., a CAMEL rating of 1 or 2 versus 3, 4, or 5 (not shown in tables). The results again show a statistically significant effect of the credit crunch dummy variable. The results were also more economically significant than the full model – the data suggest that for a given bank condition at the mean of the data set, the probability of a satisfactory rating decreased about 9 percentage points (from 74.2% to 65.0%). Part of the difference from our main result may be due in part to the sparser specification of the satisfactory versus unsatisfactory rating, and in part to the different point of evaluation.

To test Hypothesis H2 that supervisors got easier on banks during the boom period, we use the same models and test the coefficients of the time dummies to see if classified assets tend to be lower and CAMEL ratings tend to be more favorable in the boom period for a given bank condition and economic environment. The coefficients of the boom period dummy (1993-1998) in the classified assets equations in Table 8 are negative, larger in absolute value than the credit crunch period dummies, and statistically significant in all four cases, consistent with a reduction in supervisory toughness relative to the pre-crunch period. More important for evaluating Hypothesis H2, boom period dummy coefficients are even further below the positive coefficients of the credit crunch period dummy coefficients, consistent with a slightly larger supervisory toughening relative to the credit crunch period. These results are robust to the specification of total or weighted classified assets and whether or not the future performance variables are included.

To assess the economic significance of the classified asset results for the boom period, we evaluate the contribution to the probability that dollar of loans is classified of the boom period dummy minus the credit crunch dummy, which measures the change between these two periods. Using the same method as above for testing Hypothesis H1, we evaluate at the mean proportions of total and weighted classified assets during the boom period, .039 and .009, respectively (see Table 4). Changing the dependent variable of the total classified assets equation by (-.16131-.005211) (i.e., the coefficient on the boom period dummy minus the coefficient on the credit crunch dummy) reduces the predicted proportion of classified loans from 3.9% to 3.322%. Similarly, the predicted weighted classified proportion is reduced from 0.9% to 0.737%. These figures are not economically significant in terms of the reduction in the proportion of loans that are predicted to be classified or receive less serious classifications, on the order of magnitude of 1% or less of loans in both cases. Thus, the data are consistent with rather modest reductions in supervisory toughness during the boom period in terms of classified assets.

Turning to the potential effects of changes in supervisory toughness on CAMEL ratings during the boom period, we note that the coefficients of the boom period dummy (1993-1998) in the CAMEL models are both negative, and the coefficient for the main equation (without the future performance variables) is statistically significant. This suggests that the CAMEL ratings were harsher for a given bank condition in the boom period than in pre-crunch period, contrary to the classified assets results. More important for investigating Hypothesis H2, however, is that the boom period dummies are less in absolute value than the coefficients of the credit crunch period dummies, so they represent harsher ratings for a given condition than during the credit crunch period.

To evaluate whether the CAMEL results for the boom period are **economically** significant, we again compare the predicted values of the CAMEL probabilities. In this case, we evaluate the predicted probabilities with the coefficient of the boom period dummy in place of the credit crunch period dummy, evaluated at the median of the variables for the boom period (as well as lagged CAMEL rating 2, region 1, size class 1, and state agency examination). The predicted percentages of CAMEL 1, CAMEL 2, CAMEL 3, and CAMEL 4 or 5 are [21.98%, 77.39%, 0.63%, 0.004%], respectively, with the credit crunch dummy coefficient specified and [24.96%, 74.50%, 0.54%, 0.004%], respectively, with the boom period dummy coefficient. These data suggest that bank conditions and economic environments were so strong during the boom period that even banks with lagged CAMEL 2 ratings were predicted to have over a 20% probability of rising to a CAMEL 1 rating without any change in supervisory toughness. The effects of any change in supervisory toughness are again rather mild, consistent with supervisory easing resulting in improved CAMEL ratings on the order of magnitude of about an additional 3% of banks receiving better CAMEL ratings. The use of the binomial logit model for the probability of a satisfactory versus unsatisfactory rating also showed very little effect in this case, moving the predicted probability of a satisfactory CAMEL rating during the boom period up by less than 1 percentage point (from 92.1% to 93.0%). Consistent with the classified asset results, the CAMEL results suggest at most a relatively modest decrease in supervisory toughness.

Overall, the classified assets and CAMEL models are modestly consistent with Hypotheses H1 and H2. They generally show statistically significant results in the predicted directions but usually show only fairly small results from an economic viewpoint. In most cases, the findings are consistent with no more than about 1% of additional loans becoming classified or put into more serious classifications during the credit crunch period and similarly for the reduction in classifications during the boom period, for a given bank condition and economic environment. Similarly, the data are consistent with movements of CAMEL ratings for on the order of 3% of banks in the predicted directions as a result of any changes in supervisory toughness, which is small compared with the effects of "stickiness" in ratings during the credit crunch period and the trend toward improved ratings from economic conditions during the boom period. These findings are generally confirmed by a number of robustness checks not shown in the tables, including our Heckman correction for sample selection problems.

As noted above, we also tried evaluating economic significance by dropping the TIME DUMMIES and running the model separately for the pre-crunch, credit crunch, and boom periods, allowing the coefficients of all of the regressors to vary. While this procedure generally mostly yielded the same qualitative results – consistent with toughening during the credit crunch period and easing during the boom period – the quantitative results were often too large to be believable. For example, at the boom period medians, the CAMEL models predicted a drop from 73.4% to 2.6% in the probability of a CAMEL 3 rating from the credit crunch supervisory regime to the boom period regime. Presumably, these models simply did not work very well out of sample.

