Federal Deposit Insurance Corporation • Center for Financial Research

Working Paper Series

Loss Given Default for Commercial Loans at Failed Banks

Lynn Shibut
Federal Deposit Insurance Corporation

Ryan Singer
Federal Deposit Insurance Corporation

Current Version: October 2015

FDIC CFR WP 2015-06

fdic.gov/cfr

Loss Given Default for Commercial Loans at Failed Banks

Lynn Shibut and Ryan Singer•

October 2015

• Lynn Shibut is a Senior Economist, and Ryan Singer is an Economic Analyst, in the Division of Insurance and Research of the Federal Deposit Insurance Corporation (FDIC). Shibut is the corresponding author and can be reached at lshibut@fdic.gov.

We are very grateful to Eric Breitenstein, A. J. Micheli and Lily Freedman for research assistance and Chris Blair, Derek Johnson, Emily Johnston-Ross, John Krainer, Jack Reidhill, George Shoukry and Haluk Unal for useful comments. All errors are our own. The opinions expressed in this paper are those of the authors and not necessarily those of the FDIC.

Abstract

This paper extends what we know about loss given default (LGD) on commercial loans by studying certain types of these loans that have been excluded from previous research but that may be more representative of loans held by small and mid-sized banks. We use a newly available dataset on commercial loan losses from failed banks that were resolved by the FDIC using loss share agreements. We examine LGD for more than 50,000 distressed loans, broken into three categories: construction and development loans, other commercial real estate loans, and commercial and industrial loans. We compare the characteristics of these loans with those of previous studies and find many similarities as well as significant differences. We explore the relationship between LGD and default date, workout period, loan modification, asset size, bank characteristics, geography, lien status, and other factors that may be related to loss severity. The results inform commercial lenders and regulators about the factors that influence losses on defaulted loans during periods of distress, and provide a useful benchmark for stress testing for smaller banks. To the best of our knowledge, this paper also offers the first published empirical analysis of LGD for construction and development loans.

JEL classifications: G21, G28, G32, G33
Keywords: Commercial lending, commercial real estate, CRE, construction and development lending, ADC lending, acquisition/development/construction lending, distressed assets, credit risk, default and loss, loss given default, LGD, recovery rates, liquidation

I INTRODUCTION

Commercial lending is an essential function at banks, and the management of credit risk in commercial loan portfolios is critical to bank performance. Consequently, many researchers have studied the factors that influence the probability of default (PD) and loss given default (LGD) for commercial lending. The recent financial crisis revealed that the previous supervisory regime and capital requirement framework did not adequately consider the effects of economic downturns on the relationships between PD, LGD, and subsequent bank performance. In response, there has been a renewed focus on stress testing, as well as increasing amounts of research into the relationships between PD and LGD across the business cycle, and the incorporation of these relationships into the bank supervision process and capital requirements.

Yet large gaps remain. Almost none of the research to date is based on data from typical loans at typical banks. In his review of LGD, Schuermann (2004) states, "most of the published research treats recoveries of bonds rather than loans for the simple reason that that's where the data is."[1] Some researchers have studied credit losses on large loans that trade on secondary markets. These loans might be more comparable to typical bank lending. But how relevant are these results to the LGDs of smaller loans at small and mid-sized banks? Small borrowers might face constraints and challenges that are irrelevant to large borrowers. Smaller banks may have more limited resources for underwriting and monitoring loans, but they have offsetting advantages related to "soft" relationship lending within their local community.[2] The limited profits associated with small loans may not merit costly monitoring options, regardless of the size and capacity of the lender. To date, the influence of these factors on LGD has not been tested empirically on small bank loans.

The gaps are even greater for construction and development (C&D) loans. C&D loans are inherently more risky than other commercial loans. During the crisis, the peak noncurrent rates reported by the banking industry were 16.6 percent for C&D loans, but only 4.4 percent for other commercial real estate (CRE) loans and 3.6 for commercial and industrial (C&I) loans. Similarly, net charge-off rates in 2010 were 6.1 percent for C&D loans, but only 1.2 percent for other CRE loans and. 1.8 percent for C&I loans.[3] C&D loans are subject to construction risks that are absent for other commercial loans. In addition, market risks are greater because C&D loans are made on the basis of future market conditions for yet-to-be-built buildings.[4] However, there is almost no empirical research available on C&D loans because they have been largely absent from the corporate bond market, life insurance portfolios and secondary loan markets since the Great Depression.

This paper begins to fill these gaps by using a newly available dataset on commercial loans held by banks that failed in the recent crisis and were resolved using loss-sharing arrangements

[1] Schuermann (2004), p. 259.
[2] See Kovner, Vickery and Zhou (2014) for a discussion of economies of scale at banks. See Udel (2008) for a discussion of relationship lending for commercial loans.
[3] Source: authors' calculations using Call Report data for all FDIC-insured institutions.
[4] See Tochkarshewsky (1979) and Goodman and Gable (2006) for additional discussion.

between the FDIC and acquiring institutions. Of course, these banks can hardly be characterized as typical. These banks failed during the worst downturn in 60 years, and the results of our study cover only this distress period. Even so, an analysis of these loans and a comparison of the results with previous analyses of larger loans and bonds provide important insights, and we find that distressed loans from failed banks resemble larger distressed loans originated by other parties in many ways. For smaller banks that lack the scope to develop distress LGD estimates from their own experience, the results also provide a useful reference point for stress testing.

As expected, we find that the loan sizes in the sample are much smaller than those reported in other LGD studies. C&D loans are riskier: the mean LGD for C&D loans is 14 percentage points higher than for other CRE loans, and workout periods are also much longer. Even so, interest rate premiums for C&D loans are comparable to other loan types. LGD is highly sensitive to workout periods (LGDs increase as the workout period lengthens), age at default (loan seasoning reduces LGDs), and timing of default (LGDs are worse for loans that defaulted early during the crisis). Several other loan and failed-bank characteristics have statistically significant relationships to LGD. Except for C&D loans, we tentatively conclude that the loans in our sample have LGDs that generally behave in ways similar to those in other studies.

Section II begins with a description of the loss share program and our definitions for default, exposure at default (EAD) and LGD. Exclusions from the dataset and caveats are also discussed. Section III provides basic data about the sample and the primary variable of interest (LGD), including loss distributions. In Section IV, relationships between LGD and other items that might influence LGD (such as workout periods, lien status, and geography) are presented. Section V concludes.

II DATA USED FOR ANALYSIS

A Data Source: the FDIC's Loss Share Program

From 2008 through 2013, the FDIC closed 304 banks that were resolved under its loss share program. These banks held $126 billion in commercial loans at failure.[5] During this period, loss share was used heavily. From November 2008 to 2013, 65 percent of failed banks were sold under loss share. These banks held 85 percent of failed bank assets during the period.[6] Under the loss share program, the acquiring institution purchases loans from failed banks at book value and the FDIC indemnifies in part the subsequent credit losses for those assets.[7] The FDIC maintains a database to support program administration and risk management. Therefore, our definition of LGD flows from the provisions of the loss share program and related data availability. The dataset contains data from fourth quarter 2008 through second quarter 2014.

[5] The FDIC also entered into a loss-sharing agreement with Citibank, NA in 2008. Because the FDIC never collected loan-level data from Citibank, it is excluded from this analysis.
[6] Excluding Citibank. It is difficult to determine whether there were meaningful differences in loan quality between failed banks that were and were not sold by the FDIC under loss share. The mean estimated FDIC loss rate at failure was 3 percentage points higher for banks that did not enter the loss share program during that period, compared with banks under loss share.
[7] For more information about the FDIC's loss share program, see https://www.fdic.gov/bank/individual/failed/lossshare.

Under the loss share program, the FDIC covers the following types of losses:

- Charge-offs (net of recoveries)
- Loss on the sale of an asset (loan or ORE)
- Expenses related to the asset that is paid to third parties, except servicing fees (e.g., legal fees, foreclosure expenses, appraisals, and property maintenance costs.)
- Up to 90 days of accrued interest

If the loan is foreclosed, the FDIC is entitled to share in any income earned from the collateral. The full indemnification period is five years. For an additional three years, the acquirer is required to continue reporting all losses and recoveries, and continues to share recoveries (net of certain collection expenses) with the FDIC.

Although the FDIC's share of losses varies by agreement, most of the agreements provide the acquirers with 80 percent indemnification for most assets (i.e., all losses are split 20/80). The FDIC indemnification can weaken the incentives of acquirers to work assets effectively when compared with assets that the bank owns outright. The FDIC has taken several actions to mitigate the potential effects. First, it requires that acquirers work the covered assets in the same way that they work their own assets. Second, it requires regular standardized reporting, adequate work papers and evidence that the loans are being worked effectively. Third, the FDIC reviews loss claims and performs on-site compliance reviews at least once a year. If the acquirer fails to meet these requirements, the FDIC has the right to demand program improvements, reverse loss claims, buy back assets, or, in the case of a serious contract breach, abrogate the loss share coverage altogether.[8] Based on these mitigating factors, loss share program reviews, and discussions with program staff, we conclude that the FDIC has been largely successful in curtailing the effects of weakened incentives embedded in the loss share contracts.[9]

Another important provision is that, for bulk loan sales,[10] the acquirers receive FDIC loss share coverage only if the FDIC concurs with the sales strategy. Bulk sales of loss share assets have occurred infrequently because they are generally expected to result in higher LGDs than other workout strategies. Therefore, the results in this paper are not comparable to programs that rely heavily on bulk loan sales.

B Definitions

This section provides definitions of the key terms used in the paper.

---

[8] These are just some of the remedies available to the FDIC. Acquirers have the right to contest any FDIC action. For more details, see, e.g., the July 2010 agreement between and among the FDIC, the FDIC as receiver of Olde Cypress Community Bank, and the acquiring bank, Centerstate Bank of Florida, N.A. https://www.fdic.gov/bank/individual/failed/oldecypress_p_and_a.pdf. Other agreements can be found at: https://www.fdic.gov/bank/individual/failed/banklist.html.

[9] See FDIC Office of Inspector General (2012) for additional discussion.

[10] Under the loss share program, bulk loan sales are defined as sales of two or more loans in a single transaction.

A loan is assumed to be in default if any of the following events occur:

- The loan becomes 90 days or more delinquent,
- The loan is placed in nonaccrual status,
- The loan is classified as being in foreclosure or bankruptcy, or
- A charge-off is taken on the loan, or any claim is made under the loss share program.

Except as described below, our sample includes all defaulted loans, regardless of whether they defaulted before or after the banks failed,[11] or whether the acquiring bank filed a claim under the loss share program.

We define LGD as a ratio of loss to EAD. The numerator, loss, is defined as the difference between EAD and the discounted cash flows from default to the time when the asset was extinguished. The asset is extinguished when it is paid off, written off in full, sold or when the asset is foreclosed and the collateral is sold. We cannot directly calculate the discounted cash flows because acquirers do not report all cash inflows under the loss share program. Therefore, we estimate the net principal recovery as the EAD minus charge-offs (net of recoveries) and loss on sale. We assume that the entire net principal recovery occurred when the asset was extinguished. Expenses include unpaid accrued interest, legal fees, foreclosure expenses, appraisal fees, property preservation costs, property taxes, etc.[12] The interest rate on the loan is used as the discount rate.[13] The formula for LGD is shown below.

$$LGD = 1 - \{\frac{\frac{EAD - \sum_{t=1}^{T}(CO_t - REC_t + LOSALE_t)}{(1+r)^T} - \sum_{t=1}^{T}(\frac{EXP_t}{(1+r)^t} + \frac{AI_t}{(1+r)^t})}{EAD}\}$$

where:

LGD	= loss given default
EAD	= exposure at default
CO_t	= chargeoffs in period t

[11] Loans that default prior to failure comprised 29 percent of the sample. For these assets, the average time period between default and failure was seven months.

[12] Details on the expenses and offsetting income covered by loss share can be found in the agreements at https://www.fdic.gov/bank/individual/failed/banklist.html. We use the accrued interest claim as our estimate for accrued interest costs. In cases where the loan was placed in nonaccrual status prior to bank failure, the acquirer cannot make such a claim, and unpaid accrued interest has probably been capitalized into the loan by the failed bank. Our definition excludes capital gains. The loss share program sets a number of restrictions on fees imposed on defaulted loans.

[13] In a few cases, the interest rate was not available. For these loans, we estimate the interest rate as the rate charged by the bank for similar loans or, for banks with small portfolios, the average rate charged by all banks for similar loans. Because we lack a full payment history, we assumed that borrowers paid no interest after default if the loan did not cure, and that borrowers repaid all interest due if the loan cured. Cured loans were defined as loans that defaulted but were extinguished with no loss claims.

