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Third interim report on the consistency of risk-weighted assets

SME and residential mortgages

External report

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Abbreviations

AIRB	advanced internal ratings-based approach
BCBS	Basel Committee on Banking Supervision
CCF	credit conversion factor
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
EAD	exposure at default
EBA	European Banking Authority
ECAI	external credit assessment institution
EL	expected losses
EL BE	expected losses best estimates
EU	European Union
FIRB	foundation internal ratings-based approach
GC	global charge
GDP	gross domestic product
HPE	hypothetical portfolio exercise
IRB	internal ratings-based
IRBA	internal ratings-based approach
ISG	Impact Study Group
LDP	low default portfolio
LGD	loss given default
NSA	national supervisory authority
PD	probability of default
PiT	point in time
RM	residential mortgage
R-O	roll-out

RWs	risk weights
RWA	risk-weighted asset
SA	standardised approach
SIG BB	standard implementation group banking book
SMEs	small and medium-sized enterprises
S&P	Standard and Poor's
TTC	through the cycle

1. Executive Summary

1.1 Introduction

This report outlines the initial interim results of the third stage of the European Banking Authority' (EBA) work on banking book exposures. This stage focuses on Small and Medium Enterprises (SME) and Residential mortgages.

The exercise

Forty-three banks across 14 EU jurisdictions participated in this study submitting data for up to 10 countries per portfolio category (Residential Mortgages, SME Retail and SME Corporate) and providing risk drivers such as exposure size and companies' size (turnover/assets) for SMEs and Loan to value, Loan to income and Credit risk mitigation for Residential mortgages. Banks also provided detailed qualitative information on the Internal Ratings-Based (IRB) models used for these portfolios along with the historical data used for the development and calibration of the internal approaches.

The information

The significant detail within residential mortgages and SME portfolios means that a benchmarking approach at counterparty level is not feasible. However, the detailed quantitative data available enabled the EBA to produce top-down analyses for Retail and SME Corporate, with greater accuracy. Furthermore, and for the first time, this exercise benchmarked at cluster/pool level. It defined clusters by identifying some key drivers that qualify the banks' portfolio riskiness.

In addition, the qualitative information gathered enabled the EBA to better illustrate the differences in the application of internal approaches such as regulatory mapping and roll-out practices, usage of floors, back-testing practices and outcome, rating scales, calibration specificities or definition, and treatment of defaulted assets.

The preliminary results of the study, listed in more detail in the conclusion of this report, contributed to the identification of a set of potential policy recommendations and supervisory actions, included also in a report to the EU Commission on comparability and pro-cyclicality.

Results

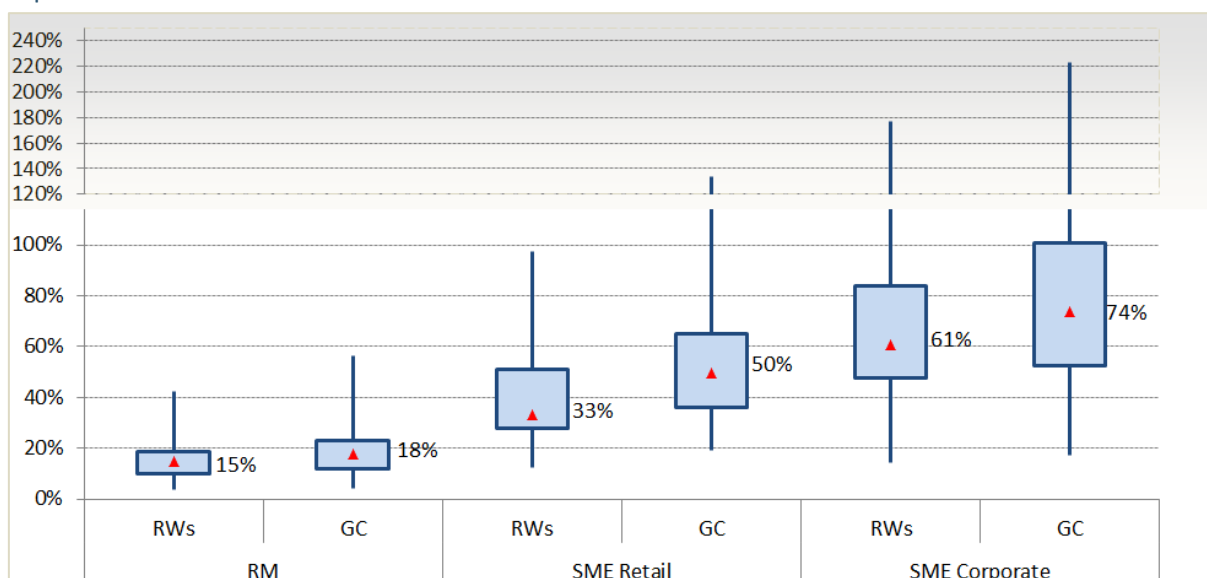
The top-down review of the Retail and SME Corporate portfolios confirmed the importance of defaulted assets (both percentage and average global charges) in driving outcomes. They account for about half of the overall Global Charge (GC) and represent a significant part – around 60% - of the variation in risk weights and expected losses.

The underlying portfolio mix represents around a third of the variation in the GCs and risk weights (RW) for non-defaulted assets. The remaining 2/3 of the dispersion for non-defaulted assets can be attributed to “B-type” drivers: differences in underlying credit risk, use of credit risk mitigation, modelling and supervisory practices.

The dispersions noted from the data are wide with the IRB RWs on non-defaulted assets for Residential mortgages ranging from 4% to 42% (median 15%), SMEs Retail from 13% to 97% (median 33%), and SMEs Corporate from 14% to 177% (median 61%).

When the analysis is conducted at a country level, dispersions still occur, albeit lower than at portfolio level. This is likely to be driven by differences in the riskiness of the portfolios but also by qualitative modelling aspects.

Figure 1: Distributions of average risk weights and global charges for the Residential Mortgages, SME Retail and SME Corporate portfolios across the sample of banks, IRB non defaulted exposures



Source: EBA specific data collection (reference date December 2012).

Country location as a driver

Country of location of the exposure is a driver of risk weight diversity. Exposures located in countries that recently experienced more stressed economic conditions generally obtain higher average risk weights as one would expect. Other country-specific aspects could play a role too - including the legal framework around repossession and liquidation of collateral. However, few banks have significant portfolios in multiple countries and the limited - although representative - number of IRB banks in the sample that are active in the different jurisdictions means it is difficult to distinguish between country-specific and bank-specific aspects driving the risk weight differences.

Exposure size and turnover

For SMEs the preliminary findings suggest there is no clear linkage between the variation in the capital requirements and the exposure size. However, the enterprises' size (turnover/total assets) does appear to influence the levels of PDs and LGDs - bigger SMEs show lower PDs and higher LGDs - and eventually the capital requirements. The differing ability of banks making full use of the regulatory "discount" in relation to the size of the enterprises is an additional driver in explaining heterogeneity in the RWs.

For **Residential mortgages**, the results of the benchmarking at cluster level by Loan to value, Loan to income and Credit risk mitigation are not available. The work will be finalised in the next few months.

Historic loss rates and data sets

For all three reviewed portfolios the research found a generally positive correlation between the banks' average risk weights for non-defaulted assets and banks' historic loss rates. Banks also demonstrate a different concentration of their exposures in the best and worst rating grades, suggesting a different quality or riskiness of the exposures; this finding is partly influenced by the number of rating grades.

There are, however, significant differences in the data time series used in the calibration of the models (e.g. long-run default rates, recovery rates, length of recovery, cure rates) applied for exposures located in the same country. This is certainly expected and does not represent itself an issue. The challenge is to investigate to what extent this reflects real differences in the underlying credit risk or if it is driven by heterogeneous practices. The measurement of the former is complicated by different modelling practices, including the use of single global models for exposures located in multiple countries.

Apart from a few exceptions, the banks' model back-testing outcomes are largely positive and suggest that the models capture historical experience. This is indeed positive evidence but cannot be considered as conclusive when considering the appropriate and consistent calibration of the internal approaches as requested by the regulatory framework (e.g. long-run PD and downturn conditions). Furthermore, although back-testing is conducted using a broadly similar framework, there remain important differences between each banks' approaches and the results are difficult to compare.

Future thematic work on the calibration of the PD and LGD models for SMEs and Residential mortgages would allow further progress in understanding the magnitude of the various drivers.

The following general features to the use of internal approaches have been observed in the study and may drive variation:

- a) definition of default;
- b) application of regulatory floors (i.e. minimum 10% LGD floor for exposures secured by real estates);
- c) mapping into regulatory portfolio categories (SMEs Corporate vs. Retail; Retail secured by real estate vs. Housing loans);
- d) differences in reporting and LGD calibration for exposures only partially secured;
- e) heterogeneity in the margin of conservatism, data sources, length of the time series and approaches used for the calibration of PD models;
- f) different practices in the frequency and triggers for the re-development and re-estimation of internal models;
- g) use of global IRBA models for exposures located in different countries; LGD estimation (defaulted and non-defaulted);
- h) different practices in the estimation of the LGD parameter on defaulted and non-defaulted assets (inclusion of incomplete workout positions, level of discount rates and legal and administrative costs, internal haircuts estimates, repossession likelihood and use/definition of cure rates);
- i) the banks try to capture downturn conditions in the LGD computation using broadly similar approaches but with different final outcomes;
- j) a wide range of practices followed by the banks in the treatment of defaulted assets (varying interpretation and use of different approaches for the computation of the best estimate LGD and RWA on defaulted assets) and in the calculations of the IRB shortfall.

Some of the above practices are likely to be more significant in driving variation for defaulted than for non-defaulted exposures. In particular a), h) and j) contributes and better qualify the variation in the GCs for defaulted assets while the others drive mostly the non-defaulted assets one.

Policy options and recommendations

The following four suggestions for policy options should be seen as **potential directions for future work** to be considered by the national competent authority and the EBA. They have been identified as priority areas of work.

1. Enhanced bank supervisory disclosure and transparency of RWA-related information. In line with the conclusion of the LDP report the regular disclosure of time series of statistics - of risk weight, regulatory parameters and historical observed default and loss rates by country portfolios - is suggested in order to provide consistent risk references and enabling dynamic analysis by third parties.
2. On-going support to competent authorities in the implementation of the upcoming new regulation (single rulebook) by promoting an exchange of experiences and supervisory interventions related to the validation and on-going supervisory monitoring of internal models and promoting the identification and use of good practice including through joint work in

colleges; encourage a more rigorous and comprehensive model validation process and back-testing framework to be followed by the banks by promoting the identification and sharing of best practice.

3. Development of additional guidelines and potentially draft technical standards that specifically address and facilitate consistency in supervisory and bank's practices:
 - Harmonisation of default definitions and clarifications about the expected classification of exposures that are restructured, under moratoria or forbore as defaulted assets; guidance on the treatment of such exposures when still classified as performing loans. A clear harmonised formula for the computation of the default rates, including the computation of multiple defaults in 1 year observation period;
 - PD model calibration. Guidance on the definition of an economic cycle, the identification of stressed years and how to cope with the absence in the available time series of adequate stress conditions to capture downturn;
 - Regarding LGD modelling, guidance on estimation of LGD on defaulted and on non-defaulted assets, including on the treatment of incomplete workouts and recovery rate; how to interpret the regulatory framework in order to capture downturn condition in the estimation of Downturn LGD;
 - Clarification or guidance on the treatment of defaulted assets (RWA, Best Estimate Expected Losses and IRB Shortfall).
 - Guidance for the usage of global models for exposures located in multiple countries;
4. Benchmarks on IRB parameter estimates. The on-going EBA work related to the implementation in 2014 of a framework for the regular conduct of supervisory benchmarking portfolio exercises (see Article 78 of the new CRD4 on supervisory benchmarking exercise) in order to support the national competent authorities in the assessment of the models seems to be key in order to provide common initial benchmarks on risk weights and regulatory parameters for similar exposures and activate when appropriate more detailed investigation; it is also expected foster convergence and harmonisation in supervisory practices.

2. Introduction

This report presents the results of a study of the differences in risk-weighted assets (RWAs) in the retail and SME Corporate portfolios of large EU banks. The study is part of the European Banking Authority's (EBA) programme of studies that investigates the extent of RWA differences and the drivers of these differences across banks. Drivers may relate to differences in the characteristics of the exposures themselves, in credit risk management strategies between banks, or in supervisory practices and banks' modelling practices.

Under this programme, EBA first conducted a top-down study of the aggregated data of banks' total exposures. The preliminary results, published in February 2013, suggested that, at the aggregate level, about half of the dispersion of the global charge (GC) of internal ratings-based (IRB) banks is driven by differences in the extent of the use of the standardised approach (SA: roll-out or permanent partial use effect) and the SA risk weights (RWs) applied, the portfolio mix effect (relative shares of the exposure classes in the banks' total credit portfolios), and the shares of defaulted assets in the banks' total credit portfolios. These drivers are referred to as A-type drivers. Because of data constraints, the first top-down study could not go more into detail and control for other drivers (B-type drivers), such as differences in the inherent credit risk of the exposures within portfolios, in the use of credit risk mitigation, in the banks' credit business and modelling practices, and in the supervisory model assessment practices.

Following the top-down study, the EBA conducted two bottom-up studies to investigate RWA differences¹ and their drivers at portfolio level:

- a study of low default portfolios, consisting of central governments, credit institutions and large corporate portfolios,
- a study of retail and SME Corporate portfolios, consisting of exposures to individuals and small and medium-sized enterprises (SMEs), including SME exposures in the regulatory categories retail and corporate.

The results of the study of low default portfolios were presented in a second interim report published in August 2013².

The current report presents the initial findings of the analysis of the residential mortgage (RM) and SME portfolios. The EBA will continue analysing these portfolios by looking in more detail at the PD and LGD calibration, time series of estimated parameters and realised values, and, specifically for RM, the main drivers of IRB parameters.

Forty-three banks in fourteen EU countries took part in this study³. Banks were selected with a significant market share in the retail and SME Corporate markets in each country. These banks submitted information on their retail and SME Corporate portfolios in 20 countries⁴, the reference date being December 2012 (some data were also collected for June 2012). Each bank submitted information for a maximum of ten countries per portfolio category (residential mortgages, SME Retail and SME Corporate). The banks also provided detailed qualitative information on the IRB models used for these portfolios in the countries selected and historical data used to develop and calibrate the most relevant internal approaches applied in each country (up to a maximum of three models for each country portfolio).

¹ Other parts of the programme are a trading book exercise, a study of RWA disclosure practices and an investigation of supervisory and banks' practices.

² See <http://www.eba.europa.eu/risk-analysis-and-data/review-of-consistency-of-risk-weighted-assets>

³ The list is provided in Section 12.1

⁴ Austria, Belgium, Czech Republic, Denmark, Finland, France, Sweden, Germany, Ireland, the United Kingdom, Italy, Luxembourg, the Netherlands, Spain, Norway, Poland, Portugal, Slovakia, Switzerland and the United States.

It is worth noting that the banks have not always developed, neither are they currently using, specific IRBA models for each country in the study. The materiality of the exposures treated with such global models would be expected to be low but it is still an important feature. This represents a potential source of variation in the regulatory parameters and RWs reported by the banks in the different countries. Please note also that a distinction has sometimes been made in the report between home country banks and others to assist readers.

The quantitative data collected enabled the EBA to produce top-down analysis and illustrate in detail the heterogeneity of the RWs in the residential mortgage, SME Retail and SME Corporate portfolios in EU banks and investigate the relationship between PD and LGD parameters and key model components (such as the length of the time series or the haircut on the value of the collateral) at country portfolio level.

The qualitative information collected also enabled the EBA to illustrate better the differences in some general features related to the application of internal approaches such as in regulatory mapping and roll-out practices, use of floors, backtesting practices and outcomes, rating scales, calibration details or definition and treatment of defaulted assets.

The historical data used to develop and calibrate the internal approaches at model level are currently used to observe the range (among the participating banks) of the banks' historical time series (e.g. observed default rates, cure rates, recovery rates, length of recovery) and understand the relationships with the regulatory parameters applied on defaulted and non-defaulted assets.

The conclusions of the study, listed in more detail at the end of the report, have helped identify policy recommendations included in the summary report "Summary Report for the Reports on Comparability and Procyclicality of the IRB approach Article 502", such as the need for harmonisation in the treatment of defaulted assets or clearer guidances for PD and LGD calibration.

The results of the study have also helped identify policy recommendations included in the summary report.

The composition of the portfolios investigated is described in Section 3. The top-down analysis is presented in Section 4. Section 5 describes the analysis of IRB parameters and RWs for the residential mortgages. Section 6 does the same for the SME Retail portfolio, followed by Section 7 for the SME Corporate portfolio. Section 8 discusses more qualitative IRB features that drive differences in RWA, and Section 9 investigates backtesting. Section 10 analyses the role of defaulted assets. Section 11 presents the conclusions and the policy recommendations that arise. The annexes (Section 12) provide more detailed information on definition and sample.

3. Sample and portfolio composition

This section describes the main aspects of the bank sample and the composition of their portfolios. First, it describes which exposures are included in this exercise, how the various portfolios are defined, and how the exposures are distributed across these portfolios. Second, it indicates which regulatory approaches to credit risk (SA, FIRB and AIRB) the banks mainly use for the non-defaulted exposures in the portfolios investigated. Third, it describes the distribution of the portfolios in the banks' home and host countries, and between defaulted and non-defaulted assets. Fourth, it shows the distributions of the average RWs and GCs across the participating banks for the portfolios studied. More details by type of approach are discussed in later sections.

3.1 Scope

The portfolios analysed in this study are the loans extended to individuals secured by residential real estate exposures (residential mortgages - RM) and loans to small and medium-sized enterprises (SME Retail and SME Corporate). Other individuals' exposures such as those secured by non-residential real estate, housing loans, qualifying revolving retail exposures (QRR) and others are included in the data collection but are not subject to any specific investigation (see Figure 2).

Figure 2: Structure of the Retail and Corporate portfolios and parameter investigated

Overall portfolio	Retail					Corporate		
Regulatory portfolio	Retail exposures to individuals secured by real estate			Other retail exposures		Qualifying revolving retail	SME corporate	Large corporate
Definition	Individuals secured by residential real estate (residential mortgages)	Individuals ⁵ secured by non-residential real estate	Individuals housing loans (which do not qualify for the RM curve)	Individuals for other RM	SME (including secured by real estate)	Individuals: QRR	Corporate with turnover or assets lower than EUR 50m, with discount factor in the asset correlation	Corporate with turnover or assets above EUR 50m.
Report perimeter	RM	Other retail			SME Retail	QRR	SME Corporate	Large corporate

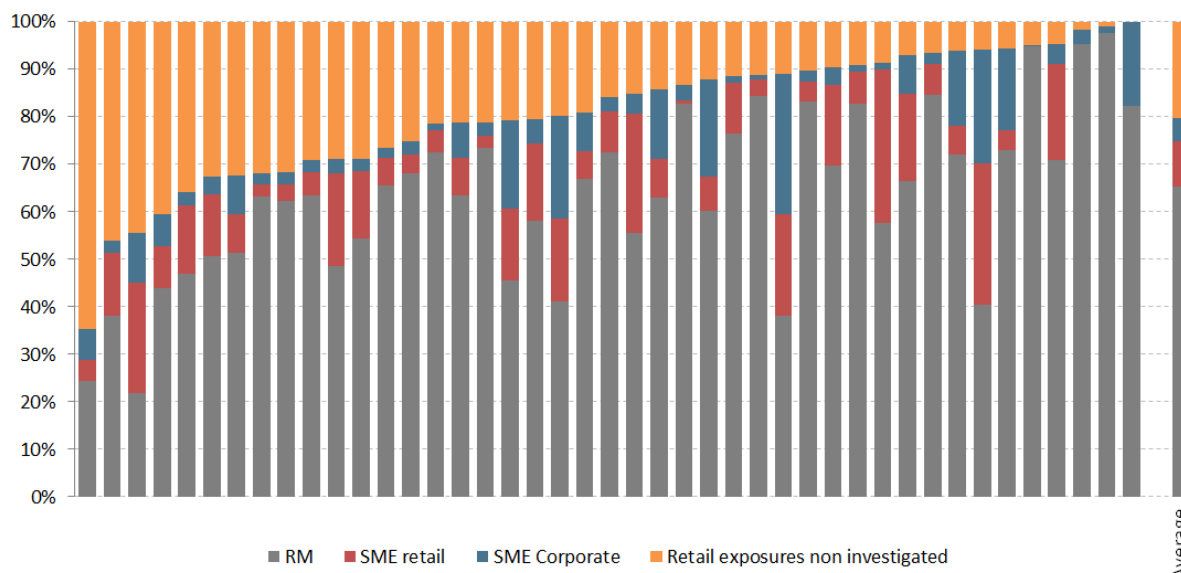
Note: The area with a grey shading is the investigated perimeter.

Figure 3 shows the composition of the portfolio investigated (SMEs and Retail portfolio) for the banks in the sample. It shows the relative shares of RM, SME Retail, SME Corporate, and other

⁵ For SA exposures there is no distinction between residential and non-residential real estate, both are thus included in the RM portfolio in this report.

retail and QRR. Over the whole sample, RM dominates the portfolio investigated. This portfolio makes up at least half of the portfolio investigated for most banks, but for a few banks the SME portfolios or the other retail and QRR are larger.

Figure 3: Distribution of non-defaulted exposures⁶, for Retail and SME Corporate, by bank



Note: The banks are sorted by their share of non-investigated portfolio.

Source: EBA data collection (reference date: December 2012).

On average, the SME exposures count only for a small portion of the investigated exposures. For most banks, the SME Retail portfolio is larger than the SME Corporate portfolio, but there are exceptions. Four banks in the sample only have a SME Corporate portfolio, not an SME Retail portfolio. The relative shares of SME Retail versus SME Corporate might be influenced by the definition used for mapping SME exposures between the Retail and the Corporate portfolios. This is further investigated in Section 8.1.

Other retail and qualifying retail revolving exposures represent on average less than 20% of the portfolio investigated. These exposures make up less than one third of the portfolio investigated for most banks but reach a maximum of 65%.

3.2 Use of regulatory approaches

This subsection shows which regulatory approaches to credit risk (SA, FIRB and AIRB) the banks mainly use for the non-defaulted exposures in the portfolios investigated. We define the main approach as the approach under which at least 50% of the EAD or exposure values are treated.

Figure 4 shows that for most banks the IRB approach is the main one used across the three portfolios investigated. Furthermore, for all banks in the sample, the IRB approach is the main approach for at least one of the three portfolios

⁶ EAD for IRB and total exposure value for SA.

Figure 4: Main regulatory approach used by bank per portfolio, non-defaulted exposures, banking group level

	Main regulatory approach used		
	RM	SME Retail	SME Corporate ⁷
Number of reporting banks	42	38	38
IRB	41	30	
AIRB			24
FIRB			10
SA	1	8	4

Source: EBA data collection (reference date: December 2012).

For residential mortgages, only one bank used the SA as the main approach; for SME Retail this is true for eight banks and for SME Corporate for four banks. For SME Corporate, most banks mainly use the AIRB, but ten banks mainly use FIRB⁸.

We note that the banks using the SA as the main approach for one portfolio are also the banks with lower exposure amount for this portfolio, in absolute or relative terms, although there are some exceptions. SA may still be applied to a large part of the portfolio, although IRB is the main approach.

3.3 Exposures across countries

This subsection shows the distribution of exposures in the investigated portfolio between the banks' home⁹ and host countries, and between defaulted and non-defaulted assets.

In Figure 5, the banks are sorted by the share of exposures in their home country. It shows that most banks have more than half their exposures in their home country. Some banks, however, have the bulk of their RM and SME activities abroad, while other banks do not have any RM and SME exposures abroad at all. Only the exposures included in the set of 20 countries are included in this analysis. The figure shows also that IRB is the main approach, both at home and abroad. For some banks, however, IRB is the main approach at home, but abroad SA predominates.

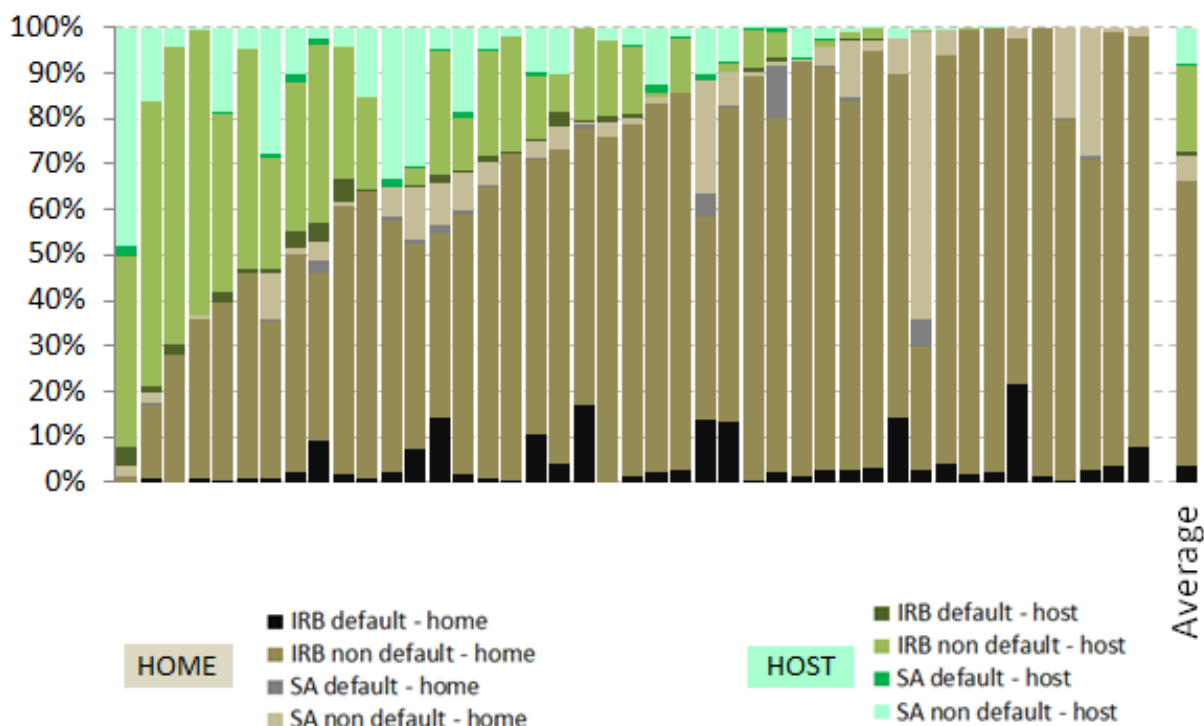
The figure shows that the shares of defaulted assets differ considerable across banks. Within banks' retail portfolios, the shares of defaulted assets may differ considerably at home and abroad. While some banks have relatively more defaults at home, for other banks the opposite is true.

⁷ For simplification, one bank is classified as AIRB although AIRB represents only 46% of its non-defaulted SME Corporate exposures

⁸ Detail by bank in Annex 12.1.

⁹ For simplification, the home country is considered as the country of the home supervisor of the bank. Nonetheless, a bank may still have material exposures in other countries and be a significant player there.

Figure 5: Retail and SME Corporate portfolio distribution between home and host countries, by status and by supervisory approach, exposure weighted¹⁰



Note: The banks are sorted by their share of non-investigated portfolio.

Source: EBA data collection (reference date: December 2012).

In Figure 6, more information is provided about the geographical spread of the bank sample for the exposure investigated under IRB approach. We see that for each portfolio investigated, half of the bank sample is present only in one country. The SME Retail portfolio seems to be the portfolio with the lowest geographical spread, while the SME Corporate portfolio has the highest (eleven banks in more than five countries).

Figure 6: Number of banks present in one or more countries by IRB portfolios investigated

	RM	SME Retail	SME Corporate
In one country	20	23	20
In two or three countries	15	9	7
In four or five countries	4	1	0
More than five countries	3	5	11
Total	42	38	38

Source: EBA data collection (reference date: December 2012), as reported for the PD models

¹⁰ SA: total exposures value for computation of RWA, IRB: EAD.

3.4 Average risk weight and global charge

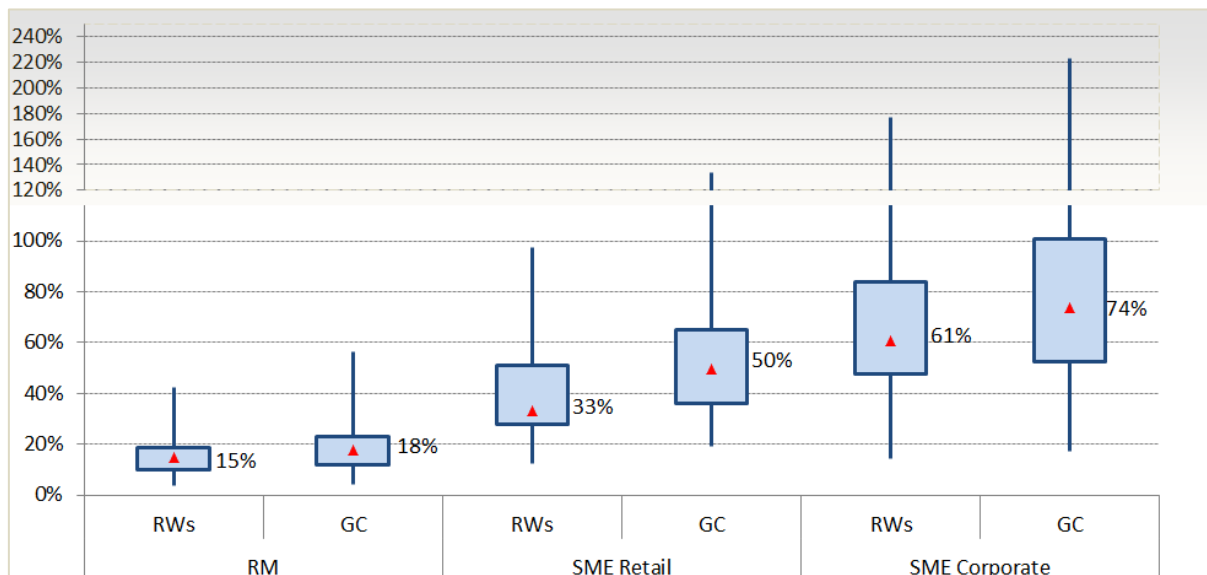
This subsection presents the distributions of the average RWs and GCs across the participating banks for the IRB non-defaulted exposures:

- The average risk weight is defined as: $RWs = RWA / EAD$
- The global charge is defined as: $GC = (RWA + 12.5 * EL) / EAD$

Figure 7 shows that average RWs and GC follow the same pattern, GC having a larger range of values than the RWs.

