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Supervisory Discipline and Bank Capital Management: Evidence from Before, During, and After the Crisis

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Supervisory Discipline and Bank Capital Management: Evidence from Before, During and After the Crisis*

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Abstract

This paper investigates the effect of supervisory discipline on bank capital management over the years immediately before, during and just after the recent crisis. It is the first study to consider the effects of informal supervisory enforcement actions. These actions are not only much more numerous than the formal enforcement actions used in previous studies, but they are also typically confidential whereas formal enforcement actions must be public. Pre-crisis, results support the capital management effects of informal actions and find that using only information on formal actions leads to substantial bias. During the crisis, formal actions became a much more effective tool for slowing declines in a bank's capital ratios and informal actions were relatively less potent. TARP capital also helped quicken a bank's adjustment speed to its capital target during the crisis, but appears to slow this speed post-crisis. Post-crisis, while it appears that the effects of enforcement actions are moving back toward the "normal" times of the pre-crisis period, the statistical relationship between supervisory discipline and capital management is less clear.

Keywords *Banks; Capital Regulation; Enforcement Actions; Regulatory Discipline*

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1 Introduction

The financial crisis that began in late 2007 led to the failure of 322 U.S. commercial banks and thrifts by the end of 2010, dramatically more than the 58 failures that occurred in the 13 years since the end of the previous crisis.[1] While analysts have advanced many causes for the most recent crisis, insufficient supervisory discipline of banks is one of the most frequently textcited. Indeed, many policymakers have argued, and the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank Act) mandates, that stronger supervisory discipline must be a core post-crisis reform (Bair, 2011; Bernanke, 2011).

This paper empirically investigates the relationship between supervisory discipline and bank capital management in the 12 years before the most recent crisis (1996 - 2007), the three "core" years of the crisis (2008 - 2010), and four post-crisis years (2011 - 2014). The approach relates proprietary supervisory data as well as public data to the speed of banks' capital adjustment toward a target capital level. Our primary motivation is to contribute to the debate about the effectiveness of supervisory discipline. However, an important secondary rationale derives from the debate over an additional objective of on-going financial reform – the need to encourage market discipline of banking organizations.[2] Specifically, if supervisory discipline is ineffective, then the case for encouraging market discipline is that much stronger. On the other hand, if supervisory discipline is even somewhat effective, and if clues can be discovered for its effects on how banks manage their capital, then the case for improving both supervisory and market discipline is strengthened. For all of these reasons, empirical evidence on the effectiveness of supervisory discipline is critical.

While our study builds on previous literature, we add a number of important

[1] In the rest of this paper we refer to banks and thrifts as "banks".

[2] Important examples of such policies include Dodd-Frank's mandate for the orderly resolution of systemic financial institutions and on-going discussions among bank supervisors of requiring systemic bank holding companies to hold minimum amounts of unsecured debt (Gruenberg, 2015; Tarullo, 2014).

advances. First, this is the first study to consider how informal (therefore typically non-public) supervisory enforcement actions affect U.S. banks' management of their capital levels.[3] Previous studies have used formal (therefore public[4]) enforcement actions, supervisory ratings and rating changes, and sometimes the frequency of bank examinations as measures of supervisory discipline. As discussed more fully below, we believe that informal enforcement actions, when combined with other previously considered information, provide a superior measure of supervisory discipline. Both types of enforcement actions are informative; ignoring one may bias any results through model misspecification. Second, this is the first paper to examine the effects of supervisory discipline in the United States on bank capital management over the years immediately before, during, and just after the recent crisis. Previous studies most similar to ours rely on samples that end just as our data begin. Third, most previous research was often chiefly concerned with the effects of supervisory discipline on credit supply – whereas our focus is on banks' management of capital. Lastly, it is widely hypothesized, and research tends to support the view, that crisis and non-crisis periods exhibit substantially different behaviors by banks and their supervisors (Berger, Kyle, et al., 2001; Curry, Fissel, et al., 2008; Krainer and Lopez, 2009). We present contemporary evidence supporting this conventional view.

Pre-crisis, our results strongly support the effects of non-public, informal actions and the view that only using information provided by public actions substantially overestimates the effects of those formal actions. In addition, banks appear to have had strong incentives to achieve their capital targets while they were in the prompt-corrective-action (PCA) "well-capitalized" zone. During the crisis, formal actions became a relatively more effective tool for slowing declines in a bank's capital ratios and informal actions were relatively less important. Many banks

[3]Berger, Bouwman, et al. (2016) use non-public supervisory data to study the effects of supervisory discipline on German banks from 1999 through 2009. They do not study U.S. banks.

[4]The Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA) required that all formal enforcement actions be made public. See Brunmeier and Willardson (2006) for additional details.

seem to have had even stronger incentives to stay within the well-capitalized or adequately capitalized PCA zones during the crisis than they did pre-crisis. This could indicate that banks expected more scrutiny or more conservative regulation, or that there was less flexibility in profitable capital levels. In addition, TARP capital helped quicken the pace at which a bank adjusted to its target capital ratio. Post-crisis, while it appears that the effects of enforcement actions are moving back toward the "normal" times of the pre-crisis period, the relationship between supervisor discipline and capital adjustment is less clear. Results for indicators of a bank's position in the prompt corrective action capital zones remain strong and suggest that, post-crisis, banks may feel the need to be much more aggressive in retaining higher capital ratios. However, the retention of TARP capital appears to slow a bank's adjustment of its capital ratios.

The paper proceeds as follows. Section 2 briefly reviews the literature. Section 3 defines our sample of banks, motivates our use of three periods, discusses our enforcement action (EA) measures of supervisory discipline, and discusses the implications for our empirical models. The next section provides descriptive statistics for our sample of EAs from 1996 through 2014 and discusses their implications for our empirical analysis. Section 5 presents our partial adjustment analytical model for examining the effects of EAs. Section 6 defines our measures of bank capital and other variables and presents our empirical results. The concluding section summarizes the results and their policy implications.

2 Literature Review

Several studies of supervisory discipline have examined its effects on bank capital. Other papers have focused on the closely- related topic of supervisory discipline's effects on bank credit supply, and this remains an area of active research interest.[5]

[5]See, for example, Danisewicz et al. (2016), Hwa et al. (2017), K. Kiser et al. (2015), Curry, Fissel, et al. (2008), Berger, Kyle, et al. (2001), Peek and Rosengren (1995, 1996), and Roman (2016).

A small number of papers have considered whether supervisors have either better or different information than market participants (Berger, Davies, et al., 2000), whether bank supervisory ratings are cyclical (Krainer and Lopez, 2009), and whether depositors care about enforcement actions (Gilbert and Vaughan, 2001). The literature has also documented patterns of EAs across time and banking agencies (Hill, 2012) and examined the potential for supervisory data to improve macroeconomic forecasts (Peek, Rosengren, and Tootell, 1999).

The first study of the effects of supervisory discipline on bank risk considered the issue only indirectly.[6] Gilbert (1993) was concerned primarily with whether the Federal Deposit Insurance Corporation Improvement Act's (FDICIA) requirement of more frequent bank examinations, enacted in late 1991, would lower expected losses to the bank insurance fund (BIF). He used data on 815 bank failures between 1985 and 1990 to investigate the effects of examination frequency on the BIF loss rate, bank asset growth, dividend payments, equity, and nonperforming loans to total assets ratios. Overall, he found that BIF losses were smaller at banks that supervisors examined more frequently.

Two papers by Peek and Rosengren (1995, 1996) considered risk more directly and analyzed the effects of formal enforcement actions on FDIC-insured banks in New England from 1989 through 1994. These authors used a bank's (leverage) capital ratio as their measure of risk, but their primary concern was with EA effects on measures of bank lending. During this crisis, New England banks were under intense pressure to raise capital and reduce certain types of real estate lending, and one-third of the banks came under formal EAs. Peek and Rosengren (1995, 1996) found that New England banks generally had great difficulty improving their capital ratio after an EA even though they shrank their loan portfolios substantially more than they would have without a formal EA.

The partial-adjustment empirical framework we use is similar in structure to the analysis used by Berger, DeYoung, et al. (2008). Though not their primary

[6] Data on formal enforcement actions only began to be reported publicly in 1989.

focus, these authors analyze the effect of supervisory action (in the form of BOPEC ratings) on banks' capital management. Using data from large, US bank holding companies between 1992 and 2006, they show that these banks actively managed their capital. Moreover, they show that banks' adjustment speed towards their individual target capital levels depended critically on the banks' capital positions relative to regulatory thresholds. Though not our main focus, this second finding is confirmed here, in spite of using data from a different time period and covering different institutions.

As part of its study of the banking crisis of the 1980s and early 1990s, the Federal Deposit Insurance Corporation (1997) briefly examined the effects of formal EAs on four risk variables: asset growth, dividend restrictions, capital injections and loan loss provisions. Their results are consistent with the view that banks subjected to formal EAs reduced their risk to a greater degree than did banks not subject of a formal EA.

Dahl et al. (1998) examined the effects of on-site bank examinations (and external audits) on two risk measures: the timing of loan charge-offs and provisioning for loan losses. Their sample included annual observations on almost all commercial and savings banks between 1987 and 1997. While Dahl et al. (1998) did not explicitly consider EAs, their measure of supervisory discipline suggested that bank examinations "had a significant and positive effect upon commercial and industrial loan-loss recognition."

Curry, O'Keefe, et al. (1999) addressed the effects of formal EAs on bank risk. Their sample included all FDIC-supervised banks from 1978 through 1998, separated into three regimes. Regression and other models were used to examine the effects of formal EAs on measures of bank performance (risk) including loan-loss provisions, net loan charge-offs, asset growth and capital injections. The authors' regression models control for supervisory ratings and rating changes, and for prior period measures of loan quality and equity capital. They found that

formal enforcement actions had statistically significant risk-reducing effects on bank performance measures that, in their view, are under a "high degree" of management control. These measures include loan-loss provisions, net charge-offs and dividends. Statistically significant effects were not found on measures over which, in their view, bank management has "relatively limited control", such as external capital injections and asset growth. Their results also suggest that EA effects were rather short-lived, typically for two quarters or less.

Berger, Bouwman, et al. (2016) use annual data provided by the German central bank on virtually all German banks from 1999 through 2009. Importantly, the data include non-public information on "regulatory interventions" by German regulators. The authors estimate that both supervisory discipline and direct capital injections reduce bank risk taking.[7]

Delis et al. (2017) use data on formal enforcement actions taken by all three U.S. federal banking agencies against U.S. banks between 2000 and 2010. Using a difference-in-differences approach with quarterly data, these authors find that formal enforcement actions "curtail the punished banks' risk-taking incentives in the year after such actions," although the banks risk-based capital ratios are not improved, particularly at "the very large, systemic banks".[8] In addition, the authors' findings suggest that formal enforcement actions tend to come too late, perhaps on the order of four to six months, and that "timely enforcement actions appear to possess a superior stabilizing effect on banks' financial safety and soundness."[9]

Roman (2016) examines the effects of formal enforcement actions on loan contracts. The analysis covers 1989 through 2011 and formal enforcement actions targeting 39 banks. The author finds a significant decrease in loan interest rates following enforcement actions. Other non-price loan terms also become more

[7]The primary focus of Berger, Bouwman, et al. (2016) is the effects of interventions on so-called "liquidity creation", a broad measure of the production of loans and other on- and off-balance sheet financial products.

[8]See Delis et al. (2017), page 37.

[9]See Delis et al. (2017), page 38.

favorable to the borrower.

On balance, previous research, most of which is based on the bank and thrift crisis of the 1980s and early 1990s, suggests that supervisory discipline has some risk reducing effects on bank behavior. This evidence is largely based on using formal, and therefore public, EAs as the primary measure of supervisory discipline. No previous studies of U.S. banks have considered the effects of informal, and therefore predominantly private, EAs.

3 Understanding the Data

This section describes our sample, puts it in the context of the broader banking industry, motivates our use of three sample periods, and discusses in some detail the types of EAs we use and the typical time-line, or process, for their initiation and enforcement. All of these factors are central to designing, and in some cases constraining, our estimation methodology.