REC_t = recoveries in period t
$LOSALE_t$ = loss on sale of asset in period t
EXP_t = expenses in period t
AI_t = accrued interest not paid by borrower, paid by FDIC in period t
r = interest rate on the loan (used for discounting)
T = workout period in quarters (from default to cure or extinction of the asset)

Loans with LGDs that exceed 100 percent occur relatively often. For example, any time a loan is fully charged-off, unpaid accrued interest plus any collection expenses will cause LGD to be greater than 100 percent. Therefore, LGD is capped at 130 percent of exposure at default.[14] If the loan defaults but no claims are made, we assume a full recovery was made on the asset.

Our definition of LGD differs from the definition of economic loss that is set forth in the guidance on LGD for the Basel 2 Advanced Approach models.[15] In addition to the items in our definition, the Basel definition for economic loss includes servicing costs and unpaid fees at the time of default. The Basel 2 Advanced Approach requires that all cash flows be discounted at a market rate; some argue that the loan rate is too low, especially during bad times.[16] The main difference between our definition and the economic loss on the asset is the exclusion of servicing costs. Most other studies omit servicing costs because they are difficult to measure. The Congressional Oversight Panel (2010) noted that a special servicer that handles problem loans "typically earns a management fee of 25 to 50 basis points on the outstanding principal balance of a loan in default as well as 75 basis points to 1 percent of the new recovery of funds."[17]

We also calculate four alternative measures of LGD. First, we cap LGD at 100 percent rather than 130 percent. Second, we discount at the higher of 15 percent or the loan interest rate, rather than solely at the loan interest rate. Third, we calculate LGD where the estimated cost of carrying the asset through the workout period is included.[18] Last, we calculate LGD to include all forgone interest throughout the workout period.[19]

[14] The 130 percent cutoff was chosen because LGDs above that level were relatively rare, and because of concerns about data quality for some of the loans with very high LGDs. LGDs that exceeded 130 percent before adjustment comprised 1.2 percent of the loans in the sample.
[15] Office of the Comptroller of the Currency, Federal Reserve System, FDIC, Office of Thrift Supervision (2007).
[16] See Office of the Comptroller of the Currency, Federal Reserve System, FDIC, Office of Thrift Supervision (2007) for the Basel definition. Brady et al. (2007) discuss discounting in depth. Araten, Jacobs and Varshney (2004) also advocate higher discount rates in bad times.
[17] Congressional Oversight Panel (2010), p. 44. They discuss servicing arrangements under commercial mortgage-backed securities. Servicing costs for bank loans might be different.
[18] For loans that did not cure, the cost of carry is calculated by applying the national average cost of funds to the recovered loan balance throughout the workout period. The accrued interest claim is omitted.
[19] For loans that did not cure, forgone interest is calculated by applying the loan interest rate to the EAD throughout the workout period. The accrued interest claim is omitted.

We separate LGD into three components. Principal loss is defined as the difference between EAD and principal recoveries. Interest expense is defined as the difference between undiscounted and discounted principal recoveries plus discounted unpaid accrued interest. Expense is defined as discounted expenses net of discounted income.

C Exclusions and Caveats

Loans are excluded from the LGD sample for several reasons. The most common reason is because the asset had not yet been extinguished (right-censoring). Loans are also excluded for left-censoring (that is, the loan defaulted before the bank failed and full information about losses that occurred before failure is not available).[20] Foreign loans and very small loans (under $100 exposure at default) are dropped. All commercial and industrial (C&I) loans from Innovative Bank are excluded because their C&I loan program was highly unusual.[21] Last, loans with meaningful data quality problems are dropped.[22] For some assets, the LGD data are complete, but information on one or more loan attributes is missing (for example, geographic information). In that case, the sample is reduced only for the items that relate to the missing loan attribute.

For default-rate calculations, loans are dropped if: a) the loans are from banks headquartered in Puerto Rico;[23] b) the loan type is uncertain; c) the default status is uncertain; or d) they are C&I loans from Innovative Bank.

Because our sample may differ from loans held by a typical privately held bank, the results should be interpreted with care. Importantly, our sample comprises solely assets from banks that failed during a severe recession. Banks rarely fail unless their portfolios have unusually high default rates. Moreover, bank failures during the recent crisis were concentrated in regions that experienced higher-than-average economic distress. For example, of the 353 banks headquartered in Georgia at year-end 2007, 87 (25 percent) failed by the end of 2013, while none of the 97 banks in North Dakota failed over the same period.

All the loans in the sample were originated prior to the bank's failure, existed when the bank failed,[24] and were extinguished after the bank failed. Unlike other studies, most of the loans in our analysis underwent a change in the servicing regime over the life of the loan. Because the originating bank failed, the quality of the loan servicing during the early period of the loan might have been weaker than average. In addition, the originating bank might have been slow to

[20] Because we have some information about pre-failure losses, we were able to retain many of the assets that defaulted shortly before failure. All loans that defaulted more than three years before failure are excluded.
[21] Innovative Bank of Oakland, CA, held a large number of defaulted out-of-territory participation loans with balances below $5,000.
[22] For example, we exclude loans where the information about loan type or loss claims is incoherent or incomplete.
[23] Both the legal and economic environment in Puerto Rico differs from the rest of the United States.
[24] Some lines of credit were originated prior to failure, but were not drawn down until after failure.

recognize losses or aggressively work out their troubled loans. On the other hand, the acquiring bank has good reason to recognize losses and work out troubled loans promptly so that losses can be realized before the FDIC's loss share coverage expires.

The effects of censoring in our analysis are likely to differ from those of other LGD studies. Unlike most other LGD studies, our dataset is left censored. Therefore, not all loans that defaulted shortly after origination are included in the sample: loans that defaulted and either cured,[25] were successfully modified, or were extinguished prior to bank failure are excluded (these loans are likely to have relatively low LGDs); loans that defaulted well before failure are also excluded. Some of the loans that are excluded for right-censoring have long workout periods and thus higher LGDs; others defaulted after the economy had begun to improve but the loan is still active. The net effect of censoring on LGD is unclear.

III Data characteristics

A Sample Size and Asset Size

Table 1 presents basic information about the sample, including sample size and concentrations and a distribution of the size of the assets. The sample is broken out by three loan types, C&D, C&I, and other CRE.

[Insert Table 1]

The median asset sizes are quite small for all three loan types: $227,000 for C&D, $57,000 for C&I and $307,000 for other CRE. The mean[26] asset sizes are somewhat larger: $1 billion for C&D, $329,000 for C&I and $930,000 for other CRE. More than half of the loans are originated by banks with less than $1 billion in assets, so loan concentration limits might constrain asset sizes. The C&I balances are especially small. Perhaps businesses generally purchase real estate as they grow, and then find it advantageous to switch from C&I loans to CRE loans to fund their businesses, or perhaps many banks require real estate collateral for larger loans. The asset size distribution is heavily skewed, with the mean balance much higher than the median. About 83 percent of the sample loans have balances below $1 million, and 99 percent have balances below $10 million.

Both the mean and median asset size differ markedly from those reported in other studies. For example, Esaki et al. (1999) report a median asset size of $4 million on their sample of CRE loans held by life insurers.[27] The smallest loan reported by Gupton et al. (2000) in their study of U.S. syndicated loans is $60 million.[28] Although Asarnow and Edwards (1995) report an average

[25] A delinquent loan cures when it returns to performing status without modification or is paid off in full.
[26] Means are calculated as arithmetic means unless otherwise noted.
[27] Esaki, et al. (1999), p 80.
[28] Gupton, et al. (2000). Their primary source was Moody's, and their analysis covered loans from 1989 through 2000. In the appendix, they provided loan-level information for defaults that occurred in 1999 and 2000; $60 million was the smallest figure reported there.

loan balance of $6.3 million at default for commercial loans at Citi, they also report that 52 percent of the C&I loans in their sample have balances below $1 million.[29]

Our sample comes from a large number of banks, and it is not dominated by one or a few banks. The geographic concentration is stronger: Georgia accounts for 25 percent each of C&D and C&I loans, and 19 percent of other CRE loans; the top five states account for 67 percent of C&D loans, 61 percent or C&I loans, and 65 percent of other CRE loans.

B Average LGD and its Components

Table 2 presents LGD information by loan type for our base definition for LGD, including a breakdown by loss components and simple statistics. It also provides basic statistics for four alternative measures of LGD, by loan type.

[Insert Table 2]

The weighted mean LGDs provide an overall portfolio measure of loss, and the other statistics focus on the typical asset. The median LGD ranges from 41 percent for other CRE to 63 percent for C&D. Other authors find LGDs that are both higher and lower than these, but consistently find that LGDs are higher during stress periods.[30] The mean LGD for other CRE (44 percent) compares favorably to the mean LGDs for defaults of commercial mortgage-backed securities (CMBS) in 2010 (53 percent), as reported by Fitch (2012).[31] They are close to the LGDs for CRE loans that are held by insurance companies for years when the volume of defaults is high (44 percent), as reported by Esaki et al. (1999), but higher than LGDs across the business cycle (38 percent).[32] The mean LGD for C&I loans (51 percent) is generally better than those reported for corporate bonds. Schuermann (2004) reports mean LGDs during recessions of 68 percent.[33] Altman et al. (2005) study corporate bond defaults from 1982 through 2001. They find average LGDs of 70 percent in years when default rates exceeded 4 percent.[34] Acharya et al. (2003) report mean distress LGDs of 59 percent; however, they also report that bank loans have recoveries that are 30 percentage points better than the most senior corporate bonds.[35] Based on data from Moody's from 1970–2003, Schuermann (2004) finds that LGDs for bank loans are 14

[29] Asarnow and Edwards (1995), p 14, 22. Their sample covers loans from Citibank NA from 1970–1993; the figures are not adjusted for inflation.
[30] Authors who report lower LGDs include Asarnow and Edwards (1995), Esaki et al. (1999), and Araten, Jacobs and Varshney (2004). Authors who report higher LGDs include Hu and Cantor (2004), Fitch (2012), and Altman et al. (2005).
[31] Fitch (2012), p 7.
[32] Esaki (1999), p 80. The higher loss severity was for loans liquidated in 1992 through 1997.
[33] Schuermann (2004), p 265.
[34] Altman et al. (2005), p 2210. The years with high default rates were 1989–1991 and 1999–2001. These are based on prices of defaulted securities shortly after default.
[35] Acharya et al. (2003), p 11. Distress LGD is calculated from Table 8b. The bank loans analyzed in this study are those traded on secondary markets. There is some evidence that bank loans held in portfolios are riskier. See Congressional Oversight Panel (2010), page 32 and Black, Krainer and Nichols (2014).

percentage points lower than for bonds.[36] Although close comparisons are not readily available, we conclude that the LGDs in this sample are generally consistent with other studies that focus on periods of distress. The variation across our sample is higher than reported elsewhere.[37] This may occur partly because we allow LGDs to exceed 100 percent; in addition, variations may be higher when LGDs are based on realized results rather than market prices shortly after default.

Principal losses comprise 84 percent of C&D losses, 85 percent of C&I losses, and 77 percent of other CRE losses. The second-largest loss component is interest cost (9 percent to 13 percent), followed by expenses (6 percent to 10 percent). Asarnow and Edwards (1995) report more interest costs: 76 percent net charge-offs, 23 percent interest drag, and 1 percent other.[38] Ciochetti (1997) also reports more interest cost in the following breakout for CRE loans held by life insurers: 59 percent capital loss, 33 percent accrued interest, and 8 percent foreclosure costs.[39] Some of the differences probably relate to the calculation method for LGD; for example, Asarnow and Edwards (1995) define LGD in a way that more closely resembles the "forgone interest" alternative than our base LGD definition.[40] The size of the loans may also explain some of the difference, because larger loans tend to have longer workout periods. In addition, failed banks may underprice loans or charge higher up-front fees, compared with loans that are sold on the secondary market.

The calculation method matters for LGD. We find that capping LGD at 100 percent, rather than 130 percent, reduces the mean LGD by only about 1 percentage point, and the weighted mean by even less. Assets with LGDs greater than 100 percent occur relatively often, but they tend to be smaller assets. Therefore the effect is smaller at the portfolio level than at the loan level. The 15 percent discount rate has a much larger effect: it increases the weighted mean LGDs by 3 to 5 percentage points and the arithmetic means by 1 to 4 percentage points. Under a "cost of carry" concept, mean LGDs are 2 to 3 percentage points lower. Note, however, that interest rates have been very low through most of the crisis—the results might be different in a more normal interest rate environment. Not surprisingly, a measure of LGD that includes forgone interest during the full workout period results in the highest overall loss: the weighted average LGD was 7 percentage points higher for C&D loans and 4 percentage points higher for C&I and other CRE loans.