We briefly discuss the other coefficients shown in Table 8, but again remind the reader that a large number of coefficients, mostly the balance sheet and income variables for the bank and their state averages, are not shown. In the classified assets equations, the coefficients of lagged classified assets are positive and statistically significant, consistent with the expectation that a prior problem loan portfolio would predict a current problem loan portfolio, all else held equal, since it takes a considerable amount of time to dispose of problem assets. The coefficients of the lagged CAMEL 1, CAMEL 2, and CAMEL 3 are positive and statistically significant in the classified assets equations. This suggests that a past rating of CAMEL 4 or 5 — the base case in the regressions – has a positive effect in encouraging banks to improve their loan portfolios and reduce classified assets relative to their lagged levels. In the CAMEL equations, the positive and statistically significant lagged CAMEL coefficients are consistent with CAMEL "stickiness" – the higher is the past rating, the higher is the predicted current rating. As expected, the level of current total classified assets has statistically significant negative coefficients in the CAMEL equations (as does the version of the model with weighted classified assets, not shown), consistent with banks with poor loan portfolios receiving poor CAMEL ratings. However, the lagged classified assets variable has a positive coefficient. Given that the current level of classified assets is in the same equation, this may be interpreted as reward (punishment) for improvement (deterioration) in classified assets since the prior examination. The variable for years since a prior examination has negative coefficients in the classified assets equations, consistent with banks that have problem portfolios being examined more often, although this does not appear to affect the CAMEL rating. The coefficients of the supervisory agency dummies, OCC, FDIC, and FRB, suggest that banks examined by the OCC and FDIC received worse supervisory assessments (higher classified assets, worse CAMEL ratings) than those examined by the Federal Reserve and state agencies (the base case), all else equal. It is not known the extent to which this reflects differences in supervisory standards versus differences in the quality distributions of banks with different supervisors. Finally, the coefficients of the future performance variables generally suggest that banks that are assigned worse supervisory ratings (high classified assets or poor CAMEL ratings) will have higher nonperforming loans and charge-offs in the future, but may also raise their capital ratios. As noted, these variables are endogenous, and so we reserve further judgment on them until later, when we treat them as endogenous variables.

6.2 Results of tests of changes in supervisory toughness on bank lending behavior (Hypothesis H3)

Table 9 presents results from regressions aimed at addressing Hypothesis H3, the effect of changes in supervisory toughness on direct measures of bank lending behavior. As discussed above, we regress changes in bank lending on three years of past changes in supervisory assessments and control variables for changes in bank condition and economic environment. The main predictions of Hypothesis H3 are that a supervisory downgrade (worsened CAMEL rank, higher classified assets) should result in smaller proportions of assets being devoted to loans, a reduction in asset growth, and a larger proportion of assets being devoted to government securities, and vice versa for supervisory upgrades.

Our regressions appear to explain very little of what drives changes in lending behavior. The adjusted R-squared's for the equations in Table 9 are generally less than 5%. Nonetheless, a number of the changes in supervisory assessments are statistically significant. The changes in classified assets all have signs that are consistent with Hypothesis H3 for all lag lengths, and all but one of these coefficients are statistically significant at the 5% level. That is, an increase in classified assets is associated with decreases in the future C&I loan ratio, real estate loan ratio, installment loan ratio, and asset growth ratio, and associated with an increase in the future Treasury holdings ratio. These results are also replicated when changes in weighted classified assets are specified in place of total classified assets (not shown). In addition, we tried rerunning the loan and Treasury ratios with different denominators to ensure that the results were not just driven by changes in asset denominator. We specified $(C\&I_t - C\&I_{t-1})/GTA_{t-1}$ and $(C\&I_t - C\&I_{t-1})/C\&I_{t-1})$ in place of $C\&I_t/GTA_t - C\&I_{t-1}/GTA_{t-1}$, and so forth for the other lending and Treasury ratios, and the results were robust.

To determine if the classified assets results are economically significant, we simply sum the coefficients on the three lags of the change in classified assets. Since the equations are linear, this gives the long-run effect of a change in classified assets, i.e., the sum of the effect of a change one, two, and three years hence. The results suggest that while the effects of classified assets are consistent and almost always statistically significant, their economic impact appears to be rather small. An increase in classified assets of 1% of assets is predicted to reduce the C&I loan ratio, real estate loan ratio, installment loan ratio, and asset growth ratio by 0.08%, 0.14%, 0.11%, and 0.72%, respectively, and to increase the Treasury ratio by 0.08% in the long run.

In contrast to the consistent but small effects of classified assets, the effects of CAMEL upgrades and downgrades on lending are not very consistent. They sometimes predict changes in lending in the opposite direction of what is expected, and the upgrades and downgrades sometimes work in the same direction (i.e., differing in the same way from the excluded case of no change in CAMEL). In most cases, the effects are very small, moving the ratios less than 1 percentage point in the long run for a CAMEL upgrade or downgrade.[10] Thus, the support for Hypothesis H3 is mixed and weak. The changes in classified assets are consistent with the hypothesis, but are small economically, and the changes in composite CAMEL ratings yield small, inconsistent effects.

Table 10 presents the regressions for the effects of changes in supervisory assessments on measures of changes in bank risk – changes in the nonperforming loan, charge-off, and total capital ratios. As discussed, these results may be interesting, but because they combine the effects of supervisory assessments on bank behavior with predictions of how banks choose to adjust their risks, we do not view these equations as valid tests of Hypothesis H3. The lagged changes in both classified assets and composite CAMEL ratings generally have statistically significant coefficients that are consistent with each other. A supervisory downgrade of either type is followed by increases in future problem loans and vice versa for supervisory upgrades. We interpret these results as suggesting a dominance of the predictive ability of the ratings over their effects in persuading banks to change the riskiness of their loan portfolios. That is, a supervisory downgrade predicts an increase in nonperforming loans and charge-offs that is not fully offset by any changes in bank behavior to reduce their risky lending, likely in part because it takes time to resolve existing problem loans. However, the results are not economically significant – a 1% change in classified assets or a CAMEL upgrade or downgrade is predicted to change the nonperforming loan and charge-off ratios by less than 1 percentage point.

The results differ for the change in total capital ratio. The coefficients of the lagged changes in classified assets are statistically significant and predict an increase in future capital, consistent with the possibility that supervisory discipline from an increase in classified assets encourages banks to increase their capital ratios, more than offsetting the erosion of capital from the change in classification. These findings are also consistent with the

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[10] The one exception of a larger predicted change is that a CAMEL upgrade predicts a decrease of 2.4% in the growth rate of

possibility that banks may have found it easier to react to supervisory discipline from increases in classified assets by changing increasing their capital ratios to cover potential losses than eliminating their problem loans. However, changes in CAMEL ratings appear to have the opposite effect, with downgrades predicting a reduction in capital and upgrades predicting an increase in capital. Once again, all of these changes are economically small.

7. Conclusions

We investigate the possibility that overall changes in supervisory "toughness" may significantly affect bank lending behavior and potentially affect macroeconomic or regional economic health. Specifically, we test three hypotheses about whether U.S. bank supervisors changed their policies and whether these policy changes affected bank lending behavior during the credit crunch period of 1989-1992 and the banking boom period of 1993-1998. We test these hypotheses using information on the supervisory process, confidential data on CAMEL ratings and classified assets from bank examinations, and bank balance sheet and income data over the period 1986-1998. We find that the data provide some support for all three hypotheses. However, the data also suggest that the economic effects of any policy changes are likely to have been quite small, and likely do not explain a substantial portion of the wide swings in aggregate bank lending to business during the 1990s.

