How Prompt was Regulatory Corrective Action During the Financial Crisis?

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Abstract

This paper empirically investigates the incidence of regulatory forbearance during the financial crisis. Using an option pricing technique in concert with valuation data gathered from failed bank sales, I find that failed banks consistently underreported the level of impairment in loan portfolios during the financial crisis period of 2008 to 2010, helping these market value insolvent banks to report adequate capital for regulatory purposes. Impairment-adjusted capital ratios provide evidence of regulatory forbearance for up to 18 months prior to seizure. Analyses of bank coverage ratios reveal that coverage ratios are negatively and significantly related to impairment levels and are significantly lower for banks with critically low levels of capital.

JEL Classification: G33, G38, G21, G12

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1. Introduction

Past studies have shown that U.S. financial regulators are inclined to practice capital forbearance during financial crises (Gupta and Misra (1999) survey the literature). Put simply, forbearance allows distressed or insolvent financial institutions to continue operation despite evidence of capital inadequacy. Various incentives motivate forbearance but it is often employed in the hope that a distressed institution may return to financial health and, in times of crisis, help prevent further destabilization of a weakened financial system.

However, the extant literature on bank failures demonstrates that regulatory forbearance, in the end, is costlier to the insurance fund[1] that underpins the U.S. banking system than the prompt resolution of severely distressed institutions. Studies of the savings and loan (S&L) crisis of the 1980's show that regulatory forbearance ultimately cost U.S. taxpayers tens of billions of dollars (DeGennaro and Thompson, 1996; Kane and Yu, 1996). In response to failings of regulatory agencies during the S&L crisis, the Federal Deposit Insurance Corporation Improvement Act (FDICIA) of 1991 revamped the regulatory mechanisms that handle bank failures. The Prompt Corrective Action provision (PCA) of FDICIA specifically addresses capital forbearance by allowing regulators to close a financial institution before it becomes insolvent and the losses become substantial; the overarching goal being to resolve the institution at the least possible long-term cost to the insurance fund.

The recent financial crisis has again tested regulatory structures designed to ensure the stability of the financial system. To date, relatively little work has been done to study the efficacy of the PCA regulations during this latest crisis, however, these studies suggest a familiar theme. An examination of FDIC material loss reviews[2] following bank failures in 2007 to 2009 concludes that banks artificially

[1] The Federal Deposit Insurance Corporation's Deposit Insurance Fund (DIF) insures the deposits of commercial banks and savings and loan institutions. In 2005, the DIF replaced the Bank Insurance Fund and the Savings Association Insurance Fund (SAIF) which insured the deposits of commercial banks and savings and loan institutions, respectively. The SAIF was created in 1989 to replace the insurance provided by the Federal Savings and Loan Insurance Corporation.

[2] A material loss review is required by FDICIA in the event of a loss to the DIF, from bank failure, deemed to be material. The review is meant to ascertain why the bank's performance resulted in a material loss to the DIF and analyze the supervisory performance of examiners, include their employment of PCA provisions.

inflated regulatory capital, sometimes with examiner complicity. In almost all cases, examiners failed to exercise discretionary corrective actions to discipline banks who intentionally misstated their financials (Garcia, 2010). Huizinga and Laeven (2012) study U.S. banks from 2001 to 2008 and find that banks overstated the value of distressed assets with the intent of bolstering their profitability and levels of regulatory capital. They conclude that bank balance sheets offer "a distorted view of the financial health of the banks and provide suggestive evidence of regulatory forbearance and noncompliance with accounting rules." Chernykh and Cole (2015) study bank failures for the 2007 to 2012 period and find evidence of distressed banks with high levels of non-performing assets and insufficient loan loss reserves, yet adequate levels of regulatory capital. The authors suggest that regulators were complicit in this capital conservation scheme and assert that forbearance allowed regulators to avoid enacting the disciplinary measures called for by PCA.

While the occurrence of forbearance during the crisis is still being explored, the cause of the financial distress analyzed in the above studies is comparatively well established in the literature. While subject to some debate, most agree that declining home prices, prompted by the bursting of the U.S. housing bubble, caused a spike in mortgage delinquencies and foreclosures which spilled over to the mortgage-backed securities market (Thakor, 2015). As a result, the market value of real estate-related assets held by banks dropped significantly relative to historic cost (Bhat, et al., 2011; Diamond and Rajan, 2011). As the financial crisis deepened, real estate development loan portfolios also experienced significant losses (Cole and White, 2012). The ensuing write-downs, in concert with severe funding problems, pushed many banks to the brink of insolvency.

This paper examines the valuation of bank loan portfolios during the height of the financial crisis - the years 2008 to 2010 – to determine the incidence of regulatory forbearance during this time. To do so, I examine two related issues: first, given the drop in real estate values and high loan loss rates during the crisis, did bank financial statements reasonably reflect asset impairment and capital adequacy? Second, given the scope of impairment in comparison to bank capital, was loan loss provisioning adequate to cover probable losses? Because PCA requires that undercapitalized banks receive more rigorous and frequent

regulatory supervision as they become more distressed, evidence of inadequate recognition of asset impairment can also be considered evidence of regulatory forbearance[3].

In order to gauge the extent to which asset impairment is reflected in bank financial reporting, I estimate the market values of bank loan portfolios (which make up the bulk of assets held on bank balance sheets and for which there is typically no exchange-determined price) from bank stock prices using an option valuation technique. If asset impairment is severe and demonstrable, as was the case during the crisis period, the increased probability of future loss should be reflected as an asset write down in the current period via loan loss provisioning. Thus, conditioned on significant deterioration in the likelihood of receiving future cash flows, loan portfolio values reported on the balance sheet, net of loan loss allowance, should be roughly equivalent to the economic or market value of the loan portfolio. The extent to which they are not - the difference between loan portfolio book value, net of loan loss allowance, and loan portfolio market value - can be thought of as a market-implied measure of asset impairment.

In concert with estimated loan portfolio values, I also use valuation data gathered from failed bank sales during the recent financial crisis to examine these questions. I find that while the market heavily discounts the loan portfolios of both failed and solvent banks during the financial crisis, the market values of failed bank loan portfolios are consistently and significantly lower than that of surviving industry peers; reflecting the lower quality/higher risk of their portfolios.

Additionally, I find evidence that both bank groups understate asset impairment on the balance sheet and consequently overstate regulatory capital. An examination of *ex-post* failed banks shows that capital ratios adjusted for market-implied asset impairment are more efficient in diagnosing distress than book value ratios. Moreover, impairment-adjusted capital ratios provide evidence of regulatory forbearance for up to 18 months prior to seizure.

This study contributes to the existing literature in three ways. First, I contribute to the literature on regulatory forbearance and prompt corrective action by examining the incidence of forbearance during the

[3] Allowing a distressed bank to delay impairment recognition through inadequate loss provisioning has historically been a common form of forbearance, and one of the reasons that specific remedial steps were codified into PCA.

latest banking crisis. While the above-mentioned studies use agency performance reviews, Q-theory and regulatory capital ratios to diagnose forbearance (Garcia, 2010; Huizinga and Laeven, 2012; and Chernykh and Cole, 2015, respectively), I use actual market values of failed bank loan portfolios sold at auction to help empirically estimate loan market values and loan impairment. To the best of my knowledge, this is the first study to do so. I show that the estimated impairment amounts are an accurate proxy for the probable future credit losses; the accuracy of these impairment estimates allows me to estimate "true" capital levels with which to determine solvency.

Second, this study contributes to a literature that examines the use of loan loss provisioning to manage earnings and capital. While existing studies on provisioning and loss coverage during the crisis (e.g., Huizinga and Laeven, 2012; and Chernykh and Cole, 2015) rely on book value loan impairment and capital data I am able to use estimates of true impairment and impairment-adjusted capital. This allows me to examine the effect of actual capital inadequacy on the provisioning behavior of distressed banks, a research design feature that reveals the incentive for bank managers to use discretionary accounting to conserve capital during times of distress.

Third, this study contributes to the growing literature on the effects of the financial crisis and provides robust evidence useful in discussions about prudential banking regulation. I show that loan impairment and related loan losses are a primary channel through which many banks experienced capital distress and ultimately failed (see, e.g. Cole and White, 2012; Ng and Roychowdhury, 2013). Given the evidence presented in this paper that regulators permitted failed banks significantly lower allowance levels to cover probable loss than their industry peers, this study should provide ammunition to proponents of more stringent capital requirements and stricter regulatory supervision in the current bank regulatory debate.

The paper proceeds as follows: Section 2 reviews the pertinent literature. Section 3 provides background on capital adequacy regulation, PCA and bank resolution procedures. Section 4 explains the methodology and empirical approach to testing. Section 5 outline sample formation and describes the data used in the empirical analysis. Section 6 presents empirical analysis of market value-adjusted loans and

regulatory capital. Section 7 presents empirical analysis of loan impairment recognition. Section 8 presents robustness analysis and Section 9 concludes.

2. Literature review

2.1 Forbearance and prompt corrective action

Because capital forbearance occurs with greater frequency during crises, the empirical literature analyzing forbearance in the U.S. banking system is comprised primarily of studies of the S&L crisis of the 1980s and early 1990s. Past studies provide support for the notion that flat-rate deposit insurance creates a moral-hazard problem in that managers of distressed banks have an incentive to pursue riskier, high growth strategies to recover from economic distress and capital inadequacy (see e.g., Peek and Rosengren, 1996). Regulatory forbearance strengthens this incentive. Forbearance can be characterized as a "mechanism that enable(s) regulators to postpone the day of reckoning into the indefinite future, at great cost to the nation's taxpayers" (Gupta and Misra, 1999, page 101). Because of this, the authors endorse the structured early intervention and resolution approach that was codified, in large part, by the FDICIA.

Eisenbeis and Wall (2002) analyze the effectiveness of the FDICIA and conclude that PCA considerably reduces the risk of large losses to the deposit insurance fund by resolving distressed banks before losses become substantial. Moreover, they endorse "FDICIA's focus on preventing failed banks from imposing a high cost to the deposit insurance fund rather than on limiting the number of failures" (page 13). ap Gwilym, et al. (2013) examine the long-run efficacy of PCA in reducing credit and default risk in the U.S. banking system; they find that PCA is effective in reducing default risk but not credit risk. Brown and Dinc (2011) examine international instances of forbearances in twenty one emerging market countries experiencing economic distress during the 1990s. They find that a government is less likely to take over or close a failing bank the weaker the banking system, the larger the government budget deficit and the larger the bank itself.

As noted in the introductory discussion, several recent studies examine the incidence of forbearance during the financial crisis. Garcia (2010) uses FDIC material loss reviews to analyze the reasons for bank

failures from 2007 to 2009. The author finds that many of the banks artificially inflated regulatory capital in an attempt to stay solvent and, in almost all cases, examiners did not exercise the discretionary action vested by PCA to discipline those banks who intentionally misstated their financials. Huizinga and Laeven (2012) study U.S. banks from 2001 to 2008 and find that banks overstated the value of distressed assets with the intent of bolstering their profitability and levels of regulatory capital. They conclude that bank balance sheets offer "a distorted view of the financial health of the banks and provide suggestive evidence of regulatory forbearance and noncompliance with accounting rules" (page 614). Chernykh and Cole (2015) study bank failures for the 2007 to 2012 period and find evidence of distressed banks with high levels of non-performing assets, insufficient loan loss reserves yet adequate levels of regulatory capital. The authors suggest that regulators were complicit in this capital conservation scheme and assert that this forbearance allowed regulators to avoid enacting the disciplinary measures called for by PCA.

Recent studies in the theoretical literature examine the socially optimal trade-off between forbearance and corrective action. Using a dynamic model, Kocherlakota and Shim (2007) find that forbearance is preferred only if the probability of collateral value collapse is sufficiently low, otherwise PCA is optimal. In contrast, Shim (2006) concludes that, ex-ante, PCA is always optimal. In order to stem possible contagion, Morrison and White (2013) argue that it may be optimal for a regulator to privately exhibit forbearance to weak banks rather than reveal it has less skill in screening banks than previously expected.

2.2 Market values of failed banks and distressed bank assets

Research on the valuation effects of the purchase of failed banks is somewhat mixed, however there is a level of consensus in the literature that failed bank auctions, on average, produce positive abnormal returns for the winning bidder, subject to temporal variation. James and Wier (1987) study FDIC failed bank auctions from 1973 to 1983 and find that average announcement period abnormal returns to winning purchase and assumption (P&A) auction bidders are positive and significant. They conclude that winning P&A bidders pay less than "true" value for failed bank assets and gain as a result of over-subsidization by

the FDIC insurance fund; they also find evidence that increasing competition in the auction process leads to higher prices and lower wealth transfers from the FDIC to the acquiring bank. Further studies of P&A transactions during the 1980s find similar positive excess returns for FDIC-assisted transactions (see e.g., Cole and Eisenbeis, 1989, and Varaiya, et al., 1991; Cochran, et al., 1995).

Gilberto and Varaiya (1989) also find that winning bid amounts at FDIC auction increase as the level of competition increases, however, they conclude that their findings support the winner's curse hypothesis. In the same spirit, additional studies find breakeven or negative abnormal returns for winning P&A bidders (see e.g., Pettway and Thrifts, 1985; Stover, 1997). Gupta, et al. (1997) conclude that Resolution Trust Corp. auction procedures during the latter stages of the S&L crisis eliminated any over-subsidization (and resulting positive abnormal returns to winning bidders) observed in prior studies.

Several recent studies extend the literature regarding FDIC failed bank auctions. Cowan and Salotti (2012) test FDIC auctions between 2008 and 2011 and find positive abnormal returns to winning bidders; they conclude that the gains are the result of wealth transfers from the FDIC via loss-sharing subsidies. Christoffersen, et al. (2012) analyze the effect of the FDIC's financial health on the terms offered to prospective bidders for the period 1992 to 2011; they also find positive abnormal returns to winning bidders. They conclude that abnormal returns increase significantly as the DIF balance worsens and that the FDIC becomes less efficient in administering the auction process as it becomes more financially constrained. Taken together, the evidence presented in the papers is generally consistent with acquiring banks achieving significant positive abnormal returns by paying less than economic fair value for failed banks and bank assets during the financial crisis.

An emerging strand of literature examines the effects of the financial crisis on the market values of assets held by banks. Using Q-theory, Huizinga and Laeven (2012) find that roughly 50% of public U.S. bank holding companies have a market to book value of assets less than 1.0 in 2008. They also estimate that the market discounts the real-estate loan portfolios of the same banks by 17.3% in 2008; the real-estate loan portfolios are discounted 14.7% as compared to prior years while the non-real estate loans are discounted 9.8% as compared to prior years. Additional studies also find that the market values of real-

estate related assets held by banks dropped significantly relative to historic cost (see e.g., Bhat, et al., 2011; Kolasinski, 2011 and Diamond and Rajan, 2011). Goh et al. (2015) analyze the market pricing of bank assets and find that assets with greater information asymmetry and lower liquidity are priced lower relative to assets with an active secondary market. However, Calomiris and Nissim (2012) attribute the majority of the drop in bank stock market-to-book ratios around the time of the financial crisis to factors other than unrecognized loan and securities losses.

2.3 Bank capital and loan loss accounting

A strand of literature that focuses on loan loss accounting highlights the conditions under which expected credit losses inherent in a loan portfolio may be recognized through loan loss provisioning in the current period. The incurred loss accounting currently prescribed by the Federal Accounting Standards Board in the U.S. requires that an estimated (future) loss be accrued for in the current period, through a loss provision, if the loss is probable and reasonably estimable (as of the date of the current financial report).