As shown in Figure 1, LGD has a bimodal distribution for all three loan types.

[Insert Figure 1]

Even at failed banks, many of the loans cure or are sold without losses: 17 percent of C&D loans, 31 percent of C&I loans, and 28 percent of other CRE loans. A substantial portion of the assets

[36] Calculated from Table 3 in Schuermann (2004), p 263. This is for senior secured debt only.
[37] Araten, Jacobs and Varshney (2004) also note that bank loan LGDs have more variability than bonds. See p 34.
[38] Calculated from Asarnow and Edwards (1995), p 20. It appears likely that our estimates include a broader set of expenses.
[39] Calculated from Ciochetti (1997), p 60.
[40] Our definition includes up to 90 days of accrued interest. The Basel definition includes accrued interest up to the point when the loan is placed in nonaccrual status.

have LGDs that exceed 100 percent: 27 percent of C&D loans, 34 percent of C&I loans, and 18 percent of other CRE loans. Most of these represent situations where there is a full charge-off plus accrued interest expenses, plus—in many cases—expenses that relate to attempts to recover funds. It is unrealistic to assume that LGDs never exceed 100 percent.

We also calculate the mean LGD by failed bank and loan type.[41] We exclude failed banks that have fewer than ten defaulted loans for a loan type. Figure 2 provides distributions across failed banks. The means by bank are 56 percent for C&D, 54 percent for C&I, and 46 percent for other CRE. The standard deviations are far lower than the loan-level data: 14 percent for C&D and other CRE, and 16 percent for C&I.

[Insert Figure 2]

C Loan Terms

Table 3 presents basic loan terms by loan type for the sample of defaulted loans.

[Insert Table 3]

The interest rates are as of the date the bank failed. Because interest rate levels and yield curves changed across the time period covered, interest rate premiums are calculated by comparing the interest rate to the Treasury rate for a similar maturity.[42] For all three loan types, roughly half of the loans have adjustable rates. This varies from other studies that reported that a larger share of bank loans held in portfolios had adjustable rates.[43] Surprisingly, C&D loans tend to have interest rate premiums comparable to other CRE loans and lower than C&I loans.[44] Over 25 percent of the adjustable-rate C&D loans had interest premiums below 100 basis points. Possible explanations include the following: the failed banks received high origination fees or other compensation for the loan; the borrower renegotiated the loan to avert foreclosure before the bank failed; or, in an effort to expand its lending, the lender's pricing was too generous.

[41] Arithmetic means (that is, average rates for all loans for each category, by bank) are presented here. We also calculate weighted means (essentially the portfolio LGD) and find that they are very similar: 58 percent for C&D, 55 percent for C&I, and 47 percent for other CRE.

[42] For adjustable-rate mortgages, we compared the loan's interest rate as of the failed bank's closing date to the one-year Treasury bill at closing for maturities one year or longer, and an appropriate Treasury rate (one, three, or six month) for shorter maturities. For fixed-rate loans, we used the origination date.

[43] Wiggers and Ashcroft (2012) report that the typical bank loan is "primarily floating." See page 9. Black, Krainer and Nichols (2014) examine portfolio loans of $1 million or larger for banks held by bank holding companies with $50 billion or more in assets, and find that 75% of the CRE loans were adjustable-rate (excluding C&D loans and owner-occupied CRE loans). See page 40.

[44] Black, Krainer and Nichols (2014) also report lower interest rates for C&D loans, compared to other CRE loans, at very large banks. See page 31.

For C&I loans, we compare the interest-rate premiums to similar premiums for moderate risk loans at small domestic banks as reported in the Federal Reserve Board's Survey of Terms of Business Lending, and the rates are generally comparable.[45]

IV FACTORS THAT RELATE TO LGD

In this section, we examine the relationship between LGD and several items for which there are theoretical reasons to expect a relationship. We explore the default date, workout period, the usage of foreclosures and modifications, asset size, failed-bank characteristics, geography, out-of-territory lending, lien status and age at default. We anticipate that loans that defaulted at the beginning or the peak of the crisis, and loans located in the weakest markets, will have higher loss rates as a result of weaker and declining markets during the workout period. We expect loans with longer workout periods to have higher losses and higher expenses. We expect that modified loans will have lower LGDs, and that foreclosed loans, and especially foreclosures in judicial foreclosure states[46], will have higher LGDs as a result of higher expenses and longer workout periods. We expect more seasoned loans to have lower LGDs than early defaults, and we expect first liens to have lower LGDs than junior liens.

A Default Date

Figure 3 presents LGD by the loan default date.

[Insert Figure 3]

The timing of the default has an extremely strong relationship with LGD, especially for the real estate loans. Loans that defaulted early in the crisis have the worst outcomes. These loans might have been made under weaker underwriting criteria and thus default occurred as soon as the real estate markets collapsed. Because they defaulted shortly after the crisis began, markets were deteriorating sharply at default, and the supply of bad loans was ballooning while demand shrank. Borrowers who defaulted later may have been better equipped to continue payments for some time, thus reducing the losses on the loans. This is generally consistent with the findings in Altman et al. (2005), where demand and supply factors have a significant effect on LGD. In addition, most of the credits that defaulted early in the crisis would have been managed by the failed banks for some time. The failed banks might have delayed taking action to avert loss recognition or might have had weak asset management capabilities. Last, these results may be influenced by censoring: the sample omits loans that defaulted before 2009 but were paid off or cured prior to the bank's failure as well as loans that defaulted in the later years but are still active at the end of the sample period.

[45] Board of Governors of the Federal Reserve System (various years). In that survey, small domestic banks are defined as banks with less than $4.6 billion in assets. See www.federalreserve.gov/releases/E2 for the survey.

[46] In judicial foreclosure states, foreclosures must be processed through the state court system. This requirement generally increases both the cost of foreclosure and the time required to foreclose.

B Workout Period and Foreclosure

We expect loans with longer workout periods to have higher LGDs. Figure 4 presents results.

[Insert Figure 4]

For all three loan types, LGD consistently increases as the workout period increases. The relationship is especially strong for the real estate loans. This result conforms with the work of other researchers. For example, Acharya et al. (2003) estimate that a one-year increase in the workout period increases LGD by 5 percentage points.[47] Our sample shows an even steeper rate of increase. Table 4 provides additional detail.

[Insert Table 4]

C&D loans have the longest workout periods: 44 percent of these loans have workout periods of two years or more. It may well be even worse than reported: the use of interest rate reserves, compounded by the incentives of failed banks to delay the recognition of loan losses, might mean that the true economic default date occurs prior to the reported default date for a substantial number of loans.[48] This is unsurprising: the workout process for distressed C&D loans is more difficult and complicated than for most other commercial loans, especially if there are construction problems. C&I loans have the shortest workout periods, with a large share (50 percent) worked out in six months or less. It may be that workout options are limited for many of these loans, since there is little or no collateral and many of the loans are small.[49] Loan sizes tend to increase with workout period, especially for the longer periods for C&I loans. As expected, the cost from expenses and interest increase substantially as the workout period lengthens, but principal losses also increase substantially as the workout periods lengthens.

The workout periods for this sample may be longer than those at healthy banks, because of: a) failing banks' incentive to avoid loss recognition; b) servicing regime changes; or c) the very limited usage of bulk sales under the loss share program. In addition, workout periods are probably longer during periods of distress than during normal times.

For the CRE loans, we also examine the effects of foreclosure and judicial foreclosure laws on LGDs, related expenses and forgone interest. Table 5 provides the results. To improve the comparison, cured loans are omitted.

[Insert Table 5]

C&D loans have substantially higher foreclosure rates. For loans that do not cure, the foreclosure rate is 51 percent for C&D loans but only 38 percent for other CRE loans. As expected, foreclosed loans have substantially higher loss rates than loans that are not foreclosed (15

[47] See Acharya, et al. (2003), p 16.
[48] This is inherently difficult to measure. However, there was considerable scope for delayed reporting by failed banks: nearly 40 percent of the C&D loans in the sample defaulted before the bank failed, and another 37 percent defaulted within nine months of the bank's failure.
[49] Recall that servicing costs were excluded.

percentage points higher for C&D, and 14 percentage points higher for other CRE). Higher expenses and interest costs contribute to the increased loss rates for both loan types, but most of the increase for C&D loans is the result of higher principal losses. Workout periods are about a year longer for the foreclosed assets. Judicial foreclosure requirements appear to materially harm returns. Compared with loans in other states, workout periods are 5–6 months longer for foreclosed assets—and 2–3 months longer for loans not foreclosed. LGDs for foreclosed assets are 5 percentage points higher for C&D and 7 percentage points higher for other CRE. For assets not foreclosed, the differences in LGD are even greater (14 percentage points for C&D and 8 percentage points for other CRE). Thus, it appears that borrowers may be able to leverage the more onerous foreclosure rules to their advantage in negotiations. Contrary to Brown, Ciochetti and Riddiough (2006), but consistent with theory, banks undertake foreclosures less often in judicial foreclosure states: the share of loans with losses that are foreclosed are 6 percent lower in judicial foreclosure states (compared to other states) for C&D loans, and 5 percent lower for other CRE loans.[50]

C Loan Modifications

We define modified loans as those classified by the acquirer as a troubled debt restructuring or a loan modification, plus loans that are bifurcated or consolidated during the period after the bank failed. Loans where there are drawdowns under the original loan terms after default or where the bank advances additional funds to protect the investment are not treated as modifications. Table 6 presents the results.

[Insert Table 6]

Modifications are performed for 15 percent of C&D loans, 12 percent of C&I loans, and 18 percent of other CRE loans. These rates are significantly lower than the modification rates reported by Petosa (2012) in a study of CMBS; however, she found that smaller loans were less likely to be modified—and of course the loans in our sample are far smaller than those held in CMBS.[51] In addition, limits imposed by the loss share program might have made certain types of modifications less likely.[52]

On average, modified loans are less costly. The difference is small for other CRE (2.7 percent), but much larger for C&D (11 percent) and C&I loans (10 percent). Note that this result might relate partly to the underlying quality of the loans rather than the workout strategy choice. More than 30 percent of the modified real estate loans were subsequently foreclosed, thus the modification failed.[53] The LGDs for the re-defaulted C&D loans are only slightly higher than the rate for loans that are not modified (69.5 percent versus 66.9 percent); for other CRE, the

[50] Brown, Ciochetti and Riddiough (2006), p 1391–2. They noted their result as "puzzling."
[51] Petosa (2012), p 58. See also S&P (2012), Esaki and Goldman (2005), and Brown, Ciochetti and Riddiough (2006).
[52] Under the early agreements, loss share coverage was lost if the maturity was extended beyond the loss-sharing period. This limit was later relaxed.
[53] Foreclosure is probably not a viable option for most of the C&I loans.

difference is greater (65.8 percent versus 56.8 percent). Although not readily comparable, these results are generally consistent with the results reported by Petosa (2012).

D Loan Size

Theoretically, loan size could influence LGD because many collection costs are fixed or semi-fixed. Figure 5 shows average LGD by loan size quartile.

[Insert Figure 5]

The C&D loans in the smallest size quartile (those under about $90,000) have a mean LGD that is 12 percentage points higher than larger assets. For C&I loans, asset size appears to have no effect. For other CRE loans, LGDs decline monotonically as asset size increases: LGD for the smallest quartile is 8 percentage points higher than for the largest quartile. Schuermann (2004) concluded that loan size has little or no effect on LGD.[54] Our evidence indicates that it may matter for small CRE loans.

E Failed Bank Characteristics

We examine several failed bank characteristics that might relate to the quality of their origination and servicing functions. First, failed bank size could influence LGD because smaller banks might lack the capacity to service distressed loans well.

[Insert Figure 6]

The size of the failed bank does not appear to influence LGD in a meaningful way, although assets at the largest failed banks (over $600 million) have slightly lower LGDs. We also test for the size of the acquiring bank, and find no effect on LGD.

Banks with very high loan growth rates tend to fail more frequently, and banks that have relatively little experience in a particular type of loan might also have weaker origination or servicing capabilities.[55] Therefore, we test for loan growth prior to failure, and find no relationship between the failed bank's loan growth rate prior to failure and LGD. We also find no relationship between the asset mix held by the failing bank and LGD. However, we do find that *de novo* banks tend to have statistically higher LGDs for C&I loans and other CRE loans.[56]

---

[54] Schuermann (2004), p 267. Most authors never mentioned size. However, Pendergast and Jenkins (2003) examined CMBS loans and found that larger commercial real estate loans ($20 million–$30 million) have lower LGDs than smaller ones ($2 million–$3 million). Asarnow and Edwards (1995) found lower LGDs for loans over $10 million (see page 22). Our sample contains few large loans, so we cannot adequately test for loan sizes that exceed $1 million.