The data provide modest support for Hypothesis H1, that there was an increase in toughness during the credit crunch period. During 1989-1992, banks of a given measured financial condition and economic environment had statistically significantly worse CAMEL ratings than in the pre-crunch period of 1986-1988, and in some cases also had statistically significantly higher classified assets.

Similarly, the data give some support for Hypothesis H2 — that there was a decline in toughness during the boom period. During 1993-1998, CAMEL ratings are estimated to have eased and moved part of the way back to their levels of the pre-crunch period for given measured circumstances. The estimated change in classified assets for given measured bank condition and economic environment is comparatively greater. Classified assets are measured to be statistically significantly lower than in either the pre-crunch or credit crunch periods for banks in a given economic condition and environment.

Despite the statistically significant support for Hypotheses H1 and H2, the data also suggest fairly small results in terms of economic significance. The findings are generally consistent with no more than about 1% of

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assets, which is inconsistent with expectations.

additional loans becoming classified or put into more serious classifications during the credit crunch period and similarly for the reduction in classifications during the boom period, after controlling for bank condition and economic environment. Similarly, the data are consistent with movements of CAMEL ratings for on the order of 3% of banks in the predicted directions as a result of any changes in supervisory toughness. The CAMEL changes are small compared with the effects of "stickiness" in ratings during the credit crunch period (the lagged CAMEL rating is very likely to be repeated) and overall improvement in ratings from improved economic conditions during the boom period (over 20% of CAMEL 2 banks are predicted to move to a CAMEL 1 based on changes in economic condition). The statistical and economic significance findings are generally confirmed by a number of robustness checks, although some of the checks suggested larger economic significance.

The data provide mixed support for Hypothesis H3, that changes in supervisory toughness, if they occurred, affected bank lending as predicted. Increases in classified assets are statistically significantly associated with decreases in the future C&I loan ratio, real estate loan ratio, installment loan ratio, and asset growth ratio, and with an increase in the future Treasury holdings ratio, all consistent with the hypothesis. However, our analysis of economic significance suggests that these effects are rather small, with an increase in classified assets of 1% of assets predicted to change these portfolio ratios by less than 1 percentage point each in the long run, often much less than 1 percentage point. The changes in CAMEL ratings did not appear to have consistent effects on future lending behavior, although these effects also appeared to be small.

We also tested for the effects of changes in supervisory assessments on measures of changes in bank risk – changes in the nonperforming loan, charge-off, and total capital ratios. These results combine the effects of supervisory assessments on bank behavior with predictions of how banks choose to adjust their risks. The findings show that supervisory downgrades in terms of either increases in classified assets or worsened composite CAMEL rank tend to predict statistically significantly more future nonperforming loans and charge-offs, and vice versa for supervisory upgrades. These findings are consistent with a dominance of the predictive ability of the ratings over their effects in getting banks to change the riskiness of their loan portfolios, likely in part because it takes time to resolve existing problem loans. The results differ for the change in total capital ratio — lagged changes in classified assets are statistically significant and predict an increase in future capital, consistent with supervisory discipline that encourages banks to increase their capital ratios, more than offsetting any direct reduction in capital that may occur from classification. However, changes in CAMEL ratings appear to have the opposite effect. As with our tests of the main hypotheses, all of the measured effects of changes in supervisory assessments on bank risk appear to be small, with a 1% change in classified assets or a CAMEL upgrade or downgrade predicted to change the nonperforming loan, charge-off, and capital ratios by less than 1 percentage point.

The findings also suggest that to the extent that regulatory changes like modifications of capital standards are enforced through the supervisory process by assigning worse CAMEL ratings, these regulatory changes may not have much effect on bank lending or portfolio risk, since lending and loan risk do not appear to be influenced substantially through changes in CAMEL ratings. However, these regulatory changes could have strong effects through other channels.

These findings are subject to a number of caveats. First, our results of testing changes in supervisory toughness (Hypotheses H1 and H2) are subject to bias because we cannot exactly replicate the information used by supervisors. Part of what we measure as changes in supervisory toughness may be systematic changes in bank conditions or economic environment over time that supervisors use, but are not specified in our econometric models. We address this issue in a number of ways, by 1) including using the level, trend, and peer percentile rank of the key balance sheet and income variables specified in the supervisory procedures, 2) including a large number of other control variables for bank condition and economic environment, 3) "bracketing" the supervisory information set using data on future performance, and 4) running many other robustness checks. The main findings results are robust to these procedures, suggesting that bias from excluding important variables is not likely to be a significant problem.

Our discussant, Steve Cecchetti, correctly points out that the estimated coefficients of our time dummies — which we interpret as reflecting changes in supervisory toughness — are highly correlated with macroeconomic series, such as industrial production. This is not surprising, given that the credit crunch period essentially corresponds to a macroeconomic recession and the boom period for bank lending essentially corresponds to a strong macroeconomic expansion. That is, the time dummies virtually **have** to be strongly correlated with macroeconomic series if Hypotheses H1 and H2 are true, since these hypotheses predict a supervisory toughening during the recession and a supervisory easing during the expansion. These hypotheses do not specify reasons behind the changes in supervisory toughness, so if such changes are caused by supervisory reactions to macroeconomic conditions, this is still consistent with the hypotheses. However, a bias may occur if the macroeconomic changes are strongly correlated with significant changes in bank conditions that supervisors consider in making supervisory assessments that are left out of our econometric models. While such a bias may exist, we do not believe it to be substantial because we control for state income growth, unemployment rate, and state-average bank balance sheet and income items. We expect these state economic environment variables to capture most of the effects of macroeconomic changes on banks, since banks mostly operated within their home states during the sample. That is, we do not expect a strong separate and independent effect from conditions outside the home state, which are represented by the macroeconomic variables. As well, we believe that the other variables in the econometric models — especially the information on future nonperforming loans, charge-offs, and capital used to “bracket” the supervisory information set – are much better proxies for the conditions that supervisors consider than are general economic conditions outside the home state.