The average RWs and GC are lowest for RM and highest for SME Corporate; IRB RWs on non-defaulted assets for RM range from 4% to 42% (median 15%), SMEs Retail from 13% to 97% (median 33%), SMEs Corporate from 14% to 177% (median 61%). This ordering for the sample does not hold for all the individual banks, however. Some banks show similar RWs and GC for RM and SME Retail. And for a significant number of banks the RWs and GC for SME Corporate, does not exceed those for SME Retail. This could be due to differences in mapping of exposures.

Figure 7: Distributions of average RW and GCs for the residential mortgages, SME Retail and SME Corporate portfolios across the sample of banks, IRB non-defaulted exposures



Source: EBA data collection (reference date: December 2012).

The following sections investigate these distributions further.

4. Top-down analysis

4.1 Method

The rationale is the same as in the first and second EBA interim reports; we aim to differentiate between variations in GC due to structure and composition (known as A-type differences in the previous interim reports) and those related to IRB risk parameters (B-type differences).

We have calculated the GC as followed:

- For IRB exposures (defaulted and non-defaulted) as $(RWA + 12.5*EL) / EAD$;
- For SA defaulted exposures¹¹ as $(RWA + 12.5*Provisions) / (Net\ exposure\ value + Provisions)$;
- For SA non-defaulted exposures $RWA / Net\ exposure\ value$.

To dissociate A-type and B-type differences we use the Taylor expansion of order one of a function $f: \mathbb{R}^n \rightarrow \mathbb{R}$ at a point $a \in \mathbb{R}^n$, which has the following expression $f(x) = f(a) + \sum_{i=1}^n f_i(a)(x_i - a_i) + R$

Applying this Taylor expansion to the GC computation we are able to break down the difference to the benchmark GC (EAD-weighted average GC for the sample) to identify the drivers of A-type differences:

- different share of defaulted exposure;
- different GC related to defaulted exposure;
- different relative shares of exposure classes ('portfolio mix effect');
- different shares of partial use of the standardised approach ('roll-out effect' –R-O);
- different SA GC by portfolio ('SA GC effect') by sub-portfolio.

The remaining differences for non-defaulted IRB assets, the so-called B-type differences are caused by idiosyncratic variations in the riskiness within an exposure class for non-defaulted IRB assets, credit risk mitigation (i.e. the business and risk strategy of the banks) and the IRB risk parameters estimation (e.g. bank and supervisory practices).

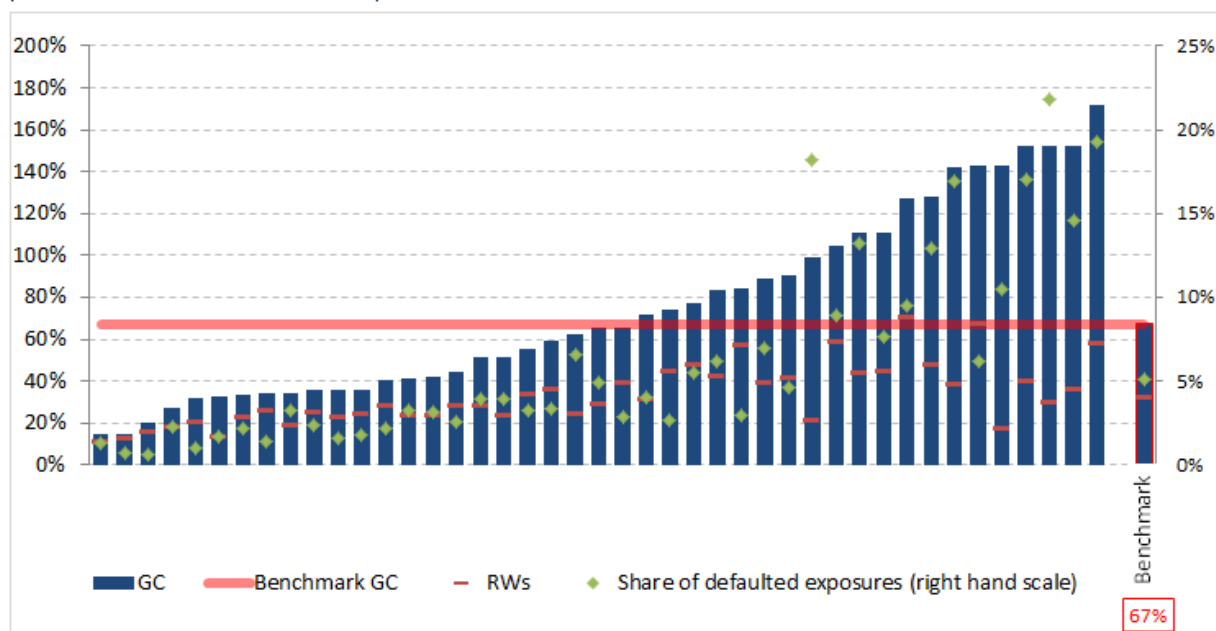
We have used the same method as in the LDP report¹² but on the retail and SME Corporate perimeter (see Figure 2), thus we present here only the starting point and the final results.

¹¹ Compared to the LDP report, we have introduced here the provisions for defaulted assets, as we had this information at a granular level.

4.2 Results of the top-down approach

We see a large range for the starting point. The GC varies a great deal across the sample from 14% to 174% with a benchmark at 67% (equivalent to the average bank). This feature is mainly driven by the expected loss for IRB exposures and the provisions for standardised exposure as the RWs are more stable across the sample (from 11% to 71% with an average at 32%). The latter are greatly influenced by the share of defaulted assets as shown in Figure 8. Indeed the GC for defaulted asset represents 47% of the total GC in average, compared to an average exposure share around 5% for our sample.

Figure 8: Total GC, RWs and share of defaulted exposures for the Retail¹³ and SME Corporate portfolios across the bank sample



Note: The banks are sorted by their GC.

Source: EBA data collection (reference date: December 2012).

In Figure 9, we present the final result of the top-down approach with the breakdown of the residual IRB GC difference by exposure class. The residual IRB GC difference for each exposure class is additive.

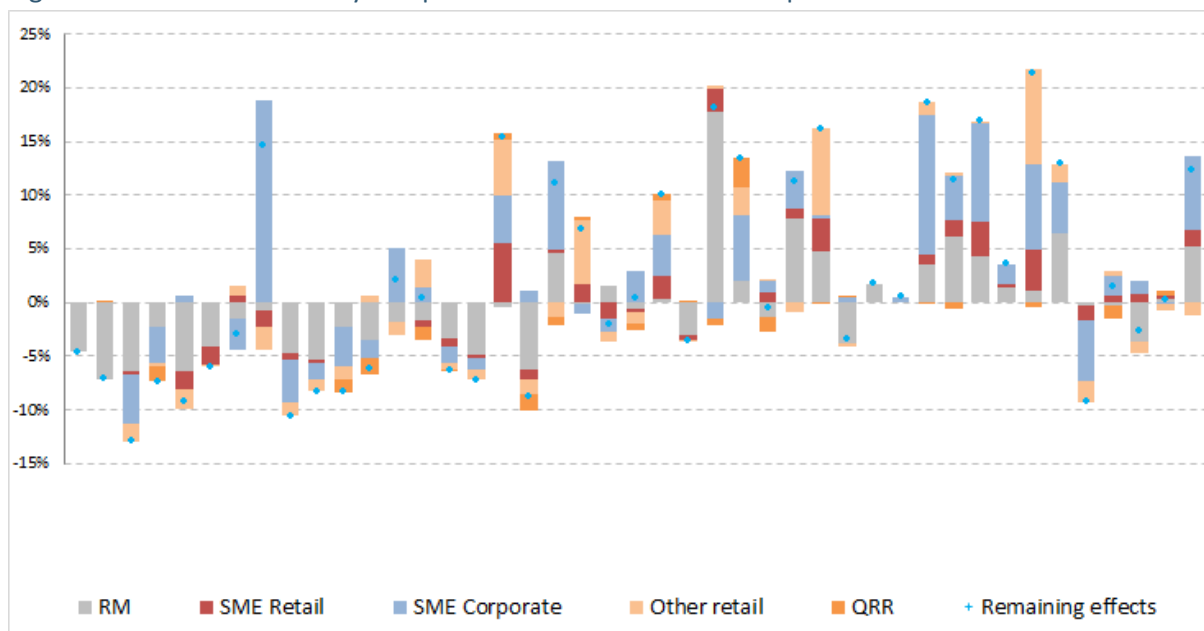
For example, the far right bank was the bank with the highest positive deviation to the benchmark (highest GC at 172%), after controlling of its share of defaulted assets, GC for defaulted assets, difference in portfolio mix, share under partial use and GC for SA exposures, we see that its deviation to the benchmark decreased from 107% (Figure 8) to circa 12% (Figure 9). Within this 12% of deviation, we see a positive contribution of 7% from the SME Corporate portfolio, 5% from the RM portfolio, 2% from the SME Retail portfolio and a negative contribution of -1% from the

¹² See footnote 2 for the link to the LDP report, in which the method is explained in more detail.

¹³ Retail portfolio is as described in Figure 2: RM, SME Retail, other retail and QRR.

other retail portfolio (the contribution of QRR portfolio is zero as this bank has no IRB QRR exposures).

Figure 9: IRB GC deviations by sub-portfolios on non-defaulted exposures



Note: The banks are sorted by their initial GC.

Source: EBA data collection (reference date: December 2012).

Conducting the analysis on the RW instead of the GC, we found consistent results; the banks with more deviation for the GC are also the ones deviating most when the RW are the focus of the analysis.

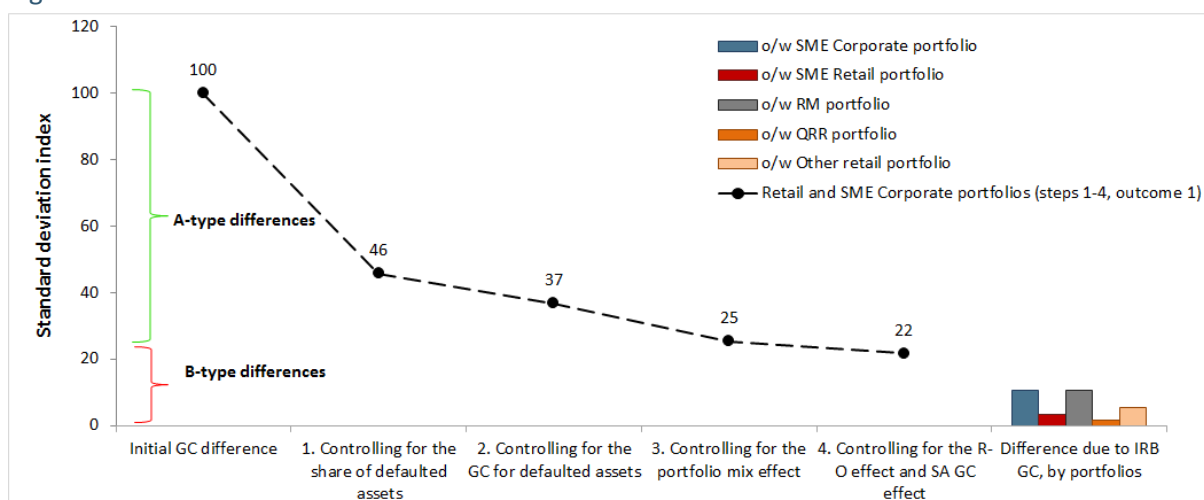
To summarise the findings we use a standard deviation index as in the LDP report¹⁴. The standard deviation is set at 100 for the initial GC difference¹⁵. Then we study the change in this standard deviation across the different steps. Figure 10 shows this change and confirms the importance of the defaulted assets in explaining a large part (about 60%) of the variation in RWs and expected losses. The impact of defaulted assets is even larger in these portfolios than previously seen in low default portfolios. This is because the share of defaulted assets is considerably larger in these SME and RM portfolios.

The impact of the portfolio mix for non-defaulted assets accounts for about one third of the residual variation after controlling for the defaulted assets. The impact of the partial use of the standardised approach is minor. The remaining two thirds of the GC dispersion for non-defaulted assets are still material and can be attributed to the B-type drivers: differences in underlying credit risk, use of credit risk mitigation, modelling bank and supervisory practices.

¹⁴ The results from the standard deviation index are consistent with the ones from 5%-95% spread measure.

¹⁵ The initial GC standard deviation is equal to 45% (total exposures under IRB and SA to retail and SME Corporate portfolios).

Figure 10: Standard deviation index



Source: EBA data collection (reference date: December 2012), EBA calculation

From the previous top-down and LDP reports the remaining dispersion after step four was around 50%, of the initial dispersion, compared to the 22% in Figure 10 (the standard deviation decreased from 100 to 22 across the different steps).

The greater impact of the top-down approach in this report is due to the difference in scope (portfolio perimeter¹⁶). The retail and SME corporate portfolios have a greater initial dispersion¹⁷ and a higher share of defaulted assets (on average 5% with a standard deviation of 5.7%, compared to 3.2% with a standard deviation of around 3.4% in the top-down and LDP reports). The impact of the steps one and two which control of the share of defaulted assets and the GC for defaulted assets is thus greater in this report; those two steps explain 63% of the initial variability in the GC, while in the two other reports it is only circa 40%.

Furthermore we have been able to better take the GC for defaulted assets into consideration (see footnote 11). All together it means that the top-down analyses results are consistent across the different EBA reports; the retail and SME Corporate portfolios being the portfolios with most of the variability.

The following sections of the report should foster a better understanding of the drivers of the remaining differences in IRB risk parameters at sub-portfolio level for RM (Section 5), SME Retail (Section 6) and SME corporate (Section 7), and for general practice (Section 8). Section 10 looks further into the differences stemming from the defaulted assets, which proved to be significant (Figure 10).

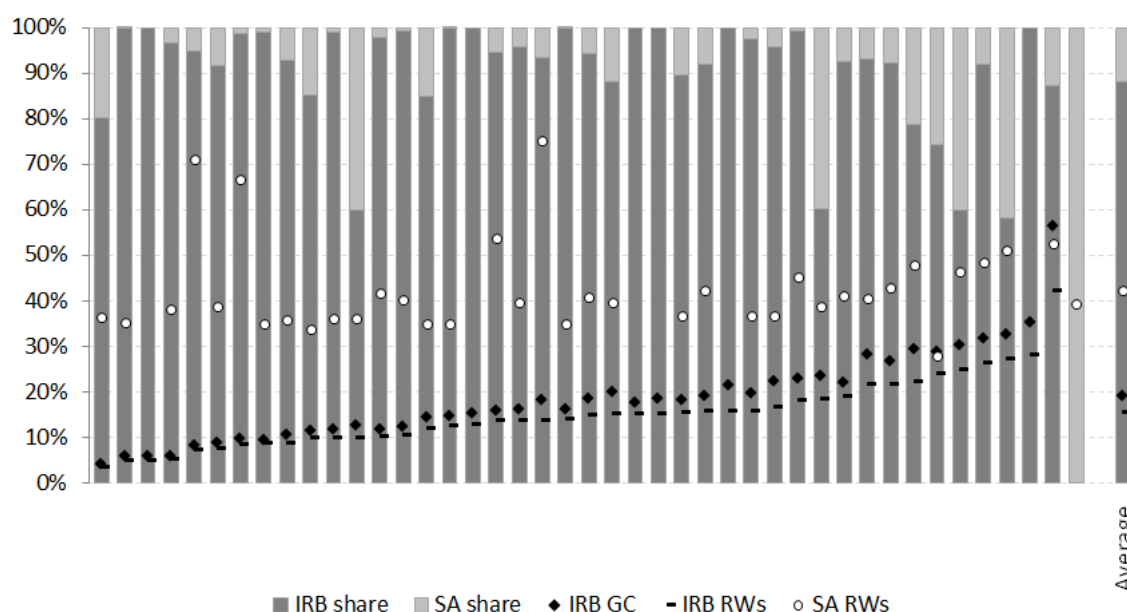
¹⁶ In the top-down report, the perimeter was the whole banking book (retail, institutions, corporate, sovereign, others), in the low default portfolio report, the perimeter was sovereign, institutions and corporate portfolio. The impact of the portfolio mix is therefore different in the three reports as the compensation impact on the portfolios differs and depends on the perimeter (for example, the portfolios of institutions and sovereigns may mitigate the dispersion across banks).

¹⁷ See Figure 1 in the top-down report, Figure 9 in the LDP report and Figure 9Figure 8 in this report

5. Residential mortgages

This section gives overview of RM exposures¹⁸ in terms of EAD and RWAs as a means of further investigating this portfolio. We analyse the IRB RWs, PD and LGD, both at a banking group and a country level. Some of the main drivers for the risk parameters PD and LGD are also detailed.

Figure 11: Share of IRB for the RM portfolio and distribution of IRB RWs, IRB GC and SA RWs, non-defaulted exposures.



Note: The banks are sorted by their IRB RWs.

Source: EBA data collection (reference date: December 2012).

As shown in Figure 11, RM exposures still under SA represent around 10% of the total exposures across the sample, with average RWs three times higher than for IRB exposures. Nevertheless, some banks differ a lot from the average.

5.1 IRB risk weights for non-defaulted exposures, RM portfolio

In this section we analyse the IRB RWs for RM portfolio, both at a banking group level and at a country level for non-defaulted exposures. In average for the bank sample the IRB non-defaulted exposures for the RM portfolio represent 51% of the retail and SME Corporate portfolios (IRB and SA non-defaulted exposures) but only 14% of the RWA.

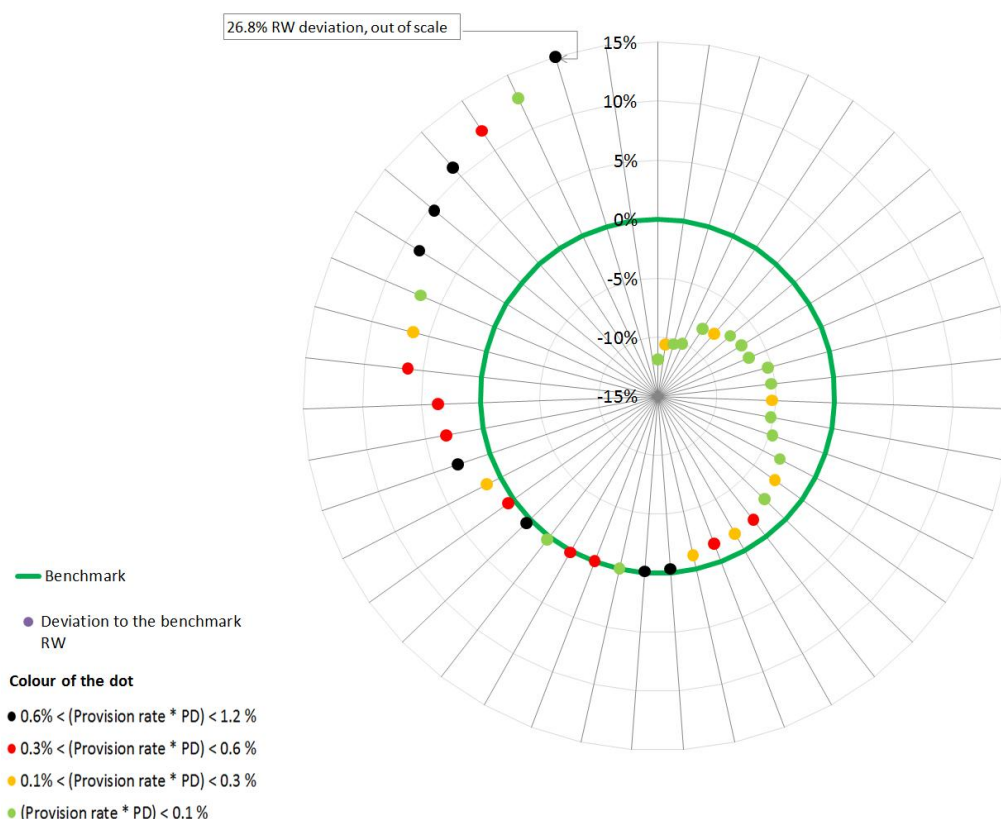
5.1.1 Banking group level, RM portfolio

¹⁸ See Figure 2 for perimeter

In Figure 11, we have represented the range of the IRB RWs across the sample, the average being 15% with a range from 4% to 42%. In Figure 12, we link the difference in RWs with the difference in the ‘experienced loss rate’ of the bank. For this purpose, we use a simple proxy¹⁹ by using the provision rate²⁰ (provision/EAD) multiplied by the EAD-weighted PD for non-defaulted exposure. The underlying assumptions being that the provision rate computed on the stock of defaulted assets (with different age of defaults and probability of cure) represents an indicative approximation of the realised losses used as a basis for the estimation of the downturn LGD for non-defaulted assets used by the banks.

Across the sample we see that banks with lower IRB RWs (negative deviation from the benchmark) generally have lower ‘experienced loss rates’ (green and yellow dots inside the green circle). Conversely, banks with higher IRB RWs tend to have higher ‘experienced loss rates’ (red and black dots close to the outside circle).

Figure 12: RWs deviation to the benchmark RW (non-defaulted exposures) and comparison with the ‘experienced loss rate’ (EAD-weighted PD for non-defaulted exposure times the provision rate (provisions / EAD) for defaulted exposures), IRB RM portfolio, by bank



Note: The banks are sorted by their RWs deviation.

Source: EBA data collection (reference date: December 2012), EBA calculation

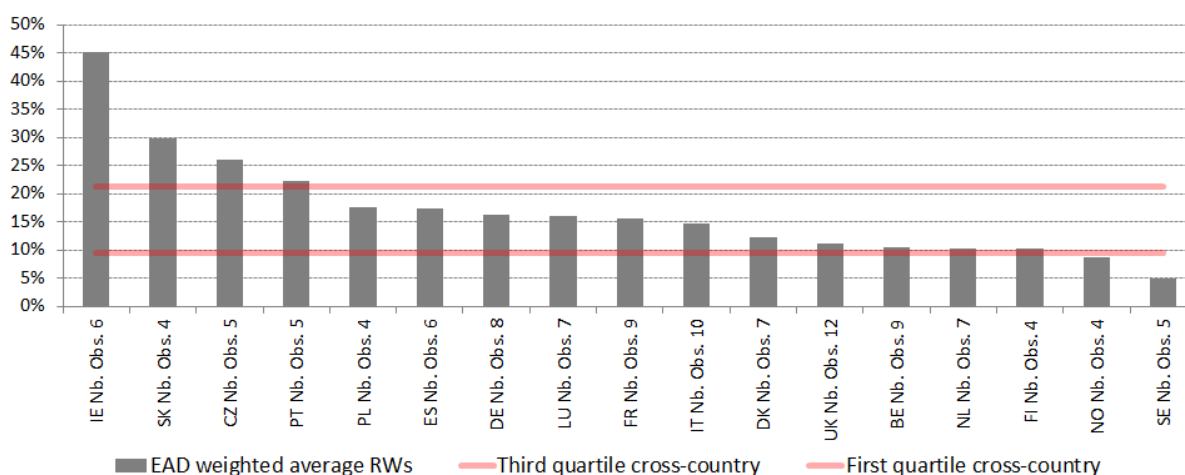
¹⁹ The main advantage is that this is a simple measure available at portfolio level and it is easy to understand; the main limitation is its point-in-time nature.

²⁰ Section 10.3 looks further into the topic of provision for defaulted assets.

5.1.2 Country level²¹, RM portfolio

Below we present an analysis of IRB RW at country level. In Figure 13 there seems to be a country pattern in the country weighted averages. Within one country we did not observe that RW distribution varies much. Wider variation within one country seems due to smaller exposures which have mostly a lowering impact on the RWs. It is worth noting that the banks have not always developed specific IRB models for each country in the study. The materiality of the exposures treated with more global models would be expected to be low but it represents a potential source of variation in the regulatory parameters and RWs reported by the banks in the different countries.

Figure 13: EAD weighted average RW range, IRB RM portfolio, non-defaulted exposures, by country



Note: The countries are sorted by their EAD weighted average RWs.

Source: EBA data collection (reference date: December 2012).

5.2 PD

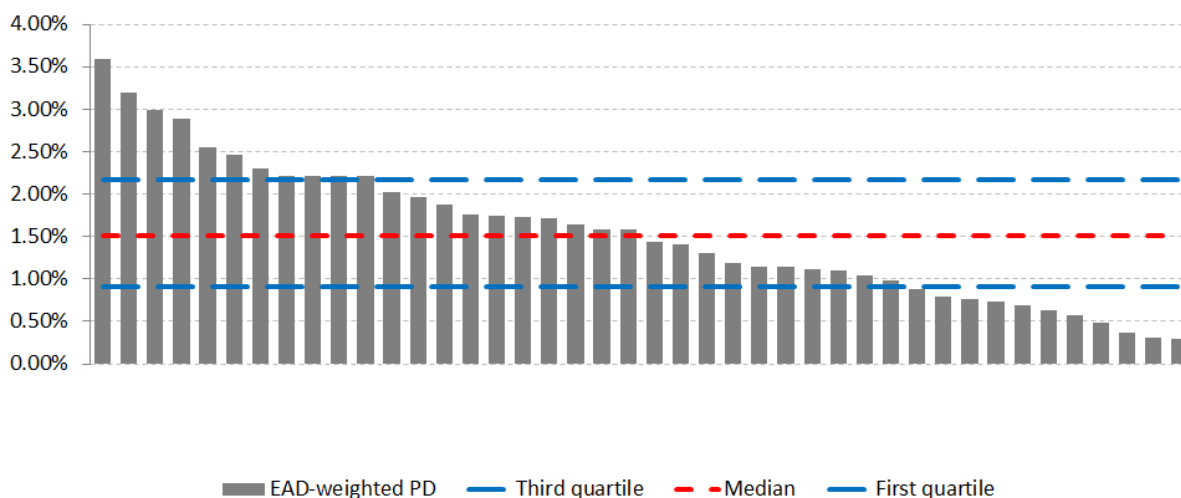
This section analyses the risk parameter PD, at a banking group level and at a country level, as also the PD main drivers, for the RM portfolio.

5.2.1 Banking group level

From the EAD-weighted PD represented at a bank level in Figure 14, we see there is a wide range of PD for this portfolio, with some banks having an EAD-weighted PD of less than 0.4% and others above 3.5%. Comparing this with Figure 12, we can see that the banks with lower RWs have also lower PD. However, this relationship is not proven for the banks with high RW, since a higher PD is not seen in these cases.

²¹ Throughout the report we have not represented any country with fewer than four data points. CH and US are not shown as the data are not representative of these countries.

Figure 14: EAD-weighted PD, IRB RM portfolio, non-defaulted exposures, by bank

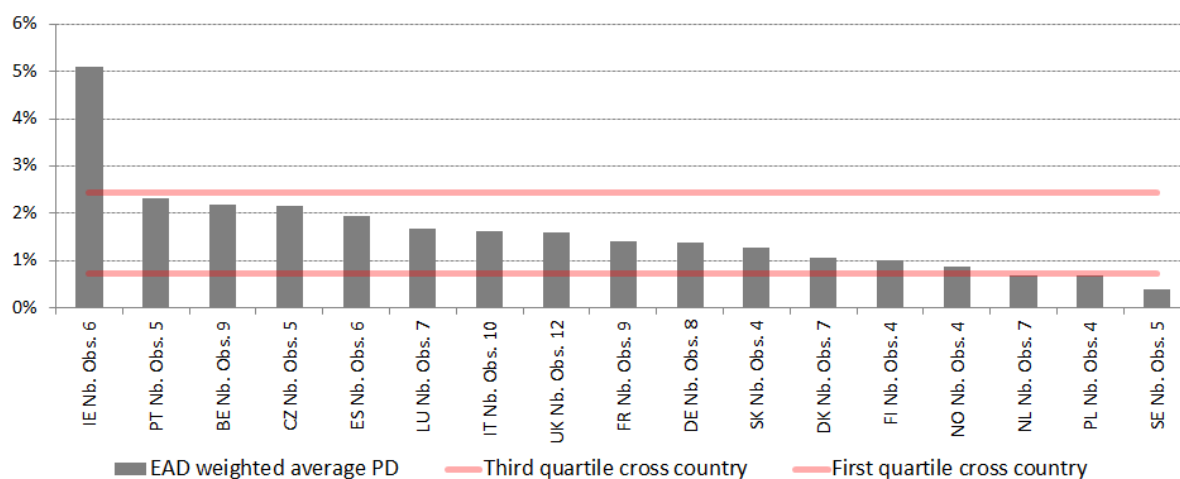


Note: The banks are sorted by their EAD-weighted average PD.
Source: EBA data collection (reference date: December 2012).

5.2.2 Country level

In Figure 19 we clearly see that there is a country pattern, as the EAD-weighted average PDs range from 5% to 0.4%. Most of the EAD-weighted average PDs are between 0.7% (first quartile cross-country²²) and 2.4% (third quartile cross-country). Furthermore, the impact of the bank with smaller exposures varies between countries.