[55] See FDIC (1997), especially Chapter 13.

[56] *De novo* banks are defined as banks that were chartered less than five years before failure. This result may relate to the lack of seasoning for the loan portfolio, or heavy reliance on out-of-territory loans, rather than bank origination or servicing quality.

The default rates for the failed banks might relate to the origination quality or servicing quality of the loans and thus influence LGD. To test this possibility, we use two default-rate measures: a) default rate at failure, and b) cumulative default rate from failure through second quarter 2014. Figure 7 compares LGD across the quartiles for these two measures.

[Insert Figure 7]

For C&I loans and other CRE loans, LGD consistently increases with both failed-bank default rates. For C&D loans, the relationship is less consistent. There is also a positive correlation between the share of the workout period undertaken by the failed bank and LGD.[57] We also find a relatively strong and statistically significant relationship between the coverage ratio of the failing bank and LGDs: banks with higher coverage ratios tend to have lower LGDs.[58] It may be that banks with higher coverage ratios are more effectively managing their problem loans.

F Geography and In/Out of Territory Lending

We determine the location of the loan based on collateral (for most CRE loans and some C&I loans); if the collateral location is not available, we use the borrower location. Figure 8 provides mean LGDs by location.

[Insert Figure 8]

Unsurprisingly, loans in the hard-hit states of Georgia and Florida experience substantially higher loss rates for all loan types. C&D loans perform the worst in Florida, whereas other CRE loans are worse in Georgia. Location apparently matters the most for C&D loans; it does not appear to be important for C&I loans. CRE loans in the West, and especially in California, perform the best. Compared with the South, CRE markets in the West declined for a shorter period of time and rebounded more quickly.[59]

We also examine the effects of out-of-territory lending on LGD. We use two methods to define out-of-territory lending. Our narrow definition generally follows the requirements of the Community Reinvestment Act: loans in the Core Based Statistical Areas (CBSAs) where a failed bank has branch locations are treated as in-territory, and loans outside those CBSAs are treated as out-of-territory. Our broad definition assumes that all loans in states where the failed bank had a branch are treated as in-territory loans, and loans in other states are treated as out-of-territory. The results are shown in Table 7.

---

[57] The underlying explanation is unclear. It might indicate that failing banks tended to manage distressed assets badly, or it might be the result of market conditions before and after most of these banks failed.

[58] The coverage ratio was calculated as the allowance for loan loss reserves divided by noncurrent loans (for the total loan portfolio), as of the final Call Report submitted by the failing bank.

[59] Source: authors' calculations using CoStar data. The peak-to-trough period was 3.5 years for the West and 4 years for the South. Three years after the trough, prices rebounded by 32 percent in the West and 24 percent in the South.

[Insert Table 7]

LGDs are consistently higher for out-of-territory loans. The largest effects occur in C&D lending (6.4 percentage points higher under the narrow definition, 3.2 percentage points under the broad definition), followed by other CRE lending. The effect on C&I lending was small, especially when a broad definition of in-territory lending is used.

G Lien Status

Many authors have found lien status to have a highly important and consistent relationship to LGD, both for corporate bonds and larger bank loans. For example, Gupton, Gates and Carty (2000) found that the mean LGD of defaulted senior secured bank loans was 30.5 percent; for senior unsecured loans, it was 47.9 percent.[60] Moody's (2011) reported that, from 1982–2010, defaulted first-lien bank loans had LGDs of 40 percent, whereas the mean LGD for second-lien bank loans were 72 percent.[61]

Because we lack information about collateral type for C&I loans, we only examine lien status for the CRE loans. Table 8 presents the results.

[Insert Table 8]

The C&D results are contrary to expectations. Perhaps a goodly portion of the second liens relate to leasehold improvements to existing structures or renovations of existing structures, and that loans of this type are less risky. Another possibility is that lenders tend to offer junior liens only to their strongest customers or to projects that have already shown some success. The junior liens are smaller on average, and have a much lower foreclosure rate than the first liens. The share of junior liens is extremely low in Georgia or Florida, so local customs may influence availability and thus the results. For other CRE loans, the effects of lien status are in the expected direction but the effects were much smaller than those reported in earlier studies of larger loans. It may be that there are substantial differences in the usage of junior liens for real estate projects of various sizes.

H Origination Date and Age at Default

Figure 9 presents LGDs by the loan origination date.

[Insert Figure 9]

For other CRE loans, the result is as expected: loans originated well before the crisis have materially lower LGDs than those originated during the mania period immediately before the crisis began. However, the relationship between origination date and LGD is weak for C&I loans

[60] Gupton, Gates and Carty (2000), p 1.
[61] Moody's (2011), p 5. The recoveries are based on debt prices shortly after default, where our study focuses on realized losses. They report lower losses for a smaller sample of ultimate recoveries from 1987–2010 (20 percent), but did not provide a breakout by lien status.

and nonexistent for C&D loans. These results might be influenced by the censoring of the dataset. Recall that all of the assets in the sample existed when the banks failed. Most of the banks failed between 2009 and 2011. Therefore, loans that were originated before 2007 and cured, or were worked out quickly, are excluded from the sample, but loans of the same vintage that were still being worked out at the time of the bank failure are included. Thus the loans in early vintages exclude many quick workouts or cures as a result of left-censoring; likewise, the loans in the latest vintages exclude assets that are still active.[62] In addition, the average term to maturity for the C&D and C&I loans tend to be short. Therefore, the effects of censoring on this relationship may be stronger for C&D and C&I loans than for other CRE loans.

Figure 10 presents mean LGDs by the age of the loan at default.

[Insert Figure 10]

Loans that defaulted shortly after origination have considerably higher LGDs. For real estate loans, the effects are the strongest after the first few years; for C&I loans, the effect stabilizes after four years. Note that most C&D and C&I loans in the sample had maturities of less than five years. Therefore, the results may be influenced by the share of maturity defaults, or by loan characteristics that relate to loan maturity (either characteristics at origination or subsequent modification, including evergreening). Censoring might have influenced the results; if so, it appears likely that the effects of age at default could be weaker than portrayed above.

I Correlations

Table 9 presents correlations between LGD and the various factors discussed in earlier sections.

[Insert Table 9]

All relationships are statistically significant. The strongest relationships are the workout period (and, for real estate loans, the closely related dummy for foreclosure) and age at default. Consistent positive correlations are found for workout period, foreclosure, out-of-territory lending, and bank default rates. Consistent negative correlations are found for loan modifications, loan age at default, failed bank coverage ratio, and failed bank size.

Two items have correlations with different signs for different loan types. Junior liens have a negative correlation with LGD for C&D loans (a surprise that was discussed earlier), but a positive correlation with LGD for other CRE loans. Loan size has a negative correlation—the expected direction—with LGD for C&D loans and for other CRE loans, but it has a small positive correlation with LGD for C&I loans.

[62] The assets may have cured, may have defaulted shortly before the end of the sample period, or may have long workout periods. The LGDs recorded to date for the active loans that were excluded from the sample are much lower than those for the loans included in the sample.

V SUMMARY AND CONCLUSIONS

We examine LGD for over 50,000 defaulted C&D, C&I and other CRE loans that were originated by banks that failed between November 2008 and December 2013. These loans differ from other studies because they are much smaller on average and they are held in portfolios of small and mid-sized banks. The median size of the loans range from $57,000 for C&I loans to $307,000 for other CRE loans—far smaller than those studied elsewhere. But in many ways, they behave very much like their larger counterparts. A substantial portion of the loans cured. The mean LGDs for C&I loans and CRE loans (other than C&D loans) are in line with other studies of LGD during distress periods. However, the LGDs in these portfolios have higher standard deviations, perhaps partly because some authors capped LGD at 100 percent, but we cap LGD at 130 percent. Like other studies, we found strong bimodal distributions.

We compare LGDs and various items that might explain variations. The relationships between LGD and default date, workout periods, foreclosure, geography and age at default are as expected and generally consistent with other studies. Out-of-territory lending increases LGDs slightly, and small assets have higher LGDs. The biggest surprise relates to lien status, where junior liens have lower LGDs than first liens for C&D loans, and junior liens have only slightly higher LGDs than first liens for other CRE loans. Other authors found that junior liens had much higher LGDs than first liens in the bond market.

Because our sample comes from nearly 300 banks, we are able to test for relationships between LGD and failed-bank characteristics. Bank size and failed bank growth rates do not appear to influence LGD. Failed banks with higher coverage ratios have lower LGDs, and those with higher default rates have somewhat higher LGDs.

The results for C&D loans confirm that they are much riskier than other types of commercial loans. The mean LGD for C&D loans is 14 percentage points higher than for other CRE loans. C&D loans also have substantially longer workout periods and foreclosure rates, and LGDs for C&D loans are more sensitive to some of the factors that influence LGD. However, the interest rate premiums are comparable to those of the other CRE loans and generally below those of C&I loans. It is unclear whether these banks were poorly compensated for risk or whether up-front fees or other compensation made up for the low interest rates.

Except for C&D loans, we tentatively conclude that these loans have LGDs that, on average, are similar to those in other studies and that generally behave in ways similar to those in other studies. However, these results should be interpreted with care. The sample is censored and comprises defaulted loans at failed banks during a period of distress; they experienced a servicing regime change; and they were worked out under the FDIC's loss share program. There is no guarantee that defaulted loans at healthy banks will behave in the same way during a stress period.

In addition, we make almost no attempt to control for other factors in this analysis. A natural next step is to analyze LGDs in a multivariate framework to better understand what drives LGDs during crisis periods. This would provide a more nuanced understanding of the factors that influence LGD.

REFERENCES

Acharya, Viral, Sreedhar Bharath and Anand Srinivasan, 2003, "Understanding the Recovery Rates of Defaulted Securities," CEPR discussion paper series, 2003.

Altman, Edward, Brooks Brady, Andrea Resti and Andrea Sironi, 2005, "The Link between Default & Recovery Rates: Theory, Empirical Evidence, & Implications," *Journal of Business* 2005, Vol 78, #6, p 2203-2227.

Araten, Michel, Michael Jacobs Jr., and Peeyush Varshney, 2004, "Measuring LGD on Commercial Loans: An 18-Year Internal Study," *The RMA Journal*, May 2004, p 28–35.

Asarnow, Elliot and David Edwards, 1995, "Measuring Loss on Defaulted Bank Loans: a 24-Year Study," *Journal of Commercial Lending*, March 1995, p 11-23.

Black, Lamont, John Krainer, and Joseph Nichols, 2014, "From Origination to Renegotiation: A Comparison of Portfolio and Securitized Commercial Real Estate Loans," working paper.

Board of Governors of the Federal Reserve System, multiple years, "Survey of Terms of Business Lending–E.2," www.federalreserve.gov/releases/E2.

Brady, Brooks and Chang, Peter and Miu, Peter and Ozdemir, Bogie and Schwartz, David C., 2007, "Discount Rate for Workout Recovery: An Empirical Study (August 2007)," working paper.

Brown, David T, Brian A Ciochetti, and Timothy J Riddiough, 2006, "Theory and Evidence on the Resolution of Financial Distress," *The Review of Financial Studies*, volume 19:4, p 1357–1397.

Ciochetti, Brian A, 1997, "Loss Characteristics of Commercial Mortgage Foreclosures," *Real Estate Finance*, Spring 1997, p 53–69.

Congressional Oversight Panel, 2010, "Congressional Oversight Panel February Oversight Report: Commercial Real Estate Losses and the Risk to Financial Stability," February 10, 2010.

CoStar, 2015, CoStar Commercial Repeat-Sale Indices, http://www.costargroup.com/costar-news/ccrsi, 2015.

Esaki, Howard and Masumi Goldman, 2005, "Commercial Mortgage Defaults: 30 Years of History," *CMBS World*, Winter 2005, p 21–29.

Esaki, Howard, Steven L'Heureax and Mark Snyderman, 1999, "Commercial Mortgage Defaults: An Update," *Real Estate Finance*, Spring 1999, p. 80-86.

Federal Deposit Insurance Corporation (FDIC), 1997, *History of the Eighties—Lessons for the Future: An Examination of the Banking Crises of the 1980s and Early 1990s*, 2 vols, FDIC.

FDIC Office of Inspector General, 2012, *Evaluation of the FDIC's Monitoring of Shared-Loss Agreements*, Office of Audits and Evaluations Report No. EVAL-12-002.