Second, our results of the effects of changes in supervisory toughness on lending and bank risk taking are subject to the possibility that part of the measured effects may reflect the reactions of market participants to changes in bank condition or economic environment that are not captured by our control variables, rather than changes in supervisory discipline. The fact that the models explain only a small percentage of the variance in the changes in bank lending and the changes in problem loan ratios tends to make this scenario more likely. However, the results of prior research suggest that supervisory assessments do embody some timely and accurate private information rather than merely reflecting information known to market participants. In addition, changes in classified assets often have a direct effect on bank lending behavior through changing regulatory capital ratios, so it is expected that our findings of small effects of changes in classified assets on lending at least partially reflect the effects of changes in supervisory harshness on bank lending behavior.

Third, our results are subject to sample selection problems. The proportion of banks examined each year changes quite dramatically over time, and the data suggest that a change in the sample selected for examination may alter the quality pool of the banks examined relative to the industry as a whole. In addition, there may be missing observations on examinations that took place at the beginning or end of our data set. As well, some banks drop out of the sample due to mergers and failures, and others enter the sample through the creation of new charters. We deal with these sample selection issues by including a large number of controls for bank quality, by including observations even when data for lagged supervisory assessments are missing, and by using a Heckman correction for sample selection bias.

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Table 1

Descriptions of Composite CAMEL Ratings

RATING	DESCRIPTION
1	Institutions in this group are basically sound in every respect; any critical findings or comments are of a minor nature and can be handled in a routine manner. Such institutions are resistant to external economic and financial disturbances and more capable of withstanding the vagaries of business conditions than institutions with lower ratings. As a result, such institutions give no cause for supervisory concern.
2	Institutions in this group are also fundamentally sound, but may reflect modest weaknesses correctable in the normal course of business. The nature and severity of deficiencies, however, are not considered material and, therefore, such institutions are stable and also able to withstand business fluctuations quite well. While areas of weakness could develop into conditions of greater concern, the supervisory response is limited to the extent that minor adjustments are resolved in the normal course of business, and operations continue satisfactorily.
3	Institutions in this category exhibit a combination of financial, operational or compliance weaknesses ranging from moderately severe to unsatisfactory. When weaknesses relate to financial condition, such institutions may be vulnerable to the onset of adverse business conditions and could easily deteriorate if concerted action is not effective in correcting the areas of weakness. Institutions which are in significant noncompliance with laws and regulations may also be accorded this rating. Generally, these institutions give more cause for supervisory concern and require more than normal supervision to address deficiencies. Overall strength and financial capacity, however, are still such as to make failure only a remote possibility.
4	Institutions in this group have an immoderate volume of serious financial weaknesses or a combination of other conditions that are unsatisfactory. Major and serious problems or unsafe and unsound conditions may exist which are not being satisfactorily addressed or resolved. Unless effective action is taken to correct these conditions, they could reasonably develop into a situation that could impair future viability, constitute a threat to the interests of depositors and/or pose a potential for disbursement of funds by the insuring agency. A higher potential for failure is present but is not yet imminent or pronounced. Institutions in this category require close supervisory attention and financial surveillance and a definitive plan for corrective action.
5	This category is reserved for institutions with an extremely high immediate or near term probability of failure. The volume and severity of weaknesses or unsafe and unsound conditions are so critical as to require urgent aid from stockholders or other public or private sources of financial assistance. In the absence of urgent and decisive corrective measures, these situations will likely require liquidation and the payoff of depositors, disbursement of insurance funds to insured depositors, or some form of emergency assistance, merger or acquisition.

Source: *Commercial Bank Examination Manual*, A.5020.1, pp. 3-4: Uniform Financial Institutions Rating System, effective 3/84.

Table 2
Components of the CAMEL Ratings

COMPONENT	DESCRIPTION
Capital Adequacy	A bank's Tier 1, total capital, and leverage ratios in relation to its peer group are the most important factors in assigning a preliminary rating. Peer groups are based on bank asset size, number of offices and location in a metropolitan or non-metropolitan area. More capital is required for banks with deficiencies in any other area of the examination, particularly in asset quality. Examiners also pay close attention to how equity and asset growth affect the capital ratios, and look at retained earnings as a ratio of average total equity to determine whether a bank's equity growth is through retained earnings or an unsustainable outside source, and to the size of the dividend payout.
Asset Quality	The asset quality rating is an indicator of future losses to the bank and affects the ratings of other areas of examination, which must be considered in light of their adequacy to absorb anticipated losses. The most important factor in the asset quality rating is the bank's weighted classified asset ratio, which is computed as [15%*substandard assets +50%*doubtful assets + 100%*loss assets]/[Tier 1 capital + allocation for loan and lease losses]. Examiners also consider the level, trend and composition of classified assets and nonaccrual and renegotiated loans, loan concentrations, lending policies, and effectiveness in monitoring past-due loans, insider loans and the types of risks inherent in the bank's on- and off-balance sheet portfolios..
Management	Management is evaluated on a number of criteria, including compliance with applicable laws and regulations, whether there is a comprehensive internal or external review audit, internal controls to safeguard bank assets, and systems for timely and accurate information. Examiners also consider the other components of the CAMEL rating, shareholder return, and the extent to which the bank is serving all sectors of its community.
Earnings	Earnings are assessed for ability to absorb future losses, so this rating is affected by asset quality, a bank's level, trend and relation to peer of net interest income, noninterest income, overhead expense and provision for loan and lease losses, extraordinary items, additional required provision for loan and lease losses or other nonrecurring items, and dividend payouts.
Liquidity	The liquidity rating is a determination of a bank's ease in obtaining money cheaply and quickly, and a bank's management of interest rate risk. Considerations include the bank's loan commitments and standby letters of credit, the presence of an "unstable core" of funding, access to capital markets, the ratios of federal funds purchased and brokered deposits to total assets and the ratios of loans to deposits.
Sensitivity to Market Risk (since 1997 only)	Rating is based on based on, but not limited to, assessments of the sensitivity of the financial institution's earnings or the economic value of its capital to adverse changes in interest rates, foreign-exchange rates, commodity prices, or equity prices, the ability of management to identify, measure, monitor, and control exposure to market risk given the institution's size, complexity, and risk profile, the nature and complexity of interest-rate risk exposure arising from nontrading positions where appropriate, the nature and complexity of market-risk exposure arising from trading and foreign operations.

Source: Commercial Bank Examination Manual.