3.1 Sample Banks and Periods

Our sample contains all state banks which are not members of the Federal Reserve System. For these banks, the FDIC is the primary federal regulator. We focus on banks with a composite supervisory rating of CAMELS[10] 2 through 5 at some point from 1996 through 2014. A bank's composite CAMELS rating is a non-public integer from 1 to 5 assigned to a bank by its regulator as part of the bank's safety and soundness examination. Banks rated 1 or 2 are considered to be either in excellent condition or fundamentally sound. As will be documented shortly, CAMELS 1 banks are virtually never subject to EAs and thus are excluded from our sample.[11] Banks rated 3 exhibit moderate to severe weaknesses but are deemed

[10]The letters in the CAMELS acronym stand for capital adequacy, asset quality, management, earnings, liquidity and sensitivity to market risk. For more on the CAMELS rating system, see Federal Financial Institutions Examination Council (1996).

[11]This is clearly documented in the top left panel of Table 4.

unlikely to fail; and banks rated 4 or 5 are considered to be either severely or critically, respectively, unsound with failure a distinct possibility. Banks rated 3 or higher are considered to be "troubled" by their supervisor. All data are from either non-public supervisory sources or public regulatory reports (Call Reports or TARP Transaction Reports) collected and published by the federal banking agencies.

Table 1 gives the total number of FDIC-supervised banks for each year of our study, the percent such banks are of the total number of U.S. banks, and the percent of total assets held in FDIC-supervised banks relative to the total assets of the banking industry. In every year, most U.S. banks are included in this sample, though they are on average smaller than the universe of all banks. Still, the assets contained in these banks are more than $2.5 trillion by the end of 2014. Column 2 shows that the percentage of U.S. banks for which the FDIC is the primary federal regulator has been rising gradually from about 54 percent in 1996 to 63 percent in 2014. Column 3 shows that over this period the percent of total banking industry assets held in FDIC-supervised banks has remained remarkably steady at about 18 percent, but still fell slightly from 20 percent in 1996 to 17 percent in 2014. Though the sample contains only state, non-member banks, any results will be applicable to *most* banks by the construction of the data. Further, there are strong reasons to expect a degree of similarity in the nature of supervisory discipline across regulators. The Federal Financial Institutions Examinations Council (FFIEC) was created for the express purpose of prescribing uniform standards for all state and federal regulators.[12] This council also conducts schools for examiners used by the five federal bank regulatory agencies, so that individual examiners will have similar instruction, irrespective of their agency.[13]

The sample period of 1996 through 2014 was chosen for three reasons: (1) the supervisor began systematic collection of separate categories of EAs (e.g.

[12]See Title X of the Financial Institutions Regulatory and Interest Rate Control Act of 1978 (FIRA), Public Law 95-630.

[13]See `www.ffiec.gov/about.htm` for more information.

"capital-related" EAs) in 1996, allowing cleaner analysis, (2) it begins well after implementation of the 1991 FDICIA, a major regulatory and supervisory reform, and (3) it includes a substantial number of pre-crisis years as well as the recent crisis/recession and post-crisis/recession periods.

We separate our time span into three periods: (1) pre-crisis (1996 through 2007), (2) crisis and recession (2008 through 2010), and (3) post-crisis/recession (2011 through 2014). With regard to our pre-crisis period, it is well known that changes in banking regulatory and supervisory regimes can have substantial effects on bank behavior.[14] In our case, FDICIA's reforms represented a major regime change for several reasons. Most importantly, supervisors were instructed to take "prompt corrective action" when a bank's regulatory capital ratios began to deteriorate; Congress mandated that the FDIC resolve a failed institution in the "least cost" manner for the deposit insurance fund; more frequent bank examinations were required; and banking agencies were told to make formal enforcement actions public. Any one of these changes could (and was intended to) change the behavior of both the bank and its regulator. Thus, it is quite likely that a study of supervisory discipline would find substantial differences in effects pre- and post-FDICIA. Since we are interested in the contemporary effects of supervisory discipline, we limit ourselves to the post-FDICIA supervisory regime.

We date the core years of the financial crisis and the ensuing "Great Recession" from 2008 through 2010. We begin in 2008 in part because our empirical model uses annual data and we want our first year of crisis observations to include fully the crisis and the ensuing recession, recognizing that the decline in house prices was underway by the fall of 2007 and the National Bureau of Economic Research dates the start of the recession in December 2007.[15] More importantly, in 2007 only three banks failed, and none because of the crisis, but the number of failures rose to 25 in 2008, 140 in 2009, and peaked at 157 in 2010. While the number of

[14] See Ashcraft (2008) and Covitz et al. (2004).
[15] See Bernanke (2010).

failures was still a relatively elevated 92 in 2011, it seems reasonable to argue that 2011 was well into the start of a definite improvement in the health of the banking industry.[16] In addition, passage of the Dodd-Frank Act in 2010 established in the minds of bankers and their supervisors that a new supervisory and regulatory regime was about to begin.

3.2 Definition of Supervisory Discipline

We define supervisory discipline as the issuance by the primary federal regulator of either an informal enforcement action (IEA) or a formal enforcement action[17] (FEA) resulting from a bank safety and soundness examination and directed at bank capital adequacy concerns.[18] We exclude enforcement actions associated with other areas, such as consumer protection and community reinvestment. IEAs and FEAs vary along several important dimensions. Perhaps the most important is the degree of public knowledge of the action; informal actions are not typically made public, while formal actions are required to be. The non-public nature of IEAs suggests that the effects of an IEA are likely to be relatively clean measures of supervisory discipline because such effects will be isolated from the confounding effects of any market discipline imposed on the bank that results from the public announcement of an EA.[19] Still, FEAs are potentially powerful instruments of supervisory discipline and are included in our analysis.

3.3 Types of Enforcement Actions

The supervisor may issue an IEA when a bank either is in a marginally unsatisfactory condition or is otherwise engaging in activities that raise significant

[16] There were 51 banks failures in 2012, 24 in 2013, and 18 in 2014.

[17] Also referred to as "formal administrative actions".

[18] Enforcement actions are categorized by the CAMELS component to which the action applies. In this case, we keep only actions pertaining to the "C" or capital adequacy component. Focusing only on actions referencing capital adequacy implies that these actions should have a direct effect on the adjustment speed between actual and target capital levels.

[19] Bennett et al. (2015) show that even smaller banks of the type that characterize our sample were subject to quantity market discipline during the crisis.

supervisory concerns. Informal actions are not enforceable in a court of law, and consist primarily of two types. A Bank Board Resolution (BBR) is the weakest form and is generally associated with a CAMELS 2 bank. A BBR is a declaration written by a bank's board of directors in consultation with the supervisor outlining a plan for correcting deficiencies. It identifies specific reforms and time-lines for implementing those reforms. Alternatively, a Memorandum of Understanding (MOU) is the strongest such IEA and is generally associated with CAMELS 3 banks. An MOU is a written agreement drafted by the supervisor and signed by the supervisor and each member of the bank's board. According to the FDIC, "[a]n MOU provides a structured way to correct problems at institutions that have moderate weaknesses, but have not deteriorated to a point requiring formal corrective actions."[20] It outlines specific actions a bank must take and sets deadlines for achieving those actions. Informal enforcement actions are treated as confidential information by the regulator. However, it is possible for the target bank to release the information, though this is atypical. For instance, if an enforcement action is a material event, the bank may be required to disclose to shareholders.

Two other important supervisory actions need to be considered for inclusion in a "broad" definition of IEAs: the timing of a bank's safety and soundness examination and the downgrading of a bank's CAMELS rating. CAMELS downgrades almost always occur at the end of a bank examination and neither the occurrence of the examination nor the CAMELS downgrade are made public. Importantly, while bank examinations do not necessarily result in adverse supervisory actions, a CAMELS downgrade is always a serious act of supervisory discipline. Still, unlike the "narrow" definition EAs discussed above, a CAMELS downgrade does not by itself require particular actions by the bank.[21] Because the timing of a CAMELS downgrade and a bank examination are approximately coincident, our empirical

[20]See the FDIC's *Risk Management Manual of Examination Policies* at `https://www.fdic.gov/regulations/safety/manual/`.

[21]We address this definitional problem by estimating a range of models that in some cases include only the narrow definition of an IEA and in others include the broad definition. Only the analysis using the broader definition is provided here, but the results hold in either case.

models do not account separately for a bank examination. CAMELS ratings are treated as confidential by the regulator and target institutions are strictly prohibited from releasing them in any form.

While formal actions are stronger than their informal cousins, FEAs also vary from relatively weak to quite strong directives. Unlike IEAs, formal actions are enforceable in a court of law. The 1989 passage FIRREA required that all FEAs be publicized.[22] A "Consent Order" (CO) – sometimes referred to as a "Cease and Desist Order" – identifies specific actions the bank must take and deadlines for correcting problems. Although the issues specified in a CO may be the same as those raised in a MOU, the language in a CO is often stronger and more specific. Moreover, a CO is issued after a hearing before an administrative law judge (the right to such a hearing is often waived by the affected bank). A CO remains in effect until it is ended or modified by the regulator or set aside by an administrative law judge. COs can be broader in scope than their name may suggest and usually require a range of actions to correct specific problems. A bank must normally have at least a CAMELS 4 rating to receive a a capital-related CO.

Prompt Corrective Action directives are another type of FEA. Under FDICIA, the FDIC is authorized to (and in some cases must) take increasingly severe actions against a bank as specific capital ratios fall below minimum regulatory levels. For example, PCA actions initially include relatively mild constraints such as prohibiting capital distributions (dividend payments) and limiting certain activities and progress to more severe requirements such as limiting growth, selling new equity shares, and either merging with another institution or being placed into an FDIC receivership.

Other types of FEAs include a menu of actions such as temporary COs, the suspension or removal of individuals from a bank's board, executive, or employee ranks, and civil money penalties. All of these are included in our definition of

[22]See Brunmeier and Willardson (2006) for details on changes from FIRREA and FDICIA and also on types of enforcement actions.

FEAs.

3.4 The Enforcement Action Process

Another important factor that complicates the estimation of supervisory discipline effects is the implications of the typical time-line for the bank examination, CAMELS rating, IEA, and FEA processes.[23] This "EA process" normally extends over about two years, but may stretch over a longer (shorter) period in particularly difficult (straightforward) cases.

For our purposes, it is useful to think of the EA process as proceeding in three stages. Since the process is somewhat complex, it may be useful to refer to Figure 1 which provides an illustrative diagram. In stage 1, a bank receives an on-site examination. If the examination discovers important problems, the bank's CAMELS rating may be downgraded and the bank may be notified of any impending EA. However, issuance of the EA normally takes time, typically less than three months but sometimes up to six. Thus, stage 2 begins when the supervisor actually issues the EA. In the interim between the examination and issuance of the EA, the bank may sometimes take actions to improve its financial condition. In stage 2, assuming the bank's problems are not too severe, the normal enforcement action would be an IEA. If the bank improves substantially over the coming months, stage 2 could be the end of the process. Moreover, a CAMELS downgrade and maintenance of the CAMELS rating at the new level may be sufficient to change the bank's behavior, thus eliminating the need for an additional IEA and ending the process at stage 2. However, if the bank's condition deteriorates and/or the IEA's requirements are not met, the EA process is likely to continue to stage 3.

In stage 3, a FEA is issued and additional CAMELS downgrades (usually to a 4 or 5) are likely to occur. In any event, during stage 3 the bank is subject to much

[23]Curry, O'Keefe, et al. (1999) provide a more detailed account of this process. We also benefitted from discussions with FDIC supervisory staff.

more intensive monitoring, including additional examinations, and supervisory discipline than in stage 2. Moreover, if the stage 1 bank examination reveals particularly serious deficiencies, stage 2 may be skipped altogether and the process may go directly from stage 1 to stage 3.

