FINANSTILSYNET
THE FINANCIAL SUPERVISORY
AUTHORITY OF NORWAY

Risk weights for mortgages

Estimation of prudent risk weights for mortgages

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Contents

1 Introduction

1.1 Preface

The introduction of Basel II in 2007 led to a decrease in the risk weight for mortgages. The levels have decreased further over time even as the household debt level has increased. In the same period, housing prizes has reached record levels. The Basel I floor has prevented risk weighted assets from falling, but the development calls for a critical review of the IRB-systems. The Financial Supervisory Authority of Norway (FSA) conducted a review of the IRB-models used for mortgages in Norway in 2012. This note briefly describes the findings of the review and suggested regulatory actions to secure sound IRB-models.

1.2 Review findings

As part of the annual IRB-inspection, the institutions were asked to submit extensive information about their IRB-models for mortgages, description of the dataset and methods used for calibration and summary statistics on their mortgage portfolios. The main findings were that historical data used for PD-calibration were of poor quality, the observed portfolio PD might drift far from the calibration target, downturn adjustment for LGD-parameters were not sufficiently empirically grounded, the models include behavioral variables that indicate an imminent default and that some banks rate a large portion of their exposures with very low PD.

2 Measures

Given that authorities must be convinced that "the institution's rating systems provide for a meaningful assessment of obligor and transaction characteristics, a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk" (CRR 144(1)), it is our view that it is appropriate to impose strict requirements on the institutions' modeling. Moreover, the CRR recital (12) stating that national authorities may impose stricter requirements due to the "peculiarity of immovable property markets" suggest that special measures for residential mortgage models are justified. Although the CRD IV-package only explicitly provides for increased LGD floors, it is our view that the strict requirements for IRB models and the supervisory assessments justify measures like parameter floors and standardized procedures for determining long-run averages.

2.1 PD calibration

Due to the poor quality of historical data used to estimate a long term average PD, the FSA proposes introducing a minimum standard. The minimum will put some weight on a level the FSA estimates to be relevant for a downturn period, and some weight on a level the bank estimate to represent a neutral period. In particular the FSA proposes a 20 per cent weight on the FSA downturn PD-estimate and an 80 per cent weight on the banks own PD estimate for the non-crisis years. The FSA estimates a PD of 4 per cent for the downturn period. The requirements will likely result in a calibrated PD levels in the region of 1.0 to 1.2 per cent.

The weights are motivated by the frequency of severe downturns experienced in Norway, and allows for four downturns per century, each lasting five year. This includes a small safety margin over the observed historical frequency.

The level of the downturn estimate is based on the experience during the last severe downturn in Norway around 1990. The FSA has used the banks' reported levels of defaulted exposures during the Norwegian banking crisis to estimate the relevant default frequency. The considerable amount of uncertainty around this estimate is taken into account in a prudential manner in the proposed minimum standard. For details about the PD level and frequency of crises, see appendix.

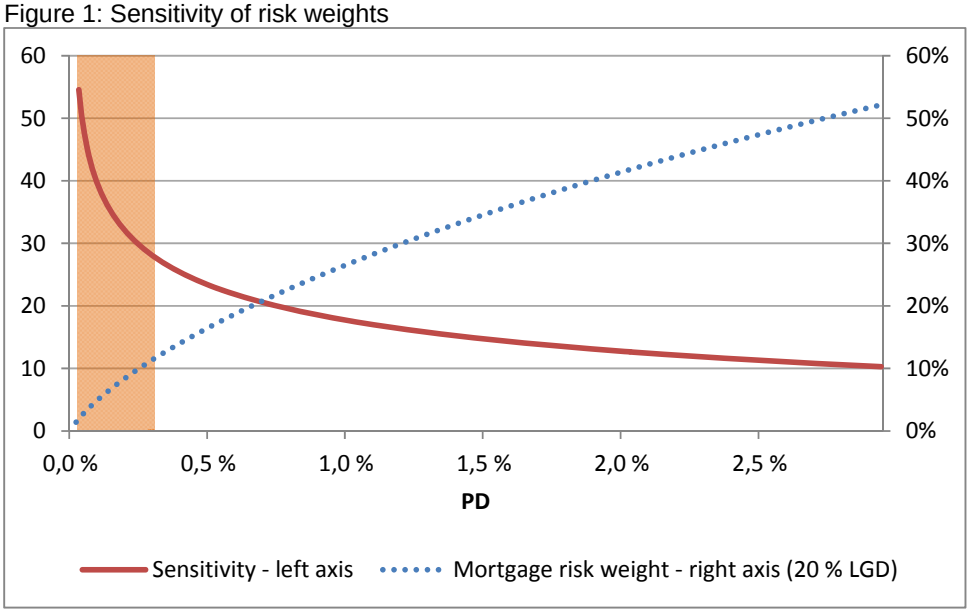
The requirement for long term estimates clearly needs further specifications and the Nordic authorities have agreed that at least the early 90's banking crises should be included in the data. Further, we think that the questionable data quality and the requirement to "incorporate all relevant data" (CRR 179(1a)) justify the requirement to use general data from the early 1990's. Moreover, doubts about whether the historical data are "relevant to current and foreseeable conditions" (CRR 179(1d)) and the fact that "[t]he less data an institution has, the more conservative it shall be in its estimation" (CRR 179(1a)) suggest conservative measures when determining the weight on crisis years when estimating the long term average.