Table 3
Classified Asset Categories

COMPONENT	DESCRIPTION
Special Mention	This category includes loans that are potential problems, but that are currently of adequate quality. Loans with inadequate documentation and loans particularly vulnerable to a change in economic conditions may be classified as such. Loans to borrowers with deteriorating but still acceptable financials are another example.
Substandard	Loans in this category are judged to have a well-defined weakness that may result in losses to the bank if left uncorrected. Characteristics include significant deviations from scheduled payments, delinquency, carried-over debt, numerous extensions or renewals without statement of source of repayment, decreased borrower profitability or poor borrower cash flow.
Doubtful	Doubtful loans have problems similar to those of substandard loans, but also have a loss exposure considered severe enough to jeopardize full collection of the loan highly unlikely. However, the loan is not yet considered a loss due to the possibility of mitigating circumstances, such as a proposed merger, capital injection or refinancing plans. A loan should not be classified as doubtful for two consecutive exams, since it is assumed the status of the loan should be resolved during the time between exams.
Loss	A loan considered uncollectible is classified a loss. Although some probability of partial recovery may exist, it is considered preferable to write off the loan in the current period. Such loans are characterized by severe delinquency.

Source: Commercial Bank Examination Manual.

Table 4: Summary Statistics from Bank Examinations over Time

Panel A

Year	Number examined	Total Classified Assets	Weighted Classified Assets	Mean CAMEL	Fraction CAMEL 1	Fraction CAMEL 2	Fraction CAMEL 3	Fraction CAMEL 4	Fraction CAMEL 5
1986	6042	0.098	0.028	2.402	0.152	0.480	0.217	0.117	0.034
1987	6763	0.086	0.024	2.291	0.177	0.515	0.182	0.093	0.034
1988	7729	0.082	0.022	2.257	0.188	0.521	0.170	0.089	0.033
1989	8352	0.082	0.022	2.216	0.206	0.525	0.153	0.077	0.039
1990	8316	0.072	0.018	2.207	0.207	0.519	0.165	0.078	0.031
1991	8377	0.070	0.017	2.194	0.202	0.523	0.178	0.075	0.023
1992	9040	0.063	0.015	2.089	0.215	0.566	0.149	0.056	0.014
1993	9594	0.051	0.012	1.869	0.297	0.580	0.088	0.029	0.007
1994	8867	0.041	0.010	1.758	0.346	0.575	0.058	0.016	0.005
1995	7821	0.036	0.008	1.676	0.396	0.547	0.045	0.010	0.002
1996	7273	0.033	0.008	1.609	0.445	0.509	0.037	0.007	0.001
1997	6381	0.033	0.008	1.591	0.467	0.488	0.036	0.009	0.001
1998	5578	0.032	0.008	1.624	0.444	0.500	0.046	0.008	0.002

Panel B

Period	Number examined	Total Classified Assets	Weighted Classified Assets	Mean CAMEL	Fraction CAMEL 1	Fraction CAMEL 2	Fraction CAMEL 3	Fraction CAMEL 4	Fraction CAMEL 5
Pre-crunch	20534	0.088	0.024	2.311	0.174	0.507	0.187	0.098	0.034
Credit crunch	34085	0.072	0.018	2.175	0.208	0.534	0.161	0.071	0.026
Boom	45514	0.039	0.009	1.704	0.389	0.539	0.054	0.014	0.003

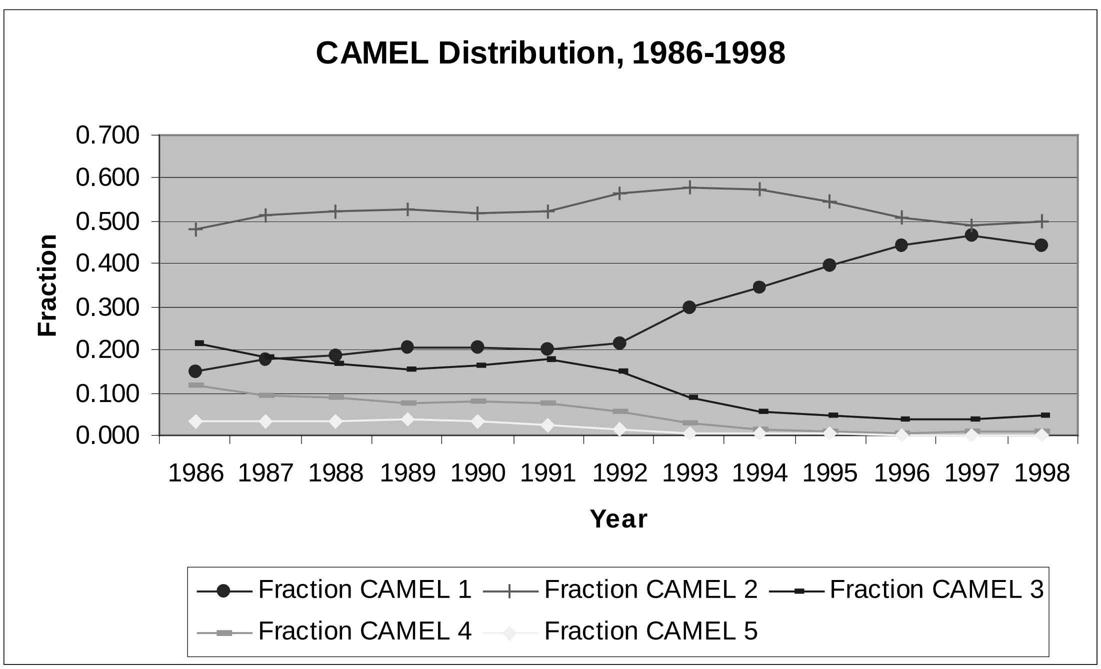

Table 5: Sample Selection – Examined Banks versus the Industry over Time

Panel A

Year	Number of Banks			Total Capital Ratio			Nonperforming Loan Ratio		
	Examined	Industry	Fraction Examined	Examined	Industry	Difference	Examined	Industry	Difference
1986	6042	14197	0.426	0.154	0.178	-0.024	0.061	0.057	0.004
1987	6763	13956	0.485	0.157	0.177	-0.019	0.057	0.057	0.001
1988	7729	13443	0.575	0.170	0.185	-0.015	0.050	0.049	0.000
1989	8352	12863	0.649	0.173	0.185	-0.012	0.044	0.044	0.001
1990	8316	12447	0.668	0.178	0.186	-0.008	0.043	0.042	0.000
1991	8377	12088	0.693	0.169	0.177	-0.008	0.043	0.043	0.001
1992	9040	11677	0.774	0.169	0.178	-0.009	0.042	0.042	0.000
1993	9594	11232	0.854	0.179	0.186	-0.007	0.033	0.034	-0.001
1994	8867	10778	0.823	0.183	0.191	-0.008	0.029	0.029	0.000
1995	7821	10266	0.762	0.184	0.191	-0.007	0.026	0.025	0.000
1996	7273	9760	0.745	0.182	0.193	-0.011	0.027	0.027	0.000
1997	6381	9346	0.683	0.131	0.137	-0.005	0.028	0.028	0.000
1998	5578	8954	0.623	0.173	0.192	-0.018	0.026	0.026	0.001