This description of the EA process guides our modeling and regression estimation procedures, discussed in Sections 5 and 6 below, in at least two important ways. First, separate indicator variables are included for IEAs and FEAs. As noted earlier, no other study of supervisory discipline makes this potentially critical distinction. Second, because the timing of the EA process is highly variable, complex, full of uncertain lags, and does not align with the timing of regulatory data collection, we limit our investigations to annual data. In this way, we attempt to "average through" many of the complex interactions that we know can and almost surely do occur, while still hoping to identify separate effects of the EAs.[24]

4 Descriptive Statistics of Enforcement Actions

To provide some context for the use of EAs, Table 2 describes the incidence of FDIC-imposed IEAs and Table 3 provides the same for FEAs. Beginning our discussion with Table 2, a distinctive cyclical pattern (there was a mild recession in 2001) is not apparent in the number of IEAs until the crisis years of 2008-2010 (shown in bold). The number of IEAs jumped by 49 percent between 2008 and 2009, peaked in 2010 (150 percent greater than in 2007) and fell back slightly in 2011. By 2014, as the crisis abated, the number of IEAs was less than 60 percent of the 2010 maximum. In addition, the percent of FDIC-supervised banks subject to at least one IEA, which had remained stable at around 1 percent from 2000 through 2007, jumped sharply in 2008 (to 4 percent) and 2009 (to 8 percent), peaking at more than 12 percent in 2010, and remained elevated through 2013.

[24] Use of annual data is common in the literature. See, for example, Berger, Kyle, et al. (2001), and Berger, DeYoung, et al. (2008).

One can see similar patterns in the time series of the number of FEAs (Table 3). However, on average, and in every year, both the number of FEAs and the percent of banks subject to at least one FEA are considerably smaller than the corresponding values for IEAs. As with the IEAs, the number of FEAs rose markedly in 2008. By 2009 the number of FEAs was higher than in 2007 by an order of magnitude (23 vs 245, respectively). This lagged pattern of FEAs relative to IEAs is consistent with the stages of the EA process described in the previous section. Table 3 also shows that COs are consistently the most common type of FEA, averaging 92 percent of FEAs over the 19 sample years.

Table 4 displays, for each year in our sample, the number of FDIC-supervised banks sorted by their CAMELS rating and, for each CAMELS-based group, the percentages of banks in each year with any type of EA, with an IEA and with a FEA. Several important observations emerge from Table 4. First, as referred to previously, essentially no CAMELS 1 banks have any type of EA. Indeed, the mean percentages to one decimal point for both types of EAs are zero over the 19 year sample.

In every year of our sample except 1996, there were CAMELS 2 banks with some type of EA. While the mean percent of CAMELS 2 banks with an EA was around 3 percent, the percent for each year after 2009 was substantially above the mean, peaking at more than 11 percent in 2012. Consistent with the EA process described above, the percentage of CAMELS 2 banks with an IEA was typically much larger than the percentage with a FEA. On average, 3 percent of the CAMELS 2 banks had an IEA, but less than a quarter of a percent incurred a FEA.

The jump in the incidence of EAs at CAMELS 3 banks relative to CAMELS 2 banks is, unsurprisingly, quite pronounced. For example, the mean percent of CAMELS 3 banks with an EA is around 43 percent, almost 14 times the mean at the CAMELS 2 banks. As with the CAMELS 2 banks, at the CAMELS 3 banks

the incidence of IEAs dominates the incidence of FEAs – the percent of IEAs is larger by a substantial margin in every year of the sample.

Also as expected, the average percent of CAMELS 4 and 5 banks with an EA is larger than that of any other group. However, this pattern reverses in 2011, reinforcing the importance of considering separately the post-crisis period. In sharp contrast to the CAMELS 2 and 3 banks, except for the first two years of the sample, the incidence of FEAs at the CAMELS 4 and 5 banks is always substantially greater than the incidence of IEAs. This is again consistent with the EA process described in Section 3.4, in which the financial condition of the CAMELS 4 and 5 banks is much worse and persistently poorer than the condition of the CAMELS 3 banks.

Lastly, the incidence of EAs, especially at the CAMELS 3 and CAMELS 4 and 5 banks, picks up in 2008 and remains elevated through at least 2012, well after the peak years of the crisis (2009 and 2010). This too is consistent with the EA process described above where it was noted that the EA process normally extends over about two years but may be longer in particularly difficult (e.g. during a major financial crisis and severe recession) cases.

Table 5 presents the dynamics of the CAMELS rating system. The table shows the empirical transition probabilities between the five CAMELS ratings and failure for each of the three time periods. The data show that, at least in the pre-crisis "normal" times, CAMELS ratings are quite sticky, where often the most likely future rating is the current rating. For example, in the pre-crisis period over 86 percent of the banks that were rated a CAMELS 2 in year t were rated 1 the next year. However, there are notable differences between the time periods. First and unsurprisingly, banks were much more likely to transition to worse ratings during the crisis. Thus, for example, during the crisis just under 81 percent of banks that were rated a 2 in year t were rated a 1 the next year. Second, ratings post-crisis have, once again, become more persistent. Thus, post crisis over 90 percent of

banks that were rated 2 in year t were rated a one the next year.

Table 5 also shows changes in the risk environment faced by banks in our periods of analysis. One direct measure of this is the number of failures per year. There were an average of four failures per year during the pre-crisis period. This escalates to 108 during the crisis, but returns to a lower level at 46 during the post-crisis period. These risks are shown by the transitions of banks' ratings from their one-year lagged status to a current status that has a CAMELS rating of 3 or above. Pre-crisis, less than one percent of 1-rated institutions transitioned to a 3, 4 or 5 rating from one year to the next. During the crisis, that transition likelihood more than doubled, rising to over two percent. After the crisis, the likelihood of such a downgrade fell back to below one percent.

The observations we have made regarding Tables 2 through 5 have several important implications for the specification of our empirical models. First, the data strongly reinforce the importance of accounting for both IEAs and FEAs. Studies that only use FEAs may well be subject to omitted variable bias. Second, the data emphasize the uniqueness of the crisis period for the number and type of EAs and the percent of banks subject to an enforcement action. Third, the data support the view that the post-crisis period is worthy of separate analysis. Lastly, the virtual absence of EAs of any type at CAMELS 1 banks, even during and after the crisis, strongly suggests that the financial condition of these banks is considerably better than that of banks in the other three CAMELS groups. Thus, we drop the CAMELS 1 banks from further consideration.

5 Partial Adjustment

The focus of our paper is on incorporating previously inaccessible data into the ongoing analysis of supervisory discipline and bank capital management. As such, our empirical model follows as closely as possible previously developed methods in the literature (see Flannery and Rangan (2006) and Berger, DeYoung, et al.

(2008), for examples). Following that literature, we model the dynamics of a bank's capital structure using a partial adjustment framework. Write the capital ratio for bank i at time t as $k_{i,t}$. Assume that each institution adjusts its current capital ratio towards its individual target capital ratio, $k^*_{i,t}$. Using the standard partial-adjustment framework, we then have

$$k_{i,t+1} - k_{i,t} = \lambda(k^*_{i,t+1} - k_{i,t}) + T_t + \delta_{i,t+1}, \tag{1}$$

where T_t is a yearly fixed effect and $\delta_{i,t+1}$ is a random error. The yearly fixed effects help to control for the overall economic environment faced by all banks. This is especially important given the widely varying macroeconomy over the sample period, though we also split the data into three distinct periods.

Clearly, banks' target capital levels , $k^*_{i,t}$, cannot be directly observed by the econometrician; it must instead be estimated. Following the literature, we allow the target capital be a function of bank-specific, time-varying factors: $X_{i,t}$ and a bank fixed effect B_i. In the first stage, we use Equation (2) (below) to get estimates for β and B_i. These are estimated using the generalized method of moments technique from Blundell and Bond (1998); this technique was analyzed in detail by Flannery and Hankins (2013), whose procedure we follow as closely as possible. That is, we estimate,

$$k^*_{i,t+1} = \beta X_{i,t} + B_i. \tag{2}$$

Thus, target capital is a function of bank specific on- and off-balance sheet characteristics and a bank-level fixed effect. Its primary purpose in our modeling is to "control" for the capital ratio a bank would seek to achieve on its own if it were not subject to any supervisory actions. Similar to the second step of Berger, DeYoung, et al. (2008)[25] (and mentioned in Flannery and Rangan (2006)), we

[25]Our method differs from Berger, DeYoung, et al. (2008) in that we consider the difference between current capital and lagged capital, rather than between current capital and a "do nothing

also let the adjustment speed, λ, vary based on other bank-specific characteristics. However, in contrast to their study, we want to test whether EAs affect the speed with which a bank adjusts toward its target capital ratio.

$$\lambda_{i,t} = \Lambda Z_{i,t}. \tag{3}$$

By substituting, we are left with the second stage regression given by

$$k_{i,t+1} - k_{i,t} = \Lambda Z_{i,t}(\beta X_{i,t} + B_i - k_{i,t}) + T_t + \delta_{i,t+1} \tag{4}$$

We then use the predictions from the first stage estimation, $\hat{k^*}$, for this second stage estimation. This provides estimates for the relative importance of the various factors, $Z_{i,t}$, including EAs, on banks' speed of adjustment towards their target capital. For estimation of the econometric model, we followed the "BB" technique described in Flannery and Hankins (2013).[26] As found by Flannery and Hankins (2013), this particular estimation technique has the advantage of being consistent across a range of potential endogeneity.[27] Moreover, those authors find that in such complex situations, "BB" is one of the most accurate of the estimators they consider. Specifically, we employ their two-step procedure, with a maximum of two lags and setting the explanatory variables as "predetermined".

In our analysis, we also allow for an asymmetry in adjustment speed.[28] It is

capital", a *pro forma* ratio which assumes that the bank maintains its dividend payments and number of shares from the previous year. We generally consider dividend payments and other capital distributions to be an integral part of capital management. Moreover, restrictions placed on banks by their regulator can directly influence the amount of dividends that the bank is permitted to pay. However, to the extent that capital pay-out levels remain the same, the exact assumption for the "do nothing capital", the difference would be subsumed in the estimated constant term, rather than manifesting as a difference in the modeled adjustment speeds.

[26]In Flannery and Hankins (2013) the "BB" technique is a specific implementation of the methods from Blundell and Bond (1998).

[27]To the extent that EAs and CAMELS ratings represent a "snap-shot" of bank safety and soundness, this supervisory discipline should be independent of future capital adjustment rates. To the extent that they are forward looking, our selected technique has been shown to be relatively robust to such conditions in the data.

[28]Results for the combined sample are also available. However, since allowing for asymmetry is more general and because there are marked differences between the asymmetric results, we believe reporting them separately is more informative.

conceivable that banks' capital management will differ whether they are above their target, and therefore seek to shed capital, or if they are under their target, and therefore seek to raise capital. Indeed, lowering capital is widely seen as easier than raising capital (e.g., an increase in dividends will lower capital). This asymmetry could be due to differences in the institutional mechanisms for raising versus lowering capital or in the different implications for management's risk appetite. Mechanically, we separate the estimation of Equation (4), after plugging in the estimated $k^*_{i,t+1}$, according to the sign of $k^*_{i,t+1} - k_{i,t}$. That is, whether or not the bank is below its target capital level ("below-target") or above its target capital level ("above-target").[29]

6 Empirical Analysis

We measure bank capital k using two measures: Base Capital is the ratio of total book equity to total book assets and the Leverage Ratio is the ratio of tier-1 risk-based capital to book assets.[30] During the crisis, market participants focused on such measures as being most relevant to the survival of the firm, and discounted the importance of the risk-based measures. Post-crisis, the emphasis on core equity has continued by banks, their regulators and market participants.[31]

Observations include only banks primarily regulated at the federal level by the FDIC and banks with a composite CAMELS rating of 1 are excluded. In addition, to avoid counting capital transfers between separately incorporated banks

[29]To the extent that stronger supervisory discipline itself leads to a higher capital target level, rather than how the bank manages its capital to get to that target, our measure of overcapitalization will understate the "truth" for banks which are more heavily disciplined by their supervisor. Likewise, in that case the real relationship will be understated for more lightly disciplined banks.