Fitch, 2012, "CMBS 1.0…2.0…3.0…But Are We Progressing?," www.fitch.com, January 4, 2012.

Goodman, Gary A., and Elizabeth A. Gable, 2006. Defensive Construction Lending: What a Lender Needs to Know Before Making a Construction Loan," *Banking Law Journal*, November/December 2006.

Gupton, Greg M., Daniel Gates and Lea V. Carty, 2000, "Bank-Loan Loss Given Default," Moody's, November 2000.

Hu, Jian and Richard Cantor, 2004, "Defaults and Losses Given Default of Structured Finance Securities, *The Journal of Fixed Income*, March 2004.

Kovner, Anna, James Vickery and Lily Zhou, 2011, "Do Big Banks Have Lower Operating Costs," *FRBNY Economic Policy Review* December 2014.

Moody's, 2011, "Corporate Default and Recovery Rates, 1920–2010," February 28, 2011.

Morgan, Donald P and Adam B Ashcraft, 2003, "Using Loan Rates to Measure and Regulate Bank Risk: Findings and an Immodest Proposal," *Journal of Financial Services Research* 24:2/3 p 181-200.

Office of the Comptroller of the Currency, Federal Reserve System, FDIC, Office of Thrift Supervision, 2007, "Risk-Based Capital Standards: Advanced Capital Adequacy Framework—Basel II: Final Rule," https://www.fdic.gov/regulations/laws/federal/2007/07BASEL2dec7.pdf, December 7, 2007, p 69287–69445.

Pendergast, Lisa and Eric Jenkins. 2003, "CMBS Loss Severity Study: Portfolio Theory Aside, Size Matters," *CMBS World*, Spring 2003, p 30–33, 55–59.

Petosa, Stephanie, 2012, "CMBS Servicer Workouts Maintain an 86% Recovery Rate," *CRE Finance World*, Winter 2012, p 58–-62.

S&P, 2012, "CMBS Quarterly Insights: CMBS Inflection Point Reached in 2012, Credit Pendulum Swings Forward in 2013," November 19, 2012.

Schuermann, Til, 2004, "What do we know about Loss Given Default?," *Credit Risk Models and Management*, edited by David Shimko, published by Risk Books, p 249–274.

Tockarshewsky, Joseph B., 1979, "Why Construction Lending Requires More Know-how than Real Estate Lending," *The Appraisal Journal*, January 1979: p 28–34.

Udel, Gregory F., 2008, "What's in a relationship? The case of commercial lending," *Business Horizons* 51: 2, p 93–103.

Wiggers, Tyler and Adam B. Ashcraft, 2012, "Defaults & Losses on CRE Bonds during the Great Depression Era," Federal Reserve Bank of New York Staff Report, 2012.

Table 1
Basic Descriptive Data on the Sample

This data table provides information about the sample size, concentrations, and a distribution of the size of the assets in the sample broken out by three loan types: Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D).

	C&D	C&I	OTHER CRE
Number of Loans	16,340	17,193	17,116
Aggregate Loan Balance at Failure ($ Millions)	$16,808	$5,661	$15,911
Total Number of Failed Banks	278	291	295
Distribution of Loan Balances at Failure			
25th Percentile	$81,991	$18,773	$114,534
Median	$226,663	$56,575	$306,797
75th Percentile	$831,553	$200,000	$869,104
Mean	$1,028,631	$329,248	$929,599
Concentration by bank (based on asset counts)			
% from largest bank	9%	5%	6%
% from five largest banks	23%	18%	17%
Concentration by bank (based on asset balances)			
% from largest bank	12%	13%	7%
% from five largest banks	30%	37%	25%
Concentration by location			
% from top state (GA)	25%	25%	19%
% from top 5 states (GA,CA,FL,IL,WA or MI)	67%	61%	65%

Table 2
Average LGD and Its Component Parts

This data table reports basic sample statistics about the Loss Given Default (LGD) for the assets in the sample. The top panel provides the components of the weighted average LGD and basic statistics for LGD. The memo section compares alternative LGD measures to the base LGD calculation. The results are provided for three loan types: Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D).

	C&D		C&I		Other CRE	
	% of EAD*	% of total loss	% of EAD*	% of total loss	% of EAD*	% of total loss
Weighted Mean LGD: **						
Undiscounted principal loss	44.7%	83.8%	38.6%	85.0%	29.6%	76.9%
Interest cost ***	5.2%	9.8%	4.2%	9.3%	5.2%	13.4%
Expenses, net of income	3.4%	6.4%	2.6%	5.7%	3.7%	9.7%
Total LGD	53.3%		45.5%		38.5%	
Mean LGD	57.4%		50.6%		43.8%	
Median LGD	63.3%		51.0%		41.1%	
Standard deviation	38.6%		45.2%		39.5%	
Memo:Alternative LGD Measures	% of EAD*	(Diff fr Base LGD)	% of EAD*	(Diff fr Base LGD)	% of EAD*	(Diff fr Base LGD)
LGD capped at 100%						
Weighted mean LGD **	53.1%	*-0.2%*	45.0%	*-0.5%*	38.3%	*-0.2%*
Mean LGD	56.3%	*-1.2%*	49.3%	*-1.4%*	42.9%	*-0.9%*
Median LGD	63.3%	*0.0%*	51.0%	*0.0%*	41.1%	*0.0%*
Standard deviation	36.9%	*-1.6%*	43.4%	*-1.8%*	37.9%	*-1.5%*
LGD based on 15% discount rate						
Weighted mean LGD **	58.5%	*5.2%*	48.9%	*3.4%*	43.5%	*5.0%*
Mean LGD	61.0%	*3.5%*	51.9%	*1.3%*	47.1%	*3.4%*
Median LGD	69.5%	*6.2%*	56.0%	*5.1%*	49.3%	*8.3%*
Standard deviation	37.8%	*-0.7%*	44.8%	*-0.4%*	39.5%	*0.0%*
LGD based on cost of carry						
Weighted mean LGD **	49.7%	*-3.6%*	42.3%	*-3.2%*	34.6%	*-3.9%*
Mean LGD	54.5%	*-2.9%*	49.1%	*-1.6%*	40.5%	*-3.2%*
Median LGD	58.3%	*-5.1%*	47.0%	*-4.0%*	33.8%	*-7.3%*
Standard deviation	39.5%	*0.9%*	45.6%	*0.4%*	39.7%	*0.3%*
LGD based on forgone interest						
Weighted mean LGD **	60.6%	*7.3%*	49.7%	*4.3%*	42.3%	*3.8%*
Mean LGD	64.1%	*6.7%*	53.9%	*3.3%*	48.2%	*4.4%*
Median LGD	70.3%	*6.9%*	54.4%	*3.4%*	44.6%	*3.5%*
Standard deviation	44.0%	*5.5%*	48.6%	*3.4%*	44.5%	*5.0%*

** Exposure at default*

*** Weighted by exposure at default*

**** Includes the difference between discounted and undiscounted principal recoveries plus discounted unpaid accrued interest.*

Table 3
Basic Loan Terms

This data table reports interest rates and terms to maturity for the loans in the sample, broken out by three loan types (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), and by adjustable-rate (ARM) and fixed-rate loans. The interest rate premiums are calculated as the difference between the loan interest rate and a comparable U.S. Treasury rate.

	C&D		C&I		OTHER CRE	
	ARM	Fixed	ARM	Fixed	ARM	Fixed
% of total	53.3%	46.7%	48.1%	51.9%	48.7%	51.3%
Interest Rates:						
25th Percentile	4.50	5.88	5.00	6.30	5.00	6.13
50th Percentile	5.90	6.50	6.00	7.25	6.00	6.96
75th Percentile	6.50	7.51	6.75	8.25	7.00	7.50
Interest Rate Premium over Treasuries:						
25th Percentile	0.63	2.15	1.07	2.99	1.31	2.24
50th Percentile	2.09	3.65	3.13	4.32	2.78	3.32
75th Percentile	4.17	4.95	5.00	5.98	4.38	4.70
Term to Maturity (in years):						
25th Percentile	1.8	2.0	2.0	2.0	3.0	2.9
50th Percentile	2.9	3.0	3.8	4.0	5.8	5.0
75th Percentile	4.4	5.0	6.0	5.0	10.1	6.3

Table 4
Relationship Between LGD Characteristics and Workout Period

For each of three loan types in the sample, this data table provides information about the distribution of workout periods and trends in Loss Given Default (LGD) and the loan workout period. The trends relate to volumes of assets, asset size, LGD and its components. The three loans types are Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)).

Asset Type	Workout Time Period	# Assets in Sample	% Total # of Assets in Sample	Avg Asset Size	Mean LGD	Weighted Mean LGD	Weighted Expenses/ EAD *	Weighted Int Cost /EAD *+
C&D	LT 6 months	3463	21.1%	838,114	22.8%	12.3%	0.3%	0.7%
C&D	6-12 months	1769	10.8%	926,837	47.8%	37.9%	1.3%	2.3%
C&D	12-18 months	1929	11.8%	838,834	58.3%	47.3%	2.7%	3.7%
C&D	18-24 months	1969	12.0%	1,023,933	63.0%	54.8%	3.3%	5.0%
C&D	2-3 years	3667	22.4%	1,259,603	71.3%	63.5%	4.4%	6.1%
C&D	GT 3 years	3610	22.0%	1,524,505	78.2%	72.2%	5.2%	8.2%
C&I	LT 6 months	8195	49.9%	239,986	37.6%	24.2%	1.0%	0.6%
C&I	6-12 months	2800	17.1%	313,941	55.0%	45.7%	2.1%	2.0%
C&I	12-18 months	1865	11.4%	307,333	62.4%	55.4%	2.9%	3.2%
C&I	18-24 months	1340	8.2%	370,802	63.5%	59.7%	2.6%	3.7%
C&I	2-3 years	1721	10.5%	495,384	64.3%	54.9%	3.9%	6.4%
C&I	GT 3 years	1290	7.9%	859,996	75.6%	63.6%	4.7%	11.4%
Other CRE	LT 6 months	5234	31.9%	830,603	17.4%	11.2%	0.4%	0.7%
Other CRE	6-12 months	2084	12.7%	879,056	37.1%	32.3%	2.0%	2.4%
Other CRE	12-18 months	2173	13.2%	912,838	49.0%	41.0%	3.3%	4.3%
Other CRE	18-24 months	1975	12.0%	1,012,409	53.4%	45.6%	4.3%	5.5%
Other CRE	2-3 years	3247	19.8%	1,068,922	61.8%	53.4%	6.1%	7.8%
Other CRE	GT 3 years	2433	14.8%	1,102,685	70.0%	60.1%	7.2%	11.3%

** Exposure at default*

+ Interest cost is defined as the difference between discounted and undiscounted principal recoveries plus discounted unpaid accrued interest.

Table 5
Mean LGD and Foreclosure for Loans That Did Not Cure

For two types of real estate loans (Construction & Development (C&D) and other Commercial Real Estate (CRE loans, excluding C&D)), this table presents mean LGD and workout periods for loans that are and are not foreclosed, further broken out by those where the collateral is found in states with and without judicial foreclosure laws.

	C&D			Other CRE		
	Not Fore-closed	Fore-closed	Diff	Not Fore-closed	Fore-closed	Diff
All States						
Sample Size	6,944	7,345		8,255	4,986	
% total	48.6%	51.4%		62.3%	37.7%	
Mean LGD	58.3%	73.4%	15.1%	51.6%	65.3%	13.8%
Expense / EAD *	3.9%	9.3%	5.4%	4.8%	12.6%	7.7%
Interest Cost / EAD *+	4.3%	5.9%	1.6%	4.8%	7.9%	3.1%
Workout Period (in days)	596	909	313	462	813	351
Not Judicial Foreclosure						
Sample Size	3,763	4,441		4,073	2,705	
% total	45.9%	54.1%		60.1%	39.9%	
Mean LGD	51.2%	72.3%	21.2%	45.8%	62.4%	16.6%
Expense / EAD *	3.5%	8.7%	5.1%	4.1%	11.0%	7.0%
Interest Cost / EAD *+	4.5%	5.9%	1.4%	5.0%	7.5%	2.5%
Workout Period (in days)	488	882	394	441	757	316
Judicial Foreclosure						
Sample Size	2,876	2,705		3,791	2,060	
% total	51.5%	48.5%		64.8%	35.2%	
Mean LGD	65.5%	77.5%	12.0%	54.2%	69.7%	15.5%
Expense / EAD *	4.5%	10.7%	6.2%	5.7%	15.0%	9.3%
Interest Cost / EAD *+	4.3%	6.5%	2.2%	5.0%	9.0%	4.0%
Workout Period (in days)	591	1032	441	514	926	412
Difference between Judicial & Nonjudicial Foreclosure						
% of sample	*5.7%*	*-5.7%*		*4.7%*	*-4.7%*	
Mean LGD	*14.3%*	*5.2%*		*8.4%*	*7.2%*	
*Expense / EAD **	*0.9%*	*2.0%*		*1.6%*	*4.0%*	
*Interest Cost / EAD *+*	*-0.3%*	*0.6%*		*0.0%*	*1.6%*	
Workout Period (in days)	*103*	*150*		*73*	*169*	

** Exposure at Default*

+ Interest cost is defined as the difference between discounted and undiscounted principal recoveries plus discounted unpaid accrued interest.