Panel B

Period	Number of Banks			Total Capital Ratio			Nonperforming Loan Ratio		
	Examined	Industry	Fraction Examined	Examined	Industry	Difference	Examined	Industry	Difference
Pre-crunch	20534	41596	0.494	0.161	0.180	-0.019	0.055	0.054	0.001
Credit crunch	34085	49075	0.695	0.172	0.181	-0.009	0.043	0.043	-0.000
Boom	45514	60336	0.754	0.174	0.182	-0.008	0.028	0.028	0.000

Table 6: Changes Between Examinations in CAMEL Ratings and Classified Asset Ratios

Panel A

Year	Number of Banks	CAMEL			Total Classified Asset Ratio		Weighted Classified Asset Ratio	
		Upgrades	Downgrades	Constant	Decreases	Increases	Decreases	Increases
1986	472	0.131	0.119	0.750	0.523	0.477	0.511	0.489
1987	3816	0.187	0.155	0.658	0.583	0.417	0.591	0.409
1988	5426	0.161	0.168	0.672	0.576	0.424	0.586	0.414
1989	7258	0.157	0.158	0.685	0.554	0.446	0.563	0.437
1990	7905	0.127	0.175	0.698	0.526	0.474	0.533	0.467
1991	8072	0.135	0.171	0.694	0.513	0.487	0.522	0.478
1992	8729	0.182	0.113	0.706	0.557	0.443	0.564	0.436
1993	9364	0.230	0.060	0.710	0.675	0.325	0.678	0.322
1994	8777	0.182	0.063	0.755	0.701	0.299	0.691	0.309
1995	7754	0.164	0.067	0.769	0.645	0.355	0.643	0.357
1996	7194	0.149	0.066	0.784	0.589	0.411	0.575	0.425
1997	6277	0.127	0.079	0.794	0.576	0.424	0.568	0.432
1998	5422	0.095	0.100	0.805	0.557	0.443	0.553	0.447

Panel B

Period	Number of Banks Examined	CAMEL			Total Classified Asset Ratio		Weighted Classified Asset Ratio	
		Upgrades	Downgrades	Constant	Decreases	Increases	Decreases	Increases
Pre-crunch	9714	0.170	0.160	0.670	0.576	0.424	0.584	0.416
Credit crunch	31964	0.151	0.153	0.696	0.538	0.462	0.545	0.455
Boom	44788	0.165	0.070	0.764	0.633	0.367	0.627	0.373

Table 7
Variable Definitions and Sample Statistics for Supervisory Assessment Regressions

Name	Definition	Mean	Std. Dev.
	SUPERVISORY ASSESSMENTS OF BANK CONDITION		
Total Classified Assets	Proportion of loans classified as substandard, doubtful or loss.	.060	.065
Weighted Classified Assets	Weighted proportion of loans classified, weights of .2 on substandard, .5 on doubtful, and 1 on loss.	.015	.020
CAMEL 1	Dummy variable equal to 1 if CAMEL rating is a 1.	.275	.447
CAMEL 2	Dummy variable equal to 1 if CAMEL rating is a 2.	.521	.500
CAMEL 3	Dummy variable equal to 1 if CAMEL rating is a 3.	.128	.334
CAMEL 4 or 5	Dummy variable equal to 1 if CAMEL rating is a 4 or a 5 (combined because there were so few 5s).	.075	.264
CAMEL SATISFACTORY	Dummy variable equal to 1 if CAMEL rating is a 1or a 2.	.797	.403
CAMEL UNSATISFACTORY	Dummy variable equal to 1 if CAMEL rating is a 3, 4, or 5.	.203	.143
	TIME DUMMIES		
1986-1988	Pre-Crunch Period. This is excluded as the base period in the regressions.	.216	.412
1989-1992	Credit Crunch Period.	.370	.483
1993-1998	Banking Boom Period.	.414	.493
Individual Year dummies	Included in some regressions.		
	LAGGED SUPERVISORY ASSESSMENTS		
Lagged Total Classified Assets, Weighted Classified Assets, CAMEL 1, CAMEL 2, CAMEL 3	Lagged values of supervisory assessments for banks with prior examination data, set to zero otherwise (see no lagged examination data variable).		
Time Since Last Recorded Examination	Years since last recorded examination, set to zero if no prior data (see no lagged examination data variable).	.994	.701
No Lagged Examination Data	Dummy variable equal to 1 if no lagged examination data are available.	.106	.308

Table 7 (continued)
Variable Definitions and Sample Statistics

Name	Definition	Mean	Std. Dev.
	SUPERVISORY AGENCY		
OCC	Dummy variable equal to 1 if the OCC was the lead agency in the exam.	.248	.432
FDIC	Dummy variable equal to 1 if the FDIC was the lead agency in the exam.	.366	.482
FRB	Dummy variable equal to 1 if the FRB was the lead agency in the exam.	.078	.268
STATE	Dummy variable equal to 1 if State Agency or Other Federal agency. This is excluded as the Base case.	.308	.461
	BANK SIZE VARIABLES		
Ln(GTA)	Natural log of Gross Total Assets.	11.039	1.221
SIZE1	Dummy variable equal to 1 if GTA≤ $100 million (excluded from regressions as base case).	.723	.448
SIZE2	Dummy variable equal to 1 if $100 million < GTA ≤ $1 billion.	.245	.430
SIZE3	Dummy variable equal to 1 if $1 billion < GTA ≤ $10 billion.	.028	.164
SIZE4	Dummy variable equal to 1 if $10 billion < GTA.	.004	.065
	BANK BALANCE SHEET AND INCOME ITEMS		
	Total Capital Ratio, Tier 1 Capital Ratio, Leverage Capital Ratio, Real Estate Loans/Total Loans, Nonperforming Loans/Total Loans, Off-balance Sheet Items/Total Loans, Other Real Estate Owned/Total Loans, Return on Assets, and Volatile Liability Dependence. All are lagged and all are included as level, trend, and peer group percentile rank.		