[30]See 12 CFR 324.2 for regulatory definitions of the risk-based capital measures.

[31]For example, the 2009 stress tests conducted by the Federal Reserve and other regulators focused on common equity because it "is the first element of the capital structure to absorb losses, offering protection to more senior parts of the capital structure and lowering the risk of insolvency" (Board of Governors of the Federal Reserve System (2009), page 2). The Basel III capital rules, adopted in the United States in July 2013, continued the regulatory emphasis on common equity tier 1 capital (see Board of Governors of the Federal Reserve System (2013)).

of a single "parent" holding company as net capital injections, we consider only institutions which are either under no holding company or a holding company controlling only a single bank. We exclude institutions chartered outside of the 50 United States, and if business loans or retail deposits are less than 0 percent or more than 100 percent of total assets, the observation is dropped.

Enforcement actions were filtered to include only actions based on safety and soundness examinations and focused on capital adequacy concerns.[32] In addition, actions without termination dates were assigned the mean duration of terminated actions. By number, these mostly represent missing data, but because all new, open actions will have no termination date, this will tend to bias durations downward. Finally, we exclude observations where the duration is greater than the 99th percentile and instances where the action start date is after the action termination date (likely data errors). To match our annual data, we define two indicator variables to be one if at any time during that year an IEA or an FEA was in effect, and zero otherwise. The definitions and sources for all variables are given in Table 6.

6.1 Results

We begin by comparing the average target capital ratio estimated in the stage 1 regression to the average actual capital ratio held by our sample banks. As indicated in Section 5, these targets depend upon individual bank on- and off-balance sheet variables and bank fixed effects, not explicit supervisory actions taken in response to a bank's financial condition.[33] Figures 2 and 3 show the means for each of our capital ratios used.[34] The solid lines give the means of the target ratios, while the dashed lines provide the means of the actual ratios.

[32]Further, we excluded Y2K-based actions, and some types of insurance terminations (8(P) and 8(Q)).

[33]Passive, general supervisory and regulatory constraints, such as minimum captital standards, are inevitably embedded in these variables.

[34]Berger, DeYoung, et al. (2008) also show comparable figures comparing actual and target capital levels.

Figures 2 and 3 reveal several important insights. First, it is immediately apparent that after beginning to rise in about 2000, mean target ratios of both capital measures began falling in the years just before and during the start of the crisis. Indeed, average target ratios did not return to pre-crisis levels for the base and leverage capital measures until 2010 or slightly later. Second, it is clear that during both the pre-crisis and crisis periods, banks on average are estimated to have preferred (absent explicit supervisory actions) to maintain lower capital ratios than they actually held. It is only in the post-crisis years that mean target ratios are regularly higher than the actual means.[35]

There are several possible explanations for these two patterns. Perhaps in the relatively prosperous pre-crisis years, banks generally felt little need to maintain high capital ratios and may have been trying to maximize the value of the federal safety net put option. During the crisis it seems reasonable to argue that most banks could neither raise capital nor sell assets fast enough to maintain or increase their capital ratios.[36] Post-crisis, perhaps the shock of the crisis, including the failure of many banks with their size and other characteristics, caused banks on average to desire higher capital ratios even without explicit supervisory action.

Whatever the banks' motivations, the observed patterns of target and actual capital ratios have important implications for the interpretation of the stage 2 coefficients on the enforcement action indicator variables. If banks would otherwise seek lower capital ratios, then effective enforcement actions would slow their progress towards that lower level. In our model's partial adjustment context, this means that when target capital ratios are below actuals, then the estimated effect of EAs on a bank's adjustment speed should be negative. Alternatively, when target capital ratios are above actuals, EAs should quicken a bank's adjustment toward its target and thus the estimated effect of EAs on adjustment speed should

[35] In all cases, the mean target capital ratios are well above the minimum levels defined as "adequately capitalized" for prompt corrective action.

[36] An extensive fire sale literature suggests that banks might be unwilling and/or unable to sell assets during a crisis. See Shleifer and Vishny (2011).

be positive. These alternative interpretations are explicitly accounted for in our bifurcated, asymmetric estimations.

6.2 Right-Hand Side Variables

Tables 7 through 12 provide our two-stage regression results. Column 1 of each table gives our results for the first-stage regression which, as indicated above, we use to compute a bank's target capital ratio as a function of selected on- and off-balance sheet characteristics plus bank fixed effects. Our choice of right-hand-side variables follows Berger, DeYoung, et al. (2008) where possible. Variables attempt to account for the initial amount of capital (however defined), a bank's size, liability and asset composition, and extent of off-balance sheet activity.

With the one exception of TARP balance (discussed below), the other right-hand-side variables follow Berger, DeYoung, et al. (2008). Seven indicator variables control for where a bank lies in various regulatory capital zones, all of which build off prompt corrective action definitions. The idea is that a bank's proximity to certain zones may influence the speed with which it attempts to reach its target capital ratio.

A new right-hand-side variable indicates whether the bank received TARP funds and, if so, whether a balance is currently outstanding.[37] This variable, obviously relevant only in the crisis and post-crisis periods, could clearly directly affect a bank's speed of adjustment. During the crisis many banks were under intense pressure to raise their capital ratios. Yet, at that time, outside capital was virtually impossible to raise and selling assets was especially unattractive or impossible. In that situation, a bank would likely only accept TARP funds if the funds would speed-up the bank's adjustment toward its target ratio. In this case, we would expect a positive sign on TARP. Post-crisis, the cushion provided by low-cost TARP funds would likely slow a bank's capital ratio adjustment.

[37] Under the Troubled Asset Relief Program (TARP), enacted in late 2008, banks of all sizes could apply for federal government equity injections. Data is was retrieved from the US Treasury's TARP "Transactions Report".

In each of the Tables 7 through 12, Columns 2 – 5 provide our stage 2 results for four specifications of the effects of enforcement actions on a bank's speed of adjustment toward its target capital ratio. Columns 2 and 3 give results for institutions which are above target capital, while Columns 4 and 5 give results for those below their target capital levels. Within these categories, we allow for further flexibility in the model specification. Columns 2 and 4 measures IEAs by adding two indicator variables which reflect whether a bank has experienced a CAMELS downgrade to 3 (DG3) or to 4 or 5 (DG45). Columns 3 and 5 replaces these latter two variables with indicator variables reflecting the level of a bank's CAMELS rating of 3 (CAM3) or 4 or 5 (CAM45). As discussed above, the expected sign of these variables do vary with the relationship between a bank's target and actual capital ratio. Lastly, each set of regressions is estimated separately for the three time periods we analyze and for each of the capital ratios.

Stage 1 uses all available observations to best estimate the target capital level. Stage 2 estimates parameters on adjustment speed, therefore across time. As such, the second stage requires two periods per observation. Thus, one quarter is lost between stages and the total observations from the above-target and below-target regressions in stage 2 will be slightly less than in Stage 1.

6.3 Target Capital Ratio: Stage 1

While not the focus of our analysis, the Stage 1 results generally support use of the variables we have selected. As an intermediate step, we have no strong priors regarding their signs. However, we would expect a high degree of statistical significance. In the pre-crisis period (Tables 7 and 8), three of the five variables are consistently significant: lagged capital, retail deposits, and business loans. During the crisis (Tables 9 and 10), four of the five variables are significant; the same variables as in the pre-crisis regressions plus size. After the crisis (Tables 11 and 12), both the number of statistically significant variables and the level of their

significance drop off a bit. At least two variables are significant at the 10 percent level or lower: lagged capital, size, and off balance-sheet assets (for base capital only).

6.4 Adjustment Speed to Target: Stage 2

Here we examine the Stage 2 regressions that estimate the effects of enforcement actions on a bank's speed of adjustment to its target capital ratio. For the reasons discussed in 5 and also at the end of Subsection 6.1, we run separate regressions for dependent variables with positive and negative values; that is, where the target ratio is above or below the actual ratio, respectively. Each of our three time periods is examined separately. We find that the enforcement actions have varying effects in each of the time periods considered and these effects differ between below-target and above-target banks. To condense the information from the numerous results, Table 13 gives average coefficient estimates from Stage 2 only and across the capital definitions for each time period in a single table. For legibility, the standard errors are omitted from the summary table, but the full tables contain all information on standard errors.

Pre-Crisis

Tables 7 through 8 report results for the pre-crisis period. Recall that a positive (negative) sign on an EA variable in the regressions indicates that enforcement actions typically sped (slowed) the movement of a bank's capital ratio towards the capital level targeted by the bank. As we show below, in the pre-crisis period, there is relatively more evidence to show that supervisory discipline acted to slow declines in capital, rather than to speed increases.

The banks that were undercapitalized relative to their target capital regressions have positive signs on the FEA and IEA estimated coefficients for the leverage ratio regressions, but mixed signs for the base capital ratio. Thus, the relationship

between banks seeking to increase their capital (those for which their actual capital was below their target), enforcement actions of either type do not seem to exhibit a clear relationship before the crisis. However, for the overcapitalized relative to target capital regressions (Tables 7 and 8), in both the base capital and leverage ratio equations, the coefficients on CAMELS downgrades are negative and significant. This shows that the capital adjustment toward their target capital level for these banks slowed down. That is, for banks which would have sought to lower their capital levels, informal enforcement actions are associated with slower capital adjustment. On balance, for the pre-crisis period these results support both the importance of informal actions (broadly defined) as an instrument of supervisory discipline and the view that studies that only use information on FEAs are likely to overestimate the importance of FEAs. Therefore, it is clearly important to control for these factors in a study of how banks adjust their capital structure.

Looking briefly at results for the indicators of a bank's position in prompt corrective action capital zones (in 7 for example), in the base equity and leverage ratio regressions where the target capital level is below actual, all the coefficients are positive and significant at the one percent level or lower. However, in regressions when the target level is above the actual capital level, the coefficient estimate switch from negative and significant to positive and significant as the capitalization category goes down (at the top category, the estimate is -0.58 and significant at 1 percent, while at the lower categories, the estimate is positive at varying levels of significance). Therefore, it is important to control for these factors in a study of how banks adjust their capital structure.

The Crisis

Tables 9 and 10 report regression results for the financial crisis. The enforcement action results for the crisis differ quite markedly from those of the pre-crisis

period. For example, in the above-target (overcapitalized) regressions of both the base equity and leverage ratio equations, the estimated parameters on supervisory discipline have mixtures of positive and negative and are never significant. However, in contrast to this and the pre-crisis result, the measures of supervisory discipline for below-target banks align more closely to their expected signs and are more often statistically significant in both Tables 9 and 10, especially for the CAMELS levels and downgrade variables. The supervisory discipline parameters for the below-target bank regressions follow their expected positive signs, except for the FEAs and only in the regressions containing the CAMELS levels.

The broad IEA coefficients for downgrades and CAMELS levels are both positive and highly significant in the below-target regressions. That is, supervisory discipline increased adjustment speed for banks which would seek to increase their capital levels. Moreover, magnitude of the parameters on 4 and 5 rated institutions are over three times larger than the parameters on 3 rated banks. This would imply that supervisory discipline was particularly associated with faster adjustment towards higher target capital levels in troubled banks.

In short, during the crisis, the effects of enforcement actions appear to have been quite different from the pre-crisis period, a result that is perhaps not surprising given the extraordinary nature of this period. In contrast to Peek and Rosengren (1995, 1996), the results suggest that during the most recent crisis supervisory discipline became more of a tool for speeding a bank's increase in its target capital ratio. One possible reason for this result may be that during the crisis, banks that became stressed, and for whom raising their capital ratios would have been difficult and costly, were particularly subject to supervisory discipline.

Results for the indicators of a bank's position in prompt corrective action capital zones are stronger in the crisis than they are pre-crisis only for banks whose target capital levels are above their actual levels. Relative to the pre-crisis period these banks had significantly larger coefficient differences at the one percent

level or greater. Also, banks whose target was above actual capital levels had significantly larger adjustment speed coefficients. For the regressions where target capital is below actual capital, columns 4 and 5, all of the coefficients in both of the equations for each capital ratio measures are positive and statistically significant at the one percent level or lower. Therefore, these results strongly reinforce the need to control for these factors in a study of bank adjustments to their capital structure and emphasize the unique environment of the crisis.

