Journal of Banking & Finance 33 (2009) 788–799

Contents lists available at ScienceDirect

Journal of Banking & Finance

journal homepage: www.elsevier.com/locate/jbf

Loss given default of high loan-to-value residential mortgages

Min Qi *, Xiaolong Yang

Office of the Comptroller of the Currency, 250 E Street S.W., Washington, DC 20219, USA

ARTICLE INFO

Article history:
Received 25 January 2008
Accepted 8 September 2008
Available online 21 September 2008

JEL classification:
G21
G28

Keywords:
Loss given default
Residential mortgage
Default
Recovery
Downturn
Basel II

ABSTRACT

This paper studies loss given default using a large set of historical loan-level default and recovery data of high loan-to-value residential mortgages from several private mortgage insurance companies. We show that loss given default can largely be explained by various characteristics associated with the loan, the underlying property, and the default, foreclosure, and settlement process. We find that the current loan-to-value ratio is the single most important determinant. More importantly, mortgage loss severity in distressed housing markets is significantly higher than under normal housing market conditions. These findings have important policy implications for several key issues in Basel II implementation.

Published by Elsevier B.V.

1. Introduction

Under the new Basel II capital framework,[1] the calculation of minimum regulatory capital under the advanced internal rating-based (A-IRB) approach requires accurate estimation of parameters that determine the credit risk of banks' financial asset portfolios: probability of default (PD), loss given default (LGD), and exposure at default (EAD).[2] While there has been a growing body of research relevant to the modeling and estimation of PD, there are few studies on LGD (or loss severity, which is equal to 1—the recovery rate) to date, but the number has been increasing rapidly.[3]

The growing literature on LGD has covered several areas, including defining and measuring LGD and the correlation between PD and LGD, both theoretically and empirically. The existing literature has also studied various factors that affect LGD. These include: (1) contract characteristics—seniority and security, credit facility type (loan, bond), term or revolving facility, covenant protection, collateral (type, appraisal date, and results); (2) borrower characteristics—profit margin, debt cushion, leverage; (3) differences across industry and industry conditions; and (4) macroeconomic systematic risk factors. Cyclical effects on LGD are also examined, and LGD during economic downturn periods has been compared to LGD under normal economic conditions. Lastly, research has been carried out to investigate the statistical distribution of LGD.

However, the vast majority of these LGD studies are on wholesale exposures, such as corporate bonds and loans (see, for example, Dermine and Neto de Carvalho, 2006 and the references therein). Partly because of the unavailability of public data, very few studies have been done on retail exposures. In a theoretical credit risk model for large dimensional portfolios such as retail and mortgages, Nyström and Skoglund (2006) moved away from the traditional assumption of fixed recovery rate to models of recovery rate with stochastic collaterals, but their recovery rate models are not calibrated to real data. Clauretie and Herzog (1990) study the effect of state foreclosure laws (judicial procedure, statutory right of redemption, and deficiency judgment) on

* Corresponding author. Tel.: +1 202 874 4061; fax: +1 202 874 5394.
E-mail addresses: min.qi@occ.treas.gov (M. Qi), xiaolong.yang@occ.treas.gov (X. Yang).

[1] International Convergence of Capital Measurement and Capital Standards: A Revised Framework, June 2006, Basel Committee on Banking Supervision. VanHoose (2007) reviews the literature on bank behavior under capital regulation to evaluate the intellectual underpinning for the proposed Basel II system and to assess its effects on bank lending, loan rates, leverage ratio, asset risk, and overall safety and soundness of the banking system.

[2] Effective maturity (*M*) is also needed for corporate, sovereign, and bank exposures.

[3] Altman et al. (2005a) provide a comprehensive survey of literature on default recovery rates for corporate credit risk. Altman et al. (2005b) contain a collection of papers on recovery risk. Qi (2005) surveys research on LGD in stressed market conditions. In general the estimate of the recovery rates is not easy due to insufficient sample data (Abaffy et al., 2007).

0378-4266/$ - see front matter Published by Elsevier B.V.
doi:10.1016/j.jbankfin.2008.09.010

loan losses for mortgages insured privately (i.e., private mortgage insurance (PMI)) and by government (e.g., Federal Housing Administration (FHA)). They find that judicial procedure and statutory right of redemption extend the foreclosure and liquidation processes and thus are associated with larger loan losses. They also show that deficiency judgment reduces loss severity for PMI that has no incentive conflict due to its coinsurance feature, while deficiency judgment has no significant impact on the recovery rate for FHA insurance, with which incentive conflict arises due to the lack of a coinsurance arrangement. Lekkas et al. (1993) empirically test the frictionless form of the options-based mortgage default theory. They find that higher initial loan-to-value (LTV) ratios, regions with higher default rates (Texas), and younger loans are associated with significantly higher loss severities whereas the difference between contract and current interest rates has no impact on loss severities; consequently, they reject the propositions about loss severity implied by the frictionless form of the options-based mortgage default theory. Crawford and Rosenblatt (1995) extend options-based mortgage default theory to include transaction costs and show theoretically and empirically the effect of frictions on the individual strike price that affects loss severity.