Figure 15: EAD-weighted average PD range, RM portfolio, non-defaulted exposures by country of exposure, logarithmic scale



Note: The countries are sorted by their EAD-weighted average PDs.
Source: EBA data collection (reference date: December 2012).

5.2.3 PD drivers

²² Distribution across countries is calculated as the distribution of all the reported observations (banks x countries).

Variables used

Regarding the main risk drivers for the segmentation of their PD models, the great majority of the banks mention the borrower profiles and payment behaviour ones (of which the use of the national credit register data when available) as the most significant ones. Then the debt-service ratio and the vintage are used by around half of the banks (which represent 40% and 30% of the models under review, and are present in 80/85% of the countries studied). Occupier versus buy-to-let, interest rate related variables, amortisation types and maturity at origination variables are not reported as relevant in the sample, but they are relevant for some banks in some countries.

PD versus default rates

In this subsection, we analyse the relationship between the observed default rate and the PD. Observed default rates are first examined at country level to determine if a pattern per country emerges. In Figure 16, we have used all available information at model level on default rate used in the calibration (minimum and maximum default rates as well as the case-weighted average default rate²³), looking at all the banks of the sample then only at the home country banks.

In this chart we see a high differentiation among countries when looking at the median of the default rates which ranges from 0.3% to 4.2%. We can distinguish three groups of countries, one with low range (inter-quartile spread below 2%); one with mid range (inter-quartile spread ranging from 2% to 7%); and the last group with an inter-quartile spread above 25%.

When focusing on the home banks, we see that their influence varies across countries; the median and quartiles being lower or higher when focusing on the home.

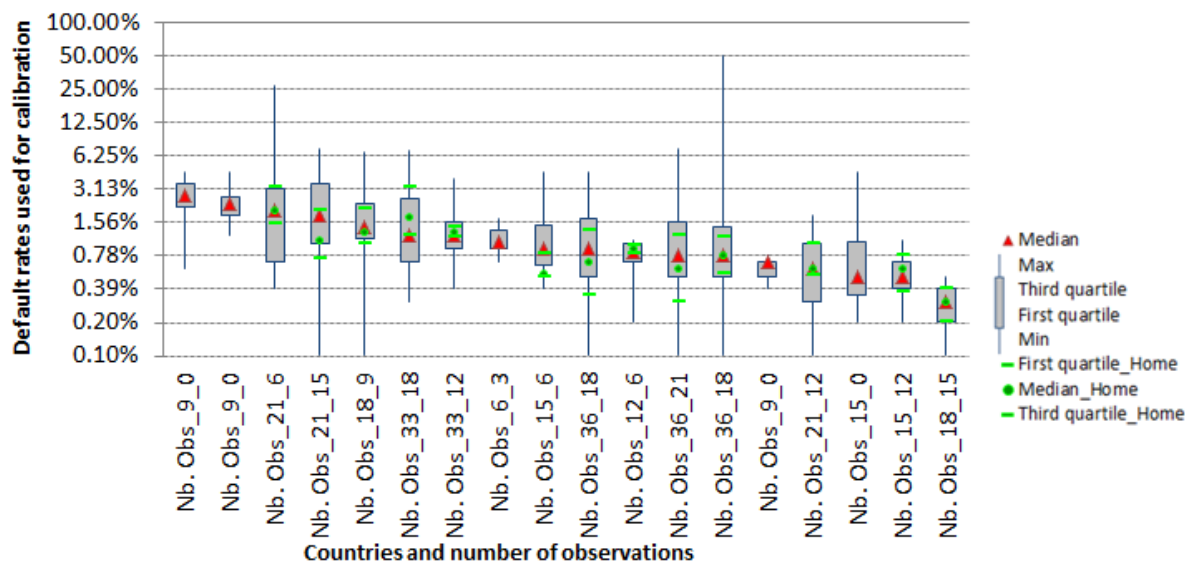
From Figure 16, we can conclude that:

- default rates used in the calibration differ across countries;
- some countries have a large range of default rates used in the calibration (may be due to more stressed period included in the data series, more cyclicity embedded in the models for these countries or simply due to different quality/segmentation of the portfolios);
- the characteristics of home banks compared to host banks differs across countries.

Figure 16: Default rates used for model calibration reported²⁴ for RM portfolio, by country.

²³ They may therefore cover different periods as the banks are using different time series.

²⁴ Minimum default rate, maximum default rate and case-weighted default rate used in the calibration. Model information is included only if those three variables have been met. This means that there are three observations for each bank's model in the chart.



Nb. Obs_18_15 means 18 observations of which 15 from 5 Home Country Models

Note: Countries are sorted by the median

Data source: EBA data collection (reference date: December 2012)

We also investigate the difference in the relationship between the observed default rate in 2011 and the EAD-weighted average PD in 2012²⁵. This is to find out whether the last observation has a large impact on the PD.

In Figure 17, we can see that there is a high correlation between observed default rates in 2011 and estimated PD in 2012. Nevertheless, the countries with a high range in Figure 16 do not appear as outliers. This means that the large range of observed default rates used in the calibration (Figure 16) is reflected by the PD models, but does not seem specifically driven by the country of exposures, as we see high variability within the same country for the level of the observed default rates in 2011 and the EAD-weighted average PD in 2012. We also note the relationship between those two variables.

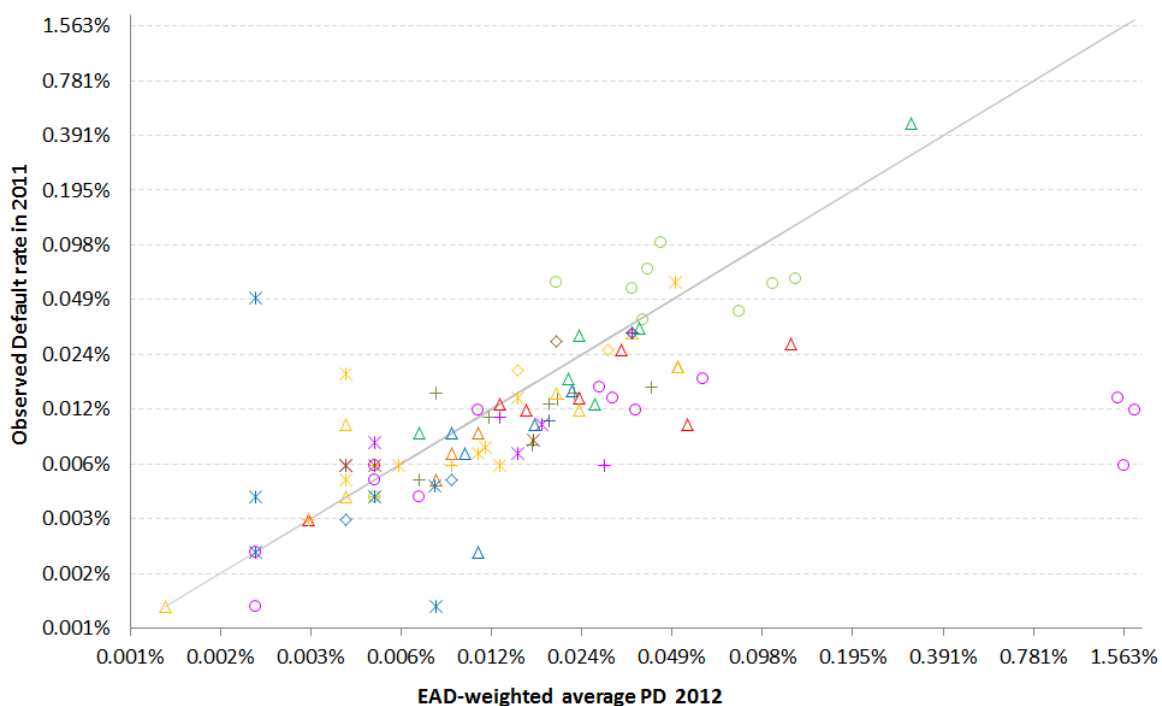
Conducting the same analysis by bank we did not find a general outlier bank or country in terms of relationship between the observed default rate and the PD. It tends to be one model from one bank, or about one country that is out of range compared to others rather than a general feature from a bank or a country. This also supports the idea that the nature and quality of the portfolios are a significant driver.

Nevertheless, the use of the same model for multiple countries could also be a source of potential variation that complicates the investigation.

Those findings should be therefore seen as preliminary and further work will be conducted on the calibration of the PD models

²⁵ We prefer to use the EAD-weighted average PD although the case-weighted average PD will be more comparable with the case-weighted observed default rate. But the EAD-weighted average PD is the most common understanding of PD and has a correlation with the case-weighted average PD of close to one.

Figure 17: Comparison of the observed default rates in 2011 and the EAD-weighted average PD in 2012, logarithmic scale



Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures

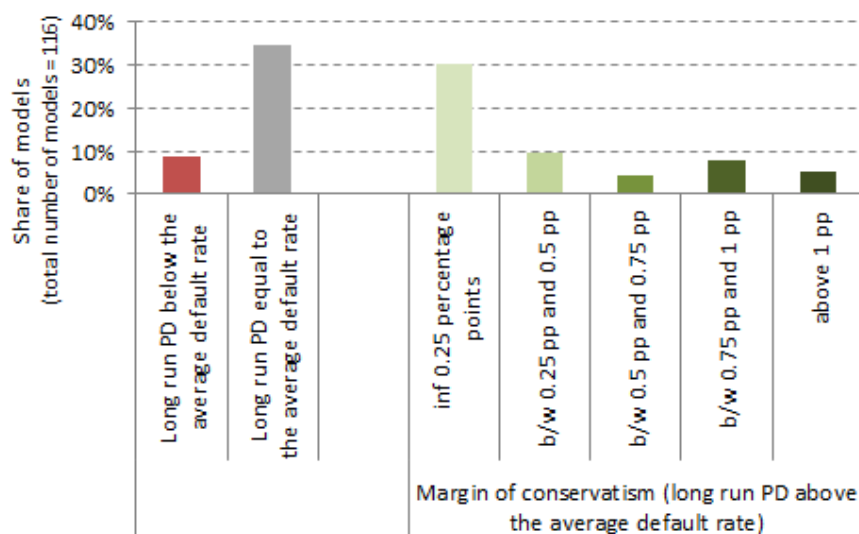
Source: EBA data collection (reference date: December 2012).

Examining further the relationship between observed default rate and PD, Figure 18 illustrates the margin of conservatism across the PD models, since banks may incorporate this margin into their model because their time series is too short or does not include enough distressed years (see Section 8.4). It thus does not represent *per se* the conservatism of a model, but rather the correction of its intrinsic lack of conservatism.

As a proxy we use the difference between the long-run PD and the average default rates (both variables being used for calibration).

In Figure 18, we can see that 9% of the models have a negative margin of conservatism (long-run PD lower than the average default rate, the minimum being -0.7 percentage points), this is due for some banks to very limited time series and predominance of distressed years. A total of 34% of the banks did not report a different value of the long-run PD and the average default rate. Furthermore, the margin of conservatism, if it exists, is rather limited, being at below 0.25 percentage points for 30% of the model. This margin of conservatism is not bank or country specific as the investigation covers 22 different banks in 20 countries. Moreover the proxy used does not tell if the margin of conservatism is sufficient or not.

Figure 18: Illustration of the margin of conservatism (proxy) across RM PD models



Source: EBA data collection (reference date: December 2012).

From this initial analysis we show that if the country is a natural driver of the PD it is not the only explanation. The additional drivers of the margin of conservatism, difference in time series, segmentation of customers, and definition of default should therefore be investigated in more detail. This is partly done in Section 8, and further work will be carried out by the EBA in these areas.

5.3 LGD

This section focuses on LGD of the RM portfolio, both at banking level and country level, and the main drivers thereof.

5.3.1 Banking group

Figure 19 shows the EAD-weighted LGD for IRB RM at a bank level. Banks that apply the regulatory floor of 10% at the portfolio or sub-portfolio level are represented in light blue, the other banks applying it mainly at the account level. We note that most banks have an EAD-weighted LGD between 10% and 20%, although one bank has a much larger EAD-weighted LGD of 50%²⁶.

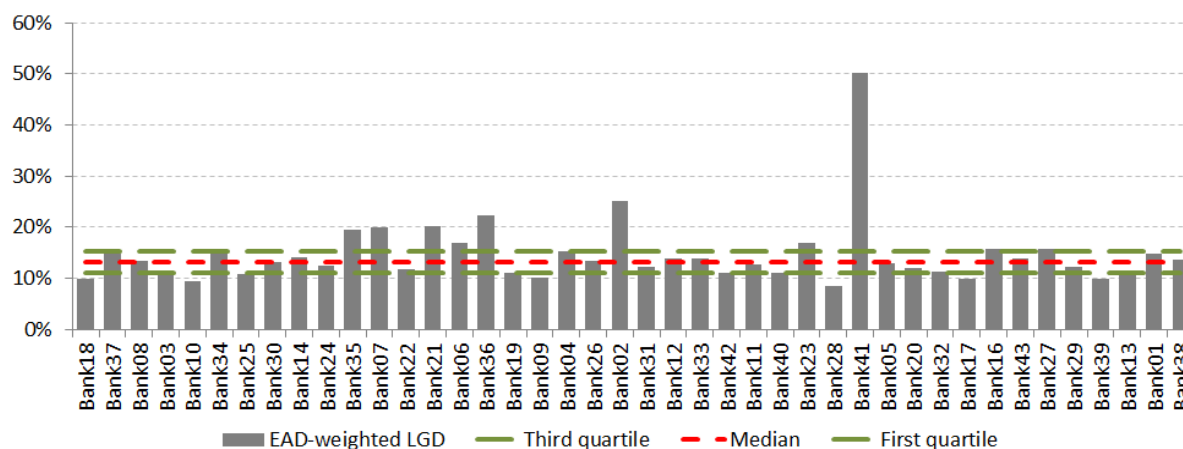
From this chart and from Figure 12, we can conclude that banks with a higher LGD also have a higher RW, whereas it is more difficult to assess the materiality of the impact caused by the different practice to apply the floor at portfolio or account level; different reporting practices create additional challenges in drawing conclusions from the simple comparisons of exposure weighted LGD

²⁷

²⁶ This is due to the practice of the banks of classifying RM where if an exposure is covered by mortgages to some extent then the exposure is categorised as a mortgage.

²⁷ With the support of the NCAs the EBA is currently investigating the topic

Figure 19: EAD-weighted LGD, IRB RM, non-defaulted exposures, by bank



Note: The banks are sorted by their EAD-weighted PD.

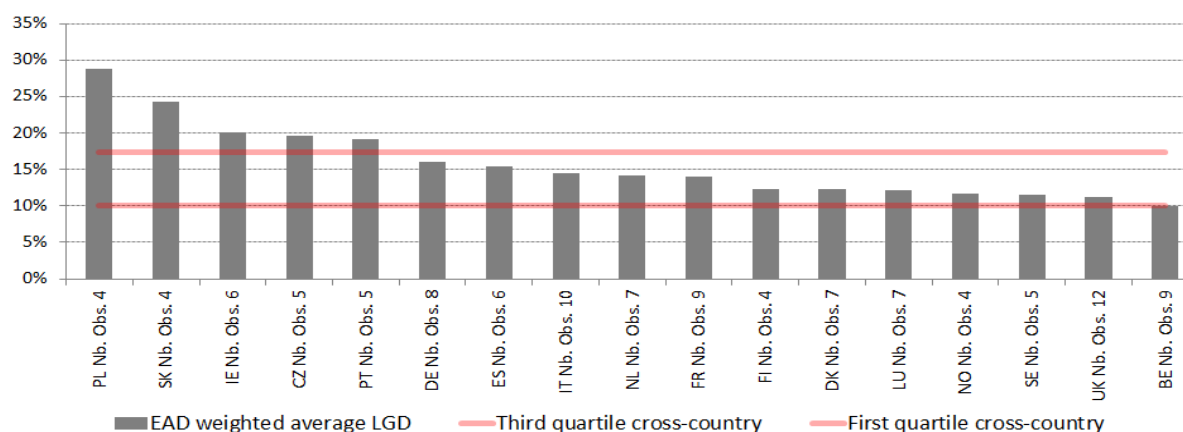
Source: EBA data collection (reference date: December 2012).

5.3.2 Country level

We note in Figure 20 that PL, SK, CZ, IE and PT have, on average, a high LGD (above 17.6% the third quartile cross-country), while UK, BE, SE, NO have, on average, a low LGD (around 11%). The first cross-country quartile is around 10% showing that 25% of the LGD reported at the country level by the banks have just the level of the 10% floor.

The countries CZ, IE and PT with a high LGD have also a high PD and RW. With low figures for LGD, PD and RW we have only SE, while the other countries that have the lowest RW (NO, FI) or lowest PD (NL, PL) do not follow the same trend in the LGD figure.

Figure 20: EAD-weighted LGD, IRB RM, non-defaulted exposures, by country of exposure



Note: The countries are sorted by their EAD-weighted average LGDs.

Source: EBA data collection (reference date: December 2012).

5.3.3 LGD drivers

Variables used

Regarding the main risk drivers for the segmentation of their LGD models, 81% of the banks report the loan-to-values, and only 58% and 44% of the bank report respectively the type and location of real estate. Any type of guarantee provided is reported by 35% of the banks; the same proportion reporting the vintage, but the type of amortisation being reported only by 5% of the banks.

Recovery

In this subsection we study the relationship between the recovery rate for non-cured exposures (lifetime average of the portion of EAD recovered when an account does not cure), the length of the recovery period and the LGD for non-performing assets²⁸. If an asset is non-performing, the bank will still recover a part of the value of the asset (mainly depending of the collateral). The recovery rate is the observed value, whereas the LGD is the conservative estimate by the LGD model of the loss after recovery.

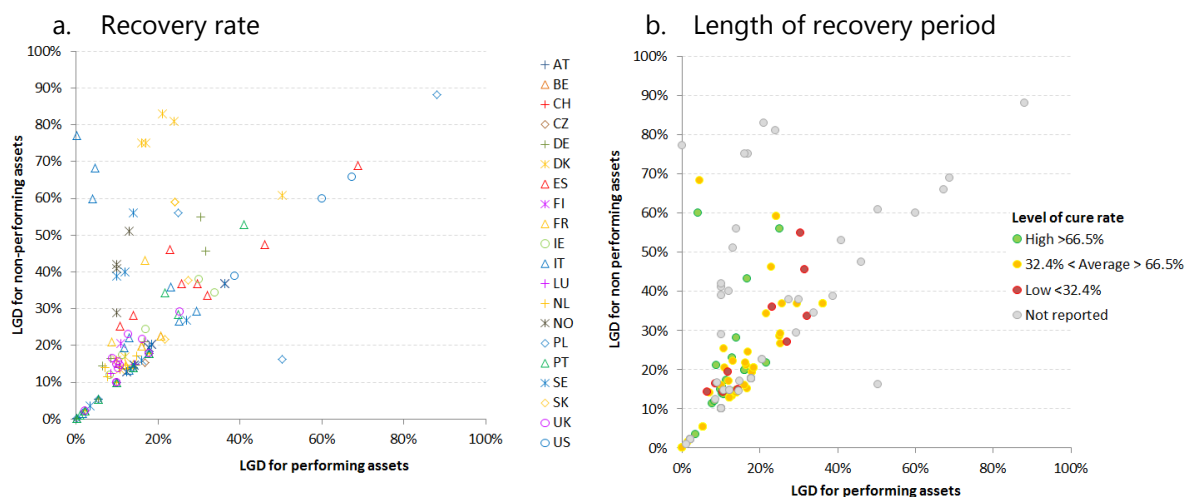
This recovery rate will also be driven by the time needed before the full process of recovery is over (length of recovery period). Those features may be highly dependent of the country of exposures as legal framework may play an important role.

In Figure 21, we see that recovery rate and LGD for non-performing assets are not closely correlated. Furthermore, we noted very different levels of recovery rate for a given country but a smaller range in terms of LGD parameter. The difference in terms of recovery rate for non-cured assets may be due to difference in time series (see Section 8.4), different practices in including/excluding open unclosed workout and also different segmentations or policy of the banks, and thus the lower range for LGD parameter could be explained by embedded correction.

This is not explained by differences in the length of recovery (right-hand side of Figure 21). We see that the experience of the length of recovery does not seem closely related to the country of exposures. This could be explained by very different approaches used by banks when dealing with defaulting assets (e.g. arrears management, selling defaulted exposures).

²⁸ The information has been collected for performing and non-performing assets. The non-performing assets may differ of the defaulted ones depending of the definition of the banks.

Figure 21: Characterization of the relation between LGD for performing assets and LGD for non-performing assets by the level of the cure rate²⁹, RM portfolio.



Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures

Source: EBA data collection (reference date: December 2012).

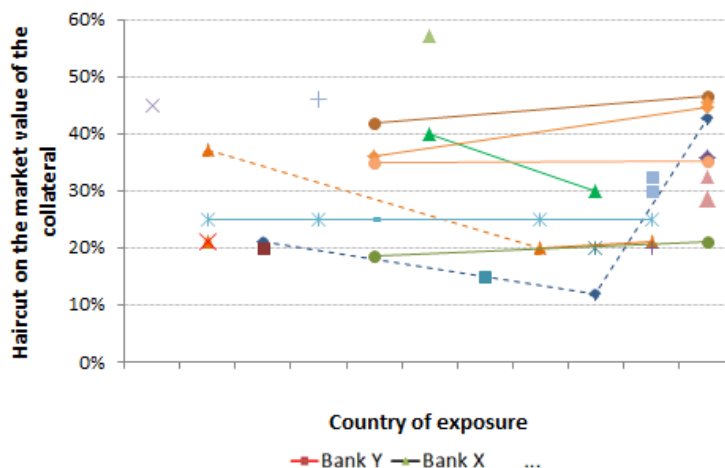
Haircut on the market value of the residential real estate collateral

The difference in the valuation of the collateral may explain part of the differences in the LGD estimates. In Figure 22, we look at the different haircuts applied to the market value of the residential real estate collateral across model by bank and by country. We see that in one country the haircut applied to the collateral may be very different. Some banks seem to apply the same haircut without differentiating by country, while other banks may use different haircuts for one country if they have multiple LGD models (e.g. for two pink triangles and for two lavender squares).

This show that the country dimension is less important that the portfolio segmentation when determining the haircut of the collateral.

²⁹ The assessment of the level of the cure rate is calculated thanks to the distribution of all the cure rate reported for the portfolio, "High" is above the 75th percentile, "Low" is below the 25th percentile, "Average" is between the 25th and the 75th percentile. If the bank has not reported any cure rate then it is labelled as "Not reported".

Figure 22: Haircut on the market value of the residential real estate collateral for RM portfolio, by country and by bank³⁰



Source: EBA data collection (reference date: December 2012).

LGD for performing assets and cure rates

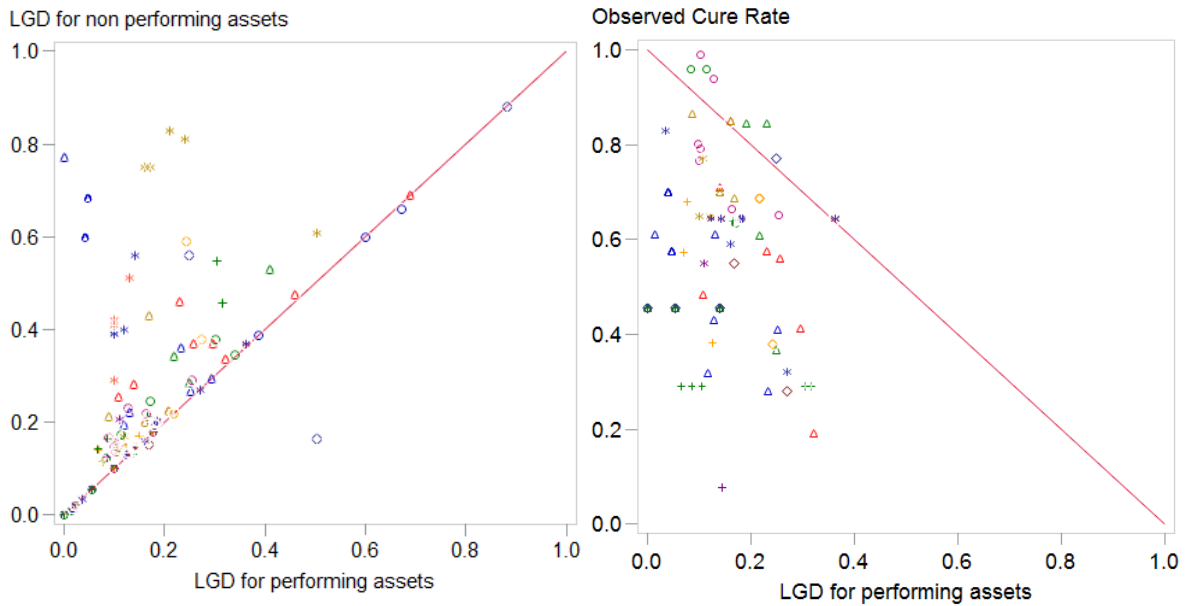
In Figure 23 we show the correlation between the LGD for non-performing assets and the LGD for performing assets. We see that apart from one exception the LGD for non-performing assets is always higher or equal to the LGD for performing assets. When there is equality it may be because the bank has developed different LGD models for performing and non-performing assets.

Then we analyse the cure rate, meaning the portion of assets that do not support losses. Usually the higher the cure rate, the lower should be the LGD, but we do not find such a relationship in Figure 23 (right-hand side). The absence of relationship may be due to other variables that may affect the LGD for performing assets thus leading to compensation effects. However, from Figure 23 (right-hand side) we can conclude that the cure rate is not the main driver of the LGD for performing assets, and the cure rate does not seem driven by the country.

There will be further investigation of the relationship between cure rates and PDs (higher cure rate should lead to higher PDs).

³⁰ Only a sub-sample of banks reported haircut on the collateral as estimated by their model, as the haircut on the collateral value for the RM portfolio is not always an estimate of the banks' LGD models.

Figure 23: LGD for non-performing and performing assets and cure rates

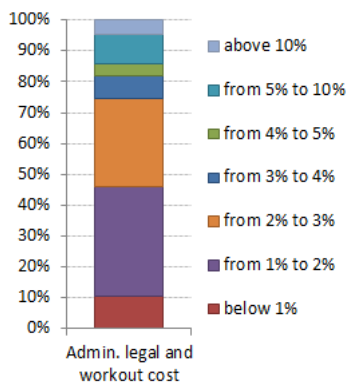


Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures
Source: EBA data collection (reference date: December 2012).

Other costs taken into account for LGD models

Other costs may influence the LGD for performing or non-performing assets, such as the administrative, legal or workout cost. They may even represent the bulk of the loss for the performing asset. Variation across performing LGD could be due in some extent to the large difference across the model in terms of those other costs, as these range from below 1% to above 10%. However, the bank practice as well as the country of exposures may be the main drivers of those costs.

Figure 24: Observed administrative, legal and other workout cost for non-cured exposure



Source: EBA data collection (reference date: December 2012)

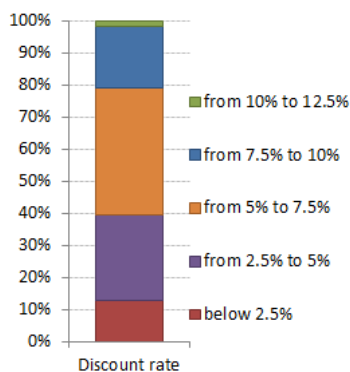
Discount rates

The discount rate is a key element for the LGD as most of the losses will be accounted for years later and some income flows may still be received by the bank. The discount rate allows the bank to actualize the different flow of income and losses over the time to recovery.

From the results of the questionnaire submitted to the banks, it seems that the discount rates are computed in the same manner by the banks. Most of them say they use a risk-free rate with a risk premium³¹.

Nevertheless, the definition of the risk-free rate (monthly, quarterly or on a ten-year basis) and the size of the risk premium create variation in the use of discount rates, with 40% of the model below 5% and 60% above. The variation in discount rates may be linked to the characteristics of the assets, but may create different LGD at the portfolio level.

Figure 25: Distribution of discount rates used across the sample of LGD models



Source: EBA data collection (reference date: December 2012)

5.4 Conclusion for the RM portfolio

In this section we analyse the driver of differences in RWs, PD and LGD parameters, with a specific emphasis on the country dimension. A country pattern seems to emerge when we look at the EAD-weighted average RWs, PDs and LGD for this portfolio (Figure 13, Figure 15 and Figure 20). However, when analysing each driver of differences for PD and LGD estimates, the country pattern seems less clear. The importance of bank practices and of model segmentation for portfolios (different perimeters as a bank may have multiple models for one portfolio in one country) seems to cause the variation across PD and LGD models. From these findings, it is difficult to disentangle the impact of any single component (e.g. cure rate) on the estimates. The different underlying components used in the different models may have different effects and one should be

³¹Other answers include the interest rate of the loan, the cost of capital, cost of funding, etc. Different approaches are followed by the banks for incorporating downturn conditions in the discount factor but most of them focus their estimates on stress years/periods.

careful about drawing conclusions without being able to investigate and analyse the combined effect of these components on the final estimation of the PDs and LGDs.

Those interim findings may praise for more guidance in the PD and LGD modelling by the banks, even if it is also important to underline that these disparities are inherently due to the use of internal models which should reflect the experience of any specific bank.