For the regressions for below-target banks, the TARP indicator variable is positive and significant at the one percent level or lower, except in one case where it is significant at five percent. Conversely, TARP is always insignificant in the above-target regressions. This result is intuitive since TARP was intended and designed to increase capital levels. Thus, our result strongly supports the view that TARP funds helped quicken the pace at which a bank receiving TARP funds adjusted *up* to its target capital ratio. Moreover, the results confirm the need to control for access to TARP funds in any study of bank capital structure during this period.

Post-Crisis

Tables 11 through 12 present results for the post-crisis period. The enforcement action results for the post-crisis period differ from those of both the pre-crisis and the crisis periods. While it appears that the effects of supervisory discipline are in some ways moving back toward the "normal" times of the pre-crisis period, the overwhelming impression is that the estimated effects of supervisory discipline remain less clear. In the post-crisis period, the results with respect to informal enforcement actions (broadly defined) are mixed. Indeed, on balance, the estimated effect of supervisory discipline on the speed of a bank's adjustment to either its target base equity or leverage ratio, is unclear whether or not it is above- or below-target.

The above-target regressions show that the FEA and IEA coefficients are negative. These IEA parameters are only marginally significant for the base capital regressions (Table 11) meaning that, ceteris paribus, this enforcement action slows the adjustment to target capital. The downgrade and CAMELS level parameters have mixed signs. The base capital regressions have positive coefficients for these parameters. The leverage ratio regression CAM45 coefficient is significant and agrees with their expected positive sign while CAM3 is negative. The IEA and FEA parameters for the below-target regressions have mixed signs. However, the CAMELS downgrade and level parameters do have the expected negative sign, though are not typically significant.

Results for the indicators of a bank's position in the prompt corrective action capital zones remain very strong, especially in the above-target regressions, reinforcing the need to control for and better understand such factors. This result is consistent with, for instance, Berger, DeYoung, et al. (2008). Moreover, the general pattern is maintained in each of the periods, both across capital position and target capital relative to actual capital. All of these coefficients in all of the equations for each of the capital ratio measures are positive and statistically significant at least at the one percent level in the above-target regressions. As was true in the previous two periods, statistical tests indicate that their magnitudes increase as a bank falls into lower capital categories. The capital adjustment coefficients are significantly greater than the higher capital groups for each capital category consecutively down to the significantly under-capitalized group in the above-target adjustment regressions and the under-capitalized group in the below-target regressions. This result suggests the very interesting (and hopeful) conclusion that, post-crisis, banks have felt the need to be much more aggressive in retaining higher capital ratios.

Post-crisis, the TARP indicator variable in all but one set of regressions is negative and statistically significant at the one percent level or better. This result is puzzling in that, while the relationship between TARP and capital adjustment

is clear during the crisis, the net effect of TARP in the years following the crisis is more uncertain.

7 Conclusion

This paper examines the effects of supervisory discipline, defined as supervisory enforcement actions, on bank capital management at banks before, during, and after the financial crisis and Great Recession. Unlike previous studies, we are able to distinguish between informal (non-public) and formal (public) enforcement actions. In addition, ours is the first study we know of to consider the effects of enforcement actions in the United States during and after the crisis.

In the pre-crisis period, our results strongly support both the capital management effects of informal actions and the view that studies using only information on formal actions are likely to substantially overestimate the importance of such actions. In addition, the evidence suggests that banks had strong incentives to achieve their capital targets while they were in the prompt corrective action "well-capitalized" category.

During the crisis, we find that formal actions became a much more effective tool for slowing declines in a bank's capital ratios and informal actions were relatively less potent as an independent instrument of supervisory discipline. It also appears that during the crisis, many banks had even stronger incentives to stay within the well-capitalized or adequately capitalized prompt corrective action zones than they did pre-crisis. In addition, the acquisition of unprecedented TARP capital helped quicken the pace at which a bank adjusted to its higher target capital ratio.

Post-crisis, while it appears that the effects of enforcement actions are moving back toward the "normal" times of the pre-crisis period, the effects of supervisory discipline are more difficult to estimate. Results for indicators of a bank's position in the prompt corrective action capital zones remain strong and suggest that, post-crisis, banks may feel the need to be much more aggressive in retaining higher

capital ratios. However, the retention of TARP capital appears to slow a bank's adjustment of its capital ratios.

Our results strongly support the view that supervisory discipline has been and can continue to be an effective tool for managing bank capital levels. However, our results also find that understanding the role of supervisory discipline requires understanding the roles of both formal and informal supervisory activities, including CAMELS ratings. In addition, the crisis introduced new challenges to supervisors and banks, challenges that are still being worked out in the post-crisis period. Thus, policymakers should continue to improve the ability of both supervisory and market discipline to control bank risk.

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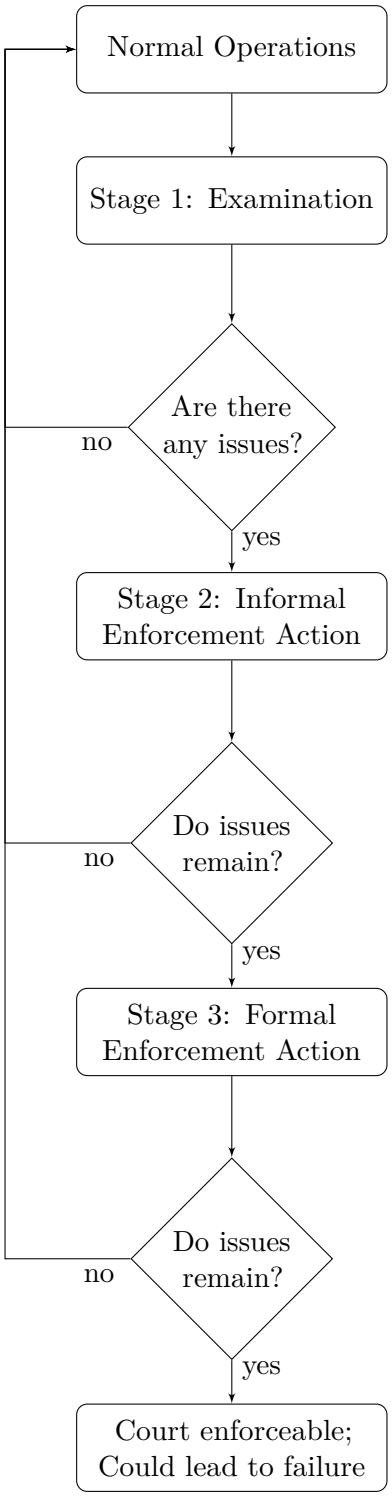

Figure 1: Highly stylized general progression of the enforcement action process. This diagram is provided for illustrative purposes only. It is applicable for the current analysis and for no other purpose.

Figure 2: Mean Target Base and Actual Capital Ratios

This figure charts the mean stage 1 estimated base (total equity) capital (to total assets) target ratio (solid line) for sample banks and the mean base capital actual ratio (dashed line) for those banks for each year from 1996 through 2014. Target ratios depend upon individual bank on- and off-balance sheet variables and bank fixed effects.

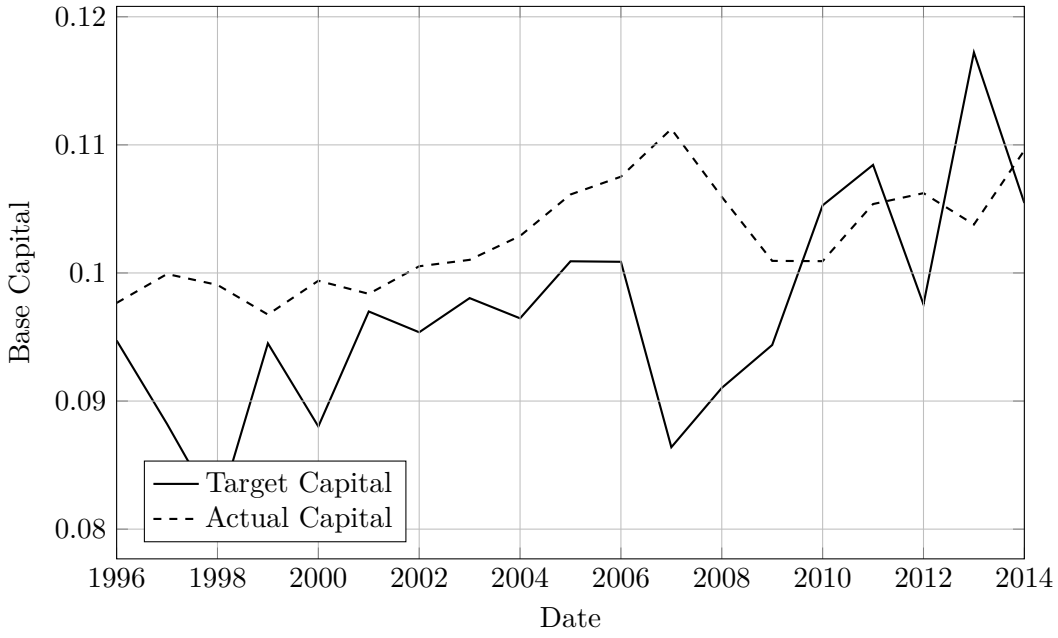

Figure 3: Mean Target Leverage and Actual Capital Ratios

This figure charts the mean stage 1 estimated tier-1 risk-based capital (to total assets) target leverage ratio (solid line) for sample banks and the mean actual leverage ratio (dashed line) for those banks for each year from 1996 through 2014. Target ratios depend upon individual bank on- and off-balance sheet variables and bank fixed effects.

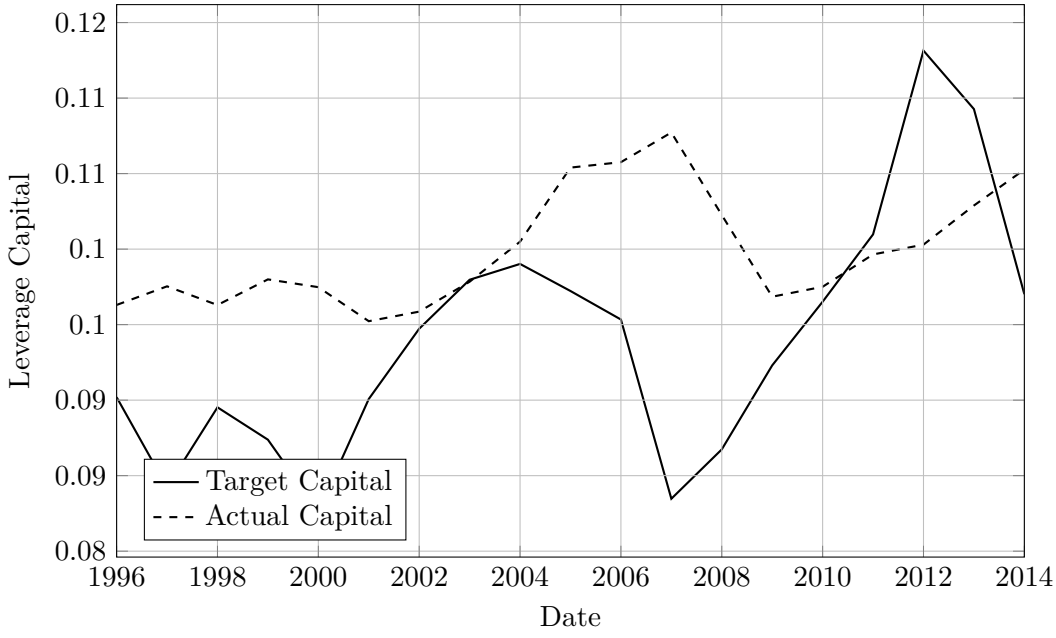

Table 1: FDIC Supervised Banks

This table shows, for each year from 1996 through 2014, the total number of FDIC-supervised banks (column 1), the percent this number is of the total number of U.S. banks (column 2), and the percent of total banking assets held in FDIC-supervised banks (column 3).