Benston and Wall (2005) examine the theoretical motivations of loan loss accounting and note that a loan, or portfolio of loans, should be reported at its economic value when its expected loss becomes probable. Balla and McKenna (2009) examine the shortcomings of the incurred loss model and argue that the model often leaves banks with inadequate reserves during economic downturns which, in turn, implies that regulatory capital has been overstated. Of course, future losses become more likely during economic downturns, making the provisioning process procyclical. Seeking to redress this effect and make bank capital less vulnerable during downturns, recent studies have advocated a dynamic provisioning approach which allows for building up a reserve buffer through pro-active loss provisioning prior to economic contractions (Balla and McKenna, 2009, Laeven and Majnoni, 2003).

In practice, banks often identify loan losses as probable based on loan payment delinquency status. The coverage ratio[4] is a commonly used metric to gauge whether loan loss reserves are adequate to cover expected loan losses (Balla and McKenna, 2009). Table 1 reports the median coverage ratio for the sample

[4] Coverage ratio = loan loss reserve as a percent of loans 90+ days past due plus non-accrual loans

of failed banks examined in this paper and for the publicly traded banks that comprise SIC code 6020 - commercial banks and financial institutions - a proxy for the banking industry[5].The data is quarterly and spans the period Q1 2008 to Q4 2010. Panel A shows that the median coverage ratio for the industry was .99 at June 30, 2008 but quickly dropped to .70 over the subsequent year; the ratio remains at roughly the same level through June 30, 2010. This result is consistent with the findings in Balla and McKenna (2009); the increase in non-performing loans quickly outpaces the increase in the level of loan loss reserves during the crisis.

Panel B shows that, beginning a full two years before failure, the median coverage ratio for the sample of failed banks drops significantly below 1.0, and that of its solvent peers. Beginning seven quarters before failure, the failed bank group had loan loss reserves less than half that of non-performing loans. The ratio dips below 25% five quarters before failure before remaining at roughly 30% for the balance of the quarters preceding failure. The level of the coverage ratio implies that the failed banks did not adequately recognize probable loan impairment. Moreover, the low coverage ratio implies that their level of regulatory capital was overstated throughout the crisis period.

<Insert Table 1 about here>

3. Background

3.1 The Prompt Corrective Action provision of FDICIA

Prior to the introduction of PCA in 1991, prudential bank regulation in the U.S. focused almost solely on minimizing the probability of failure. Regulators were given considerable discretion in the supervision of capital adequacy, resulting in capital enforcement actions and penalties with little consistency across the industry (Chernykh and Cole, 2015). Following the lengthy and expensive resolution

[5] Several bank/quarter observations are removed from Table 1, Panel A because the requisite non-performing loan data is not available. Several extreme outliers in early quarters are removed from the failed bank sample presented in Panel B. Unreported sensitivity tests finds that the analysis and conclusions in this paper are robust to inclusion of the observations.

of the S&L crisis during the late 1980s and early 1990s, PCA was crafted to provide specific guidance in the closure of banks at high risk of failure. PCA was also designed to reduce the latitude of regulators in making a closure decision in order to reduce the cost of resolution to the FDIC, the banking system, and, ultimately, the taxpayers. Thus, the intent of the PCA provision is to reduce the cost of bank failures to the banking system, rather than to limit the number of bank failures, a significant shift in focus for U.S. prudential banking regulation from the approach of the 1980s and prior decades (Eisenbeis and Wall, 2002).

Introduced concurrently with the implementation of Basel I in the U.S., PCA mandates the use of three capital ratios: tier one capital scaled by risk-weighted assets (tier one capital ratio), total capital scaled by risk-weighted assets (total capital ratio), and tier one capital scaled by total balance sheet assets (tier one leverage ratio). These ratios are used to classify banks into five levels of capital strength with prescribed restrictions on bank activities as a capital adequacy progresses from the well capitalized category to the critically undercapitalized category.

In general, a bank is considered to have a stable capital base if it has a total risk-based capital ratio greater than 8%, and a leverage ratio greater than 4%. A bank is categorized as "significantly undercapitalized" if it has a total risk-based capital ratio less than 6% or a leverage ratio less than 3% or "critically undercapitalized" if it has a tangible equity ratio less than 2%. If a bank is, on average, critically undercapitalized for three quarters it must be seized, by regulation, unless certain conditions are met and regulators make a determination that the bank is "viable" and not expected to fail. Table 2 outlines the capital standards and activity restrictions of PCA.

<Insert Table 2 about here>

3.2 FDIC resolution process

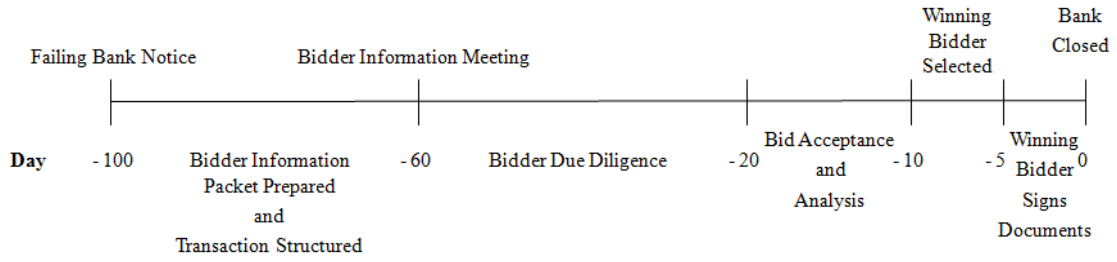
Once a bank's supervising regulator makes the decision to close a distressed bank, the bank is handed over to the FDIC for resolution. The FDIC is the regulatory body responsible for the resolution of a federal or state chartered bank or S&L once that institution's banking charter has been revoked by its chartering authority (typically the primary regulator). Of the roughly 2,500 banks that failed and were

seized by regulators during the period 1985-2010, almost 1,900 were resolved by the FDIC via a P&A auction.

The FDIC is required by law to choose the resolution option that is least costly to the FDIC Deposit Insurance Fund. If a P&A auction is identified as the resolution option likely to be the least costly option to the insurance fund, the FDIC begins the process of confidentially marketing the failing institution to potential acquirers consisting of approved financial institutions and private investors. Once the (least cost) winning bid has been chosen from the sealed bids submitted at auction and the failed bank sold to the acquiring bank, the FDIC reimburses the acquiring bank for the amount of the deposits purchased.

"The final step in the resolution process occurs when the institution is closed, and the assets that the acquirer purchased and the deposits that it assumed are transferred to the acquirer. The chartering authority closes the institution and appoints the FDIC as receiver (usually on a Friday)."[6] The announcement of the bank's seizure and subsequent sale is released to the public via a FDIC press release usually the next calendar day following the seizure (usually on a Saturday). The entire resolution process is generally carried out in 90 to 100 days. Figure 1 depicts the steps in the process and the approximate timeframes.

Figure 1. Timeline of FDIC P&A auction process



[6] FDIC Resolutions Handbook

4. Empirical methodology

This section describes the structural model used to estimate the market values of bank assets; the market values are then used to estimate loan impairment levels and impairment-adjusted capital ratios. Because there is no active secondary market for the majority of bank loan types I derive an estimate of the market value of each failed bank's loan portfolio from the bank's stock price. To do this I employ the options valuation technique developed by Black and Scholes (1973) and applied specifically to bank risk-based insurance by Merton (1977). This approach is used in practice and in the academic literature to value bank loan portfolios and price deposit insurance (see e.g., Ronn and Verma, 1986 and 1989; Giammarino et al., 1989; Allen and Saunders, 1993; Duan and Yu, 1999), quantify the risk profiles of banks (see e.g., Gizycki and Levonian, 1993; Hovakimian and Kane, 2000; Laeven, 2002; Lehar, 2005) and measure credit risk (see e.g., Ericsson and Reneby, 2001, Vassalou and Xing, 2004; KMV's credit risk model).

4.1 Option-pricing of bank loan portfolios

Black and Scholes (1973) note that it is possible to value numerous assets using an option-pricing approach. They specifically highlight that one may value a bank's assets in this way if one were to treat the bank's equity as a call option on the bank's assets. In an option-pricing context, stockholders of a publicly traded bank have the option to "repurchase" the bank's assets from the liability holders (the depositors, in the case of a bank) by paying the depositors the required interest and or/principal amounts owed. If the assets are worth less than the liabilities, the stockholder's have the option to forfeit the assets to the depositors in settlement of the debt and walk away from the bank. The payoff to this option is thus:

$$E = \max(0, V - B) \tag{1}$$

where E is the value of bank equity, V is the total market value of bank assets and B is the value of bank liabilities. In this way, the market value of a bank's equity can be viewed as a derivative of the bank's assets, of which loans make up a majority of the value and for which there is often no readily available market price.

Of course, the duration of the liabilities is likely to vary, making the "repurchase" option at expiration of the option difficult to model. Merton (1977) argues that the annual regulatory audit of a public bank may effectively serve as an expiration date; if the bank is found insolvent by examiners and seized, the stockholder's are wiped out. Thus, for valuation purposes, one year may be used for the length of time to option maturity. As noted previously, however, regulators may be inclined to practice capital forbearance. For purposes of this model, that means that the bank may not be seized when the asset/liability is strictly 1.0; regulators may seize the bank only when the asset/liability is clearly less than 1.0, for example .97, .95 or lower. The adjustment for forbearance is represented in the payoff equation by ρ:

$$E = \max(0, V - \rho B) \tag{2}$$

In the context of the Black Scholes model, with the same assumptions, the equation may be represented as:

$$E = VN(x) - \rho BN\left(x - \sigma_v\sqrt{T}\right) \tag{3}$$

$$x = (\ln(V/\rho B) + \sigma_v{}^2 T/2))/\left(\sigma_v\sqrt{T}\right) \tag{4}$$

and:

$$\sigma_E = (V/E)(\partial E/\partial V)\sigma_v \tag{5}$$

where N is the cumulative standard normal distribution function, T is the time to maturity (or next audit) and σ_v is the instantaneous standard deviation of dV/V.

Given that one can observe the market value of equity (E), and the standard deviation of equity returns (σ_E), it remains to solve for the two unknowns in the above equations: V, the total market value of bank assets and σ_v, the standard deviation of the rate of change of the total market value of bank assets (V). I refer the reader to Ronn and Verma (1986) for a more complete discussion of the theoretical underpinnings of the model.

4.2 Empirical approach

I use the software program MATLAB's F-solve non-linear optimization routine to solve for the two unknown variables, V and σ_v. I lean on prior studies (Ronn and Verma, 1986; Giammarino, et al., 1989 and Liu, et al., 2006), for guidance in setting the value of the forbearance adjustment variable ρ = .95. While the market values derived using this technique are sensitive to this assumption, an advantage of my approach is that I am able to use the fair market values of the failed banks' loan portfolios (determined by acquirers as of the time of sale) to calibrate the value of p that produces a time series of fair market values most consistent with known temporal values of bank assets, the valuations in the literature (e.g., Huizinga and Laeven, 2012; James, 1991) and the stylized facts of the mortgage and real estate related bank assets that make up a majority of the loan portfolios in the industry.

In this way I am able to compile a time series of loan portfolio market values, for each bank, up to the time of sale at FDIC auction. For the subsample of failed banks for which I am able to obtain the requisite data, I use auction date fair value data disclosed by the purchasing banks to validate the derived auction date loan market values. Because loan portfolio fair market values as of auction date are generally deflated by factors unique to the failure, seizure and P&A auction processes, I calibrate the model to produce auction date discounts significantly lower than the discounts found at auction.[7] I then use the same assumptions to generate the time series of loan portfolio market values for the full sample of banks examined. Loan portfolio impairment is then calculated for each bank as the difference between the estimated market value of the loan portfolio and the book value of the loan portfolio (net of loan loss allowance). This process produces conservative estimates of loan portfolio impairment at auction date and for each quarter in the sample period. Section six discusses, in detail, the empirical results of this process.

[7] One of the reasons the FDIC moves so quickly to sell a failed bank to a solvent bank is because loan values are known to fall when not being actively monitored and "worked" by loan officers, as is generally the case when a bank is deeply distressed and failure seems likely.

4.3 Construction of impairment-adjusted capital ratio

In order to simulate the impact of asset impairment on regulatory capital levels, I apply the following adjustments to calculate a time series of tier one leverage ratios from Q1 2005 to Q2 2010 for each bank:

$$Market\ Adjusted\ \ Tier\ 1\ Capital_t = MAT1Cap_{t-1} \times \frac{T1Cap_t}{T1Cap_{t-1}} - (\Delta Loan\ MVA_t) \quad (6)$$

$$Market\ Adjusted\ Average\ Total\ Assets_t = AAQ_t - (\frac{Loan\ MVA_t + Loan\ MVA_{t-1}}{2}) \quad (7)$$

$$Market\ Adjusted\ Leverage\ Ratio_t = \frac{Market\ Adjusted\ \ Tier\ 1\ Capital_t}{Market\ Adjusted\ Average\ \ Total\ Assets_t} \quad (8)$$

where $MAT1Cap_{t-1}$ equals the market adjusted tier one capital from the previous quarter-end, $T1Cap_{t-1}$ equals tier one capital from the previous quarter-end, $\Delta Loan\ MVA_t$ equals the change in loan market value adjustment during the current quarter, $Loan\ MVA_{t-1}$ equals the loan market value adjustment from the previous quarter-end[8], and AAQ_t equals the average quarterly total assets for the current quarter.[9]

For each bank in the sample I begin with quarter-ending Q4 2004 data (or the earliest available quarter-end thereafter)[10] and construct the level of market adjusted tier one capital in equation 6 by adjusting the previous market adjusted tier one capital for the change in book value capital during the current quarter. From the new level of capital I then subtract that quarter's change in market value loan adjustment (or add to capital any positive valuation effects). In this way I am able to capture the change in capital from the bank's ordinary course of business as well as the marginal effects of any market value loan adjustment. Because recognition of any loan impairment affects net income, the market value loan adjustment to capital is net of taxes. I use 30% as an estimate of the median effective U.S. corporate tax rate in recent years (PWC, 2011; Goldman Sachs Investment Research, 2013). I do not account for any possible tax shield

[8] The $Loan\ MVA$ is most often a discount, so the sign is set to be positive. In this way, a market value discount reduces capital while a market value premium increases capital.

[9] For the first quarter in each bank time series, the previous quarter's tier one capital is used in place of $MAT1Cap_{t-1}$ in equation 6.

[10] A small minority of banks publicly list, or appear on CRSP, after Q4 2004.

benefits, but instead reduce the magnitude of any market discount or premium by the constant tax rate. In this way, the market adjustment effect is blunted by the tax rate. By selecting a tax rate on the high end of the range of estimates in published studies, I end up with a conservatively low estimate of impairment of regulatory capital, and thus, of the incidence of forbearance. I begin the construction of impairment-adjusted capital ratios several years prior to the start of the sample period in order to give an unbiased estimate of capital levels as valuation adjustment are generally positive prior to the financial crisis and generally negative during the crisis.

Market adjusted average total assets (equation 7) is constructed in much the same way. I subtract from the current quarter's level of average assets the average market value loan adjustment over the current quarter. The market adjusted leverage ratio is the current quarter's market adjusted tier one capital scaled by current quarter market adjusted average total assets.