Table 7 (continued)

Variable Definitions and Sample Statistics

Name	Definition	Mean	Std. Dev.
	STATE AVERAGES OF BALANCE SHEET AND INCOME ITEMS TORS		
	State averages of the same variables as the bank balance sheet and income items. These variables are also lagged and all are included as level, trend, and peer group percentile rank.		
	OTHER ECONOMIC ENVIRONMENT INDICATORS		
	Regional Dummies, State Income Growth and State Unemployment Rate.		
	FUTURE PERFORMANCE		
Future Nonperforming Loans	Leads of 1, 2, and 3 years included in regressions. Mean for lead 1 shown.	.038	.036
Future Charge-offs	Leads of 1, 2, and 3 years included in regressions. Mean for lead 1 shown.	.005	.035
Future Total Capital Ratio	Leads of 1, 2, and 3 years included in regressions. Mean for lead 1 shown.	.169	.078

Table 8
Regressions of Supervisory Assessments with Period Dummies

	Total Classified Assets				Weighted Classified Assets				CAMEL			
Variable	Estimate	Std. Error	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.
1989-1992	0.005211	0.017926	0.01003	0.018817	**0.046267**	0.018059	**0.057193**	0.018726	**-0.3355**	0.0418	**-0.1979**	0.0489
1993-1998	**-0.16131**	0.030755	**-0.13853**	0.033097	**-0.15451**	0.030464	**-0.11518**	0.032515	**-0.1695**	0.0719	-0.1268	0.0863
Lagged classified assets	**10.29125**	0.112903	**8.977898**	0.12419	**25.51462**	0.400763	**21.73203**	0.435849	**10.9414**	0.3002	**10.4541**	0.3654
Lag CAMEL1	**0.47908**	0.028467	**0.42174**	0.03119	**0.103299**	0.029719	**0.084658**	0.032084	**6.2138**	0.0674	**6.1182**	0.0823
Lag CAMEL2	**0.699025**	0.026069	**0.60777**	0.02823	**0.405948**	0.027581	**0.339049**	0.029372	**3.6971**	0.0609	**3.6969**	0.0731
Lag CAMEL3	**0.543288**	0.023706	**0.464806**	0.025212	**0.385124**	0.025478	**0.334712**	0.026676	**1.9102**	0.052	**1.9106**	0.0618
Years since last exam	**-0.16398**	0.005336	**-0.09785**	0.007457	**-0.1304**	0.00555	**-0.06696**	0.007341	0.018	0.0143	-0.00672	0.0192
No prior exam	**0.744434**	0.031395	**0.806143**	0.034212	**0.283331**	0.032533	**0.359236**	0.034756	**4.4846**	0.0766	**4.5068**	0.0919
OCC	**0.159995**	0.010574	**0.168187**	0.013095	**0.151008**	0.010116	**0.154065**	0.012467	**-0.2793**	0.0242	**-0.3743**	0.0318
FDIC	**0.11576**	0.007679	**0.14295**	0.008797	**0.115969**	0.007836	**0.15533**	0.008961	**-0.3258**	0.0208	**-0.3874**	0.0259
FRB	-0.00341	0.014849	0.008097	0.016897	0.024116	0.01436	0.024877	0.016248	**-0.1479**	0.0347	**-0.1559**	0.0431
Total classified assets									**-82.938**	0.6564	**-85.358**	0.8218
NPF, t+1			**2.797067**	0.194073			**3.352305**	0.214042			-0.00768	0.9653
NPF, t+2			**0.559802**	0.201674			**0.965655**	0.217772			-1.4128	0.9934
NPF, t+3			**0.549363**	0.173385			-0.27295	0.188366			**-4.2268**	0.8816
Charge-offs, t+1			**1.293406**	0.192597			**1.68188**	0.224471			**-20.087**	1.9758
Charge-offs, t+2			**2.142689**	0.335742			**2.430947**	0.397049			-0.4434	2.0324
Charge-offs, t+3			**0.611406**	0.21981			-0.00928	0.184508			3.9199	2.1816
Total Capital, t+1			**0.454978**	0.116291			0.126771	0.148643			**2.1243**	0.4814
Total Capital, t+2			**0.576912**	0.123038			**0.917427**	0.157945			**-1.2946**	0.4949
Total Capital, t+3			-0.04714	0.095274			-0.36475	0.118142			-0.2707	0.3772
Adj. R-sq	0.5202		0.5312		0.5027		0.5182					
Obs	107395		67425		107395		67425		107396		67426	
-2 Log L									101354.96		64756.72	

All of these regressions also include the following variables from the bank's Call Report: Total Capital Ratio, Tier 1 Capital Ratio, Leverage Capital Ratio, Real Estate Loans/Total Loans, Nonperforming Loans/Total Loans, Off-balance Sheet Items/Total Loans, Other Real Estate Owned/Total Loans, Return on Assets, and Volatile Liability Dependence. All are lagged and all are included as level, trend, and peer group percentile rank. State averages of all of these items (lagged levels, trends, and peer group percentile ranks). State Income Growth and the State Unemployment Rate are also included in all regressions.

The **bold-faced type** indicates statistical significance at the 5% level, two-sided.

Table 9

Regressions of Changes in Lending and Assets on Lagged Changes in Supervisory Assessments and Other Variables