Table 6
Modification Frequency and LGD Results

For each of three loan types in the sample, this data table presents data on the frequency of loan modifications and compares Loss Given Default (LGD) for modified loans and unmodified loans. For those that were modified, it also compares LGDs for those that were and were not subsequently foreclosed. The three loans types are Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)).

	C&D	C&I	Other CRE
Percent of Loans Modified	14.6%	12.0%	18.3%
Mean LGD:			
Modified	56.3%	59.6%	54.2%
Not Modified	66.9%	69.0%	56.8%
Difference	*-10.6%*	*-9.5%*	*-2.7%*
% of Modified Loans Later Foreclosed	43.9%	8.4%	35.3%
LGD for modified and not foreclosed	46.0%	58.8%	47.8%
LGD for modified and foreclosed	69.5%	67.6%	65.8%
Difference	*-23.5%*	*-8.8%*	*-18.0%*

Table 7
LGD by In- and Out-of-Territory Lending

For each of three loan types in the sample, this data table presents a comparison of arithmetic mean Loss Given Default (LGD) for loans that in and out of a bank's territory. The "Narrow" definition of out-of-territory follows the definitions used in the Community Reinvestment Act; the "Broad" definition assumes that only loans made in states where the bank has no branches are out-of-territory. The three loans types are Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)).

	C&D		C&I		Other CRE	
	Narrow	Broad	Narrow	Broad	Narrow	Broad
Mean LGD for in-territory loans	54.7%	56.7%	48.5%	49.3%	41.2%	42.4%
Mean LGD for out-of-territory loans	61.0%	59.9%	51.9%	50.3%	45.8%	47.3%
Difference	*6.4%*	*3.2%*	*3.4%*	*0.9%*	*4.6%*	*4.8%*

Table 8
Mean LGD by Lien Status

For two types of real estate loans (Construction & Development (C&D) and other Commercial Real Estate (CRE loans, excluding C&D)), this table compares arithmetic mean Loss Given Default for first liens and junior liens.

	C&D	Other CRE
% First Liens	94.1%	91.0%
Mean LGD:		
First Liens	56.1%	41.7%
Junior Liens	52.7%	48.7%
Difference	*-3.4%*	*6.9%*

Table 9
Correlations Between LGD and Other Variables

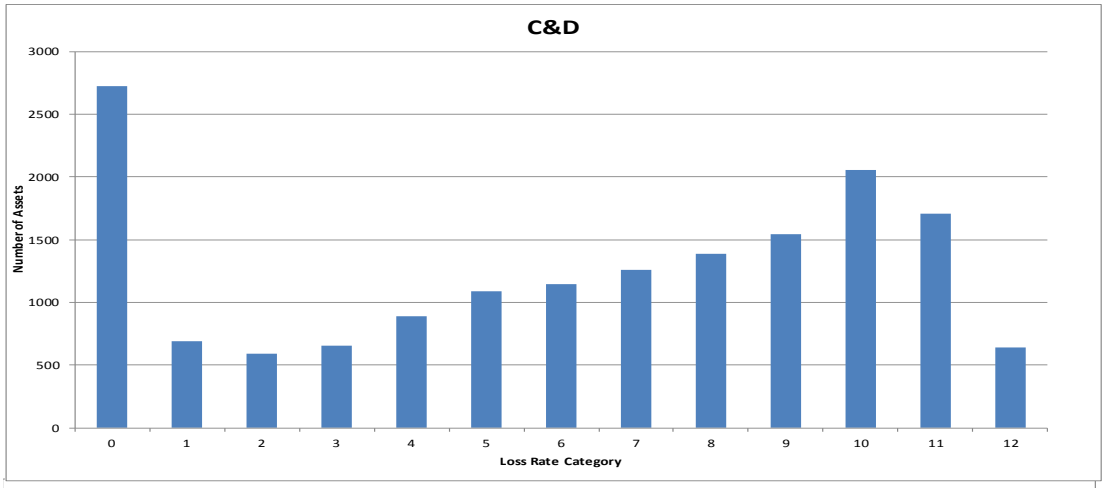
For each of three loan types in the sample, this data table presents correlations between LGD and various factors that are generally thought to be related to LGD. The three loans types are Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)).

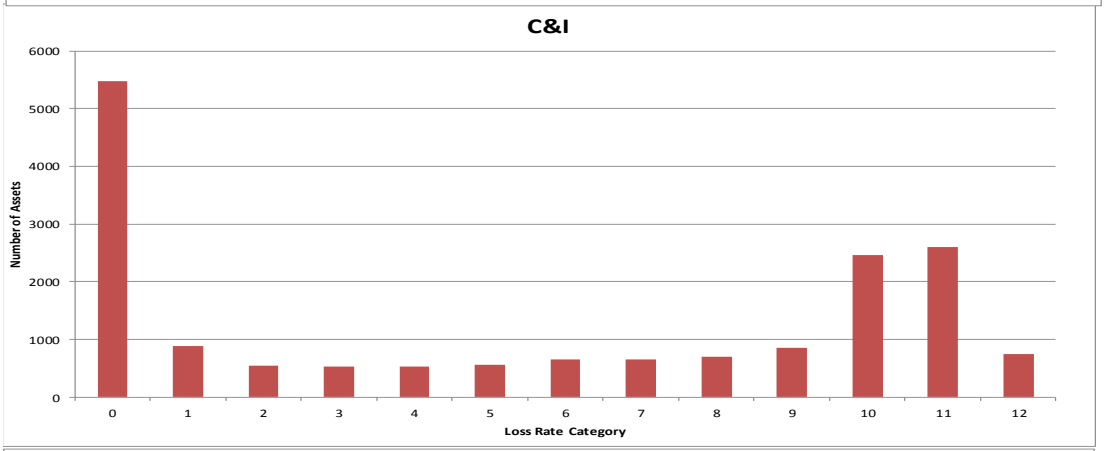
	C&D	C&I	OTHER CRE
Interest Rate Premium	0.02619***	0.06728***	0.05175***
Workout Period	0.47078***	0.25671***	0.46702***
Dummy for Foreclosure	0.36885***	0.07209***	0.34693***
Dummy for Loan Modification	-0.10967***	-0.07776***	-0.02858***
Log of Loan Size	-0.09456***	0.02201***	-0.07123***
Out of Territory - Broad	0.06015***	0.09631***	0.12113***
Out of Territory - Narrow	0.08231***	0.08222***	0.09633***
Dummy for Junior Lien	-0.02065**	N/A	0.05133***
Loan Age at Default	-0.15719***	-0.09862***	-0.28544***
Bank Coverage Ratio	-0.09944***	-0.02298***	-0.03081***
Bank Default Rate for Loan Type at Failure	0.02477***	0.04678***	0.13828***
Bank Cumulative Default Rate for Loan Type	0.11805***	0.04053***	0.0638***
Log of Failed Bank Size	-0.0723***	-0.03683***	-0.14164***

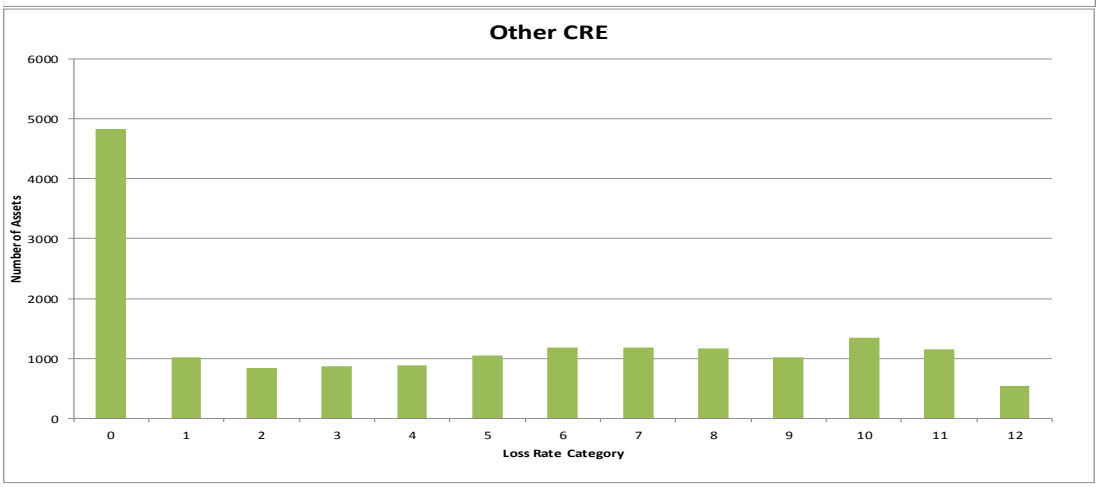
* Significant at 10%
** Significant at 5%
*** Significant at 1%

Figure 1
LGD Distribution by Loan Type

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents distributions of Loss Given Default (LGD) based on loan-level data.





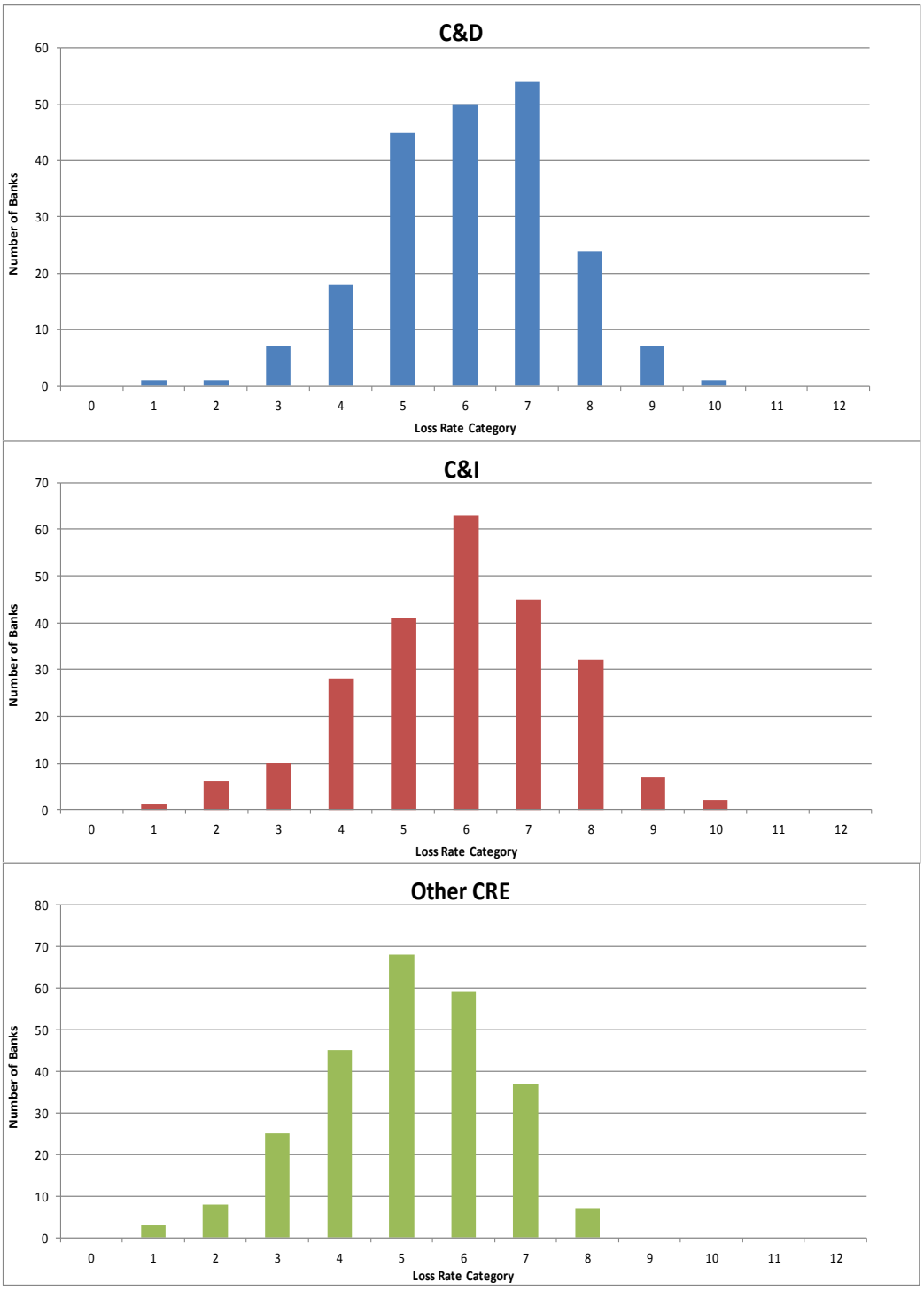


Loss Rate Category Definitions

0: = 0
1: >0 and <=.1
2: >.1 and <=.2
3: >.2 and <=.3
4: >.3 and <=.4
5: >.4 and <=.5
6: >.5 and <=.6
7: >.6 and<=.7
8: >.7 and <=.8
9: >.8 and <=.9
10: >.9 and <=1
11: >1 and <=1.1
12: >1.1 and <=1.3

Figure 2
Mean Failed Bank LGD Distribution by Loan Type

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents distributions of mean Loss Given Default (LGD) by failed bank.