2.2 Minimum exposure level PD

The rating distribution, in particular the concentration of exposures with low PD, is an important driver of the risk weight differentials across banks. In general, a more dispersed distribution will lead to lower average risk weights for a fixed average PD. The effect might be particularly large when the distribution includes a large number of exposures with very low PD coupled with a few exposures with high PD.

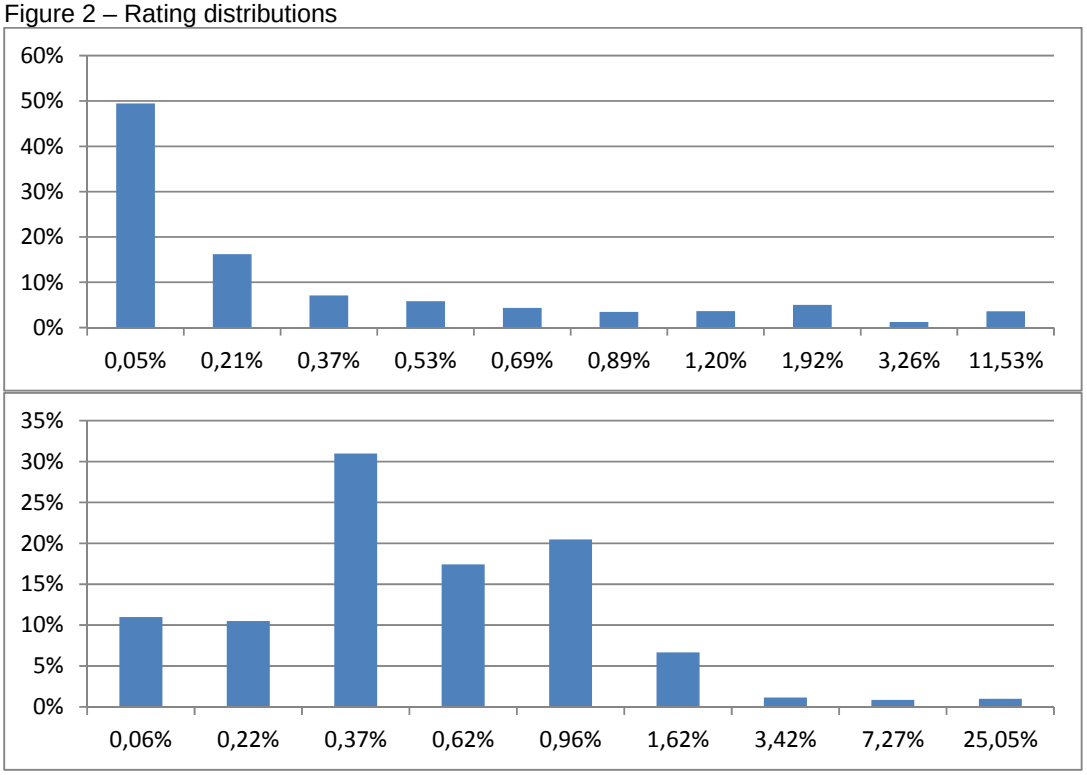
For low levels of PD, the risk weight formula is very sensitive to small errors in PD (see figure 1 – assuming LGD of 20 per cent). At the lower end of the scale, a one basis point error in PD leads to a 50 basis point error in the estimated risk weight. The sensitivity decreases quickly. At a PD-level of 0.30 per cent, a one basis point error leads to a 28 basis point error in the risk weight, while at a PD-level of one per cent the sensitivity is 18.