	Industry		
Year	Total FDIC Banks (#) (1)	Bank Coverage (%) (2)	Asset Coverage (%) (3)
1996	6,396	54.1	20.2
1997	6,135	54.3	17.9
1998	5,882	54.4	17.9
1999	5,756	54.5	18.5
2000	5,627	55.1	18.8
2001	5,497	55.0	18.8
2002	5,363	55.5	19.0
2003	5,328	56.4	19.5
2004	5,272	57.1	18.6
2005	5,253	57.9	18.8
2006	5,228	58.6	18.3
2007	5,205	59.3	16.7
2008	**5,103**	**59.6**	**16.4**
2009	**4,947**	**59.8**	**17.3**
2010	**4,721**	**59.5**	**16.9**
2011	4,604	60.2	16.9
2012	4,466	60.3	17.1
2013	4,318	60.3	17.2
2014	4,144	62.9	17.1
Mean	5,223	57.6	18.0
(std)	600	2.7	1.1

Table 2: FDIC Informal Enforcement Actions

This table shows, for each year from 1996 through 2014, the total number of FDIC informal enforcement actions (IEAs), the percentages of those actions that were Bank Board Resolutions (BBRs), Memoranda of Understanding (MOUs), and CAMELS downgrades (DGs), and the percent of FDIC-supervised banks with at least one IEA. Each type of enforcement action is descibed in detail in Subsection 3.3. Data for crisis years are shown in bold.

Year	IEAs	BBRs (%)	MOUs (%)	OIAs (%)	DGs (%)	Banks (%)
	(1)	(2)	(3)	(4)	(5)	(6)
1996	877	0.8	0.7	0.0	98.5	0.2
1997	650	1.1	3.7	0.2	95.1	0.5
1998	475	2.9	4.8	0.0	92.2	0.6
1999	421	2.9	9.3	0.0	87.9	0.9
2000	430	7.0	9.5	0.5	83.0	1.3
2001	471	6.6	12.3	0.0	81.1	1.6
2002	522	5.2	12.8	0.8	81.2	1.8
2003	527	5.5	11.8	0.2	82.5	1.7
2004	546	5.7	11.2	1.3	81.9	1.8
2005	509	4.9	9.4	0.2	85.5	1.4
2006	452	3.5	11.7	0.2	84.5	1.3
2007	352	6.5	17.3	0.0	76.1	1.6
2008	**394**	**13.2**	**40.9**	**0.0**	**45.9**	**4.1**
2009	**588**	**10.5**	**62.2**	**0.7**	**26.5**	**8.6**
2010	**881**	**9.1**	**57.3**	**0.5**	**33.1**	**12.4**
2011	792	6.3	31.8	1.0	60.9	6.7
2012	823	5.2	18.0	0.2	76.5	4.3
2013	742	2.7	12.5	0.1	84.6	2.6
2014	511	0.2	1.8	0.0	98.0	0.2

Table 3: FDIC Formal Enforcement Actions

This table shows, for each year from 1996 through 2014, the total number of FDIC formal enforcement actions (FEAs), the percentages of those actions that were Consent Orders (COs) and Other types of FEAs, and the percent of FDIC-supervised banks with at least one FEA. Each type of enforcement action is descibed in detail in Subsection 3.3. Data for crisis years are shown in bold.

Year	FEAs	COs (%)	OFAs (%)	Banks (%)
	(1)	(2)	(3)	(4)
1996	0	0.0	0.0	0.0
1997	5	80.0	20.0	0.1
1998	10	100.0	0.0	0.2
1999	11	90.9	9.1	0.2
2000	17	88.2	11.8	0.3
2001	21	95.2	4.8	0.4
2002	31	100.0	0.0	0.6
2003	23	95.7	4.3	0.4
2004	26	92.3	7.7	0.5
2005	11	90.9	9.1	0.2
2006	13	100.0	0.0	0.2
2007	23	87.0	13.0	0.4
2008	**77**	**83.1**	**16.9**	**1.5**
2009	**245**	**93.9**	**6.1**	**5.0**
2010	**280**	**88.9**	**11.1**	**5.9**
2011	110	84.5	15.5	2.4
2012	52	84.6	15.4	1.2
2013	13	84.6	15.4	0.3
2014	2	100.0	0.0	0.0

Table 4: FDIC Banks and Enforcement Actions by CAMELS Rating.

This table shows in four panels, for each year from 1996 through 2014, data on FDIC enforcement actions at FDIC-supervised banks sorted by a bank's supervisory CAMELS rating. The top left-hand panel gives CAMELS 1 banks, the top right-hand panel CAMELS 2 banks, the bottom left-hand panel CAMELS 3 banks, and the bottom right-hand panel CAMELS 4 and 5 banks. Each panel gives the number of FDIC-supervised banks in a given CAMELS category and the percentages of those banks with an enforcement action (EA), an informal enforcement action (IEA), and a formal enforcement action (FEA). Data for crisis years are shown in bold.

	CAMEL 1 Banks			
Year	Banks (#)	EA (%)	IEA (%)	FEA (%)
1996	2,831	0	0	0
1997	2,891	0	0	0
1998	2,818	0	0	0
1999	2,621	0	0	0
2000	2,426	0	0	0
2001	2,306	0	0	0
2002	2,200	0	0	0
2003	2,154	0	0	0
2004	2,130	0	0	0
2005	2,085	0	0	0
2006	2,025	0	0	0
2007	1,878	0	0	0
2008	**1,533**	**0**	**0**	**0**
2009	**1,133**	**0**	**0**	**0**
2010	**936**	**0.1**	**0.1**	**0**
2011	921	0.4	0.4	0
2012	1,018	0.2	0.2	0
2013	1,089	0	0	0
2014	1,166	0	0	0
Mean	1,903	0	0	0
(std)	669	0.1	0.1	0

	CAMEL 2 Banks			
Year	Banks (#)	EA (%)	IEA (%)	FEA (%)
1996	3,161	0.0	0.0	0.0
1997	2,889	0.2	0.2	0.0
1998	2,709	0.7	0.6	0.0
1999	2,711	0.8	0.7	0.1
2000	2,748	1.7	1.5	0.2
2001	2,729	1.9	1.8	0.1
2002	2,682	2.1	1.8	0.2
2003	2,678	2.8	2.5	0.3
2004	2,707	3.5	3.3	0.3
2005	2,770	3.5	3.1	0.4
2006	2,834	2.7	2.4	0.2
2007	2,871	1.3	0.9	0.3
2008	**2,757**	**1.2**	**1.1**	**0.1**
2009	**2,418**	**1.9**	**1.7**	**0.2**
2010	**2,222**	**5.0**	**4.9**	**0.2**
2011	2,287	9.1	8.8	0.3
2012	2,336	11.5	11.2	0.3
2013	2,392	9.9	9.5	0.4
2014	2,362	6.1	5.8	0.3
Mean	2,645	3.2	3.0	0.2
(std)	237	3.3	3.2	0.1

	CAMEL 3 Banks			
Year	Banks (#)	EA (%)	IEA (%)	FEA (%)
1996	268	3.7	3.7	0
1997	197	13.7	13.2	0.5
1998	205	19	18.5	0.5
1999	259	23.9	21.6	2.3
2000	302	25.8	23.2	2.6
2001	316	30.7	27.8	2.8
2002	334	38	34.7	3.3
2003	330	40	34.8	5.2
2004	292	47.6	37.7	9.9
2005	228	46.9	38.6	8.3
2006	207	42	34.3	7.7
2007	267	46.1	41.2	4.9
2008	**524**	**49.4**	**45.6**	**3.8**
2009	**853**	**52.6**	**51.3**	**1.3**
2010	**945**	**72.9**	**71**	**1.9**
2011	840	78.9	73.7	5.2
2012	653	76.7	64.6	12.1
2013	478	66.7	51	15.7
2014	384	45.8	29.9	15.9
Mean	415	43.2	37.7	5.5
(std)	231	20.4	18.3	4.8

	CAMEL 4 & 5 Banks			
Year	Banks (#)	EA (%)	IEA (%)	FEA (%)
1996	67	4.5	3	1.5
1997	55	32.7	18.2	14.5
1998	52	42.3	9.6	32.7
1999	53	49.1	13.2	35.8
2000	62	48.4	9.7	38.7
2001	85	55.3	16.5	38.8
2002	100	65	17	48
2003	92	63	13	50
2004	59	66.1	11.9	54.2
2005	42	64.3	14.3	50
2006	34	58.8	8.8	50
2007	62	56.5	9.7	46.8
2008	**220**	**55.9**	**12.7**	**43.2**
2009	**531**	**71.6**	**14.5**	**57.1**
2010	**615**	**77.2**	**10.4**	**66.8**
2011	555	73	8.5	64.5
2012	459	65.4	6.8	58.6
2013	357	50.7	7.3	43.4
2014	231	27.3	4.8	22.5
Mean	196	62.1	10.2	51.9
(std)	196	17.3	4	16.2

Table 5: CAMELS Transition Matrices.

This table shows the number and proportion of year-to-year movement between Composite CAMELS Rating and failure. The three panels show the statistics for each of the three analysis periods.

Pre-Crisis Period: 1996-2007

		CAMELS (t)						
		1	2	3	4	5	Failure	Total
CAMELS ($t-1$)	1	49,710	7,367	334	33	9	2	57,455
		86.52%	12.82%	0.58%	0.06%	0.02%	0%	100%
	2	6,860	77,523	4,659	786	164	28	90,020
		7.62%	86.12%	5.18%	0.87%	0.18%	0.03%	100%
	3	16	4,292	6,619	1,016	202	41	12,186
		0.13%	35.22%	54.32%	8.34%	1.66%	0.34%	100%
	4	1	187	970	1,913	496	107	3,674
		0.03%	5.09%	26.4%	52.07%	13.5%	2.91%	100%
	5	0	16	72	216	840	379	1,523
		0%	1.05%	4.73%	14.18%	55.15%	24.89%	100%
	Total	56,587	89,385	12,654	3,964	1,711	557	164,858
		34.32%	54.22%	7.68%	2.4%	1.04%	0.34%	100%

Crisis Period: 2008-2010

		CAMELS (t)						
		1	2	3	4	5	Failure	Total
CAMELS ($t-1$)	1	7,312	1,878	181	17	7	1	9,396
		77.82%	19.99%	1.93%	0.18%	0.07%	0.01%	100%
	2	633	15,081	2,173	519	131	18	18,555
		3.41%	81.28%	11.71%	2.8%	0.71%	0.1%	100%
	3	2	517	1,753	532	163	36	3,003
		0.07%	17.22%	58.37%	17.72%	5.43%	1.2%	100%
	4	0	22	98	480	277	89	966
		0%	2.28%	10.14%	49.69%	28.67%	9.21%	100%
	5	0	3	12	27	171	181	394
		0%	0.76%	3.05%	6.85%	43.4%	45.94%	100%
	Total	7,947	17,501	4,217	1,575	749	325	32,314
		24.59%	54.16%	13.05%	4.87%	2.32%	1.01%	100%

Post-Crisis Period: 2011-2014

		CAMELS (t)						
		1	2	3	4	5	Failure	Total
CAMELS ($t-1$)	1	2	3	4	5	Failure	Total	
	1	4,905	574	15	0	0	0	5,494
		89.28%	10.45%	0.27%	0%	0%	0%	100%
	2	988	14,249	477	46	5	2	15,767
		6.27%	90.37%	3.03%	0.29%	0.03%	0.01%	100%
	3	2	1,562	2,400	200	20	0	4,184
		0.05%	37.33%	57.36%	4.78%	0.48%	0%	100%
	4	0	67	495	1,017	160	8	1,747
		0%	3.84%	28.33%	58.21%	9.16%	0.46%	100%
	5	0	5	35	152	616	175	983
		0%	0.51%	3.56%	15.46%	62.67%	17.8%	100%
	Total	5,895	16,457	3,422	1,415	801	185	28,175
		20.92%	58.41%	12.15%	5.02%	2.84%	0.66%	100%

Note: The bottom number of each rating cell is the row percentage value.