5. Data sample and descriptive statistics

5.1 Sample formation and data collection

To compile the sample of failed banks used in this study, I utilize the FDIC's Failures and Assistance Transactions on-line database; the database contains detailed information on bank and thrift failures since the FDIC was established in 1934. I begin with the population of all failed banks for which the FDIC was appointed receiver during the first two years of the financial crisis, the period 2008 to 2010. The population of failed banks during the sample period consists of 322 banks. For each transaction in the sample, I review the detailed information posted to the Failed Bank Information section of the FDIC website to obtain information about the method of resolution, the acquiring bank (if applicable) and identifying data about the failed bank. To be certain that a P&A transaction involves the entirety of a sample bank's loan portfolio, I require transactions in which the failed bank is sold in whole form; thus, I exclude from the

sample transactions in which only the failed bank's assets or deposits are sold at auction[11]. This criteria leaves me with 218 failed banks sold via whole bank P&A auction. For each failed bank sold via a whole bank P&A, I determine if the failed bank's stock was traded publicly prior to failure and if it is reported in the CRSP quarterly stock file; the CRSP file is comprised of publicly traded firms on the NYSE, Amex and Nasdaq stock exchanges. This criteria leaves 49 banks in the failed bank sample.

For each of these 49 transactions, I manually search the acquiring bank's 8K, 10Q or 10K filings in the SEC EDGAR database for disclosure of the transaction. For those winning bidders for which the purchased bank was material to their financial results, the details of the valuation are disclosed in SEC filings. From these filings I hand collect the fair market values of the assets reported on the winning bidder's balance sheet. Generally Accepted Accounting Principles (GAAP), specifically *Business Combinations* topic (ASC 805), require that assets and liabilities acquired in a business acquisition be recorded at their fair values as of the date of the acquisition.[12] Fair values are determined based on the requirements of FASB ASC Topic 820, *Fair Value Measurements*. There are 28 publicly traded banks with the requisite disclosure. For these 28 failed banks, I am then able to match the fair value asset data (at time of sale) to historical (accounting) data for the failed bank in Compustat and Call reports. Hence, the final failed bank sample is comprised of 49 (publicly traded) banks; 28 of those banks have fair value disclosures, the balance of the sample do not.

However, in times of crisis it may be the case that the outgoing tide grounds all boats – that is, the market may broadly discount the loan portfolios of all banks across the industry and not just that of the (ex-post) failed banks. If that is the case, then the option-pricing framework employed in this paper would not distinguish between healthy and sub-standard portfolios. To test for this possibility I select all publicly traded banks from SIC code 6020, national and state chartered commercial banks and financial institutions,

[11] Asset-only P&A auctions generally sell only a subset of risky assets, the make-up of which is often not clear from public documents, while deposit-only transactions do not involve assets sales. Assets not sold at auction are retained by the FDIC and typically packaged together for sale in negotiated transactions at a later date.

[12] All of the transactions used in this study were accounted for as a business acquisition as defined by the *Business Combinations* topic (ASC 805). A majority of the transaction-based valuations collected for this study have been audited and opined on by a CPA firm.

as an industry control sample and estimate loan portfolio market values for each bank in the group. Any banks in SIC code 6020 that failed before December 31, 2010 are removed from this industry sample group. The industry control sample contains 146 banks as of March 31, 2004; industry count then declines nearly monotonically to 99 banks as of December 31, 2010.

Because the FDIC insures banks at the bank subsidiary level (not the bank holding company level), banks that fail are seized and resolved at the bank subsidiary level. Consequently, I use Call reports for the necessary data on the failed bank sample. I use FR Y-9C reports for the necessary data on the industry control sample. 7 of the 49 banks in the failed bank sample have multiple bank subsidiaries; in these cases I manually consolidate the bank subsidiary-level data to the bank holding company level. These 7 banks are not among the 28 banks used to match fair value to book value at auction date. As discussed in the subsequent discussion of sample descriptive statistics, the average bank in both sample groups is a small to medium size bank, engaged primarily in lending, whose bank holding company does not conduct substantial business by itself. Thus, the use of loan impairment data estimated at the holding company level for analysis of banks seized and sold at the subsidiary level does not introduce significant noise into the analysis.

To estimate loan portfolio market values for both the failed bank and industry control samples I construct equity market value and standard deviation of equity returns using data from the CRSP Daily Stock File; I use data from Compustat for the necessary asset and liability categories. To construct the loan, securities and regulatory capital variables used in regression analysis I use data from Reports of Condition and Income (Call reports) and Consolidated Financial Statements for Bank Holding Companies (FR Y-9C reports). I use bank name, address, CUSIP and/or total assets to manually verify the match between Permno, GVKEY, FDIC Cert. No., and RSSID No. Estimated loss data is from FDIC P&A legal agreements. Variable definitions and data sources are detailed in the Appendix.

5.2 Summary Statistics

Table 3 provides summary statistics for the banks in the sample. Panel A presents statistics for the commercial banking industry. Data is presented at the holding company level and is for the quarter

ending June 30, 2010, the last quarter examined for the industry control group. Loans make up 69% of the median bank's balance sheet; real estate loans account for an overwhelming majority of the loan portfolio. Total past due and nonaccrual loans, or nonperforming loans[13], average 3% of total assets. Loan loss allowance average 1% of total assets; the tier one capital ratio averages a healthy 13%. Total assets of the median bank in the industry are $2.5 billion; the largest bank in the sample has $159 billion in total assets and the smallest, $381 million. Thus, Panel A demonstrates that this industry comparison group is comprised of small to medium size banks; of which lending makes up the primary source of revenue.

<Insert Table 3 about here>

Panel B presents statistics for all failed banks, both public and private, during the period 2008 to 2010. Data is presented at bank subsidiary level (i.e., for the charter-holding bank unit seized) and is from the latest quarter-end available before seizure; on average roughly 45 days prior to seizure. Loans make up 73% of the median bank's balance sheet; real estate loans account for a higher percentage of the loan portfolio as compared to the industry control group (86% vs. 77%). Total past due and nonaccrual loans are 14% of the median failed bank's total assets, a percentage much higher than the industry group and very high by historical standards, while loan loss allowance averages only 3% of total assets. Tier one capital ratio averages 2% of risk-weighted assets, just on the threshold for PCA-mandated seizure. Median total assets of the failed bank group are $257 million; the largest bank in the sample has $307 billion in total assets and the smallest, $6 million. Similar to the industry peer group, the failed bank group is comprised of small to medium size banks; of which lending makes up the primary source of revenue. However, the failed banks are smaller, on average, and are characterized by much greater (lower) non-performing loans (capital) than the industry peer group.

[13] Nonperforming loans = loans past due (30 to 90 days) + loans past due (90+ days) + nonaccrual loans

Panel C presents statistics for the 49 publicly-traded failed banks analyzed in this paper. Because market value estimates are calculated at the holding company level, bank data for this sample of failed banks is presented at the holding company level. Data are from the latest quarter-end available before seizure; on average roughly 45 days prior to seizure. Loans make up 74% of the median bank's balance sheet; real estate loans account for a higher percentage of the loan portfolio as compared to the population of failed banks and the industry control group (91% vs 86% and 77%, respectively). Total past due and nonaccrual loans are 14% of the median failed bank's total assets; loan loss allowance averages only 3% of total assets. Tier one capital ratio averages 3% of risk-weighted assets. The averages for non-performing loans, reserves and capital are almost identical to that of the population of failed banks. Total assets of the median bank in the group are $1.4 billion; the largest bank in the sample has $307 billion in total assets and the smallest, $203 million.

Sample statistics in panels B and C highlight the similarities between the publicly traded failed bank sample group and the population of failed banks during the period 2008 to 2010. The two groups have very similar balance sheets and risk profiles, on average: total loans, real estate loans and commercial loans percentages are comparable while loan quality, loan reserves and capital are almost identical. Not surprisingly, the average publicly-traded failed bank is larger than the average failed bank during the period. Moreover, a comparison of sample statistics in panels A and C indicates that both the industry control group and publicly-traded failed bank group are made up of small to medium sized banks with similar business models; the average level of total assets and total loans are comparable and real estate loans dominate the portfolios of both groups. As expected, the average loan quality and level of capital are much greater for the solvent industry group. Notably, the ratio of loan loss allowance to nonperforming loans is much higher for the industry group than the publicly-traded failed bank group; this finding is consistent with the prediction, and extant literature, that failing banks are permitted lower levels of relative reserves as a method of preserving scarce capital.

6. Empirical market valuation of bank loan portfolios

This section provides the results of the option valuation analysis used to estimate the time series of loan portfolio market values. To provide context to the estimated values, I begin by examining the values of failed bank loan portfolios realized at FDIC auction. As noted, the portfolios purchased at auction are recorded by acquirers at fair value as of the date of the auction sale.

For many failed bank loan portfolios, there is a significant difference between the book value of the portfolio and the fair value realized at auction. Panel A of Table 4 reports that, for the sample of 96 public and private failed banks for which detailed valuation data is available, the loan portfolios of failed banks sold at FDIC auction are discounted around 30%, on average, when marked to fair value as of the date of acquisition. Panel B reports statistics for the 28 publicly-traded failed banks for which detailed loan portfolio valuation is disclosed by the acquiring bank. The mean (median) discount is 36.5% (30%). Panel C reports on the 68 private failed banks with the requisite valuation disclosure; the mean (median) discount is 29% (30.5%). A t-test of difference in means for the public and private series (in Panels B and C) produces a *t*-statistic of 0.02, which is insignificant at conventional levels.

The finding that the level of unrealized losses in loan portfolios (i.e., loan impairment not already recognized in the loan loss allowance account) is similar for both public and private failed banks is consistent with recent findings in the banking literature. In a study utilizing a large sample of public and private U.S. bank holding companies over the period 1986 to 2001[14], Kwan (2004) finds no difference in risk-taking or loan portfolio quality between the public and private bank groups. Barry, et.al (2011) examine European commercial banks from 1999 to 2005 and find no significant differences in asset risk and default risk between public and private banks. Nichols, et.al (2009) study a large sample of U.S. banks from 1992 to 2002; they find that public banks exhibit more conservative accounting practices, including more timely loan losses, than their private counterparts, on average. Thus, the valuations of public banks studied in this paper can be considered a lower bound for the valuations of the banking industry as a whole,

[14] All public and private U.S. bank holding companies that file FR Y-9c reports with the Federal Reserve.

as the extant literature shows that the average risk/discount of private failed bank portfolios is likely to be comparable or possibly greater than those of public banks.

<Insert Table 4 about here>

6.1 Impact of market valuation on loan values

Figure 2 displays the time series of loan portfolio market values, as compared to portfolio book values, for the subsample of 28 publicly traded failed banks for which detailed valuation data is available. Because failed banks are often delisted prior to seizure, in many cases stock prices are not available up to, and including, the date of seizure which prohibits the derivation of market values from stock prices during the period just prior to failure. On average, the delisting date is roughly six months, or two quarters, prior to auction. To overcome the lack of market data, and to help calibrate the value of the input variable p in the option-pricing model, I use the reported fair market values of the loan portfolios as of auction date (shown as a point estimate at time 0 in Figure 2) to manually interpolate the loan portfolio market values for quarters 1 and 0. The interpolated discounts are 16% and 21%, for quarters 1 and 0, respectively.

<Insert Figure 2 about here>

As compared to the actual (mean) auction date discount of 36% reported in Panel B of Table 4, the (mean) discount of 21% produced by the model is a much more conservative figure. Moreover, the time series of discounts produced by the model, reported in Table 5, are consistent with those found by Huizinga and Laeven (2012) using Q-theory to estimate loan market values from bank stock prices during, and prior to, the crisis. They estimate that the market discounts the real-estate loan portfolios of all public and solvent U.S. bank holding companies by 17.3% in 2008. My estimated auction date discounts are also consistent with the losses realized in bank failures reported in James' (1991) seminal study of FDIC bank resolutions. He finds unrealized losses on bank assets (i.e., unrecognized loan impairment) in P&A auctions to be 20%.[15]

[15] James measures loss on assets as the difference between the book value of a bank's assets at the time of its closure and the value of the assets to an acquirer. Here I report unrealized losses for P&A auctions as his study lacks sufficient data to report unrealized losses for only whole bank P&A sales.

Furthermore, the valuations produced by the option-pricing model are consistent with the premiums garnered by mortgage and real estate-related loans during the pre-crisis years. Thus, using .95 as the value for the forbearance variable *p* produces estimates of loan portfolio impairment over the sample period consistent with temporal values of bank assets reported in the extant literature.

<Insert Table 5 about here>

Together, Figure 2 and Table 5 report that the average estimated market-implied valuations, derived from stock prices, are significantly lower than the values reported on bank balance sheets immediately prior to, and during, the financial crisis. Loan portfolio market values of the 28 publicly traded failed banks drop below book value[16] a full two years, on average, before seizure date (quarter one); reaching a discount of 13% a full twelve months before auction date. In addition to the literature referenced above, this finding is consistent with a stylized fact of prior banking crises; the distressed status of the bank occurs concurrently with a substantial deterioration in asset values.

Using the option valuation model calibrated on the set of 28 publicly traded failed banks, I next examine the broader set of 49 publicly traded banks that comprise substantially all of the public banks seized and subsequently sold at auction in the period 2008 to 2010. Consistent with the smaller sample, estimated market-implied valuations for this group are significantly lower than the values reported on bank balance sheets during the financial crisis. As shown in Figure 3, and tabulated in Table 6a, loan portfolio market values for this group drop below book value, on average, a full two years before seizure date (quarter one), before reaching a discount of 20% at the date of seizure. The difference between book and estimated market value is statistically significant in the ten quarters preceding, and including, auction date.

Table 6b demonstrates that these steep discounts help produce a median market value asset/liability ratio of .92 at the date of seizure (quarter one) while a corresponding median book value asset/liability ratio of 1.02 indicates the banks are solvent for financial reporting purposes. Moreover, the estimates show that,

[16] For purposes of market value comparison, from this point forward, loan portfolio book value is defined as the book value of the loan portfolio net of loan loss allowance.

on average, these failed banks were insolvent on a market value basis one full year (quarter five) before seizure. The median book value asset/liability ratio on that same date is a relatively healthy 1.07.

<Insert Figure 3 about here>

<Insert Tables 6a and 6b about here>

Figure 4 and Table 7a present the results of the same comparative analysis for the commercial banking industry: SIC code 6020. Loan valuation data for the industry is consistent with the stylized facts for the mortgage and real estate-related assets that make up a majority of the loan portfolios in this industry. The loan portfolios garner a premium of 9% to 11% during the height of the real estate bubble in 2004 to 2006 but begin to dip significantly below book value beginning in Q1 2008. The difference between book value and estimated market value is statistically significant before and after the start of the financial crisis. Values dip considerably in Q4 of 2008 after the failures of Lehman Brothers, Washington Mutual, Wachovia and others revealed new information to the market about the true impairment of these assets. The blended discounts of the failed and solvent bank loan portfolios in Figures 3 and 4 are consistent with the discount of 17% on real estate loans in 2008 reported by Huizinga and Laeven (2012). Notably, the median market value asset/liability ratio of the *ex-post* solvent sample group, reported in Table 7b, are greater than 1 in all quarters. The lowest average ratio is 1.02 in Q1 2009 while the median book value asset/liability ratio remains about 1.10 throughout the time-series.