Figure 1: Sensitivity of risk weights



The distribution of exposures across PD-classes depends on the model properties and on the underlying risk. In practice it is difficult to distinguish between the two effects. The regulation requires homogeneity between exposures with similar rating, and that the models discriminate between different levels of risk. One may question whether models that classify a very large part of the exposure with very low PD conform to these requirements. Figure 2 shows the rating distribution of mortgage exposures for two Norwegian regional banks of comparable size, illustrating different types of distribution.

Figure 2 – Rating distributions



Normally the models are validated by comparing default frequencies with estimated PD, assessing the variation over time and calculating statistical measures like ROC and AUC to assess the homogeneity. However, for mortgages the traditional statistical measures might be less robust. There might be long periods of time with very low levels of defaults due to the economic conditions. In addition the models typically include behavioral variables that give a strong signal of default a short time period before the actual default – raising concerns about endogeneity in the modeling. If the concentration of exposures with low PD include customers with varying financial strength and the exposures with high PD largely includes customers that have given a signal for immediate distress, the model might pass the statistical validation tests, even though discriminating power at a fundamental level is low and the prediction horizon is short.

The FSA's assessment is that a concentration of exposures with very low PD does not reflect the underlying risk and that the current models do not provide for a meaningful differentiation of risk as required by CRR 144(1a). It is likely that the level of default going forward for the large share of customers in the low PD-classes will be higher than the prediction. The FSA suggest introducing a minimum exposure level PD in the region 0.2 – 0.3 per cent.

Given our doubts about the predictive powers in the low end of the PD scale and the high sensitivity of the risk weights to PD in this area, we are of the opinion that CRR 174(a) ("the model shall have good predictive power and capital requirements shall not be distorted as a result of its use") justifies an additional safety margin in the low end of the PD scale, for example a PD floor. It is worth noting that parameter floors are among the measures suggested in the BCBS and EBA reports on consistency of risk weighed assets.

2.3 Downturn LGD

The FSA review of the LGD models revealed large differences in the adjustment for downturn conditions. For example, there was little correlation between LTV distributions and average LGD between banks. In addition, there is very limited data available for estimating downturn adjusted LGD parameters. The FSA propose that the banks downturn adjusted LGD must meet a minimum requirement such that average LGD is above a simplified LGD-model with the following input:

- Cure rate is zero
- Valuation haircut of 45 per cent on average
- Costs of realization equals five per cent of realization value
- Recovery of unsecured part of exposure is 10 per cent

The proposed minimum requirement to downturn LGD then equals $LGD = a \cdot 0.9 + (1 - a) \cdot 0.05$ where $a = \max[0,1 - \frac{1-haircut}{LTV}]$ is the unsecured share of the loan after haircut. *Haircut* is the valuation haircut and LTV is loan to value.