6. SME Retail

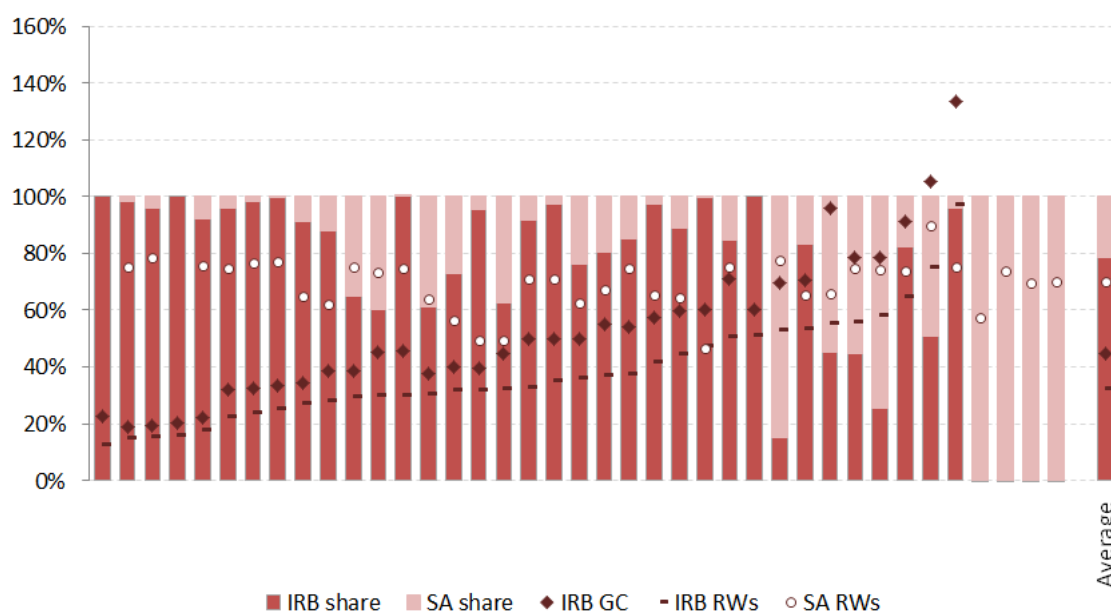
This section looks at the SME Retail portfolio in terms of EAD and RWAs versus the SA exposures and versus the rest of the retail portfolio.

The main themes analysed along this section are the IRB RW, PD and LGD, seeking for patterns both at a bank and at a country level.

Across the sample, SME Retail exposures still under SA represent around 20% of the total, with average RWs twice higher than the IRB ones. However, again, these proportions vary significantly on a bank by bank basis, as we can see in Figure 26.

Regarding the SME Retail portfolio still under SA, we see that the portfolio secured by real estate have a much lower RW than the other retail. On the other hand, for the SME other Retail the RW considered is 75% for almost 90% of the exposures.

Figure 26: Share of IRB for the SME Retail portfolio as well as distribution of IRB RWs, IRB GC and SA RWs, non-defaulted exposures.



Note: The banks are sorted by their IRB RWs.

Source: EBA data collection (reference date: December 2012).

6.1 IRB risk weights

In this section we analyse the IRB RWs for SME Retail portfolio, both at a banking group level and at country level for non-defaulted exposures. For the bank sample the IRB non-defaulted exposures for the SME Retail portfolio represent on average 7% of the retail and SME Corporate portfolios (IRB and SA non-defaulted exposures), with same proportion applying for the RWA.

6.1.1 Banking group level

At a bank level, we see in Figure 27, that the banks with the highest RWs have almost only other retail exposures. It is also noted that one bank has only SME Retail secured by real estate, while some other banks have almost only other retail exposures (towards SME).

Figure 27: Composition of the IRB RWs for the SME Retail non-defaulted exposures

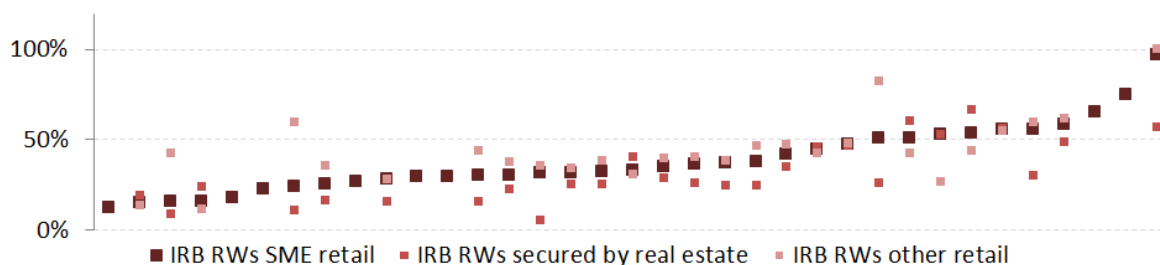
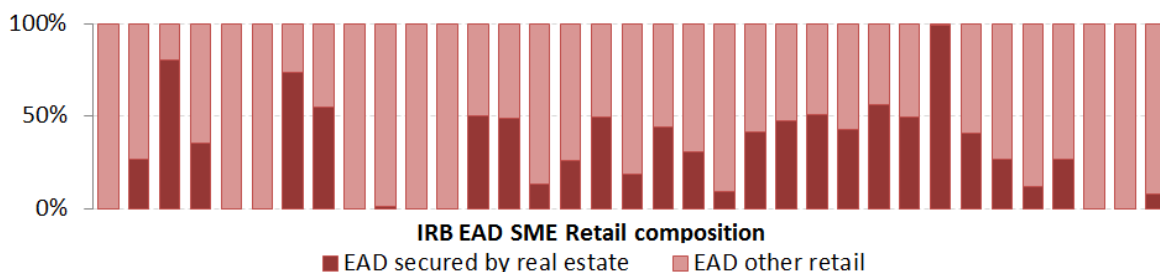


Figure 28: Composition of the IRB EAD for the SME Retail non-defaulted exposures



Note: The banks are sorted by their IRB RWs.

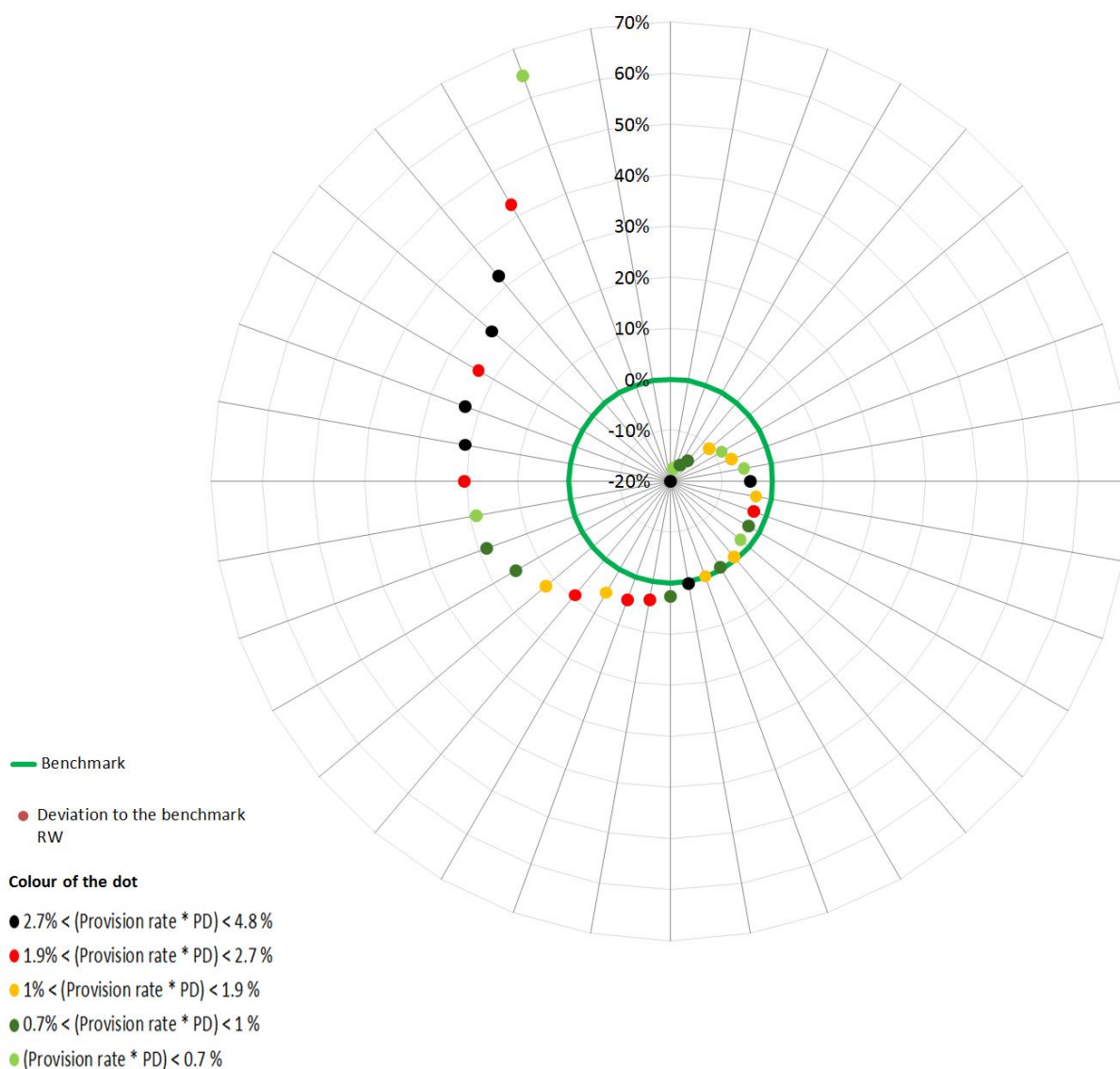
Source: EBA data collection (reference date: December 2012).

In Figure 29, we see that the banks with lower 'experienced loss rates' have a lower deviation from the benchmark (green and yellow dots near the green circle) as already seen for RM portfolio in Section 5 (same caveats applied).

Comparing the deviation of RW observed in the RM and SME Retail portfolio, we see that there is a much higher positive deviation in the SME Retail portfolio, with a maximum deviation of 65% compared to a 27% maximum deviation in the RM. The 'experienced loss rates' also have consistently more variation, ranging from 0.7% to 4.8% (compared to a range from below 0.1% to 1.2% for RM portfolio).

As for the RM portfolio, we can conclude that at the sample level the RWs variations are closely correlated to the 'experienced loss rates'.

Figure 29: RWs deviation to the benchmark RW (non-defaulted exposures) and comparison with the ‘experienced loss rate’ (EAD-weighted PD for non-defaulted exposure times the provision rate (provisions / EAD) for defaulted exposures), IRB SME Retail portfolio, by bank



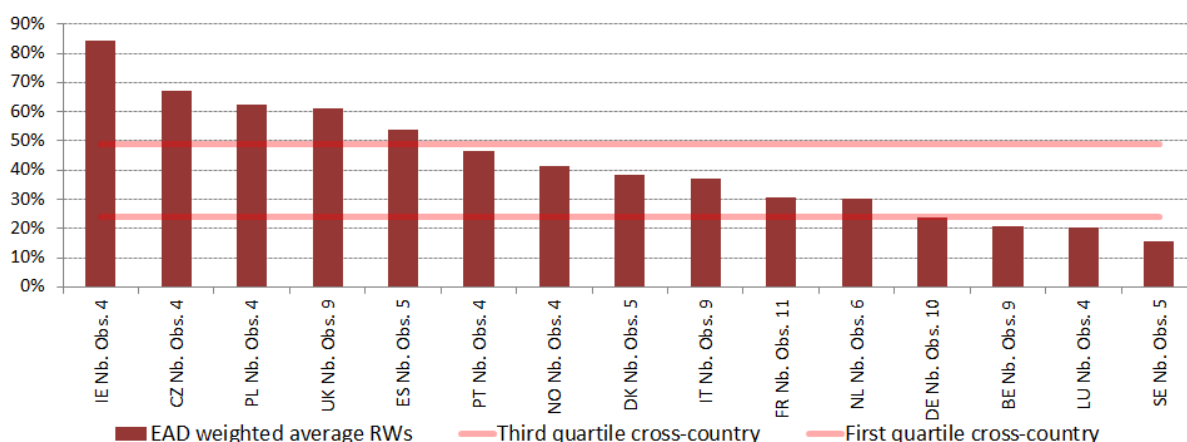
Note: The banks are sorted by their IRB RWs deviations

Source: EBA data collection (reference date: December 2012), EBA calculation

6.1.2 Country level

Looking at the EAD-weighted average RWs in Figure 30, we see a large range across the different countries from above 84% down to 15%. Within one country the range is mainly impacted by the difference between the larger and smaller banks. However, the finding should be treated with caution as the number of observations is limited for some countries.

Figure 30: RWs range for IRB SME Retail portfolio by country, non-defaulted exposures



Note: The countries are sorted by their EAD-weighted average RWs.

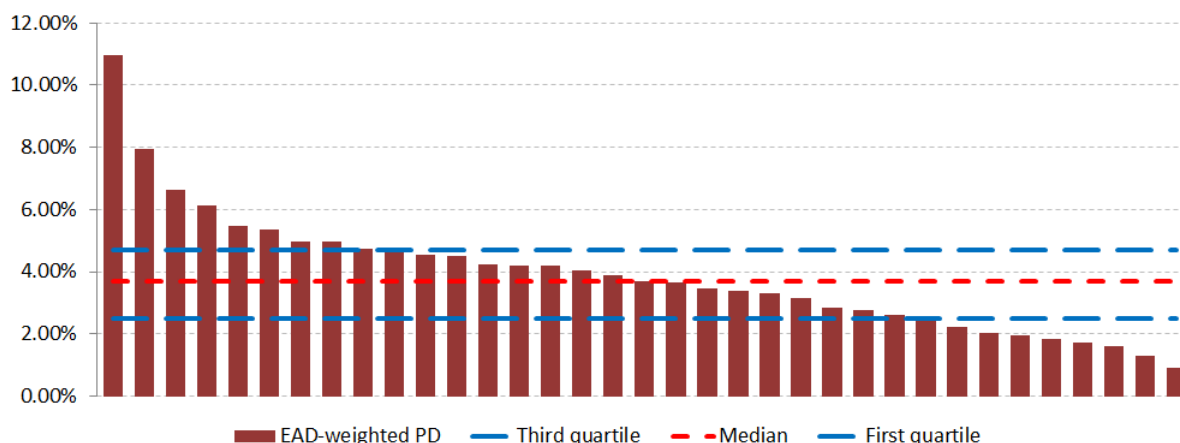
Source: EBA data collection (reference date: December 2012).

6.2 PD

6.2.1 Banking group

As expected, the PD applied for SME Retail is much higher than the PD applied for RM, being that, for the RM portfolio, the PD reaches values close to 3.5% while in the SME Retail it reaches an 11% PD. We can also see that banks with lowest and highest SME Retail PD tend to be the same as the ones where a lowest/highest RM PD was found.

Figure 31: EAD-weighted PD, IRB SME Retail, non-defaulted exposures



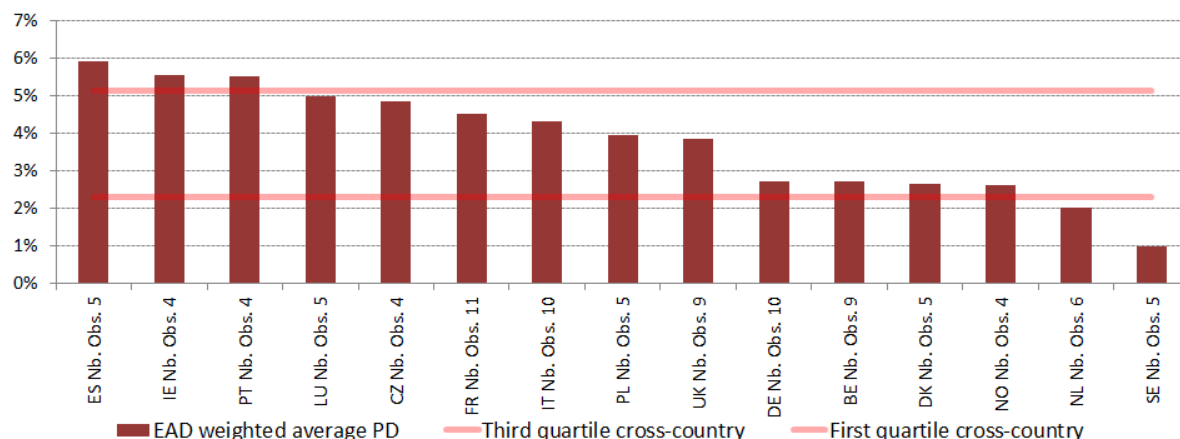
Note: The banks are sorted by their EAD-weighted PDs.

Source: EBA data collection (reference date: December 2012).

6.2.2 Country level

When analysing the PD at a country level, we see a range from 1% to 5.9%. However the range may be very high within one country with large influence of the smaller exposures as the third quartile cross-country is circa 5%.

Figure 32: EAD-weighted PD, IRB SME Retail, non-defaulted exposures



Note: The countries are sorted by their EAD-weighted average PDs.

Source: EBA data collection (reference date: December 2012).

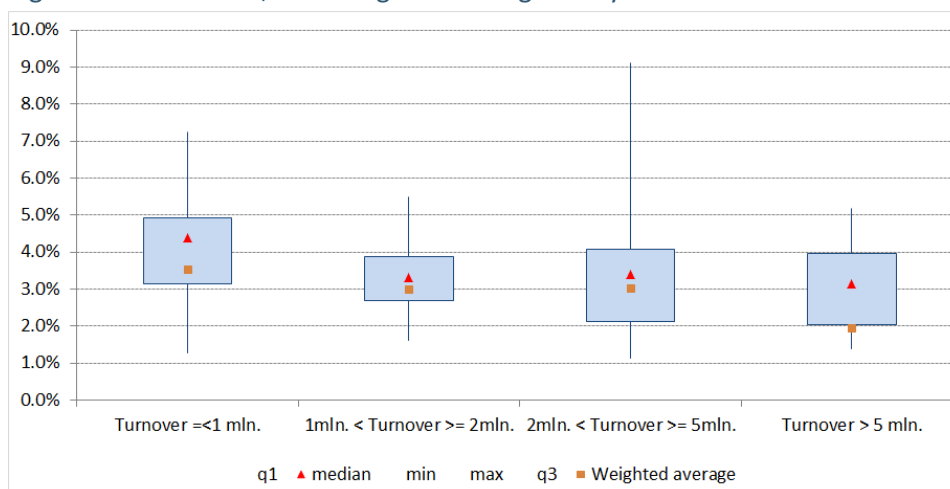
6.2.3 Possible PD drivers

Variables

Regarding the main risk drivers for the segmentation of their PD models, 56% of the banks use the size of the exposures and 51% use turnover. This means that 75% of the banks are using at least one of those two variables. The industry type and the total balance sheet amount appear to be less prevalent at our sample (around 20% of the banks mention using those variables).

As far as the turnover is concerned, the analysis of the data for banks that report they use this variable tends to show a correlation with PDs; the higher the turnover, the lower the PDs (see Figure 33).

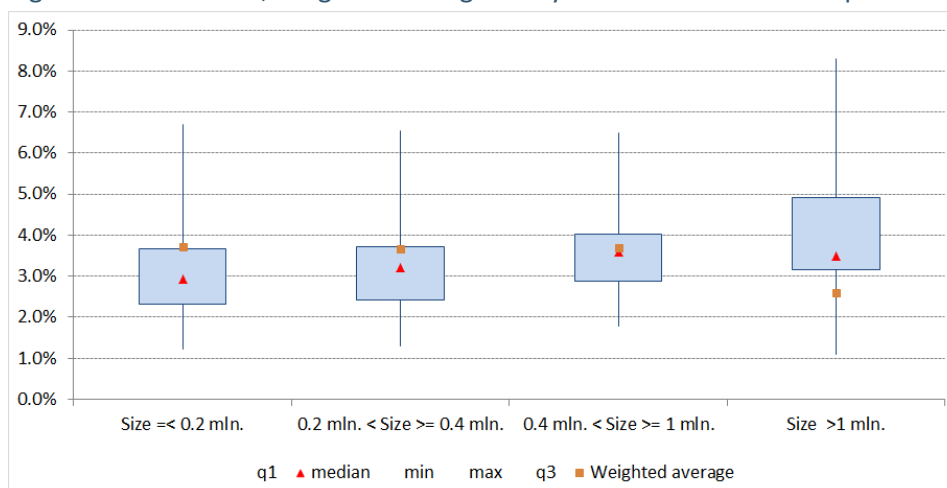
Figure 33: SME Retail, EAD-weighted average PD by bucket of SME turnover



Source: EBA data collection (reference date: December 2012).

Regarding the size of exposures (Figure 34), the picture from the quantitative analysis is more blurred³² (neither with the LGD actually), though once the exposures reach EUR 1 million³³, the EAD-weighted PD decreases.

Figure 34: SME Retail, weighted average PD by bucket of size of the exposure



Source: EBA data collection (reference date: December 2012).

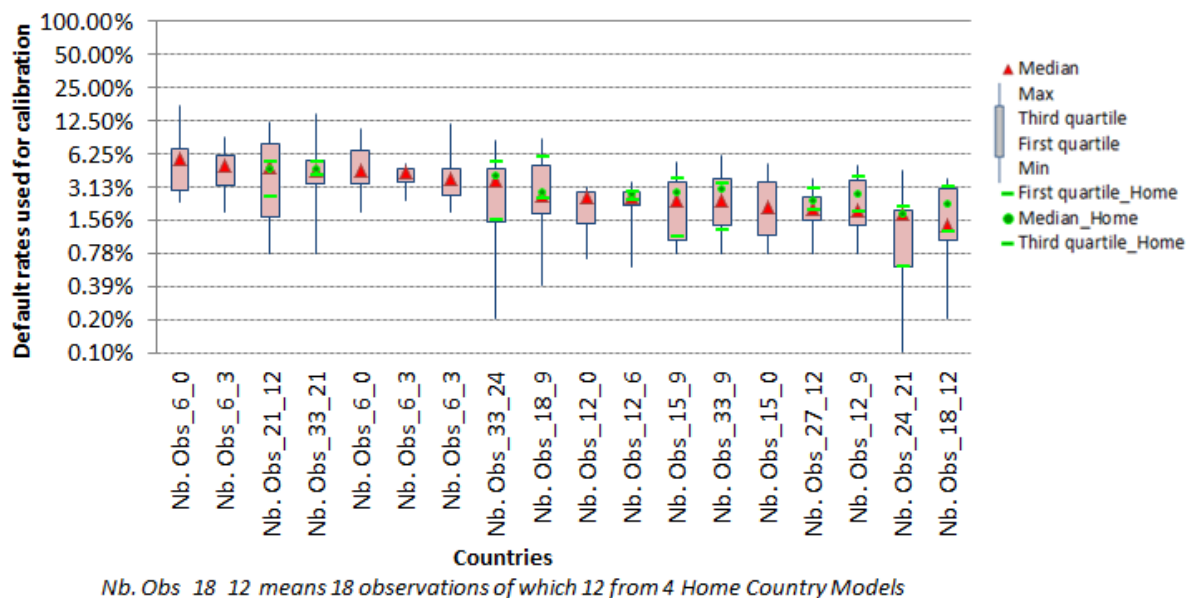
PD versus default rates

In Figure 35, we see the different default rates used for the calibration of the PD model for the SME Retail portfolio. The median across countries varies from 1.41% to 5.75% and the range within a country is different, with inter-quartile spread varying from 0.5% to 3.8%. A large inter-quartile spread may mean that the cycle of those countries are dissimilar or that banks have very different time series, or varied portfolio quality. Home banks have generally a lower median, as only for one country is the observed default rate for the home banks higher than for the global sample.

³² The variation in terms of total amount of exposure per bucket partly hinders drawing any conclusions.

³³ Exposures above the EUR 1 million threshold should not be treated under the retail curve. In order to avoid volatility in the capital requirement for exposures around the 1 million threshold, banks have policies such as that the exposure should be higher than EUR 1 million two quarters in a row before using the corporate IRB curve.

Figure 35: Default rates used for model calibration reported for the SME Retail portfolio, by country

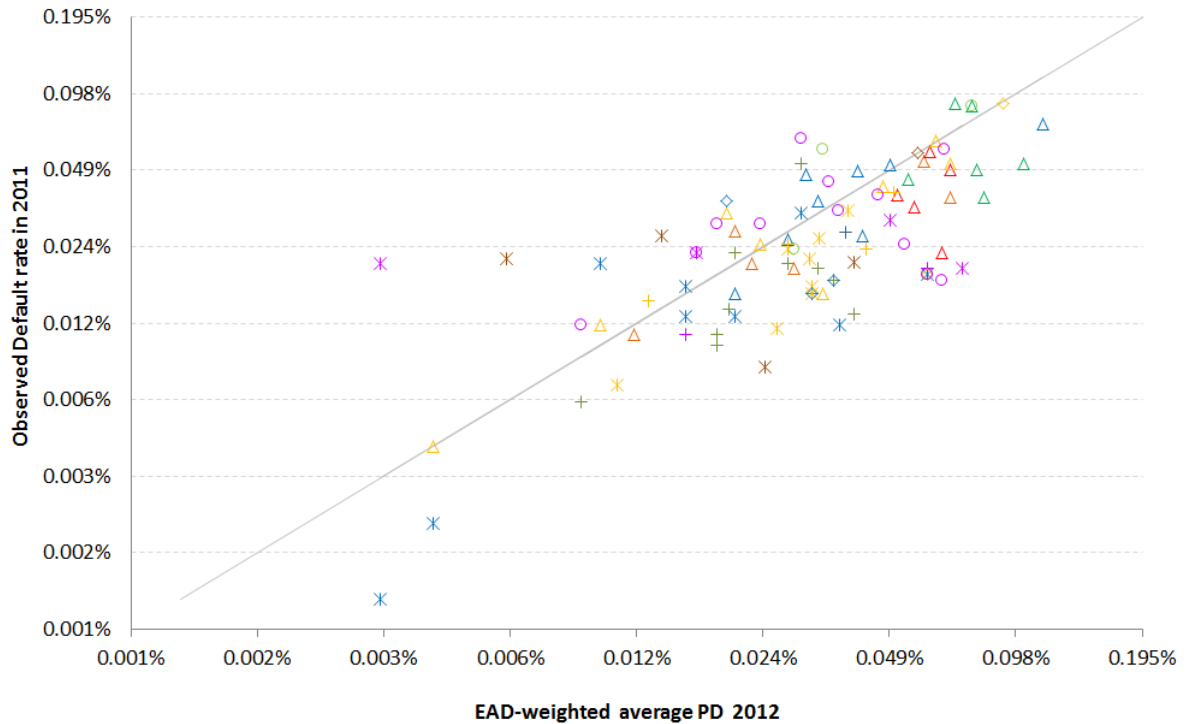


Note: The countries are sorted by their median.

Source: EBA data collection (reference date: December 2012).

When looking at Figure 36 for the comparison between the observed default rate in 2011 and the PD in 2012 we see that the values are mainly between 0.012% and 0.098%. The relationship is mild between the last observed default rate and the estimated PD showing that the PD models mainly reflect this last data point. We can distinguish a slight country pattern although the segmentation of the models may still play a role, as the variation within one country may still be significant (for example, the country shown by the blue star).

Figure 36: Comparison of the observed default rates in 2011 and the EAD-weighted average PD in 2012, logarithmic scale.



Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures
 Source: EBA data collection (reference date: December 2012).

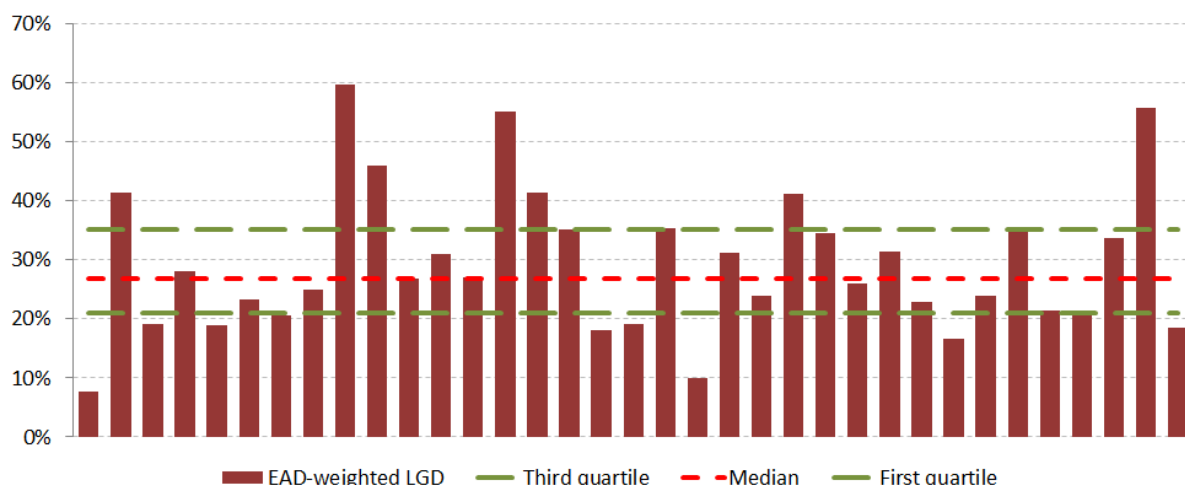
6.3 LGD

In this section we focus on the LGD for the SME Retail portfolio, both at banking group and at country level. Then we analyse some main drivers that may explain the ranges seen.