<Insert Figure 4 about here>

<Insert Tables 7a and 7b about here>

Figure 5 and Table 8 presents a comparative analysis of the implied market values of the solvent industry and failed bank loan portfolios; for this comparison market values are scaled by book values to produce a m/b ratio. The ratios are greater than 1 during the real estate bubble years of 2004 to 2006 and fall to less than 1 during the year 2007. However, the estimated m/b ratio of the commercial banking industry is higher in almost all quarters displayed: Q1 2004 to Q4 2009. The reversal of relative values in

the latest quarters is likely a small sample issue as only 5 banks make up the failed bank group in Q1 2010. The differences are statistically significant in roughly half of the quarters reported. Thus, it appears that the market recognizes the lower asset quality of, or perhaps the elevated levels of risk inherent within, the real estate-dominated loan portfolios of the failed banks *ex-ante*.

<Insert Figure 5 about here>

<Insert Table 8 about here>

6.2 Impact of market valuation on capital levels

The evidence presented to this point gives support to the notion that true asset impairment was not fully recognized in the financial reporting of either failed or solvent banks during the financial crisis. I analyze the impact of market-implied asset impairment on bank capital in this section.

Table 9 presents a comparison of the regulatory capital ratios of the solvent industry bank group and the *ex-post* failed bank group. Panel A reports regulatory capital ratios of the industry group in chronological order; Panel B reports regulatory capital ratios of the failed bank group for nine quarters prior to the auction date. The median market value-adjusted leverage ratio characterizes the solvent industry group as "well capitalized" in all quarters.

<Insert Table 9 about here>

Of course, one would expect the *ex-post* failed bank group presented in Panel B to have much lower regulatory ratios. Two full years before auction, in Q9, the failed bank group has median book value risk-based capital and leverage ratios similar to its industry peer group, however in the subsequent quarters the book and market regulatory capital ratios of the failed bank group begin to fall significantly. In fact, five quarters before auction date the median market-adjusted leverage ratio falls to 1.96%, putting the average bank in this group in the "critically undercapitalized" category. Yet the median book total risk-based and leverage ratios of the banks in this quarter are 10.39% and 7.21%, meaning that the average bank in this group is still "well capitalized" from a regulatory supervision standpoint.

From quarters six to four the median market-adjusted leverage ratio of the failed bank group is less than 2%. By regulation, a bank with a leverage ratio less than 2% for three successive quarters should be seized; thus, on average, the capital positions of the failed banks should have triggered the seizure of the banks in Q4. In reality, the banks are not seized for another nine months, on average.

Notably, the median book total risk-based and leverage ratios of the average failed bank is 5.44% and 3.03% one quarter before seizure date, which characterizes them as "significantly undercapitalized" but not "critically undercapitalized". The fact that supervising regulators did, in fact, seize the banks supports the notion that the financial reporting data, which is based on book values, did not appropriately represent the impairment and risk levels of these banks during the sample period examined in this paper.

7. Tests of loan impairment recognition

This section examines the extent to which banks delayed loan impairment and probable loss recognition during the financial crisis. Banks with thin capital who simultaneously experience negative profitability and heavy loan losses, as was the case for many banks during the sharp economic downturn that accompanied the financial crisis, will be less able to fully reserve against probable future credit losses without further reducing capital. Because PCA requires that undercapitalized banks[17] receive more rigorous and frequent regulatory supervision as they become more distressed, evidence of inadequate recognition of asset value impairment can also be considered evidence of regulatory forbearance (Jones and King, 1995).

To test for this possibility I first sort the pooled sample of failed and solvent banks by my measure of "true" capital: the market-adjusted leverage ratio. Table 10 reports quintile ranks of the banks sorted by market-adjusted leverage ratio. If distressed banks properly recognized asset impairment, then I should find no significant difference between the coverage ratios of well capitalized and undercapitalized banks. Quintile 1 reports a market-adjusted leverage ratio of -.27% for the median bank in the full sample reported; the ratio is -1.18 for 2009 and 0.45 for 2010. The ratio remains critically low in quintile 2; just under 2%

[17] Undercapitalized in this context denotes a bank that has received a classification of "significantly undercapitalized" or worse after examination by regulators

in 2009 and a bit over 2% in 2010 and the full sample period. The ratio rises monotonically, averaging over 4% in quintile 3 and around 11% in quintile 5.

<Insert Table 10 about here>

Also reported in Table 10 are the book value tier one capital and leverage ratios for the quintiles of banks. The banks in quintile 1 are reported to be well capitalized, with median tier one and leverage ratios just over 9% and 7% respectively. The ratios increase monotonically across the quintiles; quintile 5 reports median tier one and leverage ratios of roughly 12% and 10%, respectively. However, Table 10 shows that, along with market-adjusted leverage ratio, coverage ratio also varies considerably by quintile. The median coverage ratio in quintile 1 is just 37% for the full sample period. The median coverage ratio increases by over 10% for the successive two quintiles before reaching 99% and 113% in quintiles 4 and 5, respectively. The coverage ratios are very similar in magnitude within quintiles across the full sample and subsample years 2008 and 2009. The reported F-values indicate that the differences in coverage ratios across the market-adjusted leverage ratio-sorted quintiles are highly statistically significant.

The low "true" capital and coverage ratios in quintiles 1 and 2 are consistent with evidence in the literature that distressed banks with low levels of true capital were permitted to conceal their undercapitalized status by under-reserving for probable future losses, thus artificially inflating reported regulatory capital ratios. This finding supports evidence in the foregoing section, and presented in Table 9, that the "true" capital ratio of the average distressed bank falls to the critically undercapitalized level one and a half years before seizure.

I next use fixed effects regression analysis to further examine the influence of capital levels on loan impairment recognition. To do so, I test separately the samples of failed banks and solvent industry banks analyzed above. I expect that, conditioned on the level of true bank capital, an increase in loan impairment will produce a lower rate of loan loss provisioning, as proxied by the coverage ratio. The dependent variable in each model specification is the same coverage ratio examined in the univariate test above; the explanatory variables are capital, balance sheet and loan impairment variables. Explanatory variables are defined in the

Appendix; for purposes of this analysis, loan variables are expressed as a percentage of gross loans. All balance sheet-based explanatory variables are lagged one quarter to mitigate concerns about reverse causality.

Summary statistics of the primary variables of interest are presented in Table 11. Panel A presents statistics for the panel of banks in the commercial banking industry; data is presented at the holding company level and is compiled from quarterly data for the period Q1 2008 to Q4 2010. Market-implied asset impairment averages between 6% and 7% of total gross loans while book value asset impairment (total past due and nonaccrual loans) averages less than half of that: 2% to 3% of total loans. Mean loan loss allowance is 2% of total gross loans, and is 62% of book value asset impairment. The average Tier 1 capital ratio is a healthy 12%.

<Insert Table 11 about here>

Panel B presents statistics for the panel of 49 publicly traded failed banks analyzed in this paper. Because market value estimates are calculated at the holding company level, bank data for this sample of failed banks is presented at the holding company level. The statistics are compiled from quarterly data beginning from the latest quarter-end available before seizure (on average roughly 45 days prior to seizure) and ending nine quarters prior. As expected, asset impairment for the failed banks is higher than that of the industry; market-implied asset impairment averages 9% of total gross loans while book value asset impairment averages between 5% and 8% of total loans. Mean loan loss allowance is a similar 2% of total gross loans, but in this sample that equates to just 31% of book value asset impairment, a much smaller percentage than industry peers. However, even in the failed bank group, Tier 1 capital ratio averages a healthy 8% to 9%.

Table 12 presents results of regressions that test the loan provisioning adequacy of the *ex-post* failed bank group. Model 1 reports that market-implied loan impairment has a negative and significant effect on the level of failed banks' coverage ratio. Model 2 substitutes a book value measure of loan impairment, total past due and nonaccrual loans (as a percentage of total loans), in place of market-implied loan

impairment. The estimated coefficient for this book value measure of impairment is also negative and significant, however the magnitude of the effect is one third smaller than that for the measure of true impairment in Model 1. Thus, conditioned on the level of true capital, the greater the level of loan impairment the less failed banks provisioned for likely future losses.

<Insert Table 12 about here>

Model 3 adds balance sheet control variables for book value capital, loan loss allowance and size; results are consistent with the two previous specifications. Notably, the estimated coefficients for the control variables, including loan loss allowance, are not significant. This result indicates that as loan impairment increased the level of reserves, loan loss allowance, remained comparatively constant, thus reducing the coverage ratio of the failed banks. Models 4 and 5 add instrumental variables for the year just preceding failure and roughly three years before auction, respectively. The variable Year 1 is the 12 month period from 3 months prior to auction to 12 months prior to auction; the variable Year 3 is the 12 month period 21 to 30 months prior to auction. The time period covered by these two instrumental variables is particularly critical for a distressed bank; as a bank becomes increasingly distressed and capital levels depressed, the bank has a greater incentive to conserve capital. I expect that the level of probable loss coverage, as proxied by the coverage ratio, will (significantly) decrease during this period.

Model 4 reports that the Year 1 dummy has an insignificant effect on the coverage ratio; the remaining variables have estimated coefficients consistent with the prior models. Model 5 reports that the Year 3 dummy has a positive and significant relation with the coverage ratio; again, the remaining variables have estimated coefficients consistent with the prior models. Taken together, the results in Models 4 and 5 demonstrate that, conditioned on loan impairment and capital levels, failed banks increased their reserve against probable loss during the early stage of distress but did not do so as they moved closer to failure. This evidence, in concert with the univariate findings presented in Table 10, is consistent with the notion that, conditioned on the level of true bank capital, distressed banks that experienced an increase in loan impairment decreased their coverage of probable losses in order to conserve capital.

Table 13 tabulates results of the same regression analysis for the solvent industry group. Regression results for the industry group are similar to that of the failed group, with several notable exceptions. Models 1 and 2 report that the measures of loan impairment, market-implied loan impairment and total past due and nonaccrual loans, have a negative and significant effect. In this case, the magnitude of book value impairment is higher than market impairment, likely because a sizable portion of past due loans for solvent banks are only 30 to 90 days past due, which is often not considered a probable loss. Model 3 adds the same control variables for book value capital, loan loss allowance and size. In this case, loan loss allowance (as a percentage of total loans) has a positive and significant effect on the coverage ratio. Moreover, the magnitude of the coefficient is greater than either measure of loan impairment. Thus, given increasing loan impairment, solvent banks fully reserved for the probable loss. In comparison, it is notable that loan loss allowance does not have a positive and significant effect on the coverage ratio of the failed bank sample, perhaps because the level of past due and nonaccrual loans is growing faster than the loss reserves posted by the failing banks. This is indirect proof that distressed banks were allowed to underserve against probable loss during the financial crisis. Total assets have a negative and significant effect on the coverage ratio, implying that bigger banks are less concerned with adverse regulatory action. This finding is consistent with the "too big to fail effect" (Thakor, 2015).

<Insert Table 13 about here>

8. Robustness analysis of estimated loan portfolio market valuation

8.1 FDIC expected loss payouts

This section presents the results of tests performed to assess the robustness of estimated loan impairment amounts. To do so, I compare the estimated loan impairment amounts to the FDIC's estimate of expected credit loss. Expected credit loss (also known as intrinsic loss) is the FDIC's estimate of future credit loss from a failed bank's loan portfolio (Office of Inspector General Report, 2012, pg. 5). The loss estimate is compiled after a bank is seized in order to offer a shared loss agreement (SLA) to prospective

bidders at FDIC failed bank auction. The SLA, with some variation, requires the FDIC to reimburse the acquiring institution for 80% of the losses on covered loans up to a certain ceiling (typically the intrinsic loss amount) and 100% of any losses over the ceiling.

Figures 6a and 6b present a comparison of market-implied asset impairment and FDIC expected credit loss for 39 of the 49 publicly-traded failed banks analyzed in this paper for which expected credit loss data is available from FDIC P&A legal agreements. Figure 6a presents a comparison of asset impairment against the full expected credit loss amount. Asset impairment is highly positively correlated with the FDIC expected loss amount; the two series have a correlation coefficient of 0.88. However, for some of the larger banks in particular, asset impairment is considerably smaller than the corresponding FDIC expected loss amount. Overall, as reported in Table 14, the mean (median) asset impairment is 59% (46%) of the FDIC expected loss amount.

<Insert Table 14 about here>

<Insert Figure 6a about here>

Figure 6b presents a comparison of the market-implied asset impairment and the FDIC expected credit loss amounts adjusted for actual payout rates. Actual payout rates for individual SLAs have been kept confidential, however in a 2012 report[18] the FDIC details that, as of the end of 3rd quarter, 2011, the payout rate on SLAs were significantly lower than expected. The report specifies that actual losses to date amounted to only 62% of expected credit losses forecast through that date and that payout rates were expected to drop further in the future as asset values recover more quickly than the FDIC projected (Office of Inspector General Report, 2012, pg. 28). With actual loss amounts taken into consideration, Figure 6b shows that asset impairment matches the level of expected credit losses much more closely. Moreover, for the observations with significant differences, the estimated impairments amounts are lower, or more

[18] The latest date for which such information is available.

conservative, than the actual losses. Table 14 reports that the mean (median) market value is 95% (74%) of the 62% FDIC expected credit loss series.

<Insert Figure 6b about here>

The test results in this section demonstrate that market-implied loan impairment amounts estimated in this paper appear to be a good predictor of the future loan portfolio credit losses embedded in the SLAs offered to failed bank acquirers. Thus, estimates of loan portfolio value derived from stock prices serve as a good proxy for the economic value of bank loan portfolios.

8.2 Return volatility and trading volume of failed banks

The analysis used in this paper presumes that macroeconomic and idiosyncratic risk is quickly and fully incorporated into bank stock prices. In order for this to be the case, trading volume must be sufficiently robust to allow the market to clear after each new information event. If volume is not sufficient for the market to fully clear, a stock's price may not fully reflect the unexpected new information, potentially distorting returns and return volatility. Because stock return volatility affects the accuracy of the estimated loan portfolio market values calculated via an option valuation methodology, I examine the stock market activity around the announced seizure and sale of the publicly traded failed banks tested in the previous sections.

Table 15 presents two measures of stock market activity preceding the announced seizure and sale of the publicly traded failed banks during the 2008 to 2010 sample period. For comparative purposes, the table also presents the same metrics for two contemporary instances of severe financial distress in the U.S. banking industry. Panel A presents the return volatility and trading volume of the failed banks sample. Panel B presents the return volatility and trading volume of the top 50 public U.S. bank holding companies preceding the date October 7, 2008; the date marks the height of volatility following passage of the Emergency Economic Stabilization Act of 2008. Panel C presents the return volatility and trading volume

preceding the announced 2008 bankruptcy/fire-sale of 3 leading financial institutions: Bear Stearns, Lehman Brothers and Wachovia.

Both annualized volatility and trading volume are presented for the time periods one week (5 trading days), one month (20 trading days), one quarter (60 trading days) and one year (252 trading days) prior to the public announcement of the events. Annualized volatility is calculated for each period following Hull (2006, pgs. 286-288) as follows:

$$Daily\ Return = ln(S_i/S_{i-1}) \tag{9}$$

$$Annualized\ Volatility = \sigma(Daily\ Return\ Time\ Series) \times \sqrt{252} \tag{10}$$

Volume (x shares outstanding) is calculated by dividing the average daily trading volume over the time periods defined above by the shares outstanding as of the last day of the period.

As reported in Panel A, the mean (median) annualized daily volatility of the failed banks in the week immediately preceding seizure is 307% (191%). The range of volatility is high; the minimum value is 36% and the maximum is 1,519%[19]. Median volatility increases to 212% and 207% in the month and quarter preceding failure before decreasing to 177% during the year preceding failure.