Loss Rate Category Definitions

0: = 0
1: >0 and <=.1
2: >.1 and <=.2
3: >.2 and <=.3
4: >.3 and <=.4
5: >.4 and <=.5
6: >.5 and <=.6
7: >.6 and<=.7
8: >.7 and <=.8
9: >.8 and <=.9
10: >.9 and <=1
11: >1 and <=1.1
12: >1.1 and <=1.3

Figure 3
Mean LGD by Loan Default Date

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by the year of default.

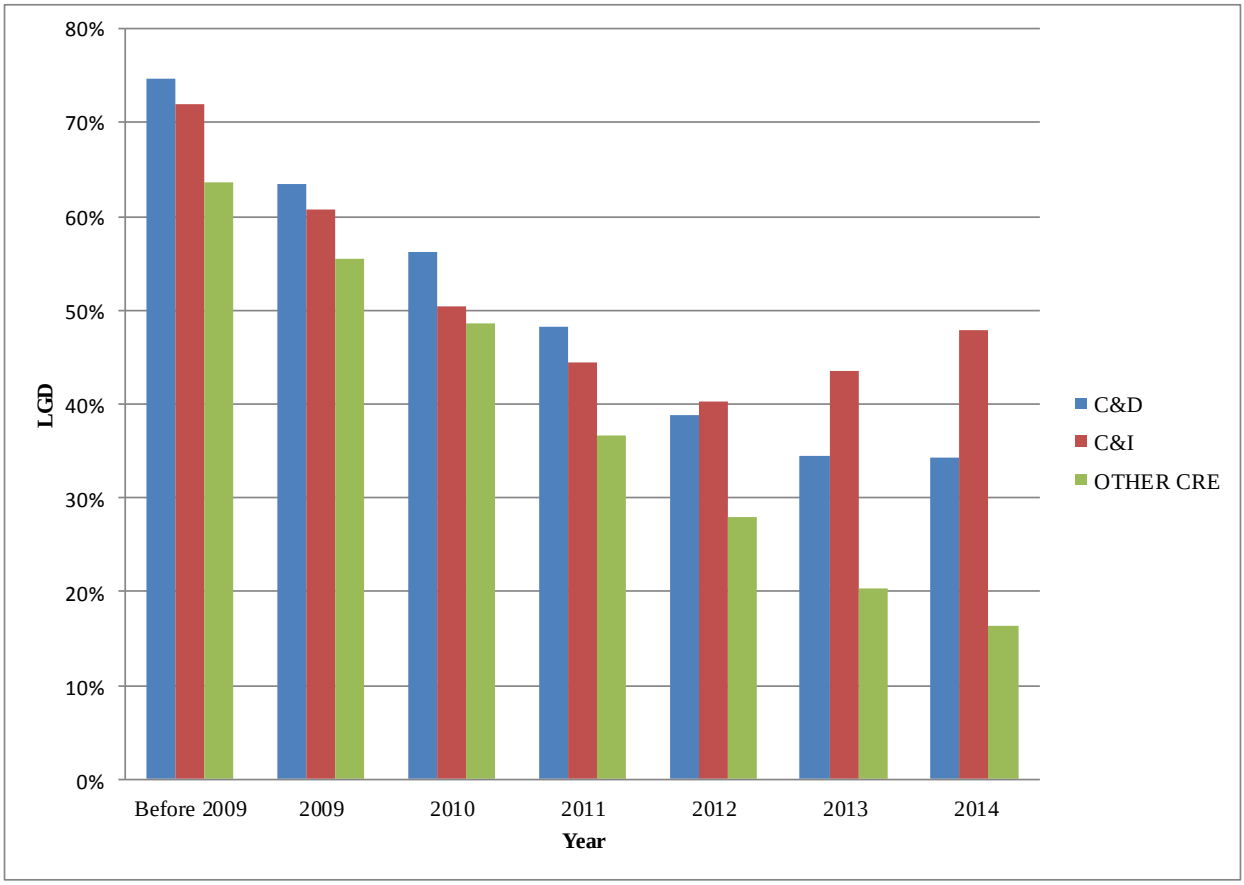


Figure 4
Mean LGD by Workout Time Period

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by the length of the workout period.

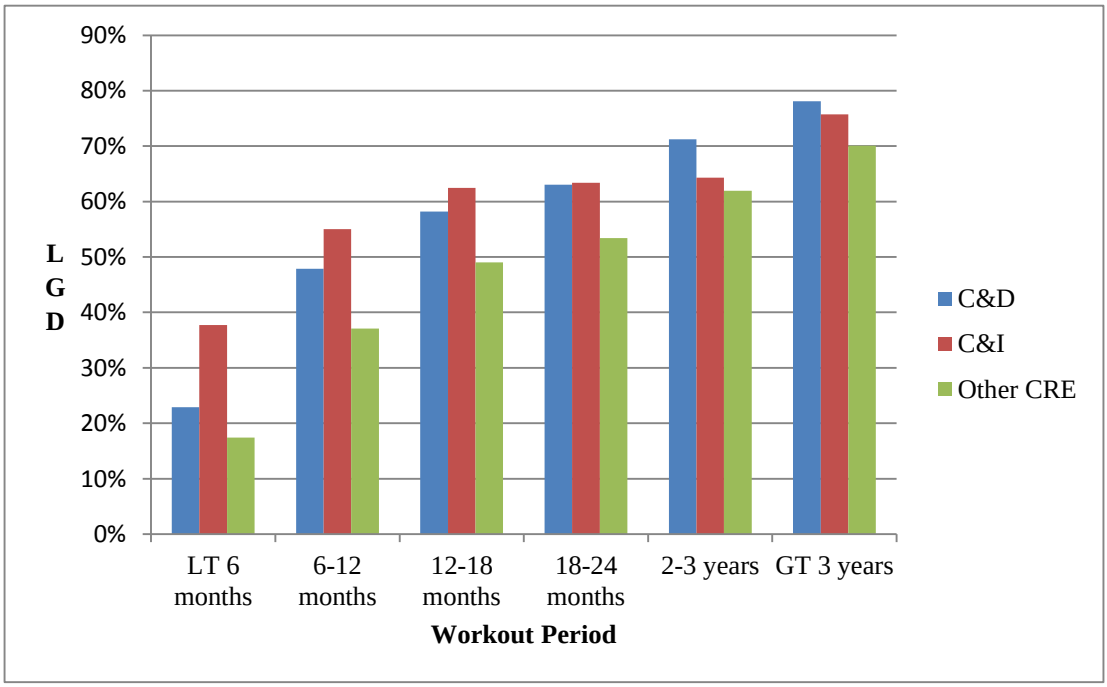


Figure 5
Mean LGD by Loan Size Quartile

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by loan size quartile. Quartiles are calculated separately for each loan type.

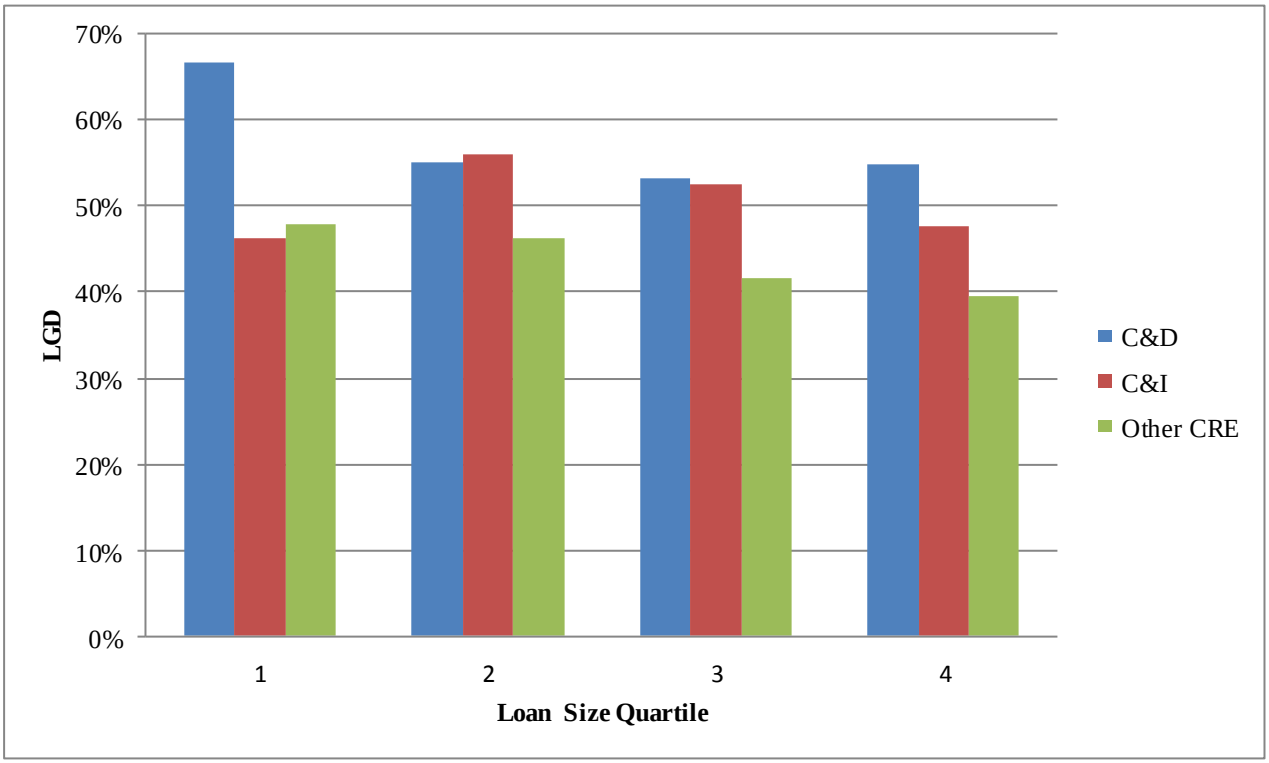


Figure 6
Mean LGD by Failed Bank Size Quartile

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by failed bank size quartile. Note that the number of loans is not evenly distributed because the larger banks hold more distressed loans.