Figure 3 – LGD as a function of Loan to Value

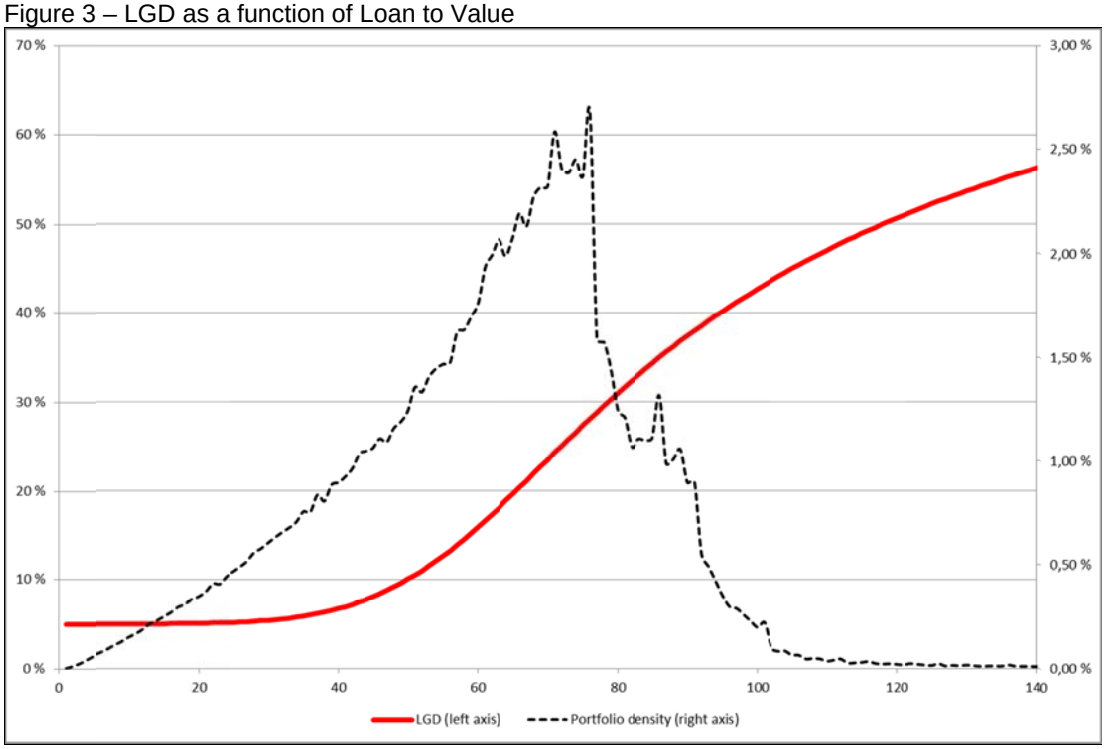


Figure 3 shows the minimum LGD level as a function of Loan to Value (full line). For exposures with low loan to value, the loans will be fully secured, and the LGD will be 5 per cent (cost of realization). As LTV increases, LGD will converge toward 90 per cent which is the estimated loss for a fully unsecured loan. As a reference we have included the distribution of the portfolio of mortgage exposures for one bank (dotted line). For this portfolio, the minimum average LGD level will be 20 per cent with the new requirement.

The lack of loss data from a downturn period makes the considerations for PD estimates even more relevant for LGD estimates. Our modeling based requirement seems more in line with the intention of the IRB framework than the floor on average LGD as it allows the capital requirement to vary with risk.

2.4 LGD floor

The LGD floor is, according to CRR 164, set at the national level and will apply for all banks with exposures in Norway. The Norwegian Ministry of Finance has set the floor at 20 per cent with effect from 1 January 2014.

2.5 Effects

An estimate of the likely effect of the requirements is provided in table 1. The table includes all Norwegian IRB-banks and the two largest foreign IRB-institutions in the Norwegian mortgage market.

The columns show the absolute change in risk weight for the banks when one, two or all three requirements are introduced. For this estimation, a LGD-floor of 20 per cent is used.

Table 1 –Estimated increase in risk weight from requirements, in percentage points

	PD floor	PD floor PD calibration	All requirements
Bank 1	3,4	5,3	11,0
Bank 2	0,9	5,6	15,0
Bank 3	0,6	1,6	12,6
Bank 4	0,5	0,8	12,8
Bank 5	0,6	0,6	11,8
Bank 6	0,5	0,5	13,0
Bank 7	0,4	0,4	13,6
Bank 8	2,5	3,8	11,2
Bank 9	0,9	0,9	13,9
Bank 10	2,5	4,6	12,8

For some banks with a large portion of exposures with very low PD, the PD floor will have a noticeable effect on the average risk weight, while the effect of the new PD calibration depends on the banks' current calibration. The largest effect comes from the minimum level for LGD. Only lifting the LGD floor would amplify the current differences in risk weights between banks.