<Insert Table 15 about here>

Panel B reports that the mean (median) volatility of the top 50 U.S. public banks in the week preceding 10/7/2008 is 132% (119%). Median volatility increases to 137% in the preceding month before decreasing to 107% and 69% during the preceding quarter and year, respectively. Panel C reports that the mean (median) volatility of Bear Stearns, Lehman Brothers and Wachovia during the week preceding the announcement of their bankruptcy/fire-sale is 1,471% (1,244%). Median volatility drops dramatically to 671% in the preceding month and continues to fall before reaching 403% and 202% during the preceding quarter and year, respectively.

[19] Typical volatility for a stock is between 15% and 60% (Hull, 2008, pg. 286).

Comparing the failed banks and top 50 U.S. banks samples reveals that the failed banks sample had greater mean and median volatility in all four time periods. However, the mean and median volatility of the failed bank sample is much lower than the mean and median volatility of the Bear Stearns, Lehman Brothers and Wachovia sample in all time periods preceding their demise. The high levels of volatility displayed by the top 50 U.S. banks sample during this period reflect the deep distress and very real possibility of failure despite the government bailout that ultimately kept the group afloat[20]. The very high volatility of Bear Stearns, Lehman Brothers and Wachovia during the time period is not surprising given the considerable debate and uncertainty about the likelihood that the three systemically important institutions would be allowed to fail vs. the likelihood that they would be bailed out (thereby preserving shareholder capital). Only one institution in the failed bank group, Washington Mutual, approached the size of those three institutions, however, it was not considered systemically important. Thus, the failed bank sample exhibits reasonable volatility preceding failure; less than the larger and systemically important group that was allowed to fail but greater than the top 50 U.S. public banks that were at risk of failure but were ultimately bailed out by the U.S. government.

The mean (median) trading volume (x shares outstanding) of the failed banks in the week immediately preceding failure, as presented in panel A, is 94.9 (18.7) times the shares outstanding. As with return volatility, the range of trading volume is high; the minimum value is 0.5 and the maximum is 1,821.4. The trading volume decreases monotonically from 17.8 times shares outstanding in the month preceding failure to 7.0 time shares outstanding in the year preceding failure.

Panel B reports that the mean (median) trading volume of the top 50 U.S. bank sample in the week immediately preceding the event is 20.0 (12.0) times the shares outstanding. Panel C reports that the mean (median) trading volume of the Bear Stearns, Lehman Brothers and Wachovia sample group is 471.2 (474.0) times the shares outstanding. In this time frame, the relative level of trading volume of the failed

[20] The FDIC's forced sale of Wachovia to Citigroup on September 29, 2008 was an open bank transfer of ownership, not a failure. Washington Mutual is not included in the group of bank holding companies as it was a savings bank holding company.

bank sample is consistent with the pattern of return volatility; less than the larger and systemically important group but greater than the top 50 U.S. public banks that did not fail. In the month, quarter and year preceding the events, however, the median trading volume of the failed bank sample is less than that of the top 50 U.S. bank sample.

The departure from the pattern of return volatility during the latter time periods is most likely due to the drop in overall market volatility during the years 2009 and 2010 as compared to the very high volatility displayed throughout most of 2008. The daily volume of the failed bank sample is still many times the total number of daily shares outstanding; nothing in the reported trade volume statistics appears to indicate that the stock prices of the failed bank sample are, on average, significantly biased in a way to affect the analysis in this study.

9. Summary and Conclusion

This paper empirically investigates the incidence of regulatory forbearance during the financial crisis. Using an option pricing technique to estimate the value of bank loan portfolios, I find that during the financial crisis period of 2008 to 2010 failed banks consistently underreported the level of impairment in loan portfolios, helping these market value insolvent banks to report adequate capital for regulatory purposes. While the market discounted the loan portfolios of both failed banks and surviving industry peers heavily during the financial crisis, the market values of failed bank loan portfolios are consistently and significantly lower. Impairment-adjusted capital ratios provide evidence of regulatory forbearance for up to 18 months prior to seizure.

Analysis of bank coverage ratios during this period also reveals telling evidence. I find that failed banks provision a significantly lower amount to cover probable loss than do their solvent industry peers during the same period of financial crisis. Regression analysis confirms the positive effect of capital on the level of bank coverage ratios. This collective evidence is strongly indicative of forbearance on the part of supervising regulators.

My analysis reveals the tendency for regulators to allow banks to provision less than is necessary to cover probable loss during correlated distress events such as the financial crisis. Apart from the study of regulatory forbearance, the financial crisis provides a fertile setting to examine the efficacy of current loan loss accounting standards. It may be that the incurred loss model was applied, and enforced, inconsistently across the banking industry as the crisis became more severe; in particular, privately-held banks may have been less constrained by the enforcement of financial reporting standards that accompany a public listing. It may also be that the standard of demonstrable evidence of probable future loss constrained some banks from bolstering capital and reserves while still healthy, leaving them little buffer during the sudden events of the crisis and then unable to raise enough capital to keep them solvent. The evidence presented in this paper highlights areas for improvement in the current regulatory framework; future research in the aforementioned areas may well provide evidence useful in the current effort to revamp prudential regulation.

Appendix

This table defines the variables used in the regression analysis

Variable	Definition	Source
Loans past due 30 to 90 days	Loans past due (30 days through 89 days and still accruing interest)	Call report
Loans past due 90+ days	Loans past due (90 or more days and still accruing interest)	Call report
Nonaccrual loans	Loans which are no longer accruing interest	Call report
Total past due and nonaccrual loans	Ratio of past due and nonaccrual loans to total loans	Call report
Loan loss allowance	Ratio of loan loss allowance to total loans	Call report
Coverage ratio	Ratio of loan loss allowance to loans past due 90+ days and nonaccrual loans	Call report
Tier 1 ratio	Ratio of tier 1 capital to risk weighted assets	Call report
Total assets	Log of total assets ($, thousands)	Call report
Market-implied loan impairment	Estimated credit loss of bank's loan portfolio as a percentage of total loans. Estimate calculated by option-pricing methodology.	Calculated
Year 1	Indicator variable. Value = 1, if quarter is 3 to 12 months prior to auction, 0 otherwise.	
Year 3	Indicator variable. Value = 1, if quarter is 21 to 30 months prior to auction, 0 otherwise.	

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Figure 2: Quarterly time-series comparison of average book value and average market value of failed bank loan portfolios sold in whole bank form at FDIC auction

This figure presents a time-series plot of the average loan portfolio book value of publicly traded failed banks sold in whole bank form as compared to the average loan portfolio market value of the same sample group. Loan portfolio book value is the mean of the book value of total loans, net of loan loss allowance. Loan portfolio market value is the mean of the market value of total loans of the failed banks as derived from the bank's daily stock prices using an option valuation methodology. Book and market values of loan portfolios at auction date are the mean values of the failed bank portfolios as reported and valued by the acquirers. Balance sheet data is from Compustat. Observations are quarterly. Auction date values are from acquirer 8-K, 10-Q and 10-K SEC filings. Projected loan portfolio book and market values are the interpolated values from the last available quarterly financial reports prior to seizure (and last quarter end stock prices prior to delisting) and the book and market values reported at auction. The sample is comprised of publicly traded banks seized during the period 2008 to 2010 for which detailed valuation is publicly available and for banks in which essentially all assets and liabilities were sold to acquirers at FDIC auction.

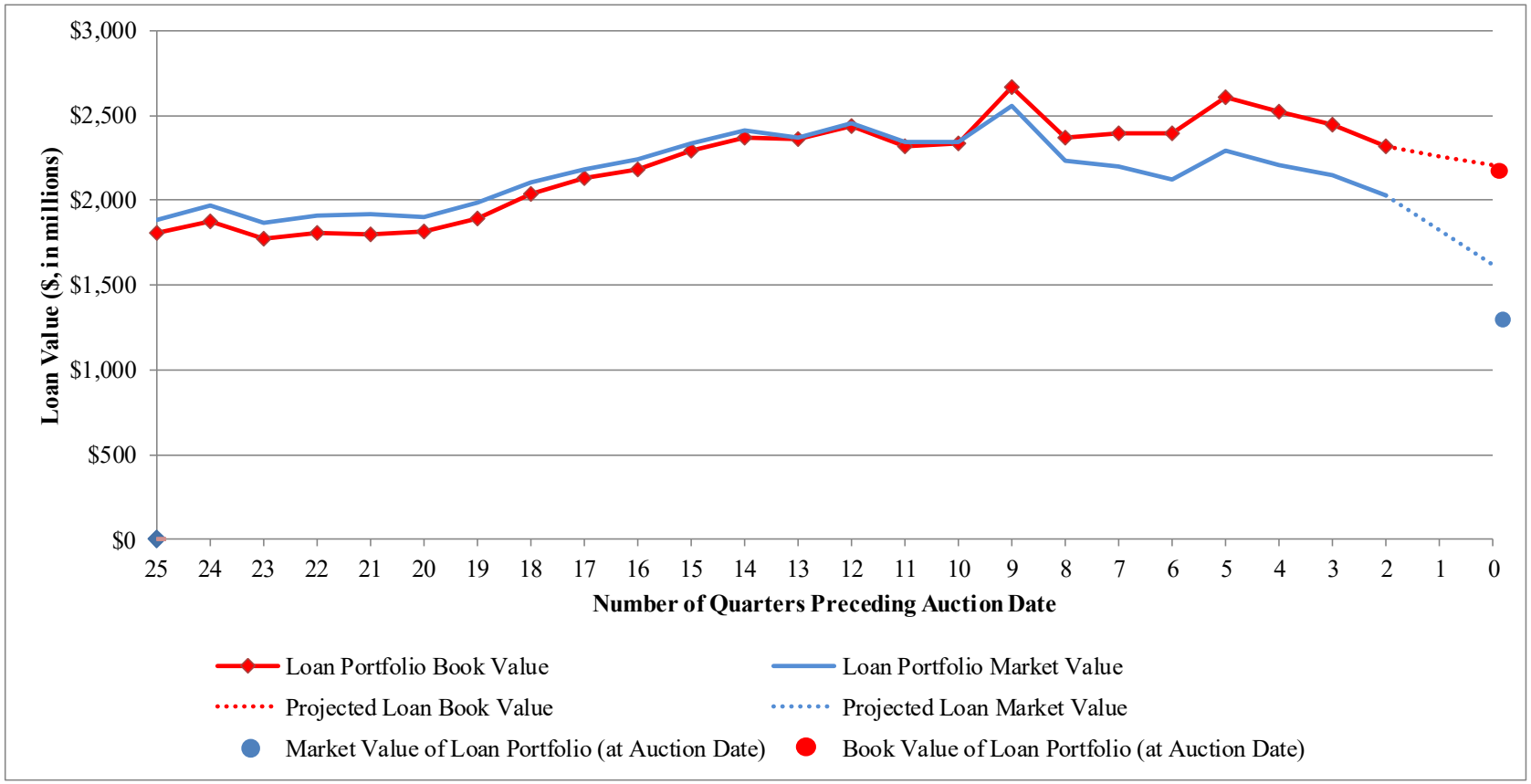

Figure 3: Quarterly time-series comparison of average book value and average market value of failed bank loan portfolios
This figure presents a time-series plot of the average loan portfolio book value of publicly traded failed banks as compared to the average loan portfolio market value of the same sample group. Loan portfolio book value is the mean of the book value of total loans, net of loan loss allowance. Loan portfolio market value is the mean of the market value of total loans of the failed banks as derived from the bank's daily stock prices using an option valuation methodology. Balance sheet data is from Compustat. Observations are quarterly. The sample is comprised of publicly traded banks seized during the period 2008 to 2010.

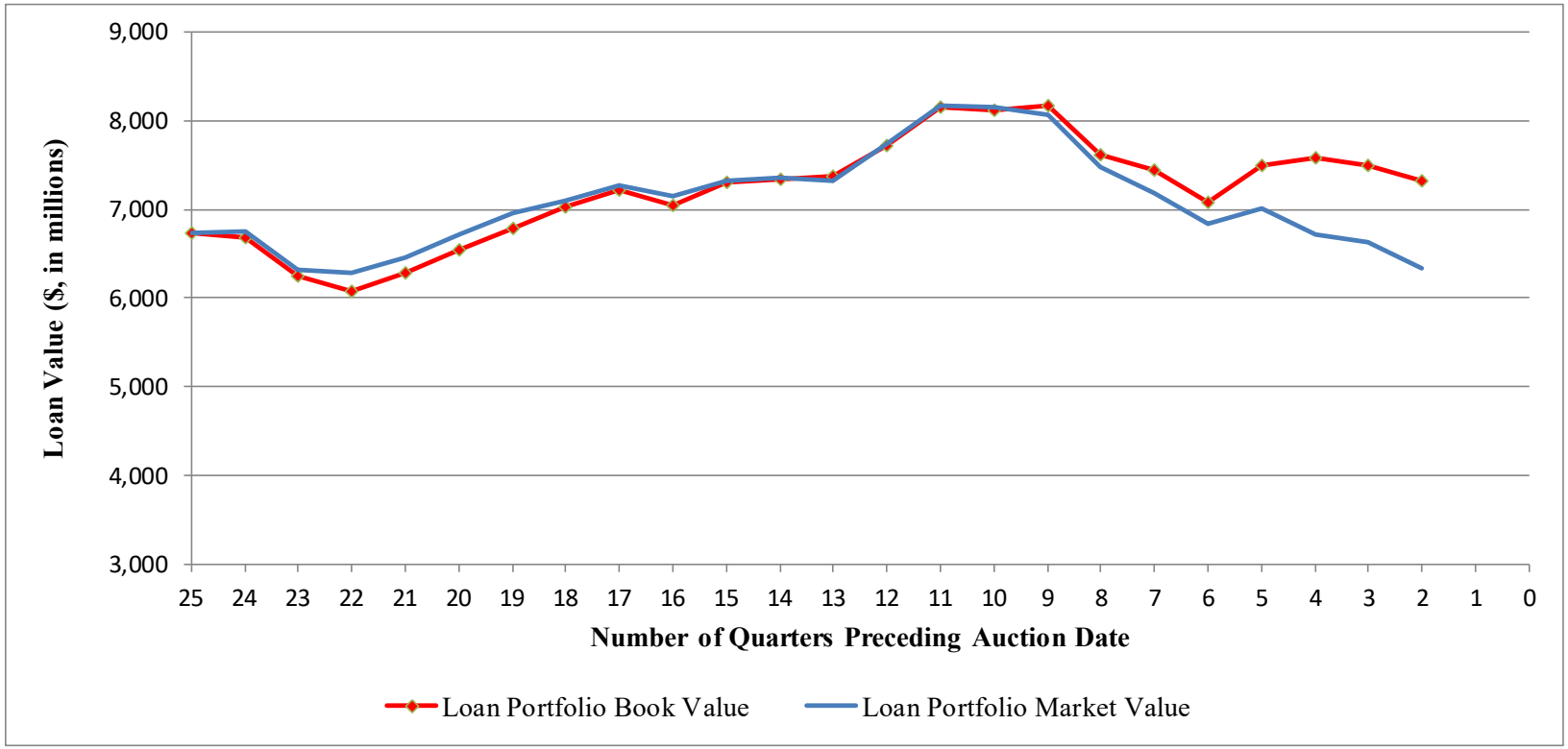

Figure 4: Quarterly time-series comparison of average book value and average market value of the commercial banking industry
This figure presents a time-series plot of the average loan portfolio book value of the solvent banks within the commercial banking industry as compared to the average loan portfolio market value of the same sample group. Loan portfolio book value is the mean of the book value of total loans, net of loan loss allowance. Loan portfolio market value is the mean of the market value of total loans of the banks as derived from the bank's daily stock prices using an option valuation methodology. Balance sheet data is from Compustat. Observations are quarterly. The industry is proxied by the banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented in Figure 2 that overlap SIC code 6020 have been removed from this sample.