6.3.1 Banking group

Figure 37 shows the disparity in LGD across the bank sample; we see that the EAD-weighted average LGD range from 8% to 60%, with a median close to 27%

Figure 37: EAD-weighted LGD, non-defaulted IRB exposures, SME Retail, by banks

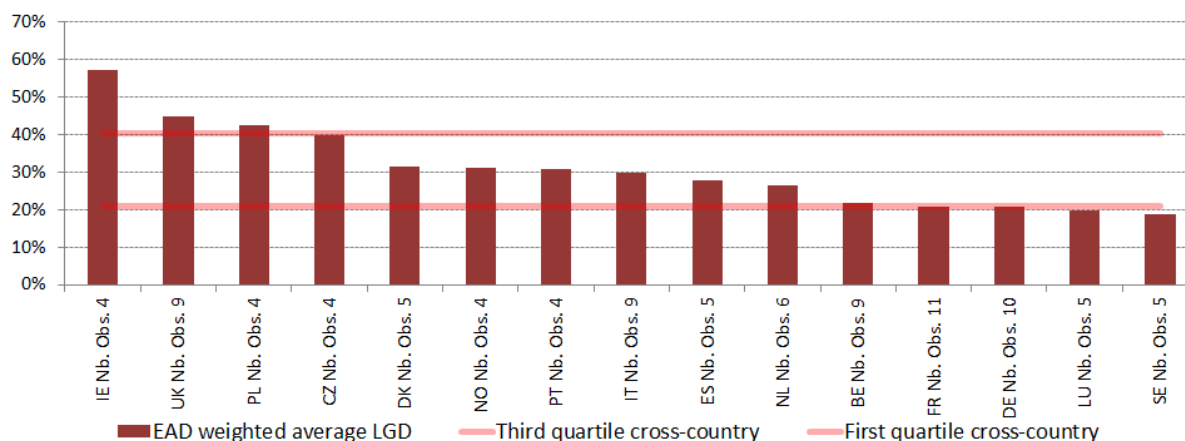


Note: The banks are sorted by their EAD-weighted PD.
Source: EBA data collection (reference date: December 2012).

6.3.2 Country level

In Figure 38, we find that from a country perspective, the range of LGD is very wide from 19% to 57%; higher average LGD are noted for IE, UK, CZ and PL (above the third quartile cross-country), while the countries with a lower average LGD are DE, LU and SE (below the first quartile cross-country).

Figure 38: EAD-weighted average LGD, non-defaulted IRB exposures, SME Retail, by country



Note: The countries are sorted by their EAD-weighted average LGDs.
Source: EBA data collection (reference date: December 2012).

6.3.3 Possible LGD drivers

Variables used

Regarding the main risk drivers for the segmentation of their LGD models, 64% of the banks report, as expected, mainly using the type and the facility type; the value of collateral being quoted 49% of the banks. Other significant variables reported (by around 30% of the banks) are the country and,

to a lesser extent, the industry sector and the size of the obligors, but our sample does not allow us to confirm these correlations or not.

Type of collateral

At a bank level, we can see that there is a wide range in the type of collateral. Figure 39 shows that seven banks have almost their whole SME Retail portfolio unsecured, whereas five banks have their whole SME Retail portfolio secured. We can also see that, on average, almost 55% of the SME Retail portfolio is unsecured, while 30% is secured by real estate and 15% by other collateral.

Regarding the LGD applied, in Figure 39 we can see that there is also a wide range of EAD-weighted unsecured LGD, ranging from 10% to 80%, being on average around 30%. As expected, the unsecured LGD is always higher than the LGD secured by real estate.

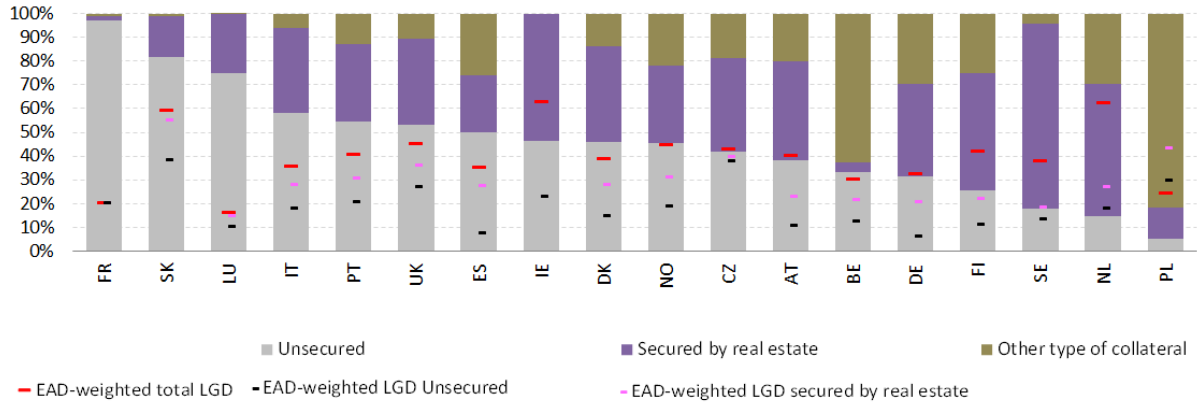
Figure 39: SME Retail, EAD-weighted LGD & EAD-distribution by collateral type, non-defaulted, banking group level



Note: Banks are sorted by their share of unsecured exposure
Source: EBA data collection (reference date: December 2012).

At the country of exposure level, Figure 40 shows that the type of collateral may be driven by the country of exposure, with France having the highest proportion of unsecured exposures, while Sweden has the greatest proportion of secured by real estate (circa 77%). We also see a wide range of LGD across the different countries, which is directly linked to the type of collateral (or the absence of collateral). This may illustrate the difference in practice when reporting the secured and unsecured EAD and the corresponding LGD.

Figure 40: SME Retail, EAD-weighted LGD & EAD-distribution by collateral type, non-defaulted, country of exposure level



Note: Countries are sorted by their share of unsecured exposure

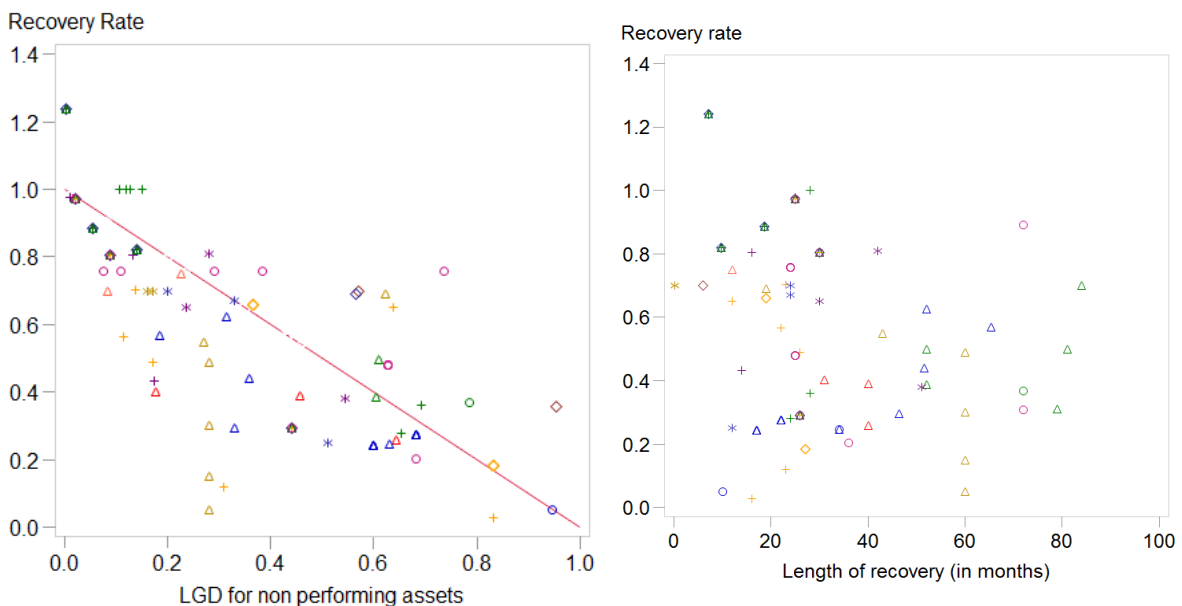
Source: EBA data collection (reference date: December 2012).

Recovery

Below we compare the recovery rate with the length of recovery period and the LGD for non-performing assets. We do not find the reverse relationship between recovery rate and LGD for non-performing assets. For example, for the yellow triangle country the same LGD is associated with a large range of recovery rates although the length of recovery seems identical. For the pink circle country the reverse applies with an identical recovery rate but different LGD.

For the length of recovery, we do not see a strong link with the recovery rate but some countries, like the yellow and green triangle in the chart, seem to have a longer length of recovery. However, there is a wide range across models, from a few months to over 80 months.

Figure 41: Comparison of the observed recovery rate and length of recovery (in months) for non-cured assets compared to the LGD for non-performing assets in 2012



Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures.

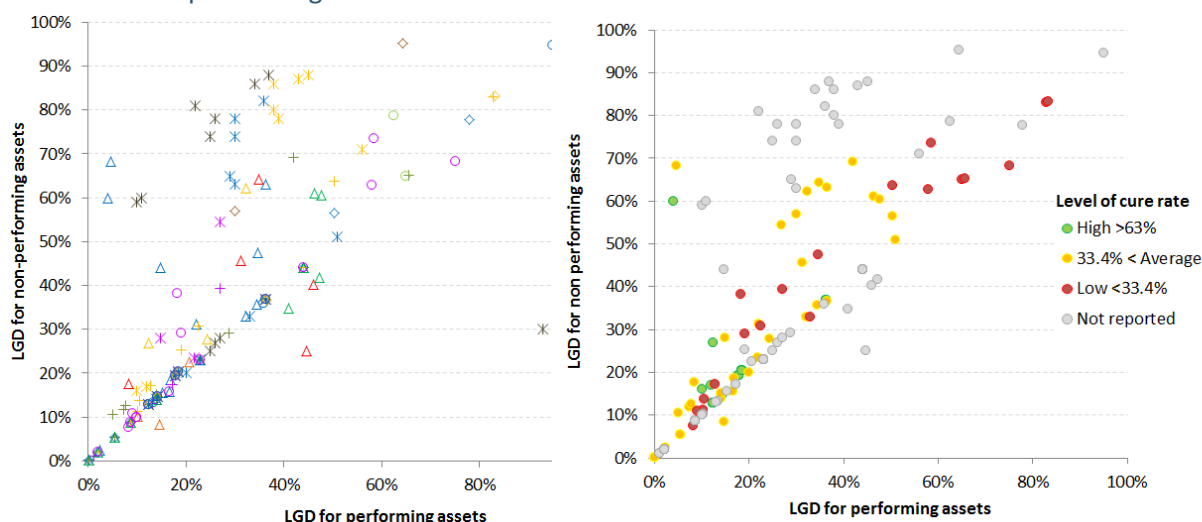
Source: EBA data collection (reference date: December 2012).

LGD for performing assets and cure rates

In Figure 42 we compare the LGD for performing assets and the LGD for non-performing assets. We see that the LGD for non-performing is mostly equal to or higher than the LGD for performing assets.

If we look at the relationship between the observed cure rate and the LGD for performing assets we note that it is not strong. Furthermore, it seems that the observed cure rates are not greatly differentiated by country but that banks mainly have one cure rate for different countries or models.

Figure 42: Comparison of the LGD performing versus non-performing, and the observed cure rate versus the LGD performing



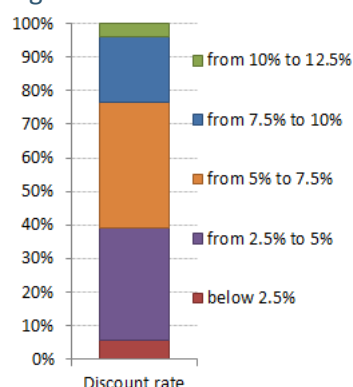
Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures.

Source: EBA data collection (reference date: December 2012)

Discount rates

We see that as for the RM portfolio there are a wide range of discount rates for the SME Retail portfolio across the LGD models. The discount rates vary from below 2.5% to 12.5% due to difference in risk-free rate (different time horizon taken into account) and additional risk premium. The calculation of the discount rates seems closely related to bank practices.

Figure 43: Distribution of discount rates used across the sample of LGD models



Source: EBA data collection (reference date: December 2012)

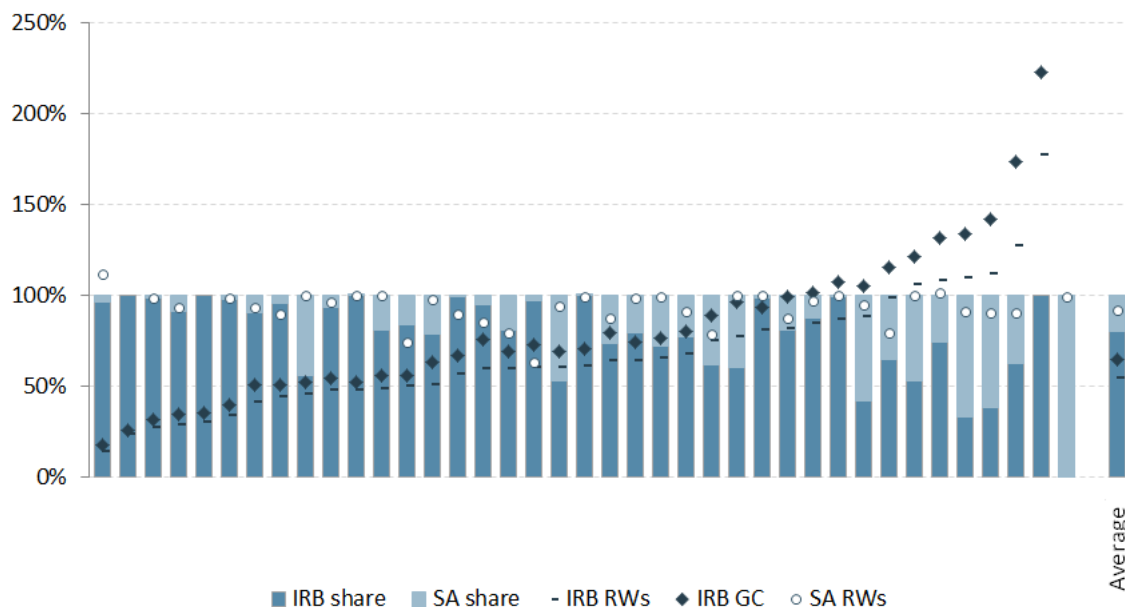
6.4 Conclusion for the SME Retail portfolio

From the SME Retail portfolio analysis we can conclude that the discrepancy across banks is higher than for the RM portfolio. This finding is not unexpected as banks may have more varied portfolios because of different levels and types of collateral and more variety in the main inputs into their models (turnover, company size, industry type, etc.). Nevertheless, the discrepancy may also be due to different use (and definition) of PD components (observed default rates, time series, etc.) and LGD components (cure rate, distinction between LGD performing and non-performing or length of recovery). Although some variations seem linked to the country of exposures or to the segmentation of the models (number of different models and different perimeters of the models), other variations may be directly linked to the banks' practices reflecting their experience or their methodological choices for their internal models.

7. SME Corporate

In this section we investigate the SME Corporate portfolio. In Figure 44 we see that, on average, almost 80% of the SME Corporate portfolio is under IRB and only 20% is under SA. We can also see that the banks with higher proportion under SA have lower SA RWs compared with the IRB RWs, although, on average, SA RW (near 100%) are higher than IRB RW (closer to 50%). The country with higher exposure of SME Corporate under SA is IT, which was also the country with higher SME Retail exposure under SA.

Figure 44: Share of IRB for the SME Corporate portfolio as well as distribution of IRB RWs, IRB GC and SA RWs, non-defaulted exposures.



Note: The banks are sorted by their IRB RWs.

Source: EBA data collection (reference date: December 2012)

When comparing SME Corporate and SME Retail portfolios, we see that, on average, banks report a higher proportion of SME Corporate than SME Retail, corporate having twice the average RW of the SME.

The proportion of SME Corporate and SME Retail varies substantially between banks (see Figure 3). Regarding the RWs applied to both portfolios, the Corporate RWs are usually higher (see

Figure 7, Figure 27 and Figure 44). Nevertheless, some banks have a similar RW for both portfolios, these also being the ones that apply a lower RW for the SME Corporate portfolio.

7.1 IRB Risk weights

In this section we analyse the IRB RWs for SME Corporate portfolio, both at a banking group level and at a country level for non-defaulted exposures. On average, the IRB non-defaulted exposures for the SME Corporate portfolio represent 13% of the Retail and SME Corporate portfolios (IRB and SA non-defaulted exposures) but this proportion rises to 22% for the RWA.

7.1.1 Banking group level

As expected, the banks under FIRB approach mostly have higher RWs, when comparing with the banks under advanced IRB which have lower RWs, as shown in Figure 45.

The banks using AIRB as the main approach represent around 63% of the SME Corporate portfolio, while the FIRB is the main approach applied for only 37% of this portfolio.

The IRB RWs for the SME Corporate portfolio vary a great deal, starting at around 20% and reaching around 175%.

Figure 45: EAD and RWs for IRB SME Corporate by regulatory approaches, non-defaulted exposures

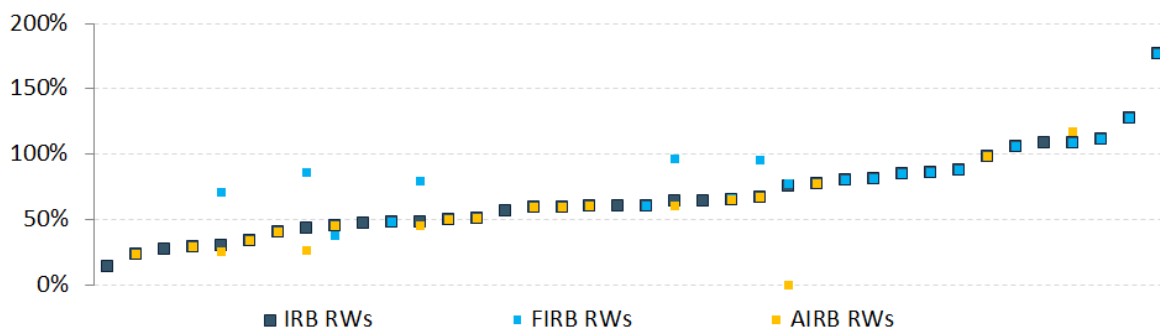
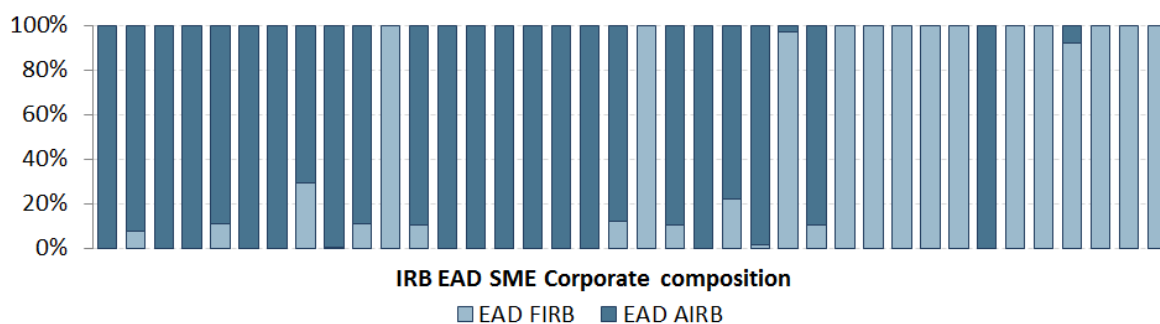


Figure 46: EAD AIRB versus FIRB, SME Corporate



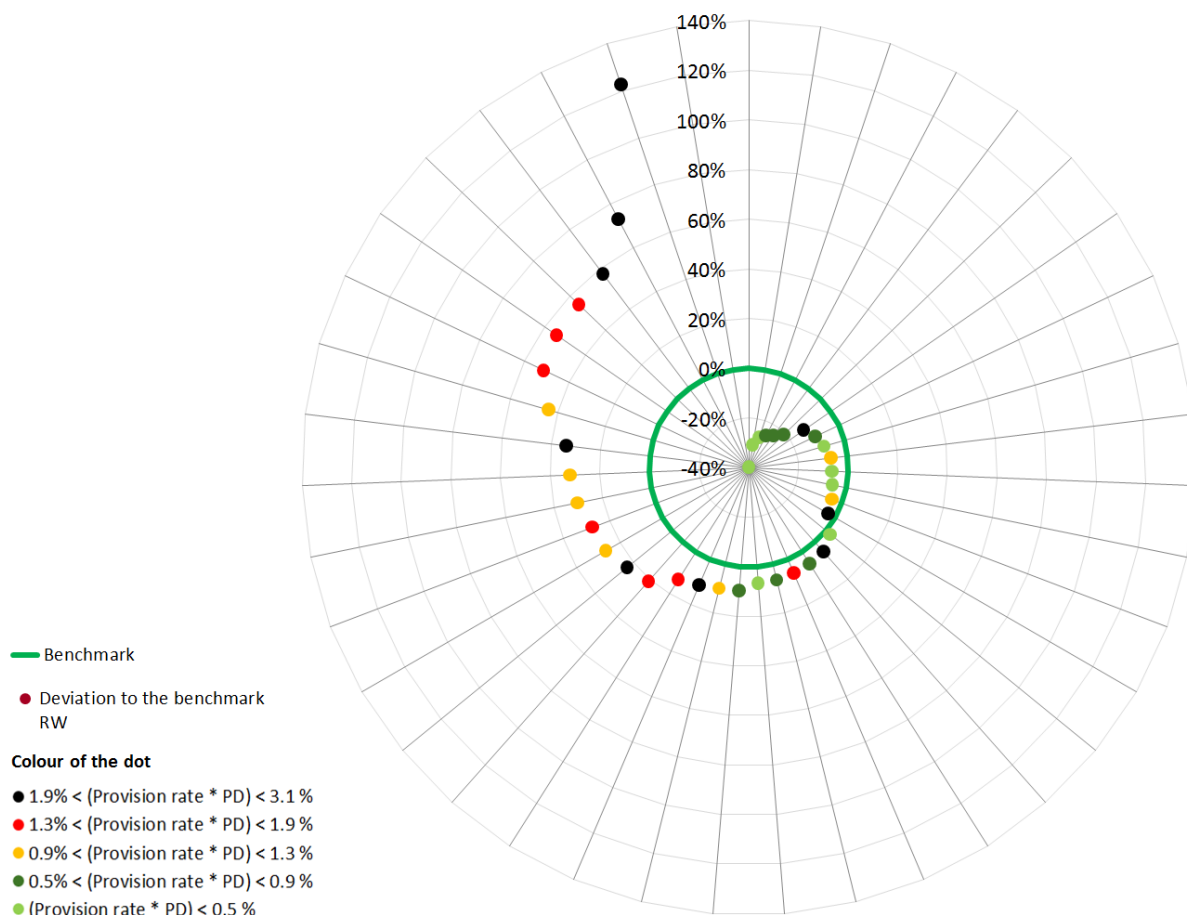
Note: The banks are sorted by their IRB RWs.

Source: EBA data collection (reference date: December 2012)

As already shown for the RM and SME Retail portfolios, in Figure 47 we see that the banks with lower ‘experienced loss rates’ deviate less from the benchmark.

We can also see that there is a much greater range of RWs in the SME Corporate portfolio (a range of -35% to 130% deviation from the benchmark) than in the two previous portfolios analysed, whereas the ‘experienced loss rates’ are in the same range as the SME Retail portfolio (but greater than in the RM portfolio).

Figure 47: RWs deviation to the benchmark RWs (non-defaulted exposures) and comparison with the ‘experienced loss rate’ (EAD-weighted PD for non-defaulted exposure times the provision rate (provisions / EAD) for defaulted exposures), IRB SME Corporate portfolio, by bank



Note: The banks are sorted by their IRB RWs.

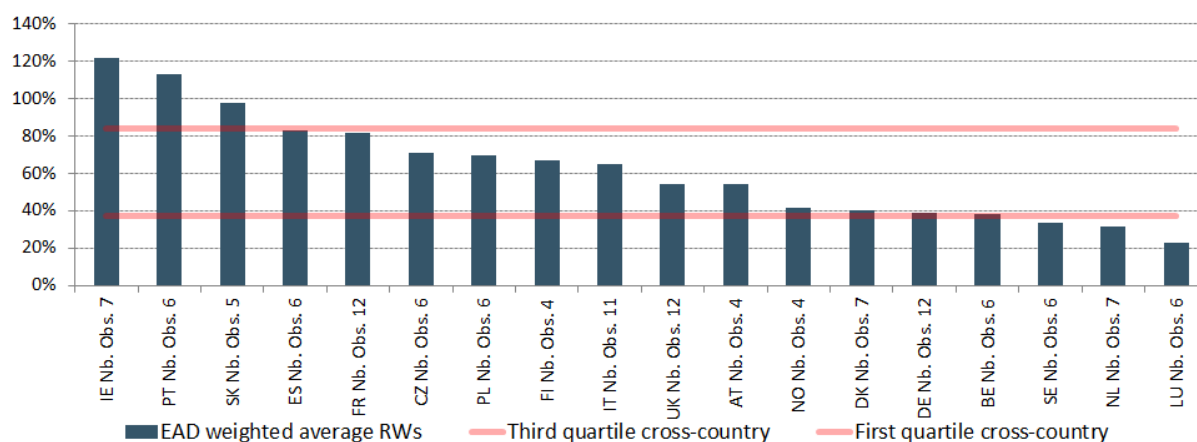
Source: EBA data collection (reference date: December 2012)

7.1.2 Country level

When analysing the RWs at a country level, we see a clear country pattern with a very large range across countries (from 23% to 122%). Even within a country the range is large (e.g. PT, IE, IT, FR, UK or AT) and greater than the one seen for the RM and SME Retail portfolios.

For IE, ES, FR, FI, and AT the banks with higher exposures seem also to be those with the highest RW, as the EAD-weighted average is largely above the median. The opposite is true for CZ, DK, DE and LU.

Figure 48: RWs range for IRB SME Corporate portfolio by country, non-defaulted exposures



Note: Countries are sorted by their EAD weighted average RWs.
Source: EBA data collection (reference date: December 2012)

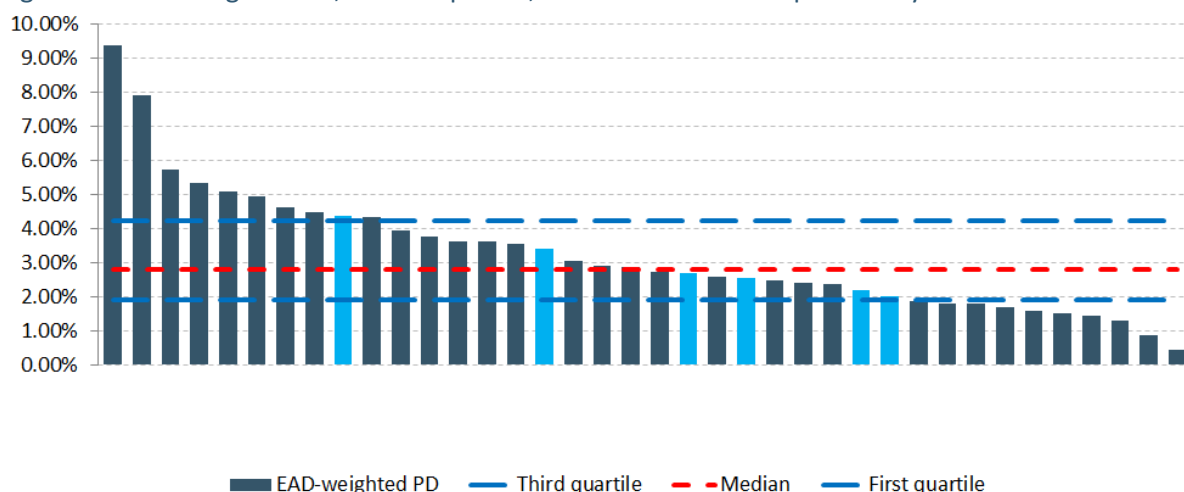
7.2 PD

7.2.1 Banking group

The EAD-weighted average PDs for SME Corporate are in the same range as for the SME Retail portfolio, but the bank’s ranking is mainly different, although the level of the median is lower (2.8% for the SME Corporate versus 3.7% for the SME Retail portfolio).

In Figure 49, the banks that apply a PD floor of 10% are represented in light blue, but these banks do not reveal any specific pattern of low or high PDs. We again see a wide range of PDs, from 0.5% to 9.4%.

Figure 49: EAD-weighted PD, SME Corporate, non-defaulted IRB exposures by banks

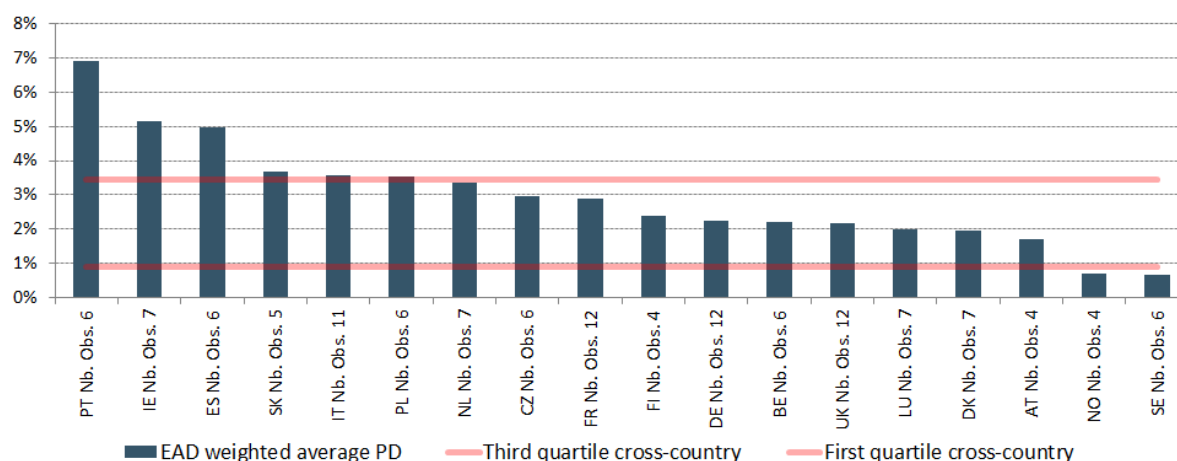


Note: Banks are sorted by their EAD-weighted PD. In light blue the banks that have reported applying a PD floor.
Source: EBA data collection (reference date: December 2012)

7.2.2 Country (by bank) level

In Figure 50, we see that the EAD-weighted average PD seems to be driven by the country of exposure as the median ranges from circa 6.9% to 0.6%, although the range within a country is also wide. A clear pattern emerges as the largest banks³⁴ have higher PD than other banks in a same country (EAD-weighted average is higher than the median).