The regression analysis in the above three studies can explain only a small portion of the total variations in loan-level mortgage LGD (R^2 ranges from 0.02 to 0.14).[4] More recently, Pennington-Cross (2003) and Calem and LaCour-Little (2004) study determinants of mortgage loss severity based on government-sponsored enterprise (GSE) data, and their regression analysis shows improved explanatory power. The R^2 reported in Calem and LaCour-Little is 0.25, whereas it is 0.95–0.96 in Pennington-Cross (2003). Although the latter study reports very high R^2, it uses a much smaller sample and covers a shorter sample period (1995–1999) that contains no serious housing market depreciation.[5] Coupled with the problems in LGD definition and the timing of the current loan-to-value (CLTV) calculation, the findings of Pennington-Cross (2003) should be interpreted with caution.

Overall the existing studies have found that CLTV or LTV are strongly related to recovery rates (Calem and LaCour-Little, 2004; Pennington-Cross, 2003; Lekkas et al., 1993; Clauretie and Herzog, 1990). The age and size of the loan have also been shown to affect mortgage recovery rates (Calem and LaCour-Little, 2004; Pennington-Cross, 2003; Lekkas et al., 1993). In addition, recovery rates are found to vary with state foreclosure laws (Pennington-Cross, 2003; Clauretie and Herzog, 1990), prime or subprime mortgages (Pennington-Cross, 2003), and the relative median income (Calem and LaCour-Little, 2004). These studies are summarized in Appendix A.

The existing residential mortgage LGD studies, however, have not paid sufficient attention to how LGD would change under housing market downturn conditions, partly because of the lack of reliable mortgage loss data through a complete housing market cycle. The only study we are aware of that quantifies the expected and economic downturn LGD relationship is Calem (2003). However, his results are based on simulated mortgage defaults of a conforming-size residential mortgage portfolio that is hypothetical and geographically diversified. It is not clear whether the same relationship would still hold if actual loan-level loss experiences were used.

In recent years, retail loans have surpassed wholesale loans in dollar amount and have accounted for the largest proportion in total assets among all commercial banks in the US. Furthermore, residential mortgage is now the largest share of aggregate retail loans of all US commercial banks. As of June 2006, the total retail and wholesale loans are around $2.66 trillion and $2.42 trillion, respectively, for all commercial banks. Residential mortgages account for 52% of all commercial banks as of June 2006.[6] Given their prominent position in banks' portfolios, retail LGD in general and mortgage LGD in particular have obviously been understudied in the existing literature. The present research intends to fill this gap.

In this paper, we study residential mortgage loss given default using a large set of historical loan-level default and recovery data of high-LTV mortgages from several private mortgage insurance companies. We show that LGD can be largely explained by various characteristics associated with the loan, the underlying property, as well as the default, foreclosure, and settlement process. As expected, CLTV is the single most important determinant. More importantly, mortgage loss severity in distressed housing markets is significantly higher than under normal housing market conditions.

Our study differs from the existing mortgage loss severity studies in several important ways. First, compared to the existing studies on mortgage loss given default, our LGD definition is more comprehensive and closer to the Basel II definition. Besides the unpaid balance and the recovery amount, we also include the accrued interest, foreclosure expenses (legal and courts), property maintenance expenses, sales costs, and repairs. Most importantly, all cash flows (positive or negative) are properly adjusted and discounted to the time of default. Second, we use a unique data set that has the most observations and covers a long period that contains a complete housing market cycle, at least for the New England and the Pacific regions. It allows us to be the first to explicitly and empirically model economic downturn LGD for residential mortgages. Third, our data also contain the most comprehensive information for each defaulted mortgage, making it possible to include more explanatory variables and to explain loss given default better than most of the existing studies. Finally, most of the existing loan-level studies use conforming GSE mortgages of usual LTV ratios, whereas our sample consists largely of high-LTV, PMI-insured mortgages.

This paper has several important policy implications for several key issues in Basel II implementation. First, although LTV at time of loan origination can be used to segment risk, updated LTV (or CLTV) dramatically improves risk segmentation. Second, the LGD mapping function specified in the proposed US. Basel II rules reflects stress effects that are generally greater than what our sample and analysis suggest but is nevertheless appropriate. Finally, after considering mortgage insurance payment, the 10% LGD floor imposed by the US and international Basel II rules for residential mortgage exposures is binding when applied to the average LGD in the MICA sample. However, it becomes non-binding if applied to downturn LGD.

The rest of the paper is organized as the follows. In Section 2, we describe in greater detail the mortgage claim data set that is used in this research. In Section 3, we compare average mortgage loss severity across time, geographic regions, and CLTV ranges. Results of regression analysis are reported in Section 4. Section 5 addresses the implications of our findings on risk-based capital. Conclusions are provided in Section 6.

2. Data and descriptive statistics

We use a large and geographically diverse individual loan-level mortgage default and recovery data set from several major private mortgage insurance companies. The data set was compiled by the Mortgage Insurance Companies of America (MICA), the trade asso-

[4] The adjusted R^2 of 0.56–0.57 reported in Clauretie and Herzog (1990) is from regressions at the state level, not at the loan level.

[5] The sample average LGD in Pennington-Cross (2003) is only 2.1%.

[6] *Source*: "Financial Performance of National Banks", OCC Quarterly Journal 25(3), September 2006.