Figure 4 – Estimated risk weights with new requirements

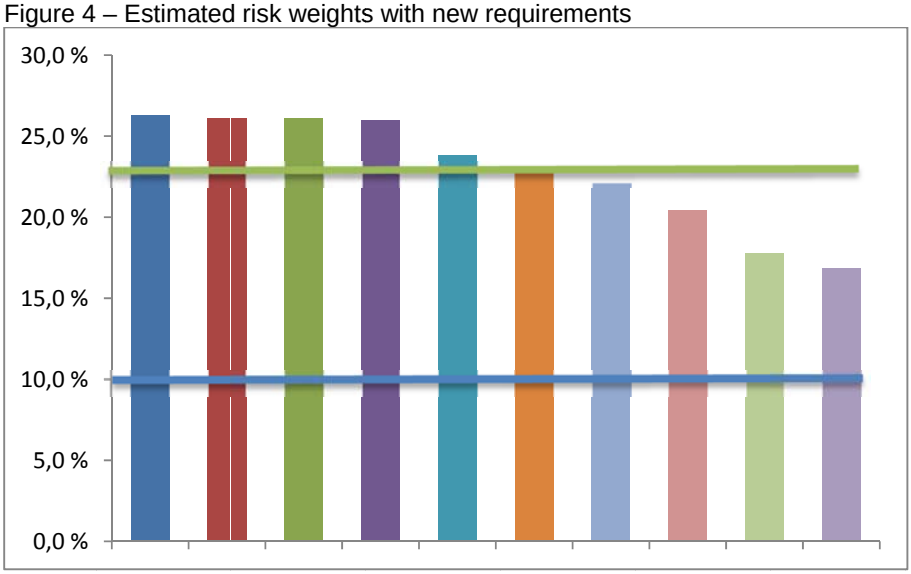


Figure 4 summarizes the estimated risk weights on mortgages for banks in Norway with the new requirements. The current average risk weight is 10.0 per cent (blue line), while the estimated new average level is 22.8 per cent (green line).

3 Commencement

These requirements will be imposed as conditions for all new IRB approvals. For approved models, the new requirements will be introduced in order to rectify material deficiencies in risk capture in the existing models (CRD 101).

4 Appendix

4.1 PD for downturn periods

The FSA uses historical reported defaulted exposures in Norwegian banks to estimate the relevant downturn PD. The figures do not meet the Basel II definition of default frequency and must be adjusted. In particular, the data consists of all defaulted exposures to private individuals, including mortgages, but also other loans. It measures the stock of defaulted exposures rather than the flow, and it is unclear which default definition was used. Also, due to e.g. mergers, acquisitions and changes in strategy, it is difficult to assess the relevance of a bank's own 20-year old historical record on today's portfolio.

The observed stock of defaulted exposures was on average 6.6 per cent for the largest Norwegian banks during the Norwegian banking crisis in the period 1990-1993. For the most recent years the ratio of stock of defaulted exposures and the default frequency reported by the IRB-banks under the Basel II default definition has been on average 0.6. Assuming that this ratio has been constant over time, the estimated default frequency during the crisis period is 4.0 per cent. Norges Bank has estimated an average default frequency of 3.6 per cent during the crisis period using a slightly different methodology[1].

4.2 Frequency of bank crisis years over longer time spans

In Riiser (2010), six periods of bank crisis in Norway is identified since 1830[2], with the periods being 1857, 1864, 1880-1890, 1899-1905, 1920-1928 and 1988-1993. The periods counts up to a frequency of 35/(2013-1830) = 0.19. An in-depth analysis of the latter three periods is provided in Gerdrup (2003), which suggest that these are of similar severity[3]. A count-up suggests a frequency of 22/(2013-1891) = 0.18. A frequency of 20 per cent seems to be a conservative but still reasonable estimate for bank crisis years.

[1] Andersen, Henrik, "Hvor høy bør risikovekten på norske boliglån være?", *Norges Bank staff memo* 10/2013.
[2] Riiser, Magdalena, "Asset prices, investment, credit, and financial vulnerability" *Norges Bank Economic Commentaries* No. 4 2010
[33] Gerdrup, Karsten R, "Three episodes of financial fragility in Norway since the 1890's" *BIS Working Papers* 142

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