Figure 50: EAD-weighted average PD, SME Corporate, non-defaulted IRB exposures by country



Note: The countries are sorted by their EAD-weighted average PDs

Source: EBA data collection (reference date: December 2012)

7.2.3 Possible PD drivers

Variables used

Regarding the main risk drivers for the segmentation of their PD models, as for the SME Retail portfolio, banks mostly make use of the size of the exposures (48%) and the turnover (70%), but the industry type is much more often used for this portfolio (55% versus 28% for the SME Retail portfolio).

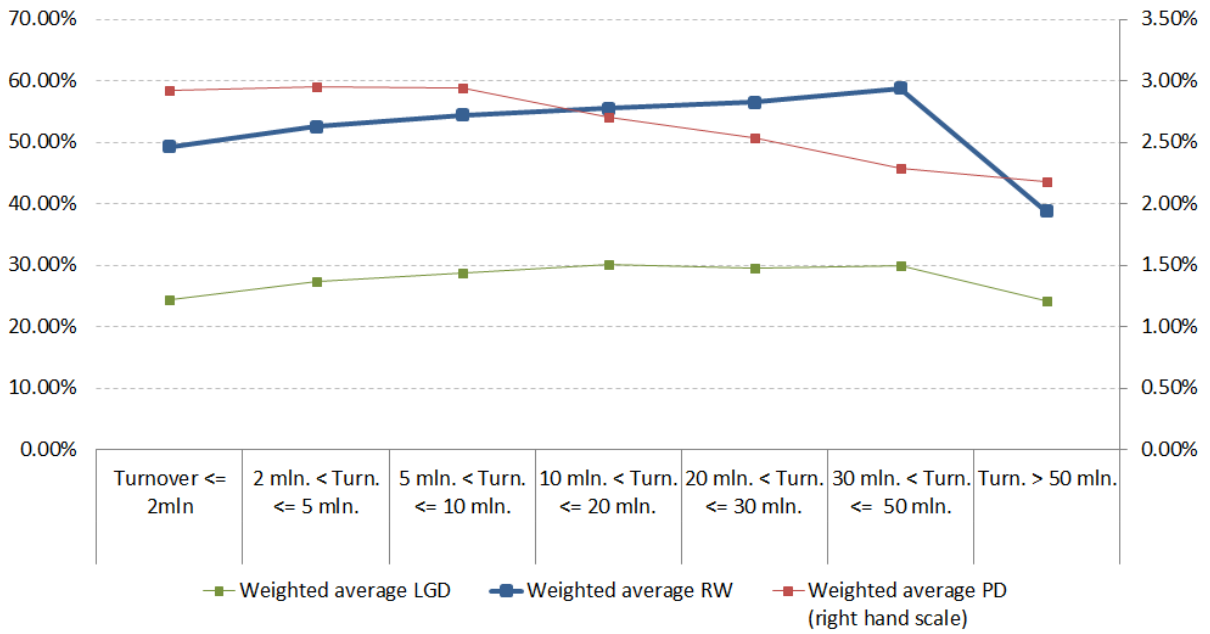
As far as the size of exposures is concerned, as for the SME Retail exposures, no significant correlation is found in the quantitative data.

Nonetheless, the data support a certain pattern of PD behaviour compared to the turnover amount. This effect increases the closer to the EUR 50 million threshold the bucket is; SME Corporate with a higher turnover attracts a lower PD on average. The inverse holds true regarding the LGD, except when close to the regulatory thresholds for which LGDs are much lower.

Furthermore we observe a rise in the RWs when exposures have greater turnover, as the regulatory formula is an increasing function of the turnover (from EUR 5 to 50 million turnover).

³⁴ The largest banks will, in general, be the “home” banks.

Figure 51: SME Corporate, weighted average PD by bucket of SME turnover

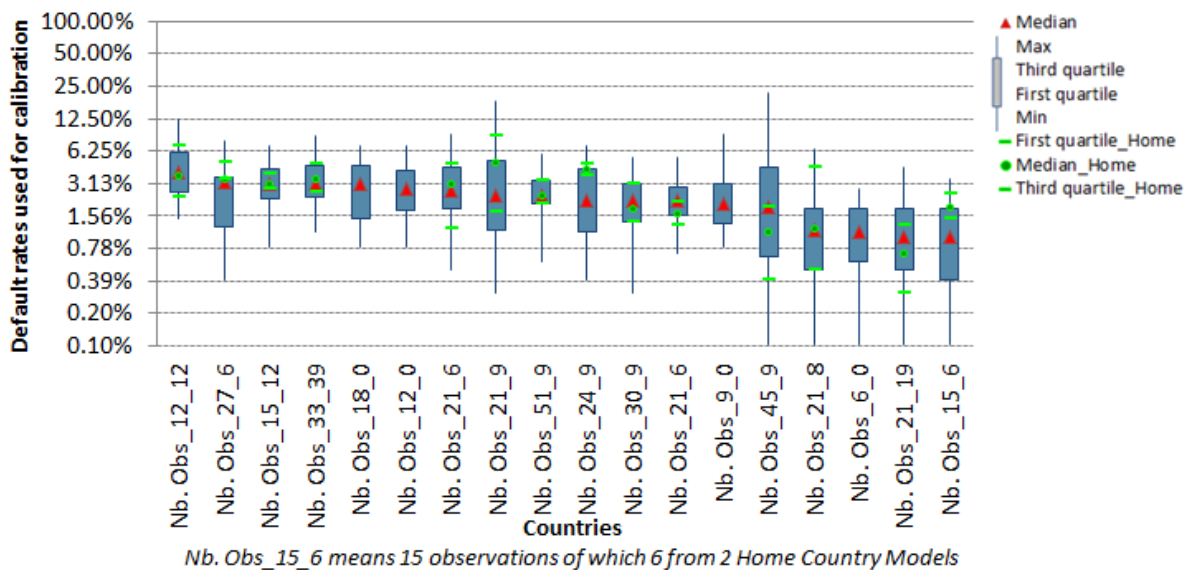


Source: EBA data collection (reference date: December 2012)

PD versus default rates

As in Figure 16, we have used all available information at model level on default rates used in the calibration (minimum and maximum default rates as well as the case-weighted average default rate), looking at all the banks of the sample and only at the home country banks.

Figure 52: Default rates used for model calibration reported for the SME Corporate portfolio, by country



Note: The countries are sorted by their median

Source: EBA data collection (reference date: December 2012)

In Figure 52 we see a high differentiation among countries in terms of the median of default rates which ranges from 1% to 4%.

When focusing on the home banks, we see that their influence varies in different countries.

The conclusions drawn for RM portfolio also apply for SME Corporate portfolio:

- default rates used in the calibration differ across countries;
- some countries have a large spectrum of default rate used in the calibration (may be due to more stressed period included in the data series);
- the characteristics of home banks compared to host banks differs across countries.

In Figure 53, we see that the correlation between observed default rate in 2011 and EAD-weighted average PD in 2012 is not very strong, with several observations having lower PD compared to their observed default rate. Furthermore, this feature is driven by some banks rather than by the country of exposure. This could be an indication that for the SME Corporate models the last observation plays a smaller role in the determination of the PD than for the SME Retail models. This feature may be influenced by the time series or cyclicity of the models (more details are provided in Section 8.4)

Compared to the SME Retail models we see a wider range of PD in 2012 and observed default rate in 2011.

Figure 53: Comparison of the observed default rate in 2011 and the EAD-weighted average PD in 2012, logarithmic scale



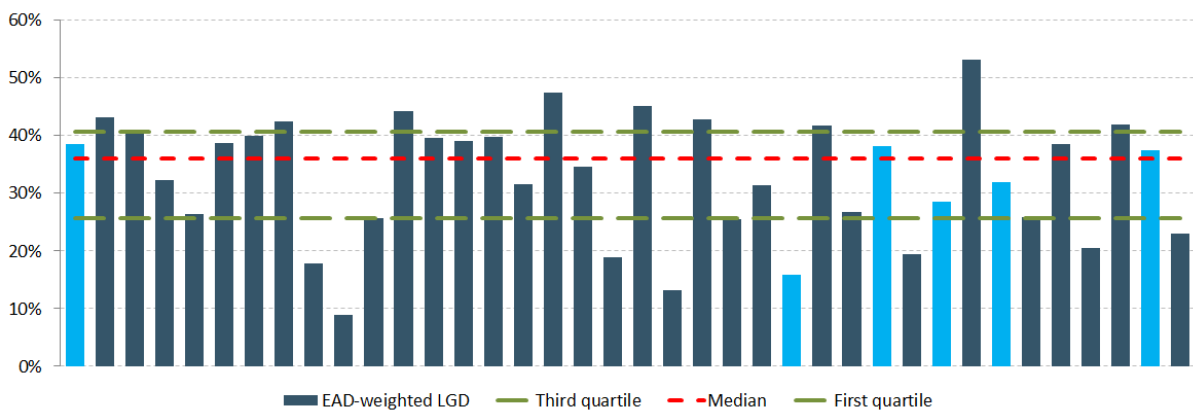
Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures
Source: EBA data collection (reference date: December 2012)

7.3 LGD

7.3.1 Banking group

In Figure 54 we can see that the median of the LGD is almost 10% higher for the SME Corporate (36%) than for the SME Retail (27%). This is partially due to the impact of the FIRB banks that typically have higher LGD.

Figure 54: EAD-weighted average LGD, SME Corporate, IRB non-defaulted exposures, by bank



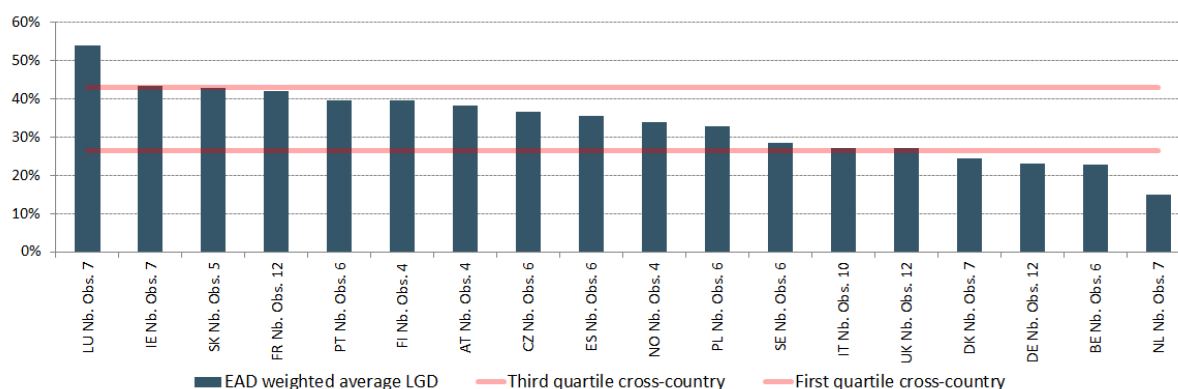
Note: Banks are sorted by their EAD-weighted average PD. In light blue the banks that have reported using a LGD floor.

Source: EBA data collection (reference date: December 2012)

7.3.2 Country level

At country level, we can see that five countries (LU, IE, SK and FR) have an EAD-weighted average LGD around or above 43% (representing the third quartile of the LGD distribution cross-country), whereas DK, DE, BE and NL have an average LGD equal or below 27% (representing the first quartile of the cross-country LGD distribution).

Figure 55: EAD-weighted LGD, SME Corporate, IRB non-defaulted exposures, by country



Note: Banks are sorted by their EAD-weighted average LGDs

Source: EBA data collection (reference date: December 2012)

7.3.3 Possible LGD drivers

Variables used

Regarding the main risk drivers for the segmentation of their LGD models, banks report mostly using the type (60% of the banks) and value of collateral (48%), the guarantee (50%) and the country of exposure (43%). The facility type, the economic activity or the seniority claim are used by 30% of the banks. Maturity is also reported as a risk driver but is used by only a minority of banks (5%).

Type of collateral

Figure 56 reveals a high proportion of unsecured exposures across the banks using FIRB as the main approach. On average, more than 60% are unsecured exposures. As expected, LGDs applied under this approach do not vary a great deal, despite the high variability seen in collateral types.

Figure 56: SME Corporate, EAD-weighted LGD and EAD-distribution by collateral type, FIRB non-defaulted exposures

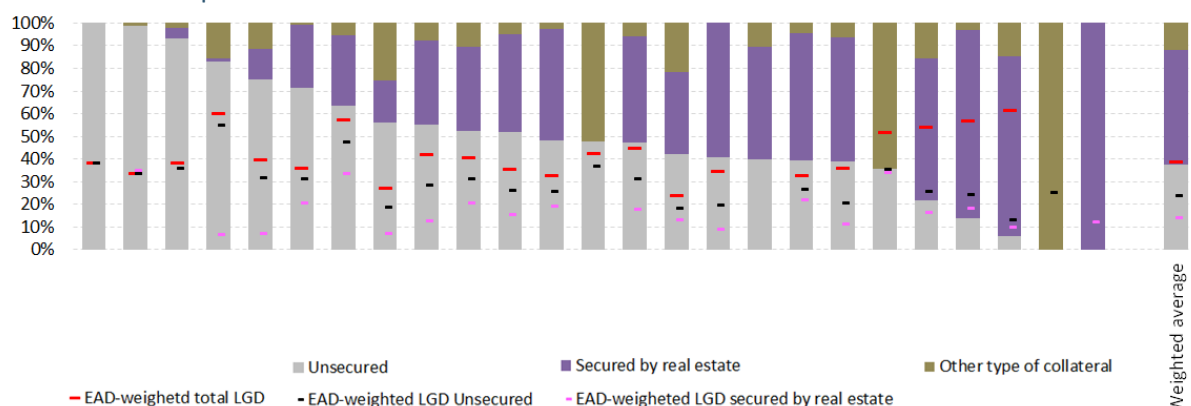


Note: Banks are sorted by their portion unsecured

Source: EBA data collection (reference date: December 2012)

Under the AIRB approach, we can confirm in Figure 57 that there is a much more significant distribution across banks, both in terms of collateral type and the related LGDs. The proportion of secured exposures is substantially higher under this approach, reaching above 60% of the EAD. Furthermore, there are some banks that have a low LGD (around 10%) for secured by real estate.

Figure 57: SME Corporate, EAD-weighted LGD and EAD-distribution by collateral type, AIRB non-defaulted exposures



Note: Banks are sorted by their portion of unsecured exposures

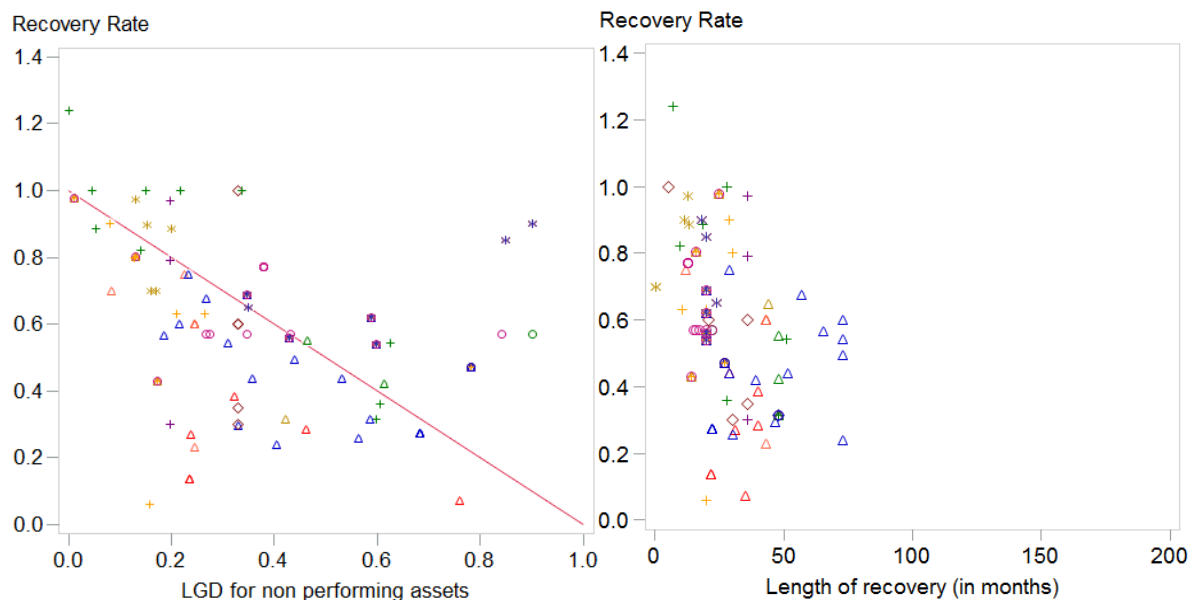
Source: EBA data collection (reference date: December 2012)

Recovery

The recovery rate and the LGD for the non-performing assets do not seem to be strongly linked for the SME Corporate models. It may be due to differences between observed values and estimated values and also differences in the definition.

Moreover, when comparing the recovery rate with the length of recovery, we do not see a strong relationship between those two variables. However, we see some country specific situation, with blue and green triangles country having longer length of recovery.

Figure 58: Comparison of the observed recovery rate and length of recovery (in months) for non-cured assets compared to the LGD for non-performing assets in 2012



Note: The colour and shape of dot represents one country; several models are reported by country of location of the exposures

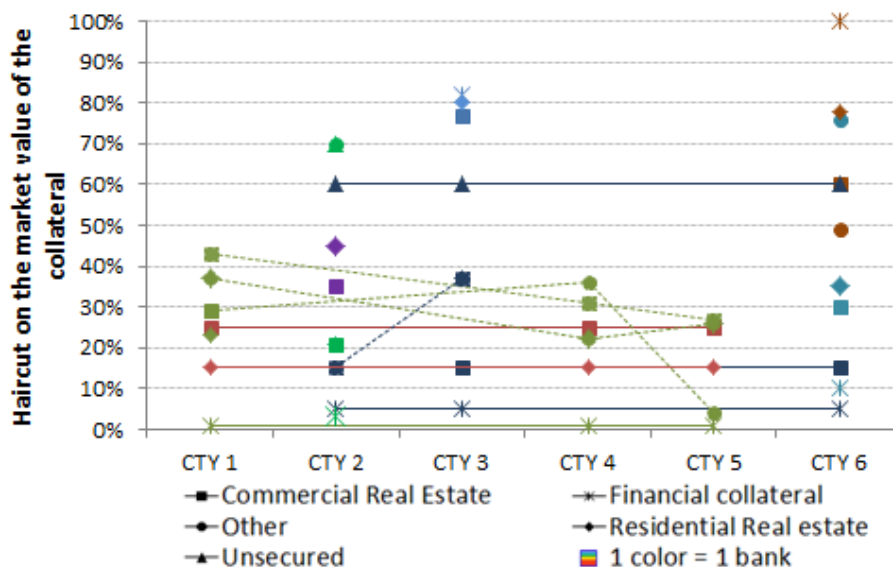
Source: EBA data collection (reference date: December 2012)

Haircut on the market value of the collaterals, SME Corporate portfolio

In this subsection we focus on six countries where the different types of collateral for the SME Corporate portfolio seem more relevant. We see that within one country different types of collateral are used (different shapes of dot) and have very different levels of haircut, financial collateral having the lowest level of haircut.

The different levels of haircut seem to be driven by the banks and the type of collateral, rather than the country. We see that for the same type of collateral some banks have the same haircut value across the country (for example, the dark blue bank), but those haircut values are very different from other banks for the same type of collateral (e.g. square dot for commercial real estate).

Figure 59: Haircut on the market value for the SME Corporate portfolio, by type of collateral, subset of countries (with at least five observations) and by bank



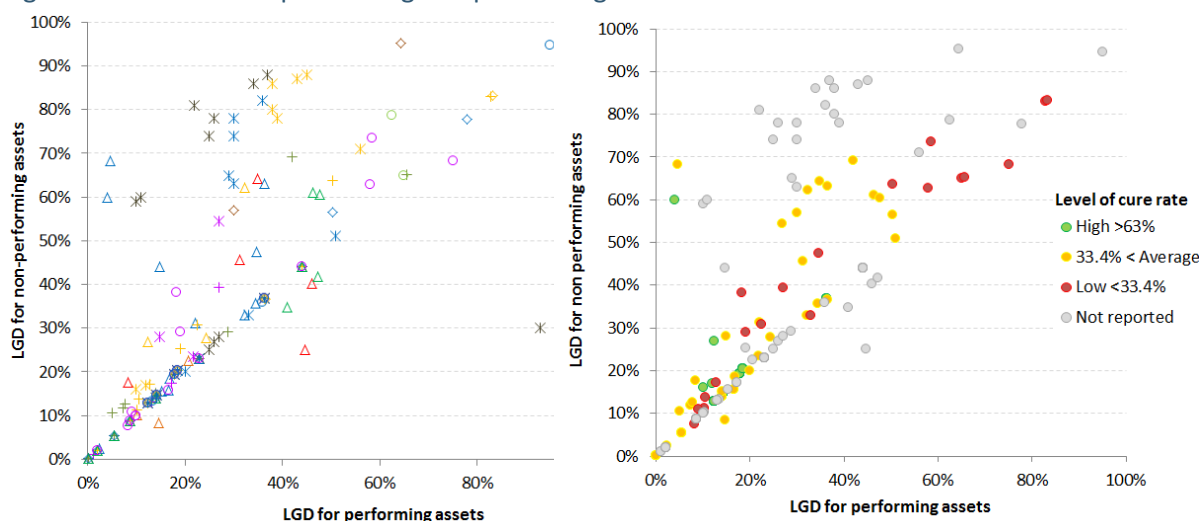
Source: EBA data collection (reference date: December 2012)

LGD for non-performing and performing assets and cure rates

In Figure 60 we study the relationship between LGD for performing assets and LGD for non-performing assets. We see that for most of the models the LGD for non-performing asset is higher than that for performing assets, although there are some exceptions, as full workout procedure may allow banks to have a higher recovery rate (lower LGD).

The cure rate gives the percentage of loans which begin to perform again. If this rate is high the probability of becoming non-performing falls. A higher cure rate may lead to a higher LGD for the performing assets, as the conditions to cure may be easier to achieve. However, we do not see a strong relationship between the observed cure rate and the LGD for performing assets. This means that the cure rate is not a main driver for the LGD for performing assets but that other components may also be important.

Figure 60: LGD for non-performing and performing assets and cure rates

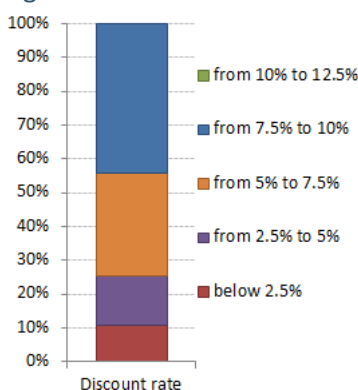


Note: The colour and pattern of the dot represents one country, several models are reported by country of location of the exposures
Source: EBA data collection (reference date: December 2012)

Discount rates

The discount rates for the SME Corporate portfolio have a wide range of values across the LGD models, as observed for the RM portfolio. The large range of values may explain some differences in the final LGDs estimated by the banks, but may also reflect the real difference in products and especially the length of recovery.

Figure 61: Distribution of discount rates used across the sample of LGD models



Source: EBA data collection (reference date: December 2012)

7.4 Maturity

The maturity profile of exposures may play an important role in explaining the variability in RWs, as it is an input into the IRB capital requirements corporate asset class, contrary to the SME Retail and RM classes. Broadly speaking, longer maturities result in higher capital requirements because there is a greater potential for longer exposures to migrate into worse grades. However, the potential use of either the foundation approach (or implicit maturity), in which maturity is generally assumed to be 2.5 years, or the advanced approach (or explicit maturity), in which the remaining

contractual maturity is used, usually with a floor of one year and a cap of five years, has to be kept in mind.

As we can see in Figure 70, the maturity profile is quite similar across categories of exposures, and therefore does not influence the RW variation across banks as such.

However, the different use of the implicit versus the explicit maturity approach might well explain some differences at the banking group or at the country level. Most of the banks make use of the explicit approach, and only a few make use of both. The use of the implicit approach seems to be concentrated in some countries (e.g. SK, FI and PT). Figure 64 shows that the EAD-weighted maturity is higher under the explicit approach.

Figure 62: Distribution of the EAD-weighted maturities (FIRB and AIRB) by type of exposure for the SME Corporate portfolio

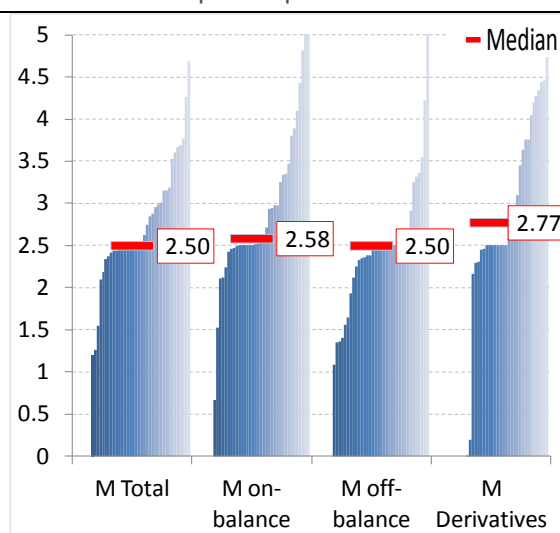
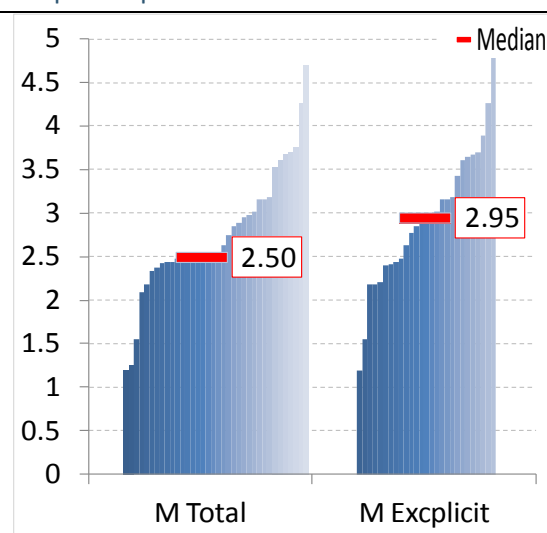


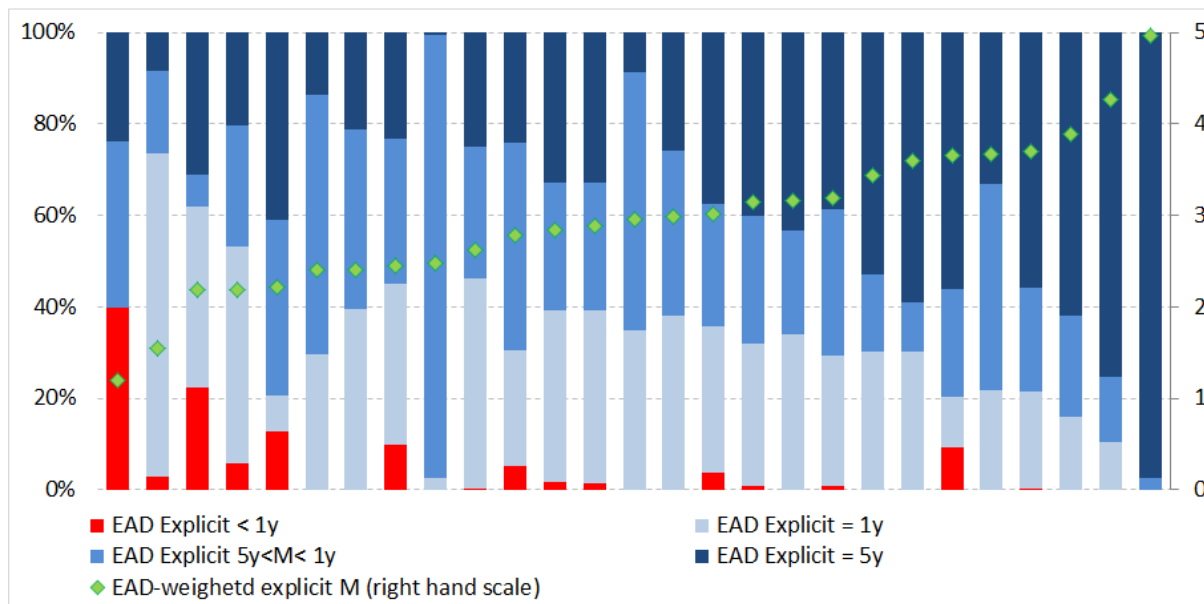
Figure 63: Distribution of the EAD-weighted maturities by type of approach for the SME Corporate portfolio



Source: EBA data collection (reference date: December 2012)

The distribution across banks is a result of the maturity structure of banks' exposures and is based on the different methods banks use to calculate maturity.

Figure 64: Spread of total EAD with explicit approach by maturity buckets and EAD-weighted average maturity



Note: Banks are sorted by their EAD-weighted maturity

Source: EBA data collection (reference date: December 2012)

7.5 Conclusion for the SME Corporate portfolio

In this section we analyse the distribution of RWs. Further investigation is still needed but at this stage it is already possible to see that the geographical mix and the level of collateral play an important role in explaining the level of RWs, PDs and LGDs. Nevertheless, inherent to the use of internal models the components used for calibrating PD and LGD seem also to reflect the banks' individual characteristics and experience (length of time series, last observation, cure rate, length of recovery, etc.). For the SME Corporate portfolio, the difference in maturity may play a role, as may the use of the foundation or advanced IRB approach.