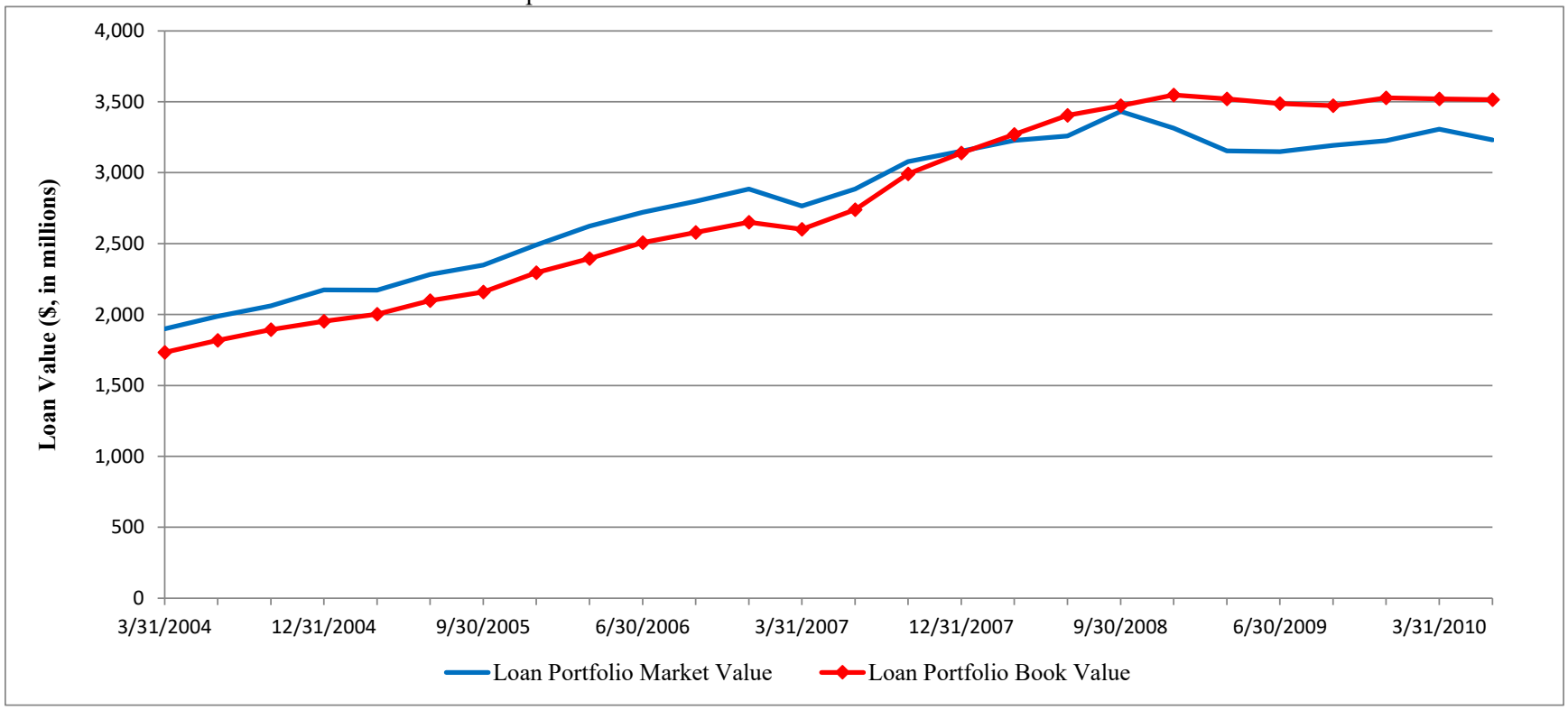

Figure 5: Quarterly time-series comparison of loan portfolio market to book values of solvent and failed banks

This figure presents a time-series plot of the average loan portfolio market to book ratio of the solvent banks within the commercial banking industry as compared to the average loan portfolio market to book ratio of failed banks. Loan portfolio book value is the mean of the book value of total loans, net of loan loss allowance. Loan portfolio market value is the mean of the market value of total loans of the banks as derived from the bank's daily stock prices using an option valuation methodology. Balance sheet data is from Compustat. Observations are quarterly. The industry sample group is proxied by the banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented in Figure 2 that overlap SIC code 6020 have been removed from this sample. The failed bank sample group is comprised of publicly traded banks seized during the period 2008 to 2010.

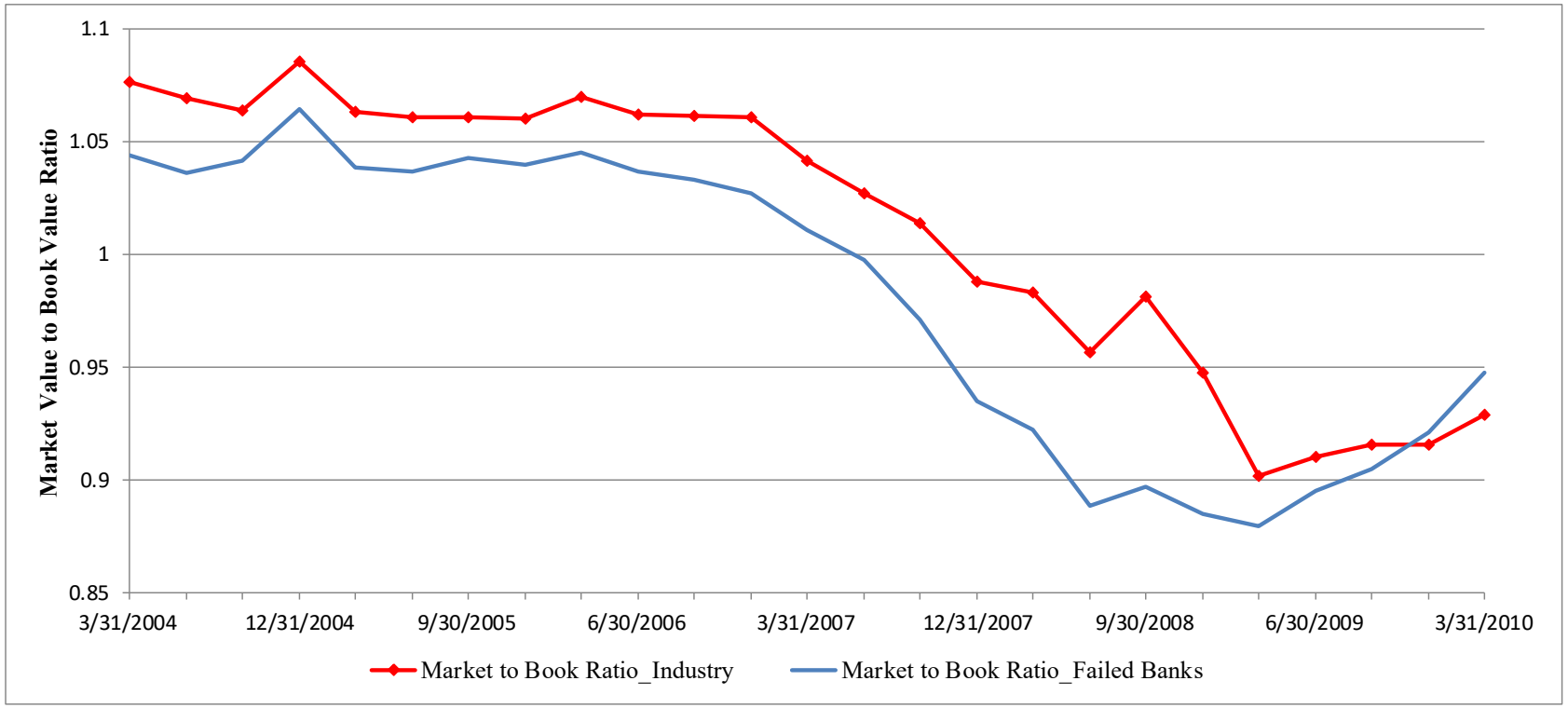

Figure 6a: Cross-sectional comparison of market-implied asset impairment and FDIC expected credit losses from loan impairment

This figure presents a comparison of the asset impairment amounts implied by bank stock prices and the FDIC expected credit loss from the loan portfolios of publicly traded failed banks seized and auctioned during the 2008 to 2010 sample period. FDIC expected credit loss is the loss estimated by the FDIC for each failed banks shared loss covered loan portfolio. Market-implied asset impairment is the difference between market and book value of total loans as derived from the bank's daily stock prices using an option valuation methodology.

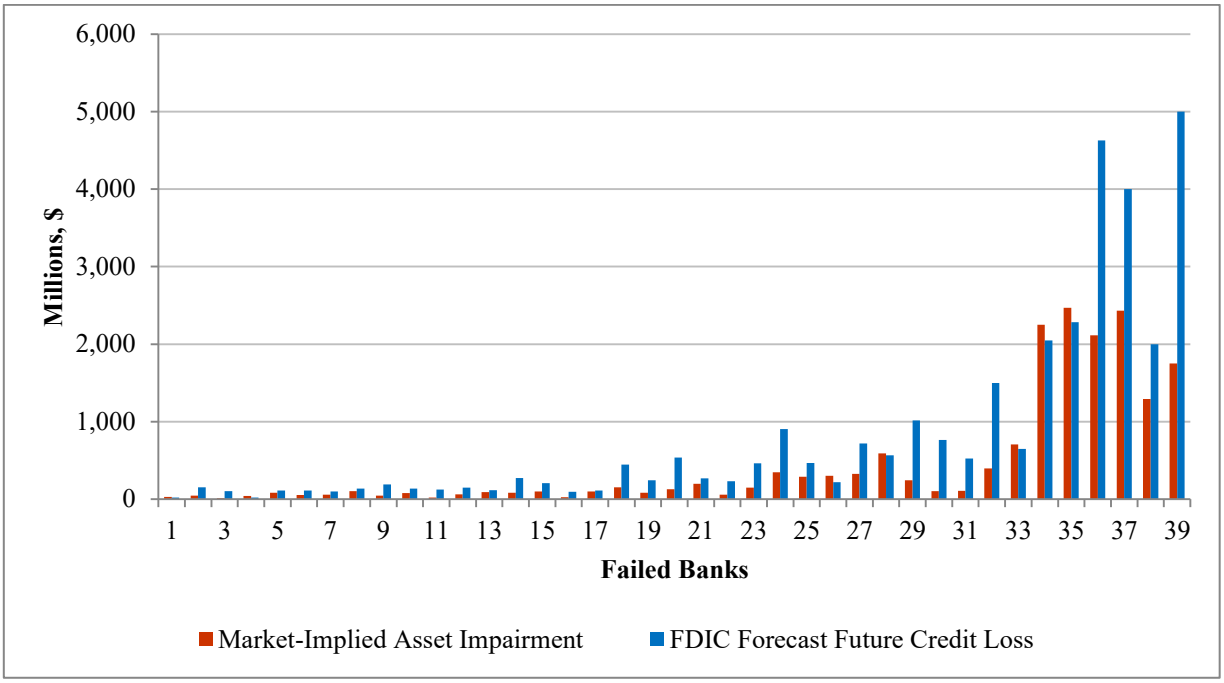

Figure 6b: Cross-sectional comparison of market-implied asset impairment and FDIC expected credit losses from loan impairment

This figure presents a comparison of the asset impairment amounts implied by bank stock prices and the FDIC expected credit loss from the loan portfolios of publicly traded failed banks seized and auctioned during the 2008 to 2010 sample period. FDIC 62% expected credit loss is the loss estimated by the FDIC for each failed banks shared loss covered loan portfolio adjusted for the actual loss payout rate disclosed by the FDIC as of end of 3rd quarter, 2011. Market-implied asset impairment is the difference between market and book value of total loans as derived from the bank's daily stock prices using an option valuation methodology.

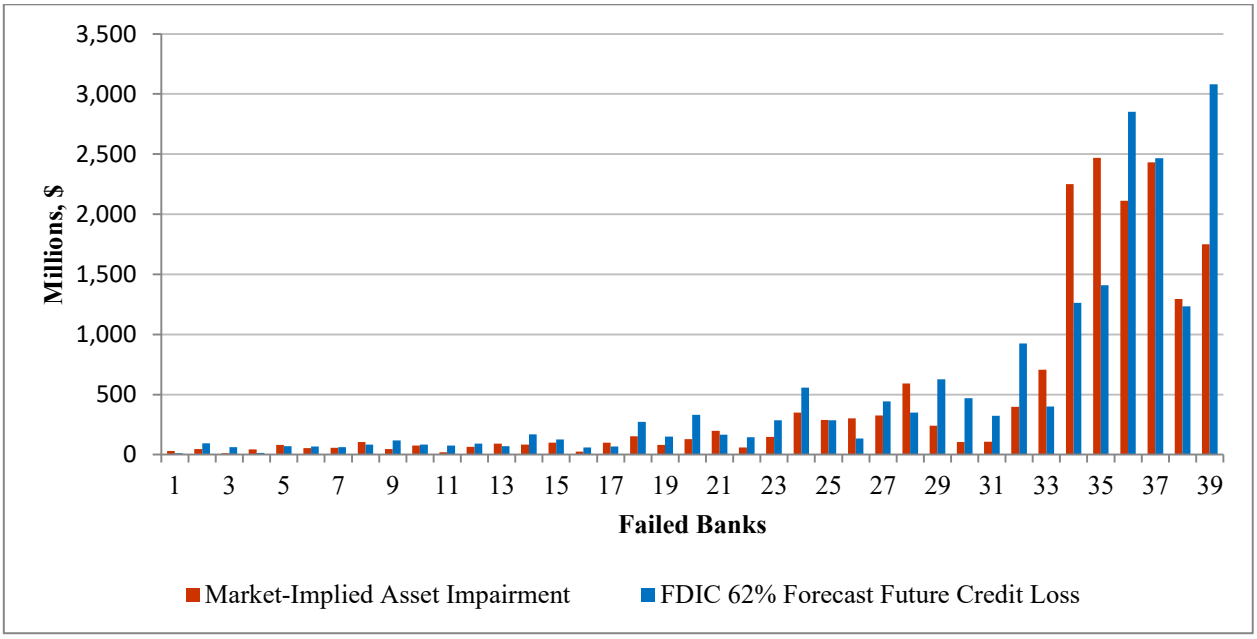

Table 1: Time-series comparison of coverage ratio of solvent and failed banks

This table presents a time-series comparison of the average coverage ratio of the solvent banks within the commercial banking industry as compared to the average coverage ratio of publicly traded failed banks for the period 2008 to 2010. The industry is proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented in Panel B that overlap SIC code 6020 have been removed from the sample presented in Panel A. Coverage ratio is loan loss reserve as a percentage of loans 90+ days past due plus non-accrual loans.

Panel A: Industry	**6/30/08**	**9/30/08**	**12/31/08**	**3/31/09**	**6/30/09**	**9/30/09**	**12/31/09**	**3/31/10**	**6/30/10**
Mean	1.50	1.34	1.19	0.90	0.95	0.95	0.84	0.91	0.92
Median	0.99	0.92	0.83	0.74	0.70	0.66	0.70	0.71	0.71
N	97	97	97	98	98	98	96	98	97

	Number of Quarter Before Auction								
Panel B: Failed Banks	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**
Mean	1.62	1.29	0.78	0.63	0.46	0.24	0.38	0.32	0.30
Median	1.09	0.68	0.56	0.43	0.37	0.22	0.32	0.28	0.27
N	41	42	43	45	47	49	49	49	49

Table 2: Capital adequacy framework under the Prompt Corrective Action provision
This table presents definitions of the capital adequacy categories and corrective action restrictions as defined by the Prompt Corrective Action provision of FDICIA. Banks are classified according to their reported level of capital. Restrictions on business activity are prescribed according to capital adequacy; only major restrictions are listed.