Table 6: Variable Definitions

Variable	Description	Source
CAPBase	Total equity capital / Total Assets *100	Call Report
CAPLEV	Tier 1 capital / Total Assets *100	Call Report
ln(Asset)	Natural Log of Total on-Balance Sheet Assets (Total Assets)	Call Report
Retail Deposits	Non-brokered Insured Deposits / Total Liabilities	Call Report
Business Loans	(Commercial and Industrial & Finance Commercial Project Loans) / Total Loans	Call Report
Off Balance-Sheet	contains off balance-sheet assets in portfolio {Dummy Var.}	Call Report
Well Capitalized (600-800)	6 to 8% capital cushion above Prompt Corrective Action (PCA) minimum level {Dummy Var.}	Call Report
Well Capitalized (400-600)	4 to 6% capital cushion above PCA minimum level {Dummy Var.}	Call Report
Well Capitalized (200-400)	2 to 4% capital cushion above PCA minimum level {Dummy Var.}	Call Report
Well Capitalized (0-200)	0 to 2% capital cushion above PCA minimum level {Dummy Var.}	Call Report
Adequately Capitalized	Within the Adequately Capitalized PCA level {Dummy Var.}	Call Report
Under Capitalized	Within the Undercapitalized PCA level {Dummy Var.}	Call Report
Significantly Under Capitalized	Within the Significantly Under Capitalized PCA level {Dummy Var.}	Call Report
TARP Balance Indicator	Indicates whether TARP funds exist on portfolio {Dummy Var.}	US Treasury
FEA	Formal Enforcement Action {Dummy Var.}	Restricted Data
IEA	Informal Enforcement Action {Dummy Var.}	Restricted Data
DG3	Downgrade to CAMELS 3 level {Dummy Var.}	Restricted Data
DG45	Downgrade to CAMELS 4 or 5 level {Dummy Var.}	Restricted Data
CAM3	CAMELS 3 level {Dummy Var.}	Restricted Data
CAM45	CAMELS 4 or 5 level {Dummy Var.}	Restricted Data

Table 7: Pre-Crisis, Base Capital

This table shows Stage 1 and Stage 2 regression results for the pre-crisis period (1996 through 2007) for our measure of a bank's base capital ratio (total equity as a percentage of total assets). Stage 1 (column 1) estimates a bank's target capital ratio as a function of on-and off-balance sheet ratios and bank fixed effects (not shown). Columns 2 through 4 provide the estimates for stage 2. This stage estimates a bank's adjustment speed toward that target ratio as a function of indicator variables for a bank's position in selected prompt corrective action capital zones and whether the bank is subject to one or more types of enforcement actions. Columns 2 and 3 provide below-target estimates, when a bank's actual capital ratio is below its target. Columns 4 and 5 provide above-target estimates, when a bank's actual capital ratio is above its target. Columns 2 and 4 contain indicators for a CAMELS downgrade to a 3 (DG3) and to 4 or 5 (DG45) to the definition of an informal enforcement action. Columns 3 and 5 substitute a CAMELS level of 3 (CAM3) and 4 or 5 (CAM45) for the CAMELS downgrade indicators of column 4. The numbers in parentheses are standard errors clustered at the bank level. The number of observations and the R^2 statistic are given for each column.

	Step 1	Step 2			
		Below-Target		Above-Target	
	(1)	(2)	(3)	(4)	(5)
CAPBase	0.60***				
	(0.02)				
ln(Asset)	0.02				
	(0.09)				
Retail Deposits	0.01**				
	(0.00)				
Business Loans	-0.04***				
	(0.00)				
Off Balance-Sheet	-0.03				
	(0.10)				
Well Capitalized (600-800)		-0.58***	-0.57***	3.32***	3.29***
		(0.15)	(0.15)	(0.21)	(0.21)
Well Capitalized (400-600)		-0.37*	-0.37*	4.04***	4.02***
		(0.15)	(0.15)	(0.21)	(0.20)
Well Capitalized (200-400)		0.24	0.24	4.31***	4.29***
		(0.15)	(0.15)	(0.21)	(0.21)
Well Capitalized (0-200)		0.98***	0.98***	4.33***	4.40***
		(0.16)	(0.16)	(0.34)	(0.32)
Adequately Capitalized		1.09**	1.02**	3.75***	4.38***
		(0.39)	(0.38)	(0.90)	(0.77)
Under Capitalized		1.79***	1.69**	5.08***	5.23***
		(0.50)	(0.52)	(0.85)	(1.01)
Significantly Under Capitalized		1.32	1.23	4.21***	6.47***
		(0.91)	(0.89)	(0.47)	(1.07)
FEA		0.21	0.02	-1.45	-0.71
		(0.18)	(0.17)	(1.18)	(1.00)
IEA		0.04	-0.02	-0.16	-0.16
		(0.05)	(0.04)	(0.11)	(0.11)
DG3		-0.02		-0.46*	
		(0.07)		(0.23)	
DG45		-0.06		-2.12**	
		(0.15)		(0.72)	
CAM3			0.08		-0.33
			(0.06)		(0.17)
CAM45			0.27		-2.33*
			(0.16)		(0.91)
Intercept	3.51**	1.54***	1.53***	-5.96***	-5.88***
	(1.14)	(0.15)	(0.15)	(0.22)	(0.21)
N	25951	12760	12760	10353	10353
r2		0.12	0.12	0.20	0.20

Table 8: Pre-Crisis, Leverage Ratio

This table shows Stage 1 and Stage 2 regression results for the pre-crisis period (1996 through 2007) for our measure of a bank's the leverage ratio (tier 1 capital as a percentage of total assets). Stage 1 (column 1) estimates a bank's target capital ratio as a function of on-and off-balance sheet ratios and bank fixed effects (not shown). Columns 2 through 4 provide the estimates for stage 2. This stage estimates a bank's adjustment speed toward that target ratio as a function of indicator variables for a bank's position in selected prompt corrective action capital zones and whether the bank is subject to one or more types of enforcement actions. Columns 2 and 3 provide below-target estimates, when a bank's actual capital ratio is below its target. Columns 4 and 5 provide above-target estimates, when a bank's actual capital ratio is above its target. Columns 2 and 4 contain indicators for a CAMELS downgrade to a 3 (DG3) and to 4 or 5 (DG45) to the definition of an informal enforcement action. Columns 3 and 5 substitute a CAMELS level of 3 (CAM3) and 4 or 5 (CAM45) for the CAMELS downgrade indicators of column 4. The numbers in parentheses are standard errors clustered at the bank level. The number of observations and the R^2 statistic are given for each column.

	Step 1	Step 2			
		Below-Target		Above-Target	
	(1)	(2)	(3)	(4)	(5)
CAPLEV	0.62***				
	(0.02)				
ln(Asset)	-0.04				
	(0.08)				
Retail Deposits	0.01*				
	(0.00)				
Business Loans	-0.04***				
	(0.00)				
Off Balance-Sheet	0.02				
	(0.09)				
Well Capitalized (600-800)		-0.74***	-0.73***	3.35***	3.32***
		(0.18)	(0.18)	(0.22)	(0.21)
Well Capitalized (400-600)		-0.67***	-0.66***	4.15***	4.12***
		(0.17)	(0.17)	(0.22)	(0.21)
Well Capitalized (200-400)		-0.11	-0.10	4.35***	4.33***
		(0.17)	(0.17)	(0.22)	(0.21)
Well Capitalized (0-200)		0.55**	0.55**	4.42***	4.46***
		(0.18)	(0.18)	(0.30)	(0.29)
Adequately Capitalized		1.00*	0.98*	4.82***	5.14***
		(0.40)	(0.41)	(0.68)	(0.62)
Under Capitalized		0.90	0.74	5.45***	5.53***
		(0.56)	(0.53)	(0.96)	(1.09)
Significantly Under Capitalized		0.71	0.57	4.58***	6.93***
		(0.81)	(0.79)	(0.74)	(1.28)
FEA		0.23	0.02	-1.51	-0.70
		(0.19)	(0.18)	(1.23)	(1.04)
IEA		0.05	0.02	-0.12	-0.12
		(0.05)	(0.04)	(0.11)	(0.11)
DG3		0.05		-0.49*	
		(0.07)		(0.22)	
DG45		0.05		-2.29**	
		(0.15)		(0.82)	
CAM3			0.08		-0.35*
			(0.06)		(0.18)
CAM45			0.36*		-2.44*
			(0.16)		(0.99)
Intercept	4.20***	1.71***	1.69***	-6.12***	-6.04***
	(1.12)	(0.18)	(0.18)	(0.23)	(0.22)
N	25951	12885	12885	10228	10228
r2		0.091	0.092	0.21	0.21

Table 9: Crisis, Base Capital

This table shows Stage 1 and Stage 2 regression results for the crisis period (2008 through 2010) for our measure of a bank's base capital ratio (total equity as a percentage of total assets). Stage 1 (column 1) estimates a bank's target capital ratio as a function of on-and off-balance sheet ratios and bank fixed effects (not shown). Columns 2 through 4 provide the estimates for stage 2. This stage estimates a bank's adjustment speed toward that target ratio as a function of indicator variables for a bank's position in selected prompt corrective action capital zones and whether the bank is subject to one or more types of enforcement actions. Columns 2 and 3 provide below-target estimates, when a bank's actual capital ratio is below its target. Columns 4 and 5 provide above-target estimates, when a bank's actual capital ratio is above its target. Columns 2 and 4 contain indicators for a CAMELS downgrade to a 3 (DG3) and to 4 or 5 (DG45) to the definition of an informal enforcement action. Columns 3 and 5 substitute a CAMELS level of 3 (CAM3) and 4 or 5 (CAM45) for the CAMELS downgrade indicators of column 4. The numbers in parentheses are standard errors clustered at the bank level. The number of observations and the R^2 statistic are given for each column.

	Step 1	Step 2			
		Below-Target		Above-Target	
	(1)	(2)	(3)	(4)	(5)
CAPBase	0.61***				
	(0.03)				
ln(Asset)	0.53*				
	(0.22)				
Retail Deposits	0.02***				
	(0.01)				
Business Loans	-0.03***				
	(0.01)				
Off Balance-Sheet	-0.09				
	(0.17)				
Well Capitalized (600-800)		0.07	0.14	3.38***	3.39***
		(0.17)	(0.18)	(0.34)	(0.34)
Well Capitalized (400-600)		0.25	0.31	3.99***	4.00***
		(0.16)	(0.16)	(0.34)	(0.33)
Well Capitalized (200-400)		1.00***	1.05***	4.25***	4.26***
		(0.16)	(0.16)	(0.34)	(0.33)
Well Capitalized (0-200)		2.49***	2.41***	4.05***	4.11***
		(0.20)	(0.20)	(0.44)	(0.45)
Adequately Capitalized		4.38***	4.03***	5.21***	5.41***
		(0.35)	(0.36)	(0.42)	(0.54)
Under Capitalized		5.60***	5.21***	4.52***	4.64***
		(0.43)	(0.45)	(0.73)	(0.65)
Significantly Under Capitalized		5.54***	5.05***	1.62***	2.27***
		(0.31)	(0.29)	(0.40)	(0.63)
TARP Balance Indicator		0.47**	0.49***	0.40	0.40
		(0.14)	(0.14)	(0.22)	(0.22)
FEA		0.34	-0.27	-0.17	0.21
		(0.19)	(0.21)	(0.33)	(0.52)
IEA		0.15*	0.08	0.15	0.19
		(0.07)	(0.07)	(0.18)	(0.17)
DG3		0.23*		-0.05	
		(0.11)		(0.17)	
DG45		1.22***		-0.43	
		(0.14)		(0.31)	
CAM3			0.29**		-0.09
			(0.09)		(0.17)
CAM45			1.34***		-0.66
			(0.17)		(0.48)
Intercept	-3.23	1.47***	1.41***	-5.86***	-5.87***
	(2.79)	(0.15)	(0.16)	(0.35)	(0.35)
N	8664	4836	4836	3186	3186
r2		0.26	0.27	0.16	0.16

Table 10: Crisis, Leverage Ratio

This table shows Stage 1 and Stage 2 regression results for the crisis period (2008 through 2010) for our measure of a bank's the leverage ratio (tier 1 capital as a percentage of total assets). Stage 1 (column 1) estimates a bank's target capital ratio as a function of on-and off-balance sheet ratios and bank fixed effects (not shown). Columns 2 through 4 provide the estimates for stage 2. This stage estimates a bank's adjustment speed toward that target ratio as a function of indicator variables for a bank's position in selected prompt corrective action capital zones and whether the bank is subject to one or more types of enforcement actions. Columns 2 and 3 provide below-target estimates, when a bank's actual capital ratio is below its target. Columns 4 and 5 provide above-target estimates, when a bank's actual capital ratio is above its target. Columns 2 and 4 contain indicators for a CAMELS downgrade to a 3 (DG3) and to 4 or 5 (DG45) to the definition of an informal enforcement action. Columns 3 and 5 substitute a CAMELS level of 3 (CAM3) and 4 or 5 (CAM45) for the CAMELS downgrade indicators of column 4. The numbers in parentheses are standard errors clustered at the bank level. The number of observations and the R^2 statistic are given for each column.