8. General features of the IRB models as the source of differences

8.1 Mapping of exposures

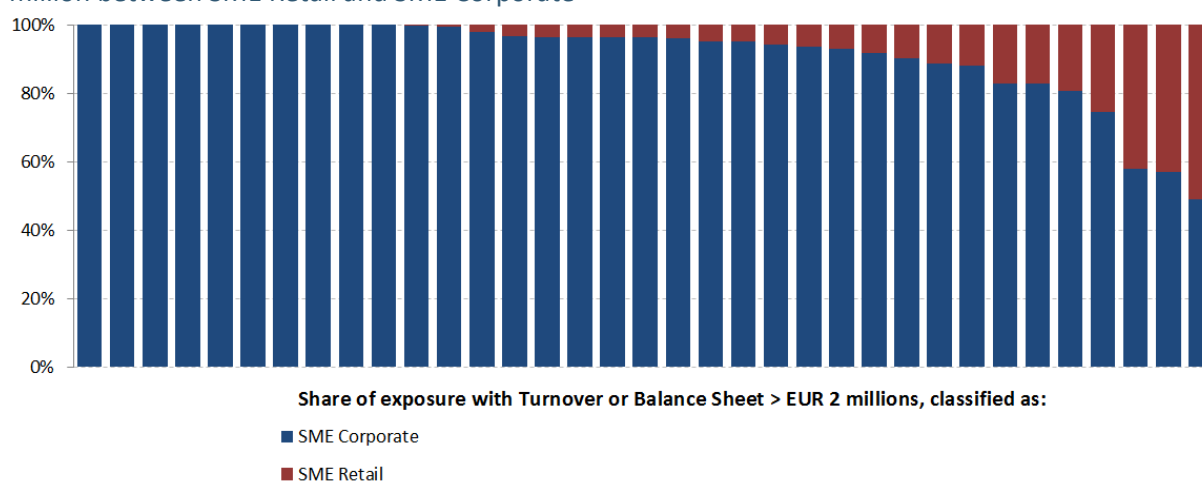
8.1.1 SME Corporate versus SME Retail

To distinguish between the regulatory portfolios SME Corporate versus SME Retail, most banks use a combination of the exposure amount and the turnover/total assets as defined by the CRD.

For the latter, the turnover is generally preferred to the total assets³⁵, which is used as a fall-back for specific industrial sectors.

Nevertheless, the thresholds provided by the CRD seem to lead to some inconsistencies across banks as Figure 65 shows. Some banks categorise similar small exposures all under SME Corporate, while some others consider only the SME Retail. These inconsistencies across banks might have affect the comparability of their exposures.

Figure 65: Classification of small SME exposures with turnover or balance sheet above EUR 2 million between SME Retail and SME Corporate



Note: Banks are sorted by their share of SME Corporate

Source: EBA data collection (reference date: December 2012)

Another example of this issue related to the mapping of exposure is shown in Figure 66 and Figure 67, in which the average RW for exposures related to SMEs with a turnover below EUR 2 million are shown, under the SME Retail, SME Corporate and an aggregated view.

³⁵ Total assets is rather used as 'fall-back' criterion when no turnover data is available for example, or when there is a more meaningful indicator available.

Figure 66: Average RWs for SME exposures with a turnover below EUR 2 million

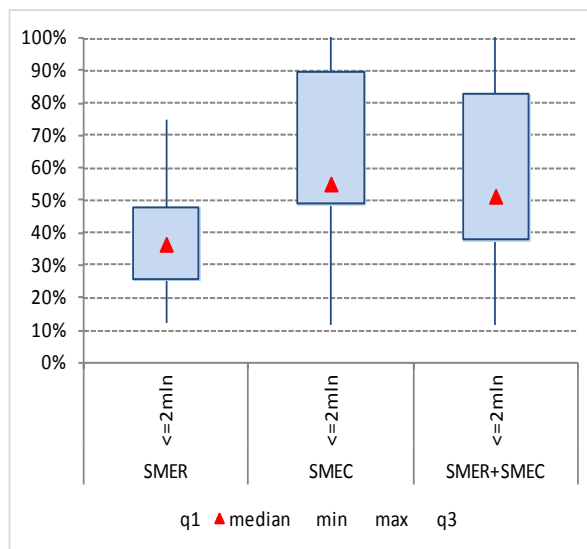
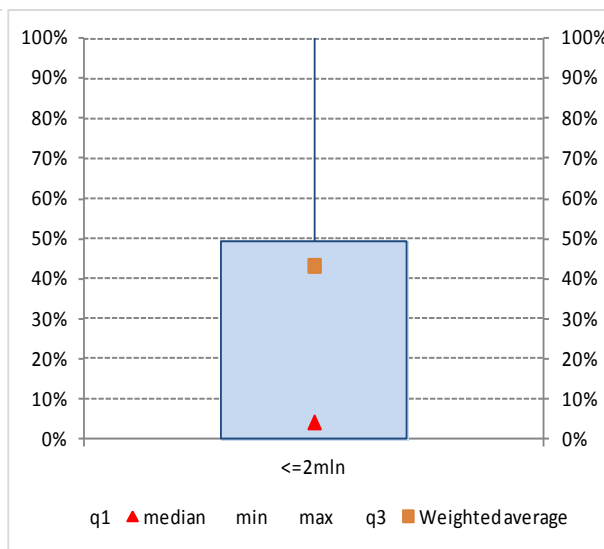


Figure 67: Proportion of exposures on SMEs with a turnover below EUR 2 million reported under SME Retail.



Source: EBA data collection (reference date: December 2012)

A large majority of the banks reported they apply the same definition of SME Corporate across the different jurisdictions where they have exposures. When there are some differences, these are based on the application of different thresholds/product approaches reflecting local markets characteristics. As regards the stability of the portfolio allocation, the majority of the banks automatically reclassify their SME Retail exposures as SME corporate if there is any breach of the pre-defined boundaries. In a few cases, the banks reported the application of additional criteria based on the objective/subjective stability of the changes noted.

8.1.2 Secured by real estate

The exposures included in the regulatory portfolio retail secured by real estate are mainly described by the banks as mortgages or credit/loans contracted to finance real estate.

Nonetheless, regarding the RM exposures some banks reported also making use of the substitution approach and transferring some 'retail exposures secured by real estate' into other exposure classes. This substitution issue will be further investigated in the next report, looking at, for example, exposures guaranteed by financial institutions and governments. Other banks reported classifying some of these exposures as 'other retail'. This was particularly so for contracts with only a mortgage mandate, for exposures above the threshold for secured value, for investment loans, for non-residential exposures, or based on an explicit decision taken by the national supervisor.

8.2 Partial use

The proportion of exposures in roll-out varies significantly across banks and across the different portfolios, this percentage being higher for SME portfolios with some banks still having more than

50% of their exposure under SA for these portfolios. Nevertheless, a large majority of banks report these roll-outs will be completed by December 2015.

Quite a significant number of banks reported having received the authorisation for a permanent partial use treatment. The amounts also vary across banks and portfolios, but are less significant than exposures reported as being in roll-out. Most of the time, non-significant portfolios/business units and exposures in host countries are the reason for this.

Apart the exposures in permanent exemption or in roll-out, some banks also reported holding some exposures in partial use for other reasons. Such 'other' exposures are mainly unrated, exposures not included in any roll-out plan, immaterial exposures in foreign subsidiaries or in associated companies (no check).

8.3 Floors

8.3.1 Regulatory floors

The survey highlighted the existence of different practices in the application of the regulatory floors. The most notable difference is about the application of the minimum LGD floor for exposures secured by residential properties. About a half of the banks reported applying this LGD floor at account level and the other half at (sub) portfolio level (few of them compute also a floor of 5% LGD at account level), the former approach being clearly more conservative than the latter but the materiality of such inconsistency is difficult to assess

Other specific cases regarding the application of the minimum 10% LGD floor are about the computation of an total LGD (exposure weighted average between the secured LGD and the unsecured LGD) and the exclusion from the floor of state-guaranteed mortgages.

8.3.2 Banks own IRB parameter floors

According to the answers provided by the banks, the application of voluntary internal floors on PD and LGD reflect decisions taken during the development phase of the models to introduce additional conservatism to deal with limitations in the time series, avoid counterintuitive parameter estimates (such as not using positive LGD values to cover internal and legal costs, even for over-collateralised exposures), unrealistic PDs for SMEs, and to cope with some issues in the calibration of the models. Nonetheless, these types of floors do not appear very common across the banks and only in a few cases do they appear potentially material in creating significant RW variation. In general, banks' floors appear more relevant for LGD SME Corporate and SME Retail.

It is complicated to disentangle the impact of specific floors used by banks on their LGD and PD parameters from the layers of conservatism that (some other) banks use when estimating the different sub-components from the models.

8.4 Calibration details

8.4.1 Number of models

In the bank sample, we noticed a wide range of segmentation practices for the models. Some banks report using only one model by country, while others may use up to thirty-three models for a given country. In our data collection we focus on the three predominant models in a given country. These three models cover over 80% of bank’s exposure for 96% of the PD models for RM portfolio, 88% for the SME Retail portfolio and 82% for the SME Corporate portfolio. The coverage of these three models may demonstrate that some models cover a rather limited share of exposures.

Figure 68: Statistics about the number of models by country across the sample

Model	Statistics	RM	SME Retail	SME Corporate
PD model	Minimum	1	1	1
	Average	4.2	5.3	5.7
	Maximum	20	20	33
LGD model	Minimum	1	1	1
	Average	2.9	3.2	3.4
	Maximum	19	13	13

Source: EBA data collection (reference date: December 2012)

8.4.2 Data used for the calibration of the risk parameters

Most banks make use of internal data. If banks make use of external data they do so (except very few cases) in combination with internal data³⁶. External data seem to be more important for PD models than LGD and CCF. With the possible exception of the LGD models for SME Corporate the approach followed by the banks is quite consistent across portfolios.

³⁶ No further information on the type of combination was asked of the banks.

Figure 69: Source of the data used for PD and LGD calibration

	RM	SME Retail	SME Corporate
PD			
Internal data	66.7%	57.5%	66.7%
External data	0.0%	7.5%	0.0%
Combination	33.3%	35.0%	33.3%
LGD			
Internal data	71.8%	84.0%	78.6%
External data	0.0%	0.0%	0.0%
Combination	28.2%	16.0%	21.4%
CCF			
Internal data	89.7%	85.0%	91.3%
External data	0.0%	10.0%	0.0%
Combination	10.3%	5.0%	8.7%

Source: EBA data collection (reference date: December 2012)

8.4.3 Time series

One source of difference between banks may also come from discrepancy in the use of time series when developing and calibrating their PD and LGD models. We have investigated this by looking at model development and the last calibration dates as well as the length of the time series used and the number of distressed years included.

PD models

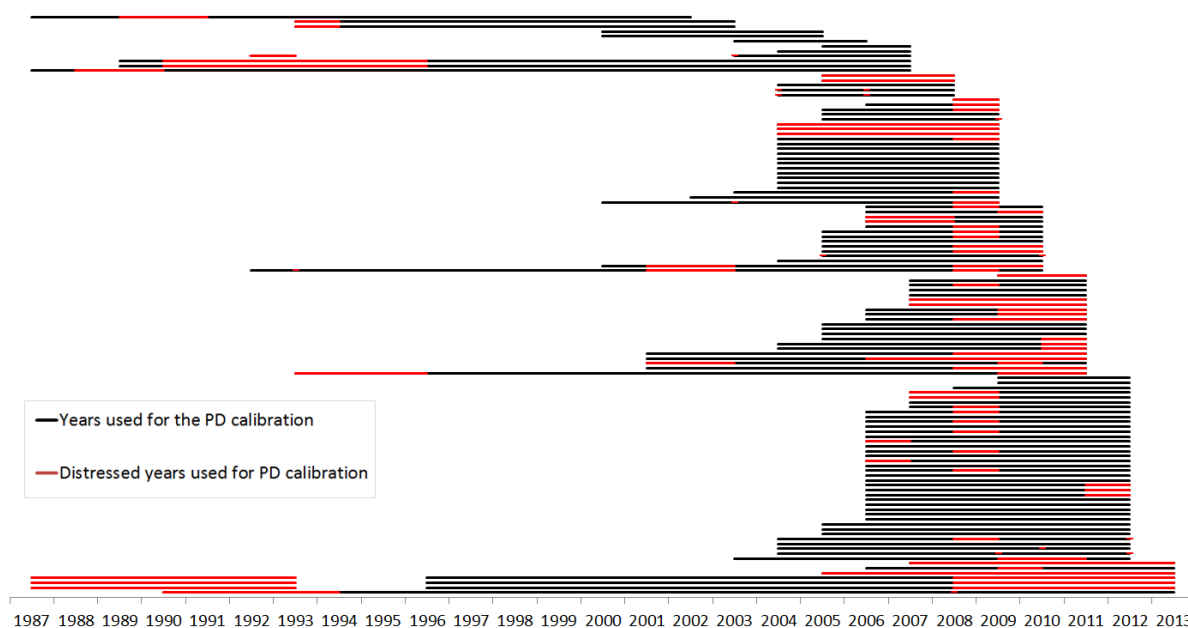
Our study shows that although the PD models were developed over a different time frame (half of the models were developed after 2009) they have mostly been re-calibrated in recent years. In terms of development, we see a slightly longer time series for the SME Corporate portfolio, the time series being longer than five years for only a third of the PD models examined and slightly shorter for the RM and SME Retail portfolios. This ratio rises to 70% for the time series used in the last calibration (again, slightly lower for RM and SME Retail).

Figure 69 shows the time series used by the banks for their PD models on RM exposures, the red sections being the ‘distressed’ years³⁷. Few banks have reported models with a time series below

³⁷ Some banks did not report ‘distressed’ years, but this could be due to reporting issues rather than the absence of distressed years in their time series.

the regulatory 5 years length; this is link to the use of a PiT or hybrid approach for calibration and could reveal a practice to overweight the most recent years, rather than a break in compliance with the regulatory length of time series. The weight applied to the different years will be further investigated as it is also relevant for very long time series.

Figure 70: Time series used by the banks for PD model calibration- RM



Note: Information at PD model level. Models are sorted by most recent year used for calibration

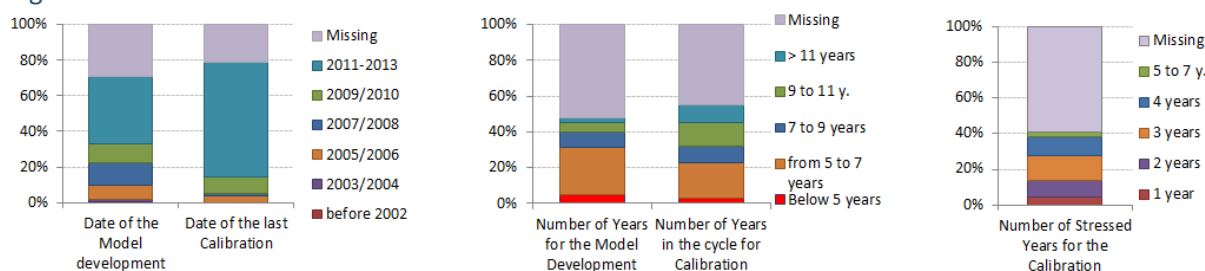
Source: EBA data collection (reference date: December 2012)

LGD models

The LGD models have similar features to the PD models, although a higher proportion of models have been developed and recalibrated in the recent years. This may explain the longer time series pattern than for the PD models (60% of the models, for which data have been reported, having time series greater than 7 years for model calibration).

Figure 71 shows some statistics for the reported data on time series for LGD calibration for the RM portfolio. The figures are more or less the same for SME Retail and SME Corporate portfolio.

Figure 71: LGD data characteristics – RM³⁸



Source: EBA data collection (reference date: December 2012)

8.4.4 Cyclicity assessment of the PD models

Figure 72, Figure 73 and Figure 74 show the bank's assessment of the cyclicity of their PD models. Comparing the three graphs it is clear that the assessment is very similar for the SME Retail and the SME Corporate portfolios, and slightly different for the RM portfolio.

From the banks' assessments, around 40% of the RM models are based on a hybrid approach, 35% on a point in time (PiT) approach and 15% on a through the cycle (TTC) approach. For the SME Retail and SME Corporate models, the portion of PiT decreases to around 10%, 35% of the models being reported as TTC and around 45% reported as hybrid.

However, when banks answer about the observed level of cyclicity, the figures are very similar for the three portfolios, the RM portfolio having the same portion of models (circa 20%) with a level of cyclicity below 10% (and thus closer to a TTC approach).

This supports the idea that banks have different definitions of what is TTC versus PiT versus hybrid, making it difficult to assess the models in terms of cyclicity.

Furthermore, we see that a higher proportion of models (45%) are considered as being at the low part of the cycle (medium-low and bottom), compared to SME Retail and SME Corporate portfolio (circa 30%).

Such variation in these answers may illustrate different practices or perceptions of the banks about cyclicity (we did not backtest cyclicity). The variation may be justified by different customer segment, product or country of exposure within the same portfolio, and as such may explain some variability in PD models.

³⁸ The data are missing partly because of the need to report the information by five different collateral types and not all the banks differentiate their time series in this way.

Figure 72: PD models by rating philosophy, buckets of observed cyclicity across the PD models and by assessment of the current position in the cycle, RM portfolio

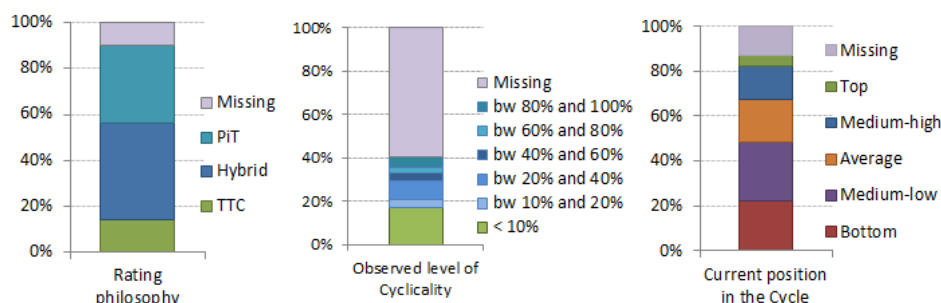


Figure 73: PD models by rating philosophy, buckets of observed cyclicity across the PD models and by assessment of the current position in the cycle, SME Retail portfolio

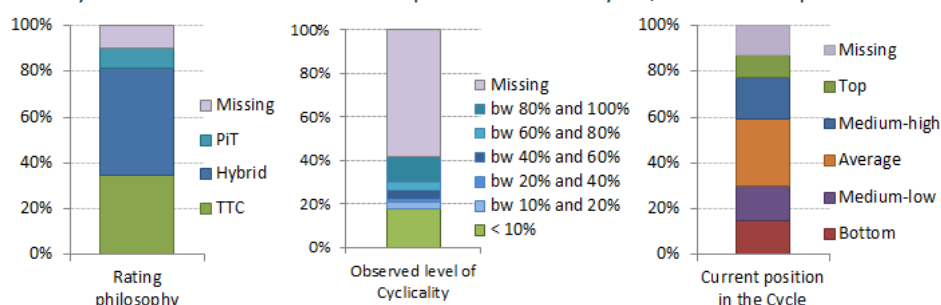
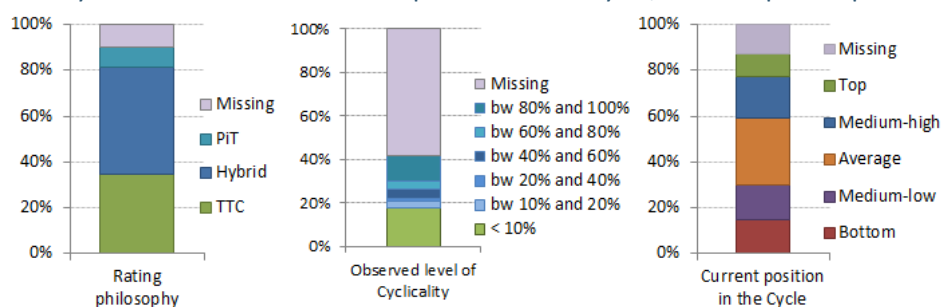


Figure 74: PD models by rating philosophy, buckets of observed cyclicity across the PD models and by assessment of the current position in the cycle, SME Corporate portfolio



Source: EBA data collection (reference date: December 2012)

8.4.5 Master/rating scales

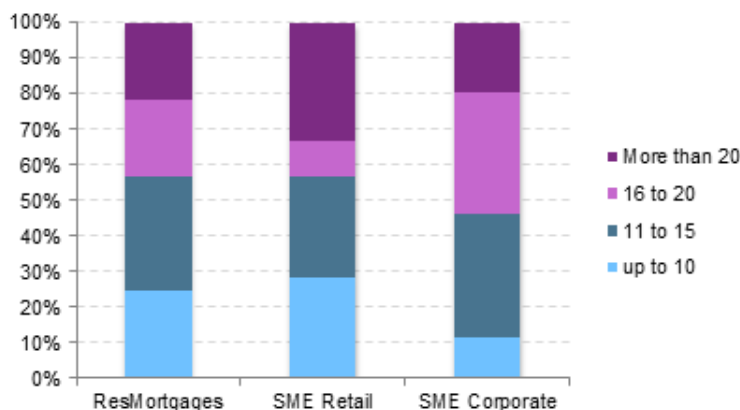
The majority of the surveyed banks use a master scale for the calibration of each regulatory portfolio, this proportion being higher for SME Corporate.

About half of the banks make use of continuous PDs for the computation of the capital requirements. Apart from a few cases, for the computation of capital requirements the banks use the same rating scale used for the calibration of the internal models.

Most banks report that they use only one rating grade scale for the computation of the capital requirements but some banks report that for some regulatory portfolios they use up to six different rating scales.

The number of rating grades (including default) at banking group level is very different among the surveyed banks and in general is relatively large for SME Corporate.

Figure 75: Number of rating grades



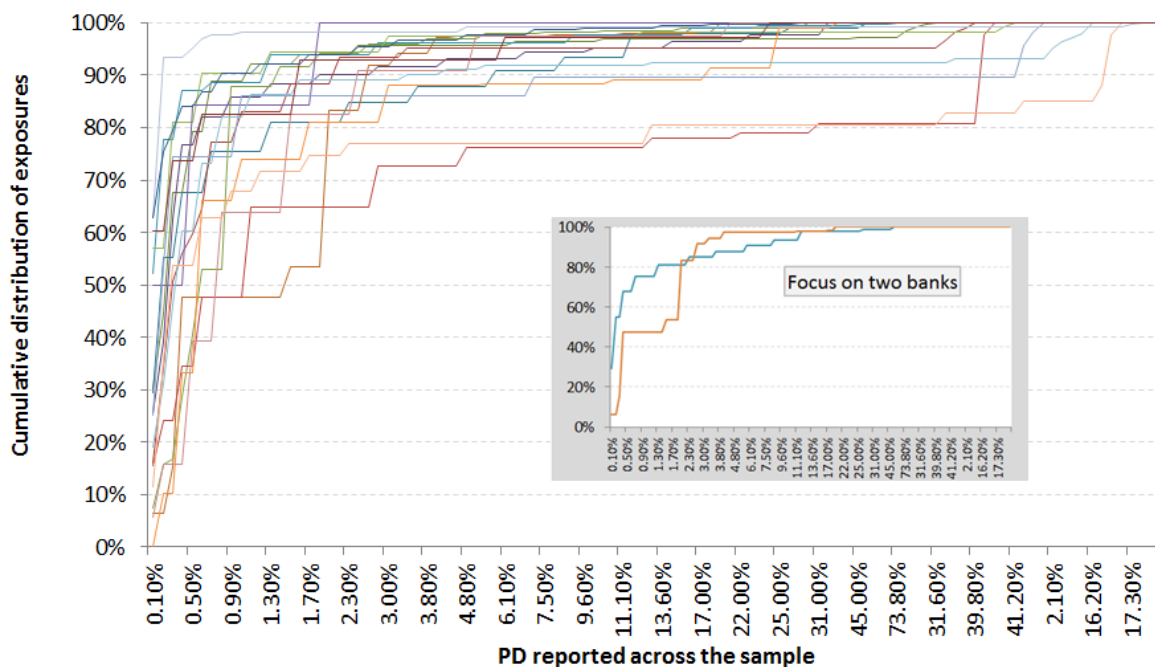
Source: EBA data collection (reference date: December 2012)

Example of the variation of the distribution of exposures across rating scales buckets

In Figure 76 we represent the cumulative distribution of exposures in function of the different rating buckets across a sub-sample of 19 banks. This sub-sample of 19 banks reported fixed PD for their internal rating scale buckets, the x-axis shows all these fixed PD that were reported. These banks also reported the amount of exposures for each of their buckets. The y-axis shows the cumulative distribution of exposures.

Focusing on two banks (shown with orange and blue lines in Figure 76) the former has a cumulative 48% of its exposures in its 0.40% fixed PD bucket (bucket of the bank with the assigned PD at 0.40%), then its cumulative distribution is flat up to the 1.50% fixed PD bucket. The blue bank reports several buckets. The orange bank then catches up with the blue bank, both banks having 80% of their exposures around the 2.30% fixed PD bucket. For the orange bank, the granularity of its rating scale is much lower than for the blue bank, which may affect its RWs, but which might also reflect its portfolio composition or the time series data used.

Figure 76: Comparison of rating scale and distribution of exposures across a sub-sample of 19 banks



Source: EBA data collection (reference date: December 2012)

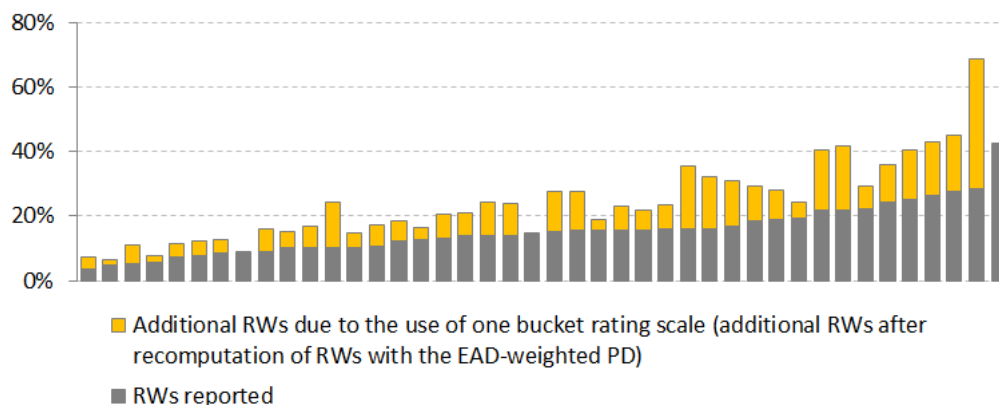
Simple example of the impact of rating scales and distribution of exposures on risk weights

Apart from the wide range of rating grades, the concentration of the exposures towards the best or work rating grades varies a lot across the banks, depending on their models and portfolios, and this materially influences the computation of RWs. This is the part of the diversification in RWs required under by the IRB regulatory framework.

Figure 77, we compare the RWs for the RM portfolio as reported by the banks and those recomputed with their EAD-weighted PD excluding defaults. The RWs reported by the banks take into account the banks' rating scales and the distribution of exposures across the bucket. The RWs recomputed with the EAD-weighted PD (and using its EAD-weighted LGD and the 0.15 correlation coefficient³⁹ for retail exposures secured by immovable property collateral) correspond to the RWs that the banks would have calculated if all their exposures were in only one bucket with the PD assigned being equal to this EAD-weighted PD.

³⁹ Article 153(3) CRD

Figure 77: Comparison of the use of one bucket rating scales and current bank rating scales for RM portfolio, non-defaulted



Note: Banks are sorted by the RWs reported

Source: EBA data collection (reference date: December 2012)

8.4.6 LGD calibration

The majority of the banks define the downturn LGD as an adjustment factor or an add-on to the long-run LGD while the other ones define the downturn LGD regardless of long-run estimates. The approach followed by the banks regarding this downturn concept sometimes varies depending on the country/portfolios. Some banks reported not having a pre-defined definition of downturn conditions but rather used some assumptions to reflect the specific conditions on the impact of a downturn in parameters. Most banks have an own definition of downturn conditions. Although there are some notable similarities in the approach followed by the banks the definition used is very different among the banks.

Most of the banks report that they take into account incomplete workout cases in the calibration of LGD parameter but they do so in very different ways. Some consider the incomplete as complete, assuming they have lost the amount not yet recovered without distinction; others do so but assign a different weight depending on time in default; others use some forecast models.

8.4.7 Cure rate

For about two thirds of the cure rates of banks studied are taken into account in their LGD models; about a half also take account of cure rates in PD and CCF models.

A few banks use different cure rates for differences in default status/category and reported applying adjustment/penalty to the parameters for cured accounts (e.g. delay in the reclassification as performing, penalties to the PD parameters or in the LGD of different magnitude and length of time).

Multiple defaults and cures in the same year are normally treated as one default.

9. Backtesting

9.1 Overview

Most of the banks use a traffic light approach or assign a synthetic judgement to the outcome of the tests. By December 2012, across the three portfolios, a vast majority of the internal models passed the tests without any warnings or actions taken. Some banks still decided to recalibrate or redevelop their models. Regarding this aspect, about half of the banks have pre-defined minimum performance/results levels driving an automatic recalibration. These pre-defined minimum performance standards are normally based on the standards observed during development (e.g. GINI development) and a relative tolerance limit (% change from development). This defines the red amber green (RAG) trigger for the performance metrics.