Capital category	Total risk-based		Tier 1 risk-based		Leverage	Restrictions
Well capitalized	10% or more	and	6% or more	and	5% or more	None
Adequately capitalized	8% or more	and	4% or more	and	4% or more	None
Undercapitalized	less than 8%	or	less than 4%	or	less than 4%	1. Capital restoration plan 2. Suspend dividends 3, Restrict asset growth 4. Prior approval for expansion
Significantly undercapitalized	less than 6%	or	less than 3%	or	less than 3%	1. Require recapitalization 2. Restrict transactions with affiliates 3. Restrict interest rates paid 4. Further restrict asset growth 5. Prohibit deposits from correspondents 6. Hire, replace senior management
Critically undercapitalized	N/A - tangible equity to total assets ratio of 2% or less					Receivership or conservatorship within 90 days unless exempted by primary regulator and FDIC

Table 3: Summary statistics for failed banks and industry control group from 2008 to 2010
This table presents descriptive statistics concerning bank balance sheet characteristics for a sample of publicly-traded failed banks, the population of failed banks, and the solvent banks within the commercial banking industry for the period 2008 to 2010. Panel A presents statistics for the commercial banking industry as proxied by the sample of banks that comprise SIC code 6020 – commercial banks and financial institutions. Any failed banks that overlap SIC code 6020 have been removed from the sample. Data is presented at the holding company level and is for the quarter ending June 30, 2010. Panel B presents statistics for the population of failed banks from 2008 to 2010. Data is presented at bank level and is for the latest quarter-end available before seizure. Panel C presents statistics for the sample of publicly-traded failed banks sold in whole bank form from 2008 to 2010. Data is presented at the holding company level and is for the latest quarter-end available before seizure; on average roughly 45 days prior to seizure. Variable definitions are presented in the Appendix. All ratios presented in this table are presented as a percent of total assets; tier 1 ratio is scaled by total risk-weighted assets.

	Mean	Median	Min	Max	Std. dev.	N
Panel A: Industry						
Real estate loans	0.51	0.53	0.04	0.80	0.14	99
Commercial and industrial loans	0.10	0.08	0.00	0.37	0.06	99
Total loans, ratio	0.66	0.69	0.30	0.84	0.11	99
Total past due and nonaccrual loans	0.03	0.03	0.00	0.17	0.03	99
Loan loss allowance	0.01	0.01	0.00	0.05	0.01	99
Tier 1 ratio	0.13	0.13	-0.02	0.20	0.03	99
Total assets ($, thous)	7,594,058	2,522,608	380,839	159,058,393	19,184,428	99
Panel B: Failed banks, 2008 - 2010						
Real estate loans	0.61	0.63	0.00	0.92	0.14	322
Commercial and industrial loans	0.08	0.06	0.00	0.49	0.07	322
Total loans, ratio	0.72	0.73	0.24	0.94	0.11	322
Total past due and nonaccrual loans	0.16	0.14	0.01	0.47	0.09	322
Loan loss allowance	0.03	0.03	0.00	0.18	0.02	322
Tier 1 ratio	0.02	0.02	-0.20	0.63	0.06	322
Total assets ($, thous)	1,968,135	257,491	6,177	307,021,614	17,291,163	322
Panel C: Failed banks, sample						
Real estate loans	0.65	0.67	0.44	0.88	0.11	49
Commercial and industrial loans	0.07	0.06	0.00	0.22	0.05	49
Total loans, ratio	0.74	0.74	0.53	0.93	0.09	49
Total past due and nonaccrual loans	0.15	0.14	0.03	0.41	0.08	49
Loan loss allowance	0.03	0.03	0.01	0.08	0.01	49
Tier 1 ratio	0.03	0.03	-0.07	0.20	0.04	49
Total assets ($, thous)	10,401,246	1,396,622	203,262	307,021,614	50,199,280	49

Table 4: Loan valuation sample statistics

This table reports failed bank loan portfolio characteristics for failed bank auction sales over the period 2008-2010. The sample comprises transactions for which detailed deal valuation data is available. Panel A presents statistics for the full sample. Panel B presents statistics for the subsample of publicly-traded failed banks; panel C presents statistics for the subsample of private failed banks. Book value is the book value of total loans of the failed bank as of the purchase date. Fair value is the fair market value of total loans of the failed bank as of the purchase date. Fair value adjustment is the adjustment to book value used to properly record loans of the failed bank at fair value as of the purchase date. Data are from acquirer 8K, 10Q or 10K filings.

Bank loan portfolio (in $, thousands)	N	Mean	Median	Standard dev.	Max	Min
Panel A: failed banks	96					
Book value	81	1,023,636	324,285	2,362,987	14,328,000	32,472
Fair value	96	600,425	196,687	1,390,781	9,776,000	131
Fair value adjustment	82	(348,206)	(96,717)	961,249	(5,424)	(6,163,904)
Fair value adjustment (% of book value)		-34.0%	-29.8%			
Panel B: failed banks, publicly-traded	28					
Book value	27	2,207,633	561,477	3,683,647	14,328,000	141,586
Fair value	28	1,408,096	473,806	2,217,209	9,776,000	113,564
Fair value adjustment	27	(804,830)	(167,643)	1,577,059	(24,211)	(6,163,904)
Fair value adjustment (% of book value)		-36.5%	-29.9%			
Panel C: failed banks, private	68					
Book value	54	431,637	242,139	836,898	5,962,086	32,472
Fair value	68	267,854	144,616	613,738	5,016,003	131
Fair value adjustment	55	(124,045)	(73,948)	181,846	(5,424)	(946,083)
Fair value adjustment (% of book value)		-28.7%	-30.5%			

Table 5: Quarterly time-series comparison of average book value and average market value of failed bank loan portfolios sold in whole bank form at FDIC auction

This table presents a time-series comparison of the average loan portfolio book value of publicly traded failed banks sold in whole bank form as compared to the average loan portfolio market value of the same sample group. Variables are defined in Figure 2. Balance sheet data is from Compustat. Observations are quarterly. The sample is comprised of publicly traded banks seized during the period 2008 to 2010 for which detailed valuation is publicly available and for banks in which essentially all assets and liabilities were sold to acquirers at FDIC auction. Reported p-values are from Wilcoxon signed rank sum tests.

	Number of Quarters Prior to Auction Date											
	13	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**
Book Value	2,356	2,438	2,321	2,339	2,663	2,367	2,391	2,390	2,610	2,524	2,450	2,315
Market Value	2,368	2,453	2,347	2,342	2,553	2,231	2,196	2,121	2,289	2,206	2,144	2,030
Difference	(11)	(15)	(26)	(3)	110	136	194	269	320	318	306	285
(p-value)	(.542)	(.779)	(.927)	(.338)	(.016)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
M / B Ratio	1.00	1.01	1.01	1.00	0.96	0.94	0.92	0.89	0.88	0.87	0.88	0.88
# of Obs.	27	27	25	26	27	27	27	27	28	28	28	28
	25	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**
Book Value	1,809	1,871	1,773	1,811	1,799	1,817	1,896	2,039	2,130	2,181	2,292	2,366
Market Value	1,884	1,965	1,865	1,911	1,917	1,899	1,982	2,101	2,178	2,244	2,336	2,411
Difference	(74)	(94)	(92)	(100)	(118)	(82)	(87)	(62)	(48)	(62)	(45)	(45)
(p-value)	(.294)	(.09)	(.134)	(.035)	(.05)	(.052)	(.06)	(.239)	(.239)	(.082)	(.215)	(.245)
M / B Ratio	1.04	1.05	1.05	1.05	1.07	1.05	1.05	1.03	1.02	1.03	1.02	1.02
# of Obs.	20	20	22	23	24	25	25	25	25	26	26	26

Table 6a: Quarterly time-series comparison of average book value and average market value of failed bank loan portfolios
This table presents a time-series comparison of the average loan portfolio book value of publicly traded failed banks as compared to the average loan portfolio market value of the same sample group. Variables are defined in Figure 3. Balance sheet data is from Compustat. Observations are quarterly. The sample is comprised of publicly traded banks seized during the period 2008 to 2010. Reported p-values are from Wilcoxon signed rank sum tests.

	Number of Quarters Prior to Auction Date												
	12	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Book Value	7,723	8,153	8,125	8,165	7,612	7,442	7,085	7,496	7,588	7,500	7,326	7,168	7,021
Market Value	7,736	8,170	8,144	8,058	7,481	7,191	6,835	7,011	6,715	6,626	6,335	5,763	5,526
Difference	(13)	(17)	(19)	107	131	251	250	485	873	874	992	1,405	1,495
(p-value)	(.688)	(.917)	(.378)	(.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
M / B Ratio	1.00	1.00	1.00	0.99	0.98	0.97	0.96	0.94	0.88	0.88	0.86	0.80	0.79
# of Obs.	44	44	44	44	45	45	47	49	49	49	49	49	49
	25	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	**15**	**14**	**13**
Book Value	6,740	6,683	6,243	6,073	6,288	6,537	6,783	7,018	7,212	7,043	7,303	7,343	7,380
Market Value	6,733	6,756	6,309	6,276	6,461	6,716	6,963	7,098	7,270	7,143	7,326	7,360	7,323
Difference	8	(73)	(66)	(203)	(173)	(179)	(180)	(80)	(58)	(100)	(23)	(17)	57
(p-value)	(.419)	(.032)	(.093)	(.008)	(.001)	(.001)	(.002)	(.012)	(.017)	(.004)	(.02)	(.096)	(.304)
M / B Ratio	1.00	1.01	1.01	1.03	1.03	1.03	1.03	1.01	1.01	1.01	1.00	1.00	0.99
# of Obs.	44	44	44	44	44	44	44	44	44	44	44	44	44

Table 6b: Quarterly time-series comparison of average book value and average market value of failed bank loan portfolios, continued
This table presents a time-series comparison of the average loan portfolio book value of publicly traded failed banks as compared to the average loan portfolio market value of the same sample group. Book value asset/liability ratios are calculated from quarterly Compustat data. Market value asset/liability ratios are calculated from quarterly Compustat data and adjusted for the effects of market valuation. % < 1.0 indicates the percentage of banks for the sample period with an asset/liability ratio below 1.0. Ratios for periods 0 and 1 are calculated based on interpolated run-rates derived from the sample presented in Figure 2. The sample is comprised of publicly traded banks seized during the period 2008 to 2010. Reported p-values are from Wilcoxon signed rank sum tests.

	Number of Quarters Prior to Auction Date									
	9	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Book Value										
Median	1.09	1.09	1.09	1.08	1.07	1.07	1.05	1.03	1.02	1.00
High	1.20	1.21	1.19	1.17	1.16	1.16	1.15	1.15	1.20	1.26
Low	1.05	1.05	1.04	1.03	1.02	1.01	0.98	0.97	0.84	0.72
% < 1.0	0%	0%	0%	0%	0%	0%	6%	21%	43%	53%
Market Value										
Median	1.05	1.05	1.02	1.00	0.98	0.97	0.96	0.96	0.92	0.91
High	1.27	1.17	1.17	1.15	1.14	1.12	1.07	1.06	1.07	1.13
Low	0.98	0.97	0.96	0.96	0.95	0.95	0.95	0.95	0.79	0.68
% < 1.0	7%	16%	27%	47%	67%	80%	88%	96%	90%	82%
# of Obs.	44	44	45	47	49	49	49	49	49	49

Table 7a: Quarterly time-series comparison of average book value and average market value of the commercial banking industry
This table presents a time-series comparison of the average loan portfolio book value of the solvent banks within the commercial banking industry as compared to the average loan portfolio market value of the same sample group. Variables are defined in Figure 4. Balance sheet data is from Compustat. Observations are quarterly. The industry is proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented that overlap SIC code 6020 have been removed from this sample. Reported p-values are from Wilcoxon signed rank sum tests.

	6/30/07	9/30/07	12/31/07	3/31/08	6/30/08	9/30/08	12/31/08	3/31/09	6/30/09	9/30/09	12/31/09	3/31/10	6/30/10
Book Value	2,739	2,992	3,139	3,270	3,405	3,472	3,549	3,520	3,487	3,472	3,529	3,521	3,515
Market Value	2,885	3,078	3,152	3,228	3,258	3,433	3,314	3,153	3,148	3,192	3,226	3,307	3,231
Difference	(146)	(86)	(13)	42	147	40	235	367	339	280	303	214	285
(p-value)	(<.001)	(.082)	(.024)	(.015)	(<.001)	(.042)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
M / B Ratio	1.05	1.03	1.00	0.99	0.96	0.99	0.93	0.90	0.90	0.92	0.91	0.94	0.92
# of Obs.	111	108	106	104	102	102	102	102	101	101	100	99	99
	3/31/04	6/30/04	9/30/04	12/31/04	3/31/05	6/30/05	9/30/05	12/31/05	3/31/06	6/30/06	9/30/06	12/31/06	3/31/07
Book Value	1,732	1,819	1,893	1,953	2,003	2,097	2,160	2,295	2,394	2,508	2,579	2,650	2,600
Market Value	1,900	1,987	2,061	2,173	2,171	2,281	2,348	2,490	2,624	2,721	2,799	2,884	2,766
Difference	(167)	(169)	(168)	(220)	(168)	(184)	(189)	(196)	(230)	(213)	(220)	(234)	(165)
(p-value)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)	(<.001)
M / B Ratio	1.10	1.09	1.09	1.11	1.08	1.09	1.09	1.09	1.10	1.08	1.09	1.09	1.06
# of Obs.	146	139	135	135	135	132	130	127	124	123	121	116	114

Table 7b: Quarterly time-series comparison of average book value and average market value of the commercial banking industry, continued

This table presents a time-series comparison of the average loan portfolio book value of the solvent banks within the commercial banking industry as compared to the average loan portfolio market value of the same sample group. Book value asset/liability ratios are calculated from quarterly Compustat data. Market value asset/liability ratios are calculated from quarterly Compustat data and adjusted for the effects of market valuation. % < 1.0 indicates the percentage of banks for the sample period with an asset/liability ratio below 1.0. The industry is proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented that overlap SIC code 6020 have been removed from this sample. Reported p-values are from Wilcoxon signed rank sum tests.