	Step 1	Step 2			
		Below-Target		Above-Target	
	(1)	(2)	(3)	(4)	(5)
CAPLEV	0.62***				
	(0.03)				
ln(Asset)	0.55**				
	(0.21)				
Retail Deposits	0.02***				
	(0.00)				
Business Loans	-0.03***				
	(0.01)				
Off Balance-Sheet	-0.17				
	(0.16)				
Well Capitalized (600-800)		-0.12	-0.04	3.60***	3.60***
		(0.22)	(0.22)	(0.38)	(0.38)
Well Capitalized (400-600)		0.07	0.14	4.38***	4.38***
		(0.19)	(0.19)	(0.37)	(0.37)
Well Capitalized (200-400)		0.69***	0.75***	4.77***	4.77***
		(0.19)	(0.19)	(0.37)	(0.37)
Well Capitalized (0-200)		2.18***	2.13***	4.80***	4.80***
		(0.21)	(0.21)	(0.42)	(0.43)
Adequately Capitalized		4.02***	3.77***	0.00	0.00
		(0.40)	(0.42)	(.)	(.)
Under Capitalized		5.16***	4.66***	4.74***	4.81***
		(0.50)	(0.53)	(0.60)	(0.56)
Significantly Under Capitalized		4.80***	4.42***	1.51***	1.99**
		(0.35)	(0.34)	(0.43)	(0.62)
TARP Balance Indicator		0.51***	0.53***	0.12	0.12
		(0.15)	(0.15)	(0.21)	(0.21)
FEA		0.14	-0.38	-0.25	-0.03
		(0.19)	(0.21)	(0.33)	(0.47)
IEA		0.20**	0.16*	0.20	0.17
		(0.08)	(0.07)	(0.17)	(0.15)
DG3		0.23*		-0.20	
		(0.11)		(0.15)	
DG45		1.10***		-0.51	
		(0.14)		(0.30)	
CAM3			0.22*		-0.10
			(0.09)		(0.15)
CAM45			1.18***		-0.50
			(0.16)		(0.44)
Intercept	-3.56	1.69***	1.63***	-6.19***	-6.19***
	(2.66)	(0.18)	(0.19)	(0.38)	(0.38)
N	8664	4676	4676	3346	3346
r2		0.23	0.23	0.19	0.19

Table 11: Post-Crisis, Base Capital

This table shows Stage 1 and Stage 2 regression results for the post-crisis period (2011 through 2014) for our measure of a bank's base capital ratio (total equity as a percentage of total assets). Stage 1 (column 1) estimates a bank's target capital ratio as a function of on-and off-balance sheet ratios and bank fixed effects (not shown). Columns 2 through 4 provide the estimates for stage 2. This stage estimates a bank's adjustment speed toward that target ratio as a function of indicator variables for a bank's position in selected prompt corrective action capital zones and whether the bank is subject to one or more types of enforcement actions. Columns 2 and 3 provide below-target estimates, when a bank's actual capital ratio is below its target. Columns 4 and 5 provide above-target estimates, when a bank's actual capital ratio is above its target. Columns 2 and 4 contain indicators for a CAMELS downgrade to a 3 (DG3) and to 4 or 5 (DG45) to the definition of an informal enforcement action. Columns 3 and 5 substitute a CAMELS level of 3 (CAM3) and 4 or 5 (CAM45) for the CAMELS downgrade indicators of column 4. The numbers in parentheses are standard errors clustered at the bank level. The number of observations and the R^2 statistic are given for each column.

	Step 1	Step 2			
		Below-Target		Above-Target	
	(1)	(2)	(3)	(4)	(5)
CAPBase	0.70***				
	(0.03)				
ln(Asset)	-0.50***				
	(0.14)				
Retail Deposits	0.00				
	(0.01)				
Business Loans	0.01				
	(0.01)				
Off Balance-Sheet	0.37**				
	(0.11)				
Well Capitalized (600-800)		-0.18	-0.19	3.32***	3.33***
		(0.23)	(0.23)	(0.39)	(0.40)
Well Capitalized (400-600)		0.26	0.25	4.17***	4.19***
		(0.22)	(0.22)	(0.39)	(0.39)
Well Capitalized (200-400)		1.26***	1.23***	4.63***	4.68***
		(0.23)	(0.23)	(0.39)	(0.39)
Well Capitalized (0-200)		3.10***	2.94***	4.31***	4.42***
		(0.30)	(0.31)	(0.63)	(0.63)
Adequately Capitalized		3.65***	3.40***	4.14***	4.32***
		(0.48)	(0.48)	(0.42)	(0.43)
Under Capitalized		5.15***	4.88***	4.95***	5.13***
		(0.41)	(0.43)	(0.39)	(0.40)
Significantly Under Capitalized		5.85***	5.58***	0.00	0.00
		(0.54)	(0.55)	(.)	(.)
TARP Balance Indicator		-0.78***	-0.79***	-0.64***	-0.62***
		(0.16)	(0.16)	(0.18)	(0.18)
FEA		-0.08	-0.21	-0.19	0.16
		(0.16)	(0.20)	(0.27)	(0.35)
IEA		-0.18*	-0.12	0.15	0.11
		(0.09)	(0.10)	(0.17)	(0.21)
DG3		0.11		-0.38	
		(0.22)		(0.74)	
DG45		0.11		-0.27	
		(0.27)		(0.30)	
CAM3			-0.09		-0.03
			(0.10)		(0.22)
CAM45			0.28		-0.53
			(0.17)		(0.30)
Intercept	8.63***	1.19***	1.19***	-6.21***	-6.21***
	(1.89)	(0.22)	(0.22)	(0.40)	(0.40)
N	8114	2806	2806	2234	2234
r2		0.30	0.30	0.15	0.16

Table 12: Post-Crisis, Leverage Ratio

This table shows Stage 1 and Stage 2 regression results for the post-crisis period (2011 through 2014) for our measure of a bank's the leverage ratio (tier 1 capital as a percentage of total assets). Stage 1 (column 1) estimates a bank's target capital ratio as a function of on-and off-balance sheet ratios and bank fixed effects (not shown). Columns 2 through 4 provide the estimates for stage 2. This stage estimates a bank's adjustment speed toward that target ratio as a function of indicator variables for a bank's position in selected prompt corrective action capital zones and whether the bank is subject to one or more types of enforcement actions. Columns 2 and 3 provide below-target estimates, when a bank's actual capital ratio is below its target. Columns 4 and 5 provide above-target estimates, when a bank's actual capital ratio is above its target. Columns 2 and 4 contain indicators for a CAMELS downgrade to a 3 (DG3) and to 4 or 5 (DG45) to the definition of an informal enforcement action. Columns 3 and 5 substitute a CAMELS level of 3 (CAM3) and 4 or 5 (CAM45) for the CAMELS downgrade indicators of column 4. The numbers in parentheses are standard errors clustered at the bank level. The number of observations and the R^2 statistic are given for each column.

	Step 1	Step 2			
		Below-Target		Above-Target	
	(1)	(2)	(3)	(4)	(5)
CAPLEV	0.81***				
	(0.03)				
ln(Asset)	-0.08				
	(0.13)				
Retail Deposits	0.01*				
	(0.01)				
Business Loans	-0.00				
	(0.01)				
Off Balance-Sheet	0.15				
	(0.10)				
Well Capitalized (600-800)		-0.61*	-0.61*	3.95***	3.97***
		(0.30)	(0.31)	(0.49)	(0.49)
Well Capitalized (400-600)		-0.38	-0.39	4.76***	4.78***
		(0.28)	(0.28)	(0.49)	(0.49)
Well Capitalized (200-400)		0.61*	0.57*	4.87***	4.90***
		(0.28)	(0.28)	(0.48)	(0.49)
Well Capitalized (0-200)		2.32***	2.13***	5.04***	5.17***
		(0.32)	(0.32)	(0.55)	(0.60)
Adequately Capitalized		4.05***	3.73***	5.93***	6.14***
		(0.42)	(0.43)	(0.49)	(0.50)
Under Capitalized		5.21***	4.86***	0.00	0.00
		(0.40)	(0.42)	(.)	(.)
Significantly Under Capitalized		5.82***	5.46***	0.00	0.00
		(0.54)	(0.55)	(.)	(.)
TARP Balance Indicator		-0.42***	-0.43***	0.05	0.05
		(0.11)	(0.11)	(0.18)	(0.18)
FEA		-0.03	-0.26	-0.44	-0.17
		(0.12)	(0.15)	(0.30)	(0.37)
IEA		-0.05	-0.05	0.15	0.05
		(0.06)	(0.07)	(0.23)	(0.25)
DG3		-0.14		-0.72	
		(0.18)		(1.20)	
DG45		0.03		-0.57	
		(0.19)		(0.40)	
CAM3			-0.05		-0.00
			(0.07)		(0.28)
CAM45			0.40**		-0.49
			(0.13)		(0.33)
Intercept	2.04	2.19***	2.20***	-5.61***	-5.61***
	(1.87)	(0.28)	(0.28)	(0.51)	(0.51)
N	8114	3507	3507	1533	1533
r2		0.40	0.40	0.16	0.16

Table 13: Average Coefficient Values – Base & Leverage Capital Regressions

Values in the table are average parameter estimates for significant coefficients and R^2 values for the Base and Leverage Capital regressions. Dashes imply there were no significant parameter estimates. The "Below" columns give the average estimate for cases when the actual capital level is below target capital level, and "Above" the cases when the actual capital level is above the target capital level.

	Pre-Crisis		Crisis		Post-Crisis	
	Below	Above	Below	Above	Below	Above
Well Capitalized (600-800)	-0.650	3.328	–	3.500	-0.610	3.630
Well Capitalized (400-600)	-0.518	4.098	0.320	4.198	–	4.458
Well Capitalized (200-400)	–	4.345	0.885	4.523	0.920	4.745
Well Capitalized (0-200)	0.765	4.435	2.313	4.448	2.620	4.715
Adequately Capitalized	1.023	4.535	4.070	5.375	3.695	5.145
Under Capitalized	1.740	5.273	5.188	4.695	4.998	5.080
Significantly Under Capitalized	–	5.598	4.985	1.765	5.653	–
TARP Balance Indicator			0.503	–	-0.598	-0.655
FEA	–	–	-0.570	–	–	–
IEA	0.140	–	–	–	-0.265	–
DG3	–	-0.555	0.360	–	–	–
DG45	–	-2.285	1.255	–	–	–
CAM3	–	-0.400	0.410	–	–	–
CAM45	0.16	-2.440	1.395	–	0.215	–
Average R^2	0.108	0.208	0.250	0.176	0.354	0.160