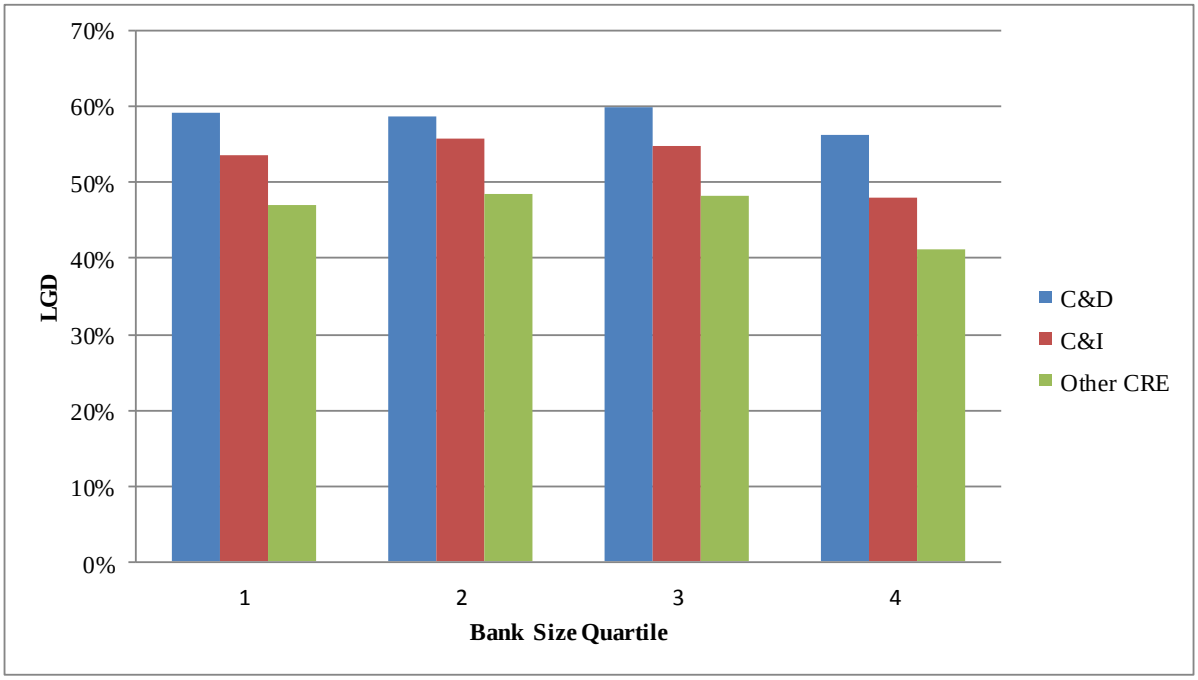


Figure 7
Mean LGD by Failed Bank Default Rate Quartiles

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by failed bank default rate quartile. Cumulative default rates include all loans in default at failure plus loans that failed from bank failure through the second quarter of 2014.

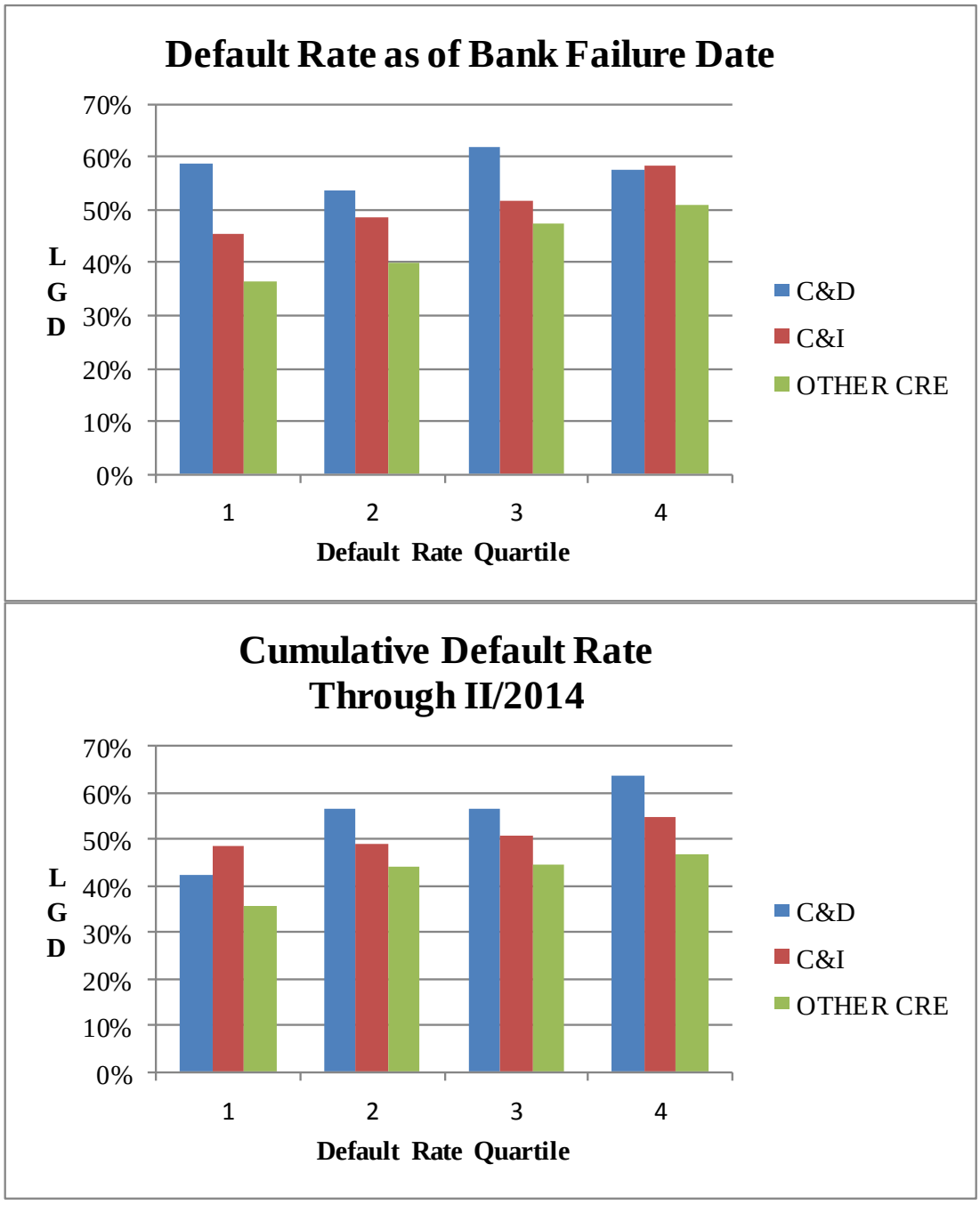


Figure 8
Mean LGD by Collateral/Loan Location

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by the location of the collateral or (if not available) the location of the borrower.

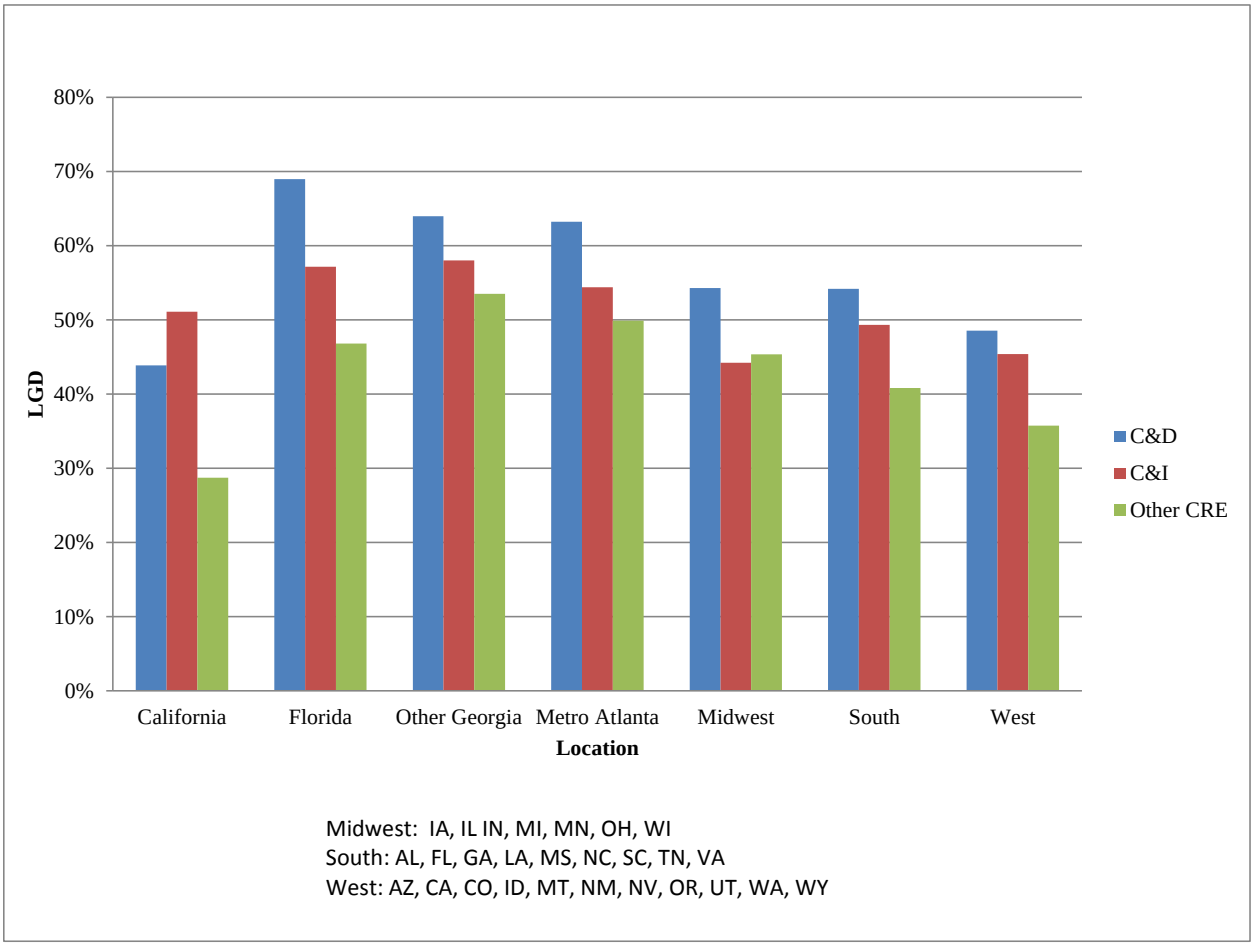


Figure 9
Mean LGD by Origination Date

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by the loan origination date.

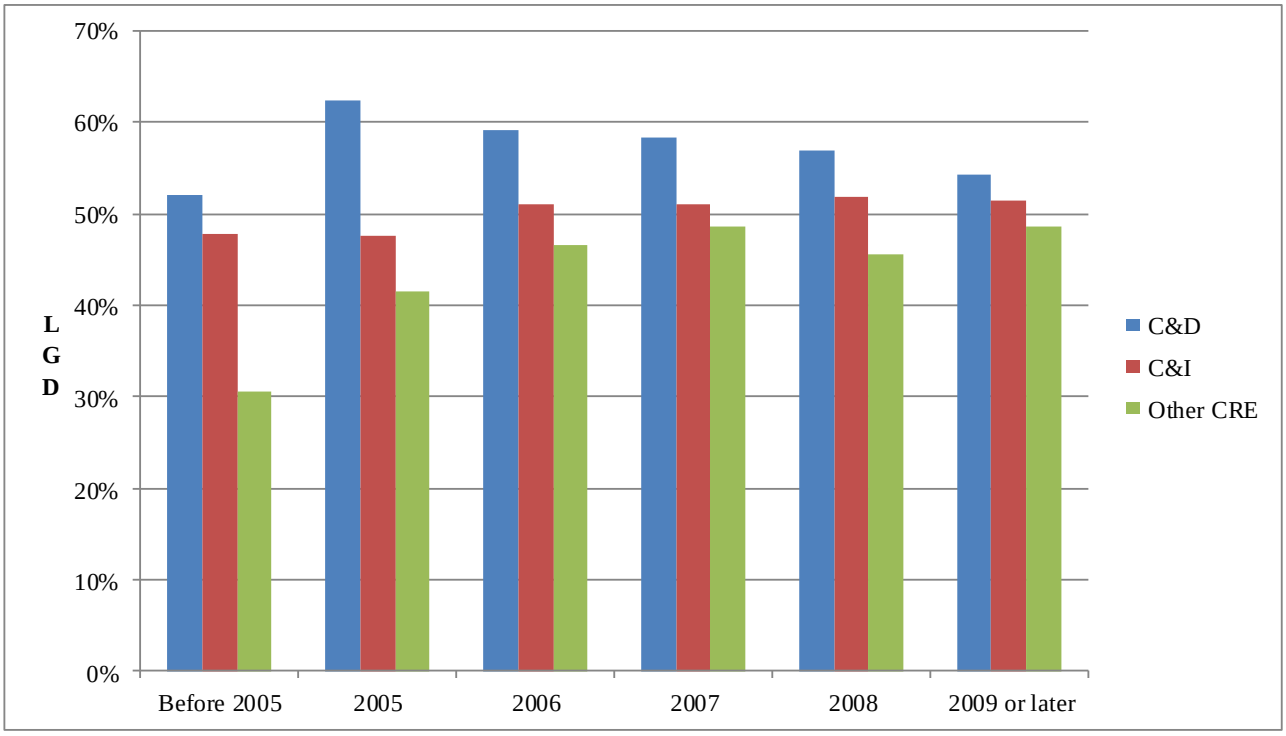


Figure 10
Mean LGD by Age of Loan at Default

For three types of loans (Construction & Development (C&D), Commercial and Industrial (C&I), and other Commercial Real Estate (CRE loans, excluding C&D)), this figure presents arithmetic mean Loss Given Default (LGD) for loans grouped by the age of the loan at the time of default.