	6/30/07	9/30/07	12/31/07	3/31/08	6/30/08	9/30/08	12/31/08	3/31/09	6/30/09	9/30/09	12/31/09	3/31/10	6/30/10
Book Value													
Median	1.10	1.10	1.10	1.10	1.10	1.09	1.10	1.10	1.10	1.10	1.10	1.11	1.11
High	1.22	1.23	1.23	1.18	1.18	1.18	1.21	1.20	1.19	1.21	1.20	1.20	1.18
Low	1.06	1.06	1.05	1.05	1.05	1.03	1.04	1.03	1.03	1.02	1.02	1.01	0.99
% < 1.0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%
Market Value													
Median	1.12	1.11	1.09	1.09	1.05	1.07	1.05	1.02	1.03	1.03	1.03	1.05	1.04
High	1.26	1.27	1.23	1.26	1.29	1.33	1.35	1.31	1.34	1.33	1.34	1.31	1.29
Low	1.01	1.00	0.98	0.98	0.97	0.96	0.95	0.95	0.96	0.96	0.95	0.95	0.95
% < 1.0	0%	0%	2%	4%	12%	11%	19%	36%	35%	32%	33%	27%	25%
# of Obs.	111	108	106	104	102	102	102	102	101	101	100	99	99
	3/31/04	6/30/04	9/30/04	12/31/04	3/31/05	6/30/05	9/30/05	12/31/05	3/31/06	6/30/06	9/30/06	12/31/06	3/31/07
Book Value													
Median	1.09	1.09	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.09	1.10	1.10	1.10
High	1.22	1.20	1.21	1.22	1.21	1.22	1.22	1.20	1.20	1.20	1.21	1.22	1.22
Low	1.06	1.04	1.05	1.05	1.05	1.05	1.05	1.06	1.06	1.06	1.06	1.06	1.07
% < 1.0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Market Value													
Median	1.14	1.14	1.14	1.15	1.14	1.13	1.14	1.13	1.14	1.13	1.14	1.14	1.13
High	1.29	1.30	1.33	1.35	1.30	1.30	1.31	1.29	1.34	1.29	1.29	1.34	1.29
Low	1.03	1.03	1.02	1.01	1.01	1.02	1.02	1.01	1.01	1.00	1.01	1.01	1.01
% < 1.0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
# of Obs.	146	139	135	135	135	132	130	127	124	123	121	116	114

Table 8: Quarterly time-series comparison of loan portfolio market to book values of solvent and failed banks

This table presents a time-series plot of the average loan portfolio market to book ratio of the solvent banks within the commercial banking industry as compared to the average loan portfolio market to book ratio of publicly traded failed banks. Variables are defined in Figure 5. Balance sheet data is from Compustat. Observations are quarterly. The industry is proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented that overlap SIC code 6020 have been removed from this sample. The failed bank sample group is comprised of publicly traded banks seized during the period 2008 to 2010. Reported p-values are from Wilcoxon signed rank sum tests.

	6/30/07	9/30/07	12/31/07	3/31/08	6/30/08	9/30/08	12/31/08	3/31/09	6/30/09	9/30/09	12/31/09	3/31/10
Industry	1.03	1.01	0.99	0.98	0.96	0.98	0.95	0.90	0.91	0.92	0.92	0.93
Failed Banks	1.00	0.97	0.94	0.92	0.89	0.90	0.89	0.88	0.90	0.90	0.92	0.95
Difference	0.029	0.043	0.053	0.061	0.068	0.084	0.062	0.022	0.015	0.010	(0.005)	(0.019)
(p-value)	(.003)	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.294)	(.657)	(.988)	(.329)	n/a
	6/30/04	9/30/04	12/31/04	3/31/05	6/30/05	9/30/05	12/31/05	3/31/06	6/30/06	9/30/06	12/31/06	3/31/07
Industry	1.07	1.06	1.09	1.06	1.06	1.06	1.06	1.07	1.06	1.06	1.06	1.04
Failed Banks	1.04	1.04	1.06	1.04	1.04	1.04	1.04	1.05	1.04	1.03	1.03	1.01
Difference	0.033	0.022	0.021	0.024	0.024	0.018	0.021	0.025	0.025	0.028	0.034	0.031
(p-value)	(.005)	(.052)	(.09)	(.032)	(.048)	(.23)	(.098)	(.052)	(.06)	(.032)	(.003)	(.009)

Table 9: Time-series comparison of regulatory capital ratios of solvent and failed banks

This table presents a time-series comparison of the average regulatory capital ratios of the solvent banks within the commercial banking industry as compared to the average regulatory capital ratios of failed banks for the period 2008 to 2010. Capital ratio data are from Call reports. Market value leverage ratios are calculated from quarterly Compustat and Call report data and adjusted for the effects of market valuation. Market valuation is derived from the bank's daily stock prices using an options valuation methodology. The industry is proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented that overlap SIC code 6020 have been removed from this sample. The failed bank sample group is comprised of publicly traded banks seized during the period 2008 to 2010.

Panel A: Industry	**6/30/08**	**9/30/08**	**12/31/08**	**3/31/09**	**6/30/09**	**9/30/09**	**12/31/09**	**3/31/10**	**6/30/10**
Ratios, Book Value									
Tier One Risk-Adjusted Capital	10.30	10.25	10.80	11.84	11.82	11.74	11.92	12.44	12.73
Total Risk-Adjusted Capital	11.93	12.04	12.53	13.45	13.46	13.53	13.58	14.25	14.45
Tier One Leverage	8.68	8.43	8.49	8.66	9.36	9.29	9.09	9.01	9.13
Ratios, Market Value									
Tier One Leverage	6.41	7.16	5.89	4.38	4.43	5.12	4.99	5.76	5.85
N	102	102	102	101	101	101	100	99	99

	Number of Quarter Before Auction								
Panel B: Failed Banks	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**
Ratios, Book Value									
Tier One Risk-Adjusted Capital	10.18	10.14	9.87	9.43	9.32	9.01	8.29	5.88	3.83
Total Risk-Adjusted Capital	11.43	11.27	11.07	10.78	10.64	10.39	9.71	7.34	5.44
Tier One Leverage	8.42	8.50	8.35	8.03	7.39	7.21	6.47	4.70	3.03
Ratios, Market Value									
Tier One Leverage	6.02	5.50	3.51	3.30	2.01	1.96	1.95	2.58	0.41
N	44	44	44	45	47	49	49	49	49

Table 10: Quintile ranks of capital and coverage ratios of pooled sample

This table presents median capital and coverage ratios of the pooled sample of banks for the period 2008 to 2010, sorted by quintile rank of market-adjusted leverage ratios. Capital and coverage ratio data are from Call reports. Market value leverage ratios are calculated from quarterly Compustat and Call report data and adjusted for the effects of market valuation. Market valuation is derived from the bank's daily stock prices using an options valuation methodology. The symbol *** denotes statistical significance at the 0.001 level.

	Ratios	2009	2010	All Qrtrs
Quntile 1	Asset Impairment Coverage Ratio	16.76	14.81	15.13
	Coverage Ratio	39.37	36.07	37.02
	Tier One Capital Ratio	8.85	9.83	9.02
	Tier One Leverage Ratio	6.63	7.26	7.19
	Tier One Leverage Ratio, Market-Adjusted	-1.18	0.45	-0.27
	Total Assets (in $1,000's)	3,635,697	2,092,737	2,337,040
Quntile 2	Asset Impairment Coverage Ratio	14.09	17.96	15.69
	Coverage Ratio	44.15	50.50	49.82
	Tier One Capital Ratio	10.18	11.01	10.29
	Tier One Leverage Ratio	8.39	8.51	8.32
	Tier One Leverage Ratio, Market-Adjusted	1.90	2.39	2.26
	Total Assets (in $1,000's)	1,879,894	2,148,242	2,051,247
Quntile 3	Asset Impairment Coverage Ratio	18.62	24.06	21.31
	Coverage Ratio	58.67	55.97	63.43
	Tier One Capital Ratio	10.25	11.28	10.60
	Tier One Leverage Ratio	8.11	8.55	8.40
	Tier One Leverage Ratio, Market-Adjusted	4.25	4.75	4.68
	Total Assets (in $1,000's)	2,204,763	1,804,138	2,115,948
Quntile 4	Asset Impairment Coverage Ratio	32.54	32.43	36.35
	Coverage Ratio	90.41	95.56	98.55
	Tier One Capital Ratio	10.80	12.79	11.24
	Tier One Leverage Ratio	8.66	8.95	8.82
	Tier One Leverage Ratio, Market-Adjusted	6.89	7.53	7.43
	Total Assets (in $1,000's)	1,857,160	3,095,097	2,879,319
Quntile 5	Asset Impairment Coverage Ratio	100.00	100.00	100.00
	Coverage Ratio	118.20	98.72	113.01
	Tier One Capital Ratio	11.82	12.47	12.10
	Tier One Leverage Ratio	9.53	10.19	9.74
	Tier One Leverage Ratio, Market-Adjusted	10.98	10.88	11.28
	Total Assets (in $1,000's)	3,077,535	3,050,659	2,787,946
	F-value	25.10***	14.38***	48.65***
	N	608	502	1,285

Table 11: Summary statistics of explanatory variables
This table presents summary statistics for the primary variables examined in this paper. Panel A presents statistics for the commercial banking industry for the period 2008 to 2010 as proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks that overlap SIC code 6020 have been removed from the sample. Panel B presents statistics for the population of failed banks for the period 2008 to 2010. Variable definitions are presented in the Appendix.

Panel A: Industry	Mean	Median	Min	Max	Std. Dev.	N
Market-implied loan impaiment	0.06	0.07	-0.42	0.25	0.09	920
Total past due and nonaccrual loans	0.03	0.02	0.00	0.21	0.03	920
Loan loss allowance	0.02	0.01	0.00	0.07	0.01	920
Tier 1 ratio	0.12	0.12	-0.02	0.21	0.03	920
Quintile rank - adjusted leverage ratio	2.00	2.00	0.00	4.00	1.41	920
Total assets	14.88	14.76	12.81	18.22	1.08	920
Panel B: Failed Banks						
Market-implied loan impaiment	0.09	0.09	-0.09	0.25	0.05	404
Total past due and nonaccrual loans	0.08	0.05	0.00	0.77	0.09	404
Loan loss allowance	0.02	0.02	0.00	0.09	0.02	404
Tier 1 ratio	0.08	0.09	-0.07	0.21	0.04	369
Quintile rank - adjusted leverage ratio	2.00	2.00	0.00	4.00	1.41	393
Total assets	14.50	14.11	12.22	19.68	1.36	360
Year 1 Dummy	0.42	0.00	0.00	1.00	0.49	404
Year 3 Dummy	0.14	0.00	0.00	1.00	0.48	404

Table 12: Regression of failed bank coverage ratio on explanatory variables

This table presents the results from fixed effects regressions of the coverage ratio on explanatory variables for publicly-traded failed banks seized and auctioned during the 2008 to 2010 sample period. Explanatory variables are defined in the Appendix. T-stats are reported in parentheses. The symbols*, **, and *** denote statistical significance at the 0.05, 0.01 and 0.001 levels, respectively.

Dependent variable = coverage ratio					
Explanatory variables	(1)	(2)	(3)	(4)	(5)
Market-implied loan impaiment	-3.3 ***		-2.9 **	-2.9 **	-2.3 *
	(4.02)		(3.29)	(3.26)	(2.55)
Total past due and nonaccrual loans		-2.1 ***	-1.7 *	-1.6 **	-1.4 *
		(4.12)	(2.45)	(2.41)	(2.06)
Tier 1 ratio			0.0	-0.6	-1.0
			(0.00)	(0.39)	(0.80)
Loan loss allowance			0.90	1.54	2.56
			(0.25)	(0.42)	(0.73)
Total assets			-0.03	-0.03	-0.03
			(1.06)	(0.94)	(0.95)
Year 1 Dummy				-0.09	
				(0.79)	
Year 3 Dummy					0.39 ***
					(3.66)
Constant	1.1 ***	1.0 ***	1.6 ***	1.6 ***	1.4 **
	(10.74)	(10.46)	(3.54)	(3.54)	(3.07)
Market-implied capital fixed effects	Yes	Yes	Yes	Yes	Yes
Adj. R-Square	0.13	0.13	0.16	0.16	0.19
Observations	347	347	347	347	347

Table 13: Regression of industry coverage ratio on explanatory variables
This table presents the results from fixed effects regressions of the coverage ratio on explanatory variables for solvent banks within the commercial banking industry during the 2008 to 2010 sample period. The industry is proxied by the sample of banks that comprise SIC code 6020 - commercial banks and financial institutions. Any failed banks presented in Panel B that overlap SIC code 6020 have been removed from the sample presented in Panel A. Explanatory variables are defined in the Appendix. T-stats are reported in parentheses. The symbols*, **, and *** denote statistical significance at the 0.05, 0.01 and 0.001 levels, respectively.

Dependent variable = coverage ratio			
Explanatory variables	(1)	(2)	(3)
Market-implied loan impaiment	-2.7 ***		-1.8 **
	(4.76)		(3.11)
Total past due and nonaccrual loans		-14.0 ***	-18.1 ***
		(9.89)	(9.80)
Tier 1 ratio			0.0
			(0.31)
Loan loss allowance			21.95 ***
			(3.87)
Total assets			-0.12 ***
			(3.78)
Constant	1.4 ***	1.7 ***	3.2 ***
	(16.20)	(20.80)	(6.02)
Market-implied capital fixed effects	Yes	Yes	Yes
Adj. R-Square	0.12	0.20	0.23
Observations	809	809	807

Table 14: Market-implied asset impairment as a percent of FDIC expected credit losses from loan impairment

This table presents an analysis of market-implied asset impairment as a percent of FDIC expected credit loss. Variables are defined in the Appendix. Asset impairment and expected credit loss estimates are for the loan portfolios of publicly traded failed banks seized during the 2008 to 2010 sample period. Column 1 expresses the mean and median asset impairment as a percent of FDIC expected credit loss. Column 2 expresses the mean and median asset impairment as a percent of adjusted FDIC expected credit loss; FDIC expected credit loss is adjusted to 62% of the full expected credit loss to reflect actual payout rates.

	% of FDIC Expected Loss	
	100%	62%
Mean (%)	58.73	95.31
Median (%)	45.65	74.09
Correlation	0.875	0.875
N	39	39

Table 15: Analysis of return volatility and share turnover of publicly-traded failed banks

This table presents a comparison of the return volatility and trading volume of publicly traded failed banks and of two contemporary instances of severe volatility in the US banking industry. Panel A presents the return volatility and trading volume of publicly traded failed banks preceding their announced seizure and sale during the 2008 to 2010 sample period. Panel B presents the return volatility and trading volume of the top 50 public domestic US bank holding companies preceding October 7, 2008; the date marks the height of volatility following passage of the Emergency Economic Stabilization Act of 2008. Panel C presents the return volatility and trading volume preceding the announced bankruptcy / fire-sale of 3 leading financial institutions in 2008.

			Annual Volatility				Volume (x Shares Outstanding)			
		N	Week	Month	Quarter	Year	Week	Month	Quarter	Year
Panel A										
Seizure, 2008 to 2010	Mean	49	307%	267%	226%	192%	94.9	53.4	28.5	16.1
49 Failed Banks	Median		191%	212%	207%	177%	18.7	17.8	13.6	7.0
	Min		36%	70%	65%	50%	0.5	0.5	0.9	0.7
	Max		1519%	889%	538%	296%	1821.4	514.8	188.6	188.2
Panel B										
Tuesday, October 7, 2008	Mean	50	132%	163%	119%	76%	20.0	24.6	22.1	15.2
50 Top US Public Banks	Median		119%	137%	107%	69%	12.0	22.7	20.9	13.6
	Min		2%	11%	53%	41%	1.9	1.5	1.4	1.2
	Max		484%	732%	436%	218%	323.9	168.7	75.1	36.4
Panel C										
Bankruptcy / Seizure, 2008	Mean	3	1471%	793%	474%	238%	471.2	178.9	101.2	49.1
Bear Stearns, Lehman, Wachovia	Median		1244%	671%	403%	202%	474.0	203.5	116.8	56.3
	Min		1150%	660%	398%	199%	82.1	67.3	52.1	24.0
	Max		2020%	1047%	622%	314%	857.4	266.0	134.6	66.9