	ΔC&I loans		**ΔReal Estate loans**		**ΔInstallment loans**		**ΔU.S. Treasuries**		**ΔGross Total Assets**	
Variable	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.
1988	-0.0015	0.00114	0.002607	0.001653	**0.002231**	0.001008	**0.012822**	0.001729	**-0.09668**	0.014974
1989	**-0.00293**	0.000906	**0.003247**	0.001313	**0.002629**	0.000801	**0.01308**	0.001374	**-0.08817**	0.011897
1990	**-0.00249**	0.000978	0.001078	0.001418	**0.002106**	0.000865	**0.021528**	0.001484	**-0.07921**	0.012847
1991	**-0.00547**	0.000868	**0.002569**	0.001257	**-0.00152**	0.000767	**0.023579**	0.001316	**-0.08796**	0.011391
1992	**-0.00351**	0.000899	**0.00462**	0.001302	**-0.00242**	0.000795	**0.027741**	0.001363	**-0.06352**	0.011802
1993	**-0.00224**	0.000932	**0.004634**	0.001351	0.000208	0.000824	**0.023088**	0.001413	**-0.071**	0.012238
1994	-0.00119	0.000897	**0.003448**	0.0013	**0.00389**	0.000793	**0.026555**	0.00136	**-0.0726**	0.011779
1995	**0.002087**	0.000916	0.002035	0.001327	**0.004961**	0.00081	**0.011197**	0.001389	**-0.06194**	0.012027
1996	**0.001892**	0.000878	**0.002887**	0.001273	**0.003276**	0.000777	**0.01199**	0.001332	**-0.05113**	0.011532
1997	**0.002663**	0.000926	**0.011934**	0.001342	**0.00199**	0.000819	0.000216	0.001404	0.017994	0.012157
1998	**0.002332**	0.000816	**0.01318**	0.001182	0.00018	0.000721	**-0.00477**	0.001237	**0.070603**	0.010709
CAMEL upgrade, t-1	**-0.00437**	0.000354	**-0.00178**	0.000514	**-0.00347**	0.000313	**0.002534**	0.000537	-0.00173	0.004653
CAMEL upgrade, t-2	-0.00057	0.000363	**-0.00346**	0.000526	-0.00023	0.000321	0.000831	0.00055	**-0.01895**	0.004763
CAMEL upgrade, t-3	0.000158	0.000357	**-0.00091**	0.000518	0.000357	0.000316	-0.00016	0.000542	-0.00329	0.004692
CAMEL downgrade, t-1	**-0.00088**	0.000432	**0.010906**	0.000625	**0.001593**	0.000382	**-0.0027**	0.000654	**0.060737**	0.005666
CAMEL downgrade, t-2	**-0.00137**	0.000447	**-0.00258**	0.000647	0.000706	0.000395	**0.003478**	0.000678	**-0.03283**	0.005867
CAMEL downgrade, t-3	**-0.00137**	0.000444	**-0.00147**	0.000644	-0.00046	0.000393	**0.002855**	0.000674	**-0.0222**	0.005835
Change in total classified assets, t-1	**-0.02704**	0.003844	**-0.08794**	0.005569	**-0.05641**	0.003398	**0.037958**	0.005828	**-0.39303**	0.050464
Change in total classified assets, t-2	**-0.0421**	0.003973	**-0.03533**	0.005757	**-0.03303**	0.003513	**0.028004**	0.006024	**-0.14216**	0.052161
Change in total classified assets, t-3	**-0.01597**	0.003834	**-0.01775**	0.005555	**-0.01677**	0.00339	0.009414	0.005813	**-0.18002**	0.050334
Adj R-sq	0.0309		0.0366		0.0202		0.0449		0.0194	0.0309
Obs	79960		79960		79960		79960		79960	79960

All of these regressions also include three years of lagged changes of the following balance sheet variables: Total Capital Ratio, Tier 1 Capital Ratio, Leverage Capital Ratio, Real Estate Loans/Total Loans, Nonperforming Loans/Total Loans, Off-balance Sheet Items/Total Loans, Other Real Estate Owned/Total Loans, Return on Assets, and Volatile Liability Dependence. Three years of lagged changes of the state averages of all of these items as well as three years of lagged changes of state averages of CAMEL and total classified assets, State Income Growth and the State Unemployment Rate are also included in all regressions.

The **bold-faced type** indicates statistical significance at the 5% level, two-sided.

Table 10

Regressions of Changes in Performance on Lagged Changes in Supervisory Assessments and Other Variables

	ΔNonperforming Loans		**ΔCharge-offs**		**ΔTotal Capital**	
Variable	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.
1988	-0.0008	0.000505	**-0.00086**	0.000391	**0.011116**	0.001117
1989	-0.00066	0.000401	3.41E-05	0.00031	**0.012442**	0.000888
1990	-0.00039	0.000433	-0.00019	0.000335	**0.00857**	0.000959
1991	-0.00031	0.000384	0.000207	0.000297	**0.013028**	0.00085
1992	**-0.0009**	0.000398	0.000461	0.000308	**0.016657**	0.000881
1993	-0.00048	0.000412	-4.9E-06	0.000319	**0.014444**	0.000913
1994	-0.0004	0.000397	6.26E-05	0.000307	**0.010648**	0.000879
1995	4.54E-05	0.000405	0.000406	0.000314	**0.009896**	0.000898
1996	-0.00024	0.000389	0.000339	0.000301	**0.00954**	0.000861
1997	-0.00027	0.00041	0.000221	0.000317	**-0.02143**	0.000907
1998	**-0.00072**	0.000361	0.000211	0.000279	**0.014723**	0.000799
CAMEL upgrade, t-1	**-0.00108**	0.000157	**-0.00044**	0.000121	**0.006821**	0.000347
CAMEL upgrade, t-2	**-0.00062**	0.00016	**-0.00036**	0.000124	**0.001418**	0.000355
CAMEL upgrade, t-3	**-0.00066**	0.000158	**-0.00042**	0.000122	4.66E-05	0.00035
CAMEL downgrade, t-1	**0.001639**	0.000191	**0.001638**	0.000148	**-0.00736**	0.000423
CAMEL downgrade, t-2	**0.000592**	0.000198	**0.000402**	0.000153	-0.00022	0.000438
CAMEL downgrade, t-3	**-0.00051**	0.000197	**-0.00068**	0.000152	**0.001562**	0.000435
Change in total classified assets, t-1	**0.083329**	0.0017	**0.026872**	0.001317	**0.03454**	0.003766
Change in total classified assets, t-2	**0.019455**	0.001757	**0.011038**	0.001361	**0.016247**	0.003892
Change in total classified assets, t-3	**-0.00539**	0.001696	**-0.00696**	0.001313	**0.013343**	0.003756
Adj R-sq	0.0882		0.0226		0.4184	
Obs	79959		79960		79960	

All of these regressions also include three years of lagged changes of the following variables: Total Capital Ratio, Tier 1 Capital Ratio, Leverage Capital Ratio, Real Estate Loans/Total Loans, Nonperforming Loans/Total Loans, Off-balance Sheet Items/Total Loans, Other Real Estate Owned/Total Loans, Return on Assets, and Volatile Liability Dependence. Three years of lagged changes of the state averages of all of these items as well as three years of lagged changes of state averages of CAMEL and total classified assets, State Income Growth and the State Unemployment Rate are also included in all regressions.

The **bold-faced type** indicates statistical significance at the 5% level, two-sided.