Most banks conduct their backtesting yearly. This seems to be particularly so for the LGD models; for PD models, the banks backtest more frequently. Most banks use a one-year time window, especially for the PD. For the LGD parameter, the time window seems to be longer, on average, across banks and portfolios.

9.2 Portfolio/pool/grade level

Different approaches exist among the banks in terms of the level of backtesting. While more granular tests (including at grade level) are noted for the PD parameters, backtesting for CCF and LGD models is mostly done at portfolio and pool level. The practice of backtesting PD at pool/portfolio level seems not fully consistent with the regulatory framework. It may hide possible inadequacy of the models by ranking the counterparts and calibration issues at rating grade level. Considering the non-linear PD contribution in the regulatory formula used for computing the capital requirements this looks to be an issue requiring further investigation.

9.3 Cyclicity included in backtesting

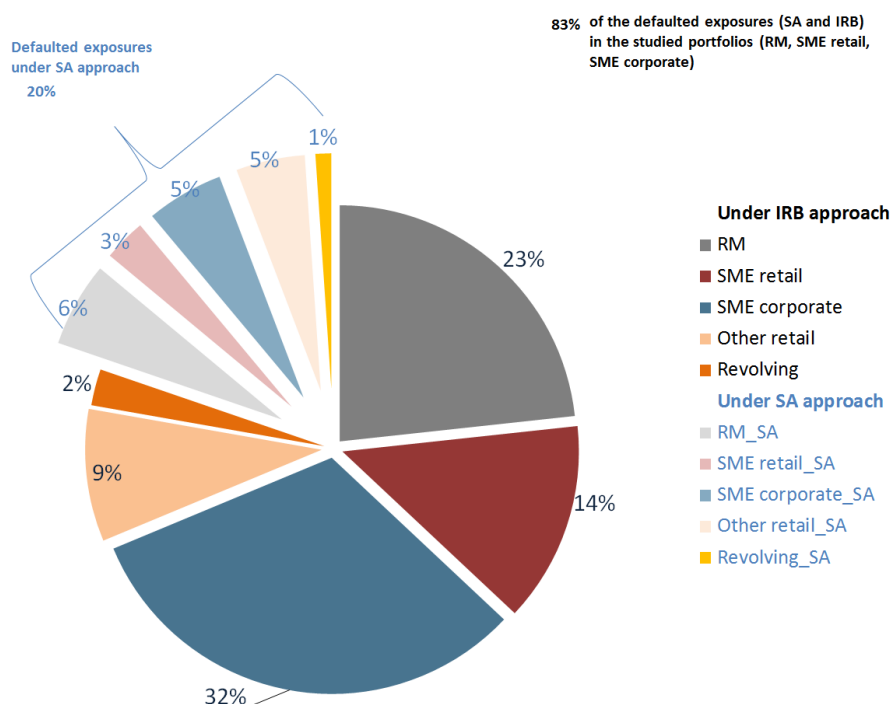
A large number of banks confirmed considering cyclicity in their tests. This is especially so for the SME Corporate portfolio and mostly for PD models. The methodologies used here are not clearly reported by banks but practices range from purely qualitative assessment to the performance of ad-hoc tests.

10. Defaulted assets

10.1 Description of the principal features about defaulted assets

Figure 78 shows the breakdown of defaulted exposures by type of portfolio and supervisory approach. About 20% of the defaulted exposures are treated under the standardised approach. However, this share is higher (more than 30%) for some banks.

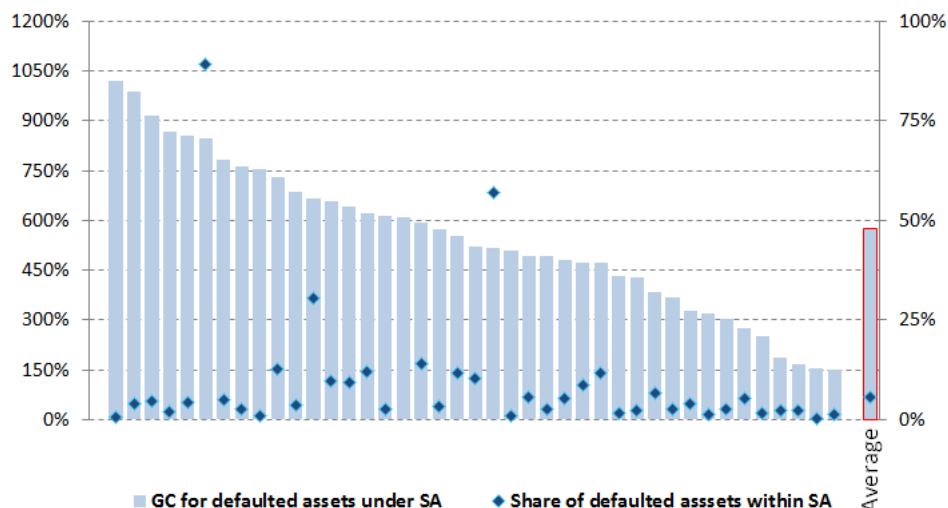
Figure 78: Spread of defaulted assets across Retail and SME Corporate portfolios and supervisory approach



Source: EBA data collection (reference date: December 2012)

The shares of defaulted assets are comparable within the SA exposures (5.1%) and IRB ones (5.2%) as it can be seen in Figure 79 and Figure 80. The GC are however higher on average for SA exposures (around 590% versus 530%). Furthermore, differences in the treatment of defaulted assets can be seen in Figure 80, as for the IRB exposures, nine banks have no RWAs for defaulted assets and only attribute an expected loss to them. Nevertheless, the impact on GC overall is difficult to assess as banks with a high level of GC may also have a low level of RW for defaulted assets. A wide range was seen for each of the three portfolios investigated.

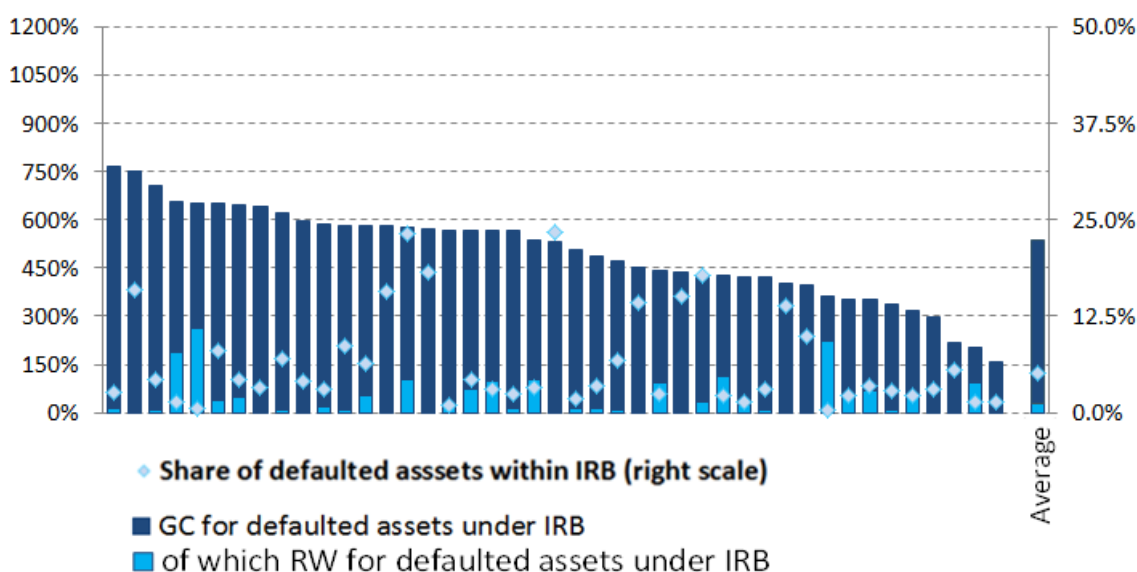
Figure 79: GC for defaulted assets and share of defaulted assets within SA exposures, Retail portfolio and SME Corporate



Note: Banks are sorted by their GC for defaulted assets under SA

Source: EBA data collection (reference date: December 2012)

Figure 80: GC for defaulted assets and share of defaulted assets within IRB exposures, Retail portfolio and SME Corporate



Note: Banks are sorted by their GC for defaulted assets under IRB

Source: EBA data collection (reference date: December 2012)

10.2 Default definition and computation default rate

10.2.1 Unlikely to pay and past-due definition

In general, banks reported applying all the elements mentioned in the Annex VII, Part 4, point 45 of Directive 2006/48/EC when considering that the obligor is unlikely to pay its credit obligations without recourse to actions such as realising security (if held). Only few banks mentioned deviating

for specific country/portfolio exposures. Some banks explicitly mentioned not including forbearance and restructuring events, or some even restrict the default definition to the 90 days past-due.

The number of past-due threshold criteria is applied by all banks and most banks use the 90-day past-due threshold for all the portfolios. However, a few banks differentiate the approach depending on the country of location of the exposures and by portfolio. Some banks reported using a threshold of past-due days higher than 90 days for the RM exposures in some countries; however, such differences may have limited impact owing to the contagion effect. A few banks reported also applying past-due thresholds lower than 90 days.

10.2.2 Materiality threshold and calculation days past due

Most banks reported using materiality thresholds as a minimum absolute past-due amount, which might vary in a bank by country of exposure and portfolio.

Most of the banks have (very) low thresholds for their RM exposure (less than EUR 250) and higher ones for their SME Corporate ones (e.g. set at minimum EUR 10 000 for a quarter of the sample) and SME Retail ones (e.g. EUR 1 000 for 50%). Finally, some banks rather define this threshold as a percentage of exposures.

The minimum number of payment terms past due as a materiality threshold is used by only few banks. Residential mortgage is the portfolio for which this is appears to more recurrent, and differentiated by country. Nevertheless, most banks apply the materiality thresholds above in combination with number of days past due and default is triggered when both criteria are reached.

10.2.3 Forbearance and moratoria

Less than a third of the banks surveyed always consider forbearance (medium/long-term arrangement) and moratoria (short-term arrangement) as a default event but the banks do not follow a consistent approach in the different countries/portfolios. It is difficult to assess if the different approach is more driven by banks' choices than by the different regulatory framework in place.

10.2.4 Calculation of the default rate and treatment of multiple defaults

The large majority of the banks use a common approach in the computation of the default rate (for both the numerator and the denominator), the default rate being defined as 'only new defaults observed during the next 12 months among the obligors that were non-defaulted at the reference date'. Some of the other definitions used refer for example to the inclusion the defaulted exposures in the denominator, the materiality thresholds being taken into consideration or not, or even the treatment of multiple defaults which for this later one leaves room for more significant differences in the treatment among banks with an equally split between banks accounting for a given obligor defaulting more than once a year and others not.

10.2.5 Customer versus product

Overall, based on information gathered at the model level, it appears that banks make much more use of the customer default definition than a product one. We find a mix of approaches within each country, except Poland where only a customer approach is used. When linking this definition of default used by the banks with PD⁴⁰, there seems to be an overall correlation at each country between a product approach and a higher PD than when using a customer approach. It seems that banks with the highest EAD-weighted PD at the banking group level reported using a product approach beside. Nevertheless this finding might be tenuous as one of the banks with the lowest PD at the banking group level also reports making use of the product definition. This aspect will be further investigated in the next report along with the banks' answers on the contagion and compensation effects.

10.2.6 Contagion

When the customer definition is used, the cross product default is applied in very different ways. About one third of the banks say it covers all related customers (especially for the residential mortgage exposures, while this is less so for the SME exposures), another third say it covers only the main customer, and the rest use other approaches.

10.2.7 Use and classification

Generally, the same definition of default is used for the classification of the defaulted assets and the calibration steps.

The use of a different definitions of default for classification and for calibration is explained by the exclusion of technical defaults⁴¹ (in line with national discretions and to better identify 'true default') in the calibration steps, inclusion of restructured mortgage in defaulted assets or the absence of materiality threshold solely for the calibration phase

About 40% of the banks reported also classifying defaults by different status/category for different severity of defaults (e.g. 90 days overdue, unlikely to pay, non-curable, liquidation and bankruptcy) and this is materially influenced by the national reporting systems and supervisory practices.

10.3 Treatment of defaulted assets

10.3.1 Computation of the EL best estimate (ELBE) on defaulted assets

The variation observed in the calculation of the ELBE on defaulted assets is wide. The main approach followed by the banks is the use of the specific provision /incurred losses as the best

⁴⁰ Done with EAD-weighted and case weighted PD 2012.

⁴¹ Technical defaults are loans that are beyond the past due criterion and thus automatically classified as default. However looking at the objective criteria and historical observations they are not considered as high risk. They are thus excluded to the number of defaults for the calibration step. This is an important retreatment as the technical defaults may represent up to 20% of the number of defaults.

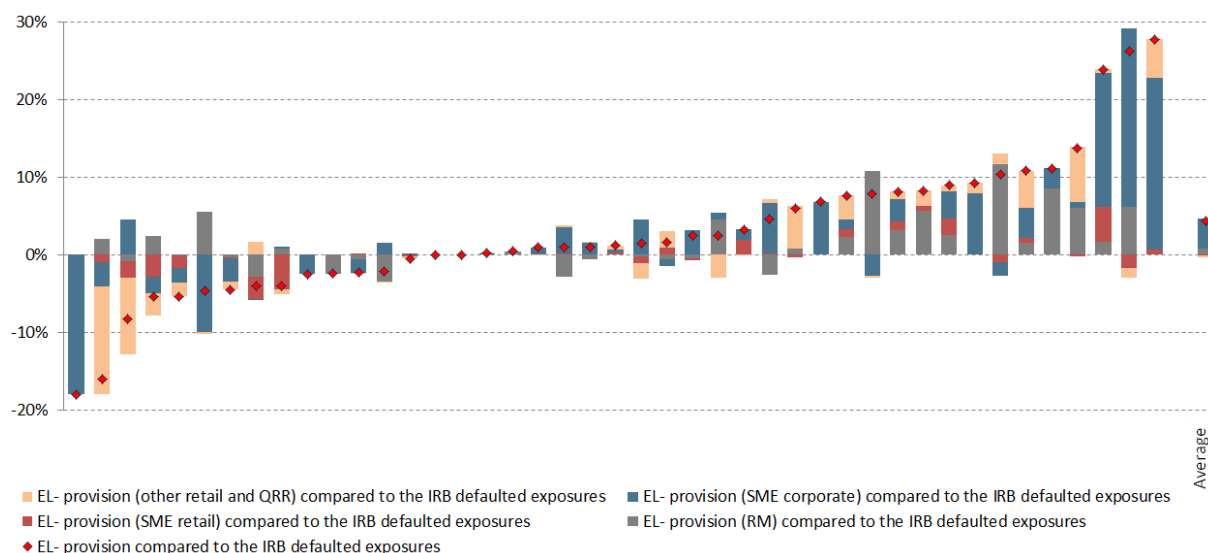
estimate, to which some banks also apply an add-ons⁴² (e.g. risk provision rate plus 1% fixed add-on for uncertainty subject to a minimum of 5% and a maximum of 100% risk provision rate). Other significant approaches reported are the use of the downturn LGD and more severe calibration of the parameters (compared to the downturn LGD for example) applied in the estimate. The time in default might also be used to calculate this ELBE.

To illustrate the differences in those practices, we use a ‘defaulted IRB shortfall ratio’ defined as the difference between EL and provisions (no inclusion of general provision of the overall portfolio level); expressed in percentage of the defaulted assets⁴³.

In Figure 81, we see that this ‘defaulted IRB shortfall ratio’ varies from -18% to 28% with an average of 5%, so the impact of the different portfolios is very bank specific. For the average bank, most of the positive ‘defaulted IRB shortfall ratio’ is due to the SME Corporate portfolio; this means that across the sample, the SME Corporate portfolio has a positive ‘defaulted IRB shortfall ratio’, while for the other portfolio, the impact levels out between banks.

It is also interesting to note that five banks have a shortfall close to zero, meaning that they aligned their EL almost perfectly with their provisions.

Figure 81: Comparison of EL BE and provisions for defaulted assets and expressed in percentage of the defaulted assets with breakdown by sub-portfolios, IRB Retail and SME Corporate portfolios



Note: Bank are sorted by their overall shortfall for retail portfolio under IRB

Source: EBA data collection (reference date: December 2012)

⁴² The most frequent source of difference reported by the banks is about the inclusion in the ELBE of recovery costs and/or simply the different model used for the calculation.

⁴³ The shortfall at the Retail and SME Corporate portfolios level is the sum of the sub-portfolios; we do not include general provision at the overall portfolio level.

10.3.2 Computation of IRB shortfall

There are significant differences in the methodology used by banks for the computation of the IRB shortfall. The granularity of the computation is a first source of variation. About half of the banks reported carrying their computation of the IRB shortfall at an overall level, while the others ones use the account or the sub-portfolio level. Another source of variation is the compensation of differences between the ELBE and provisions for different defaults status/category, with about half of the banks compensating for any differences between defaulted and non-defaulted exposures. For a few banks, the computation of the IRB shortfall is carried out after any tax effect, producing, in case of a shortfall of provisions, smaller deductions in the computation of the Common Equity Tier 1 and Tier 2.

10.4 Conclusion

The work identified a wide range of practices followed by the banks in the calculations of the IRB shortfall. The issue is also driven by the various interpretation and use of different approaches for the computation of the best estimate LGD on defaulted assets and it is connected to the practices seen in some banks of not computing any RWA on defaulted assets.

11. Summary of the main results and conclusions

11.1 Main results

11.1.1 Evidence from quantitative analysis at portfolio level and first empirical evidence at model level

The top-down approach on SMEs and retail portfolios confirmed the importance of the defaulted assets in explaining a large part (about 60%) of the variation in RWs and EL. The impact of defaulted assets is even more significant in these portfolios than previously observed in low default portfolios. This is due to the fact that the share of defaulted assets is considerably larger in these SME and RM portfolios. The impact of the portfolio mix for non-defaulted assets accounts for about one third of the residual variation after controlling for the defaulted assets. The impact of the partial use of the standardised approach is minor. The remaining two thirds of the GC range for non-defaulted assets is still material and can be attributed to the B-type drivers: differences in underlying credit risk, use of credit risk mitigation, modelling and supervisory practices.

Further analysis showed a positive correlation overall between the banks' average RWs and their historic loss rates for all the three portfolios investigated. There are some outliers, however, where banks with low RWs report relatively high loss rates and vice versa.

Country of location of the exposure is identified as a significant driver of RW diversity. The effect seems to be related to the recent developments in the countries' economic cycles.

Exposures located in countries that recently expressed more stressed conditions, generally obtain higher average RWs. Other country-specific aspects could play a role as well, however, such as the legal framework around repossession and liquidation of collateral. As a few banks have considerable portfolios in several countries however, it is difficult to distinguish between country-specific and bank-specific aspects driving the RW differences.

The variation of RWs between banks within countries remains considerable. The qualitative modelling aspects discussed in the next section, may drive these intra-country differences. Yet, these aspects are also likely to influence differences between countries.

11.1.2 General features related to the use of internal approaches

This section provides a list of practices identified through the analysis of the information collected from the banks regarding their application of the internal approaches that influence the heterogeneity in the capital requirements and expected losses. Some of those are in line with the findings of the LDP study.

Partial use of the standardised approach

The survey confirmed the different materiality of the exposures in permanent or 'roll-out' partial use and also, in a few cases, that there were other important reasons for the treatment in standard such as 'unrated exposures' or exposures not yet included in roll-out plans. The roll-out plans have also a different length.

Definition of default

As largely expected, the study found additional confirmation about the use by the banks of a different definition of defaults (materiality threshold, past-due calculation, unlikely to pay interpretation). The banks use a different definition of forbearance and moratoria, varying practices for the inclusion of such positions in default status, and they deal with forbore exposures still classified as performing in different ways (penalties, minimum PD levels). Banks do use of different formulas for the computation of default rates.

Application of regulatory floors

The survey highlighted the existence of different practices in the application of the regulatory floors (i.e. minimum 10% LGD floor for exposures secured by real estates) with varying approach related to the level of its application (account versus portfolio).

Mapping into regulatory portfolio categories

For SME exposures, these differences seem to be partially driven by heterogeneity in the mapping of exposures to the SME Retail versus the SME Corporate category. The same exposures would

generally receive a higher RW if it were classified as SME Corporates than classified as SME retail. This inconsistent practice seems mainly due but not exclusively to different 'national' implementation of the CRD.

A similar feature exists for the mapping of housing loans not secured by real estate collateral as 'secured by real estate portfolio' or 'other retail'; even when housing loans are accompany by public guarantee schemes the substitution effect does not to take place.

Partial credit protection

Although there is no conclusive evidence, the study seems to suggest the existence of different bank practices for exposures only partially secured by real estate. Those differences in practice may harm the comparability of LGD across banks. Indeed, the reporting and the calibration of the LGD parameter varies, with banks applying and estimating different LGDs for the fully secured portion of the exposure and the unsecured one whereas other banks report only a single LGD considering the exposure secured as a whole. The issue is still under investigation.

Use of data: horizon and internal/external

With specific reference to PD models there are different lengths in the time series used and there are different approaches used for integrating internal and external data.

Model review and consequences

There are also different practices in the frequency and triggers for the re-development and the re-estimation of internal models. Some banks have more automatic rules based on the results produced by periodic backtesting and annual validation.

Margin of conservatism

Apart differences in the time series length there is also a different margin of conservatism followed by the banks in the final identification of the long-run PD, with some banks increasing the target value by adding a prudent buffer to the observed default rates. This can be done in different ways (assigning more weight to stressed years, shortening the time series used in the calibration by removing non-distressed years or more simply using expert judgement).

Granularity of rating scales

The survey identified some differences in the number of rating grades and/or use of continuous rating scales. Although the current study did not produce any empirical evidence, those features appear to be a potential source of difference in the RWA outcome and suggest the need to provide some common guidelines regarding the calibration of the rating grade scales used by the banks.

Backtesting

The overall framework applied by the banks for backtesting PD/LGD/CCF models is broadly similar although there are some differences in how the banks deal with cyclicity, trigger/threshold

definitions and use to activate a recalibration/re-estimation of the models, confidence intervals, expert judgement and internal process (granularity and frequency of backtesting).

Country-specific issues

Some banks make use of global IRBA models for exposures located in different countries; usually the models are developed and calibrated to be applied mostly for exposures located in the countries for which they received the initial approval from the local supervisor. The practice is both an opportunity and a challenge as it may be difficult for the banks as there have not enough observations to monitor the performance of the models for such exposures separately and adequately.

LGD estimation (defaulted and non-defaulted)

For the calibration of the LGD on defaulted and non-defaulted assets the banks use different approach regarding the inclusion (how and if) of incomplete workout positions. Different discount rates definitions/levels for the updating of the recovery flows, legal and administrative costs, internal haircuts estimates, repossession likelihood and use/definition of cure rates are other source of variation in the LGD estimates.

The study highlighted the existence of different practices in the estimation of the LGD parameter applied to non-defaulted loans. Some banks do not differentiate the parameter from the one applied to defaulted assets while others do make more use of the likelihood of cure. It is difficult *a priori* to pass any judgement on the most appropriate or conservative approach as the feature must be considered together with the definition of default. The use of a wider definition of default entails higher default rates and ultimately PDs and also a more aggressive use of cure rates in the estimation of the LGDs, with final effects on the capital requirements that cannot be foreseen and require more in-depth analysis on a case-by-case basis.

The banks try to include downturn conditions using broadly similar approaches but with very different outcomes in the materiality of the downturn add-on/conditions in the computation of the regulatory LGD for the computation of RWA. Some banks also periodically fine tune/adjust the parameters reflecting more recent and/or current stress conditions in the market, while others do not change their parameters so often.

Shortfall

The work identified a wide range of bank practices in the calculation of the IRB shortfall. Considering the key role played by the defaulted assets in explaining the variation in the RWs and expected losses, this issue is material. It also seems to be driven by the varying interpretation and use of different approaches for the computation of the best estimate LGD on defaulted assets and it is linked with the practice, as already noted in the LDP study, of several banks not computing any RWA on defaulted assets.

11.2 Conclusions and way forward

The EBA will continue to investigate RWA in its programme of studies. Additional findings are expected from the more detailed investigation of key variables on residential mortgages (LTV, LTI and credit risk mitigations) and from future work on the calibration of banks' PD and LGD models for SMEs and residential mortgages.

Ongoing work on disclosure will continue and the recent EBA transparency exercise is part of this. Ongoing sharing of information and examples of good practice will foster consistent implementation of regulations in the future.

In the medium term, many sources of variation will be addressed by the development of regulatory and implementing technical standards (ITS) related to the use by institutions of the IRB approach for the calculation of RWA, as already envisaged by the CRR and CRD.

The recent introduction by the EBA in the ITS on reporting of dedicated items for 'NPL' and 'forbearance' (not replacing the regulatory definition of default) may help national competent authorities in the supervisory monitoring of dynamics and stocks of exposures in default and provisions, and in understanding the materiality caused by differences in the default definitions and computation of default rates.

The following four priority policy option suggestions should be seen as **potential avenues for future work** by the national competent authorities and the EBA.

1. Enhanced supervisory disclosure and transparency by the banks about RWA-related information. In line with the conclusion of the LDP report, the regular disclosure of time series of statistics of RWs, regulatory parameters and historical observed default and loss rates by country portfolios in order to provide consistent risk references and allow dynamic analysis by third parties.
2. Ongoing support to national competent authorities in the implementation of the upcoming regulation (Single Rulebook) by promoting an exchange of experience and supervisory activities related to the validation and ongoing supervisory monitoring of internal models and promoting the identification and use of good practice including through joint work in colleges; encourage a more rigorous and comprehensive model validation process and backtesting framework to be followed by the banks by promoting the identification and sharing of best practice.
3. Development of additional guidelines and possibly draft technical standards that specifically address supervisory and bank practices and facilitate consistency therein as follows:
 - harmonisation of default definitions and clarification about the expected classification of exposures that are restructured, under moratoria or forborne as defaulted assets; guidance on the treatment of such exposures when still classified as performing loans; a clear harmonised formula for the computation of the default rates, including the computation of multiple defaults in 1 year observation period;

- PD model calibration: guidance on the definition of an economic cycle, the identification of stressed years and how to cope with the absence in the available time series of adequate stress conditions to capture downturn;
 - LGD modelling: guidance on estimation of LGD on defaulted and on non-defaulted assets, including the treatment of incomplete workouts and recovery rate; how to interpret the regulatory framework in order to include downturn conditions in the estimation of downturn LGD;
 - clarification or guidance on the treatment of defaulted assets (RWA, ELBE and IRB shortfall);
 - guidance on the use of global models for exposures located in several countries.
4. Benchmarks on IRB parameter estimates. For example, supervisory benchmarks for risk parameters could be created from the data collected in this study and similar work in the future (see Article 78 CRD on supervisory benchmarking exercise).
- The ongoing EBA work on implementing in 2014 a framework for regular supervisory benchmarking portfolio exercises to support the national competent authorities in assessing the models seems to be key in providing common benchmarks on RWs and regulatory parameters for similar exposures and initiating more detailed investigation, as appropriate. This is also expected foster convergence and harmonisation in supervisory practices.

12. Annexes

12.1 Annex I List of the banks included in the sample

Bank name	ISO code of the country of the home supervisor
ERSTE GROUP BANK (EGB)	AT
RAIFFEISEN ZENTRALBANK ÖSTERREICH (RZB)	AT
BELFIUS	BE
KBC BANK	BE
ARGENTA	BE
AXA BANK	DE
DEUTSCHE BANK AG	DE
COMMERZBANK AG	DE
DANSKE BANK	DK
JYSKE BANK	DK
SYDBANK	DK
NYKREDIT	DK
BANCO SANTANDER S.A.	ES
BANCO BILBAO VIZCAYA ARGENTARIA S.A. (BBVA)	ES
OP-POHJOLA GROUP	FI
BNP PARIBAS	FR
GROUPE CREDIT AGRICOLE	FR
SOCIETE GENERALE	FR
GROUPE BPCE	FR
ROYAL BANK OF SCOTLAND GROUP PLC	GB
HSBC HOLDINGS PLC	GB
BARCLAYS PLC	GB

Bank name	ISO code of the country of the home supervisor
LLOYDS BANKING GROUP PLC	GB
NATIONWIDE BUILDING SOCIETY	GB
ALLIED IRISH BANKS PLC	IE
BANK OF IRELAND	IE
IRISH LIFE AND PERMANENT	IE
INTESA SANPAOLO S.P.A	IT
UNICREDIT S.P.A	IT
BANCA MONTE DEI PASCHI DI SIENA S.P.A	IT
BANCO POPOLARE - S.C.	IT
UNIONE DI BANCHE ITALIANE SCPA (UBI BANCA)	IT
BANQUE ET CAISSE D'EPARGNE DE L'ETAT, LUXEMBOURG	LU
BANQUE INTERNATIONALE À LUXEMBOURG	LU
ING BANK NV	NL
RABOBANK NEDERLAND	NL
ABN AMRO	NL
BANCO COMERCIAL PORTUGUÊS, SA (BCP OR MILLENNIUM BCP)	PT
ESPÍRITO SANTO FINANCIAL GROUP, SA (ESFG)	PT
NORDEA BANK AB	SE
SKANDINAVISKA ENSKILDA BANKEN AB (SEB)	SE
SVENSKA HANDELSBANKEN AB	SE
SWEDBANK AB	SE

The banks are sorted by country of the home national supervisor. This order is however never used in the report.

12.2 Annex II: Definition of the variable used

All the variables use the internal definition of the bank (no common definition provided). Data were collected for up to three PD models by country for each bank and each portfolio.

12.2.1 PD models

Minimum default rate: the minimum observed default rate included in the observed default rates data used by banks when calibrating their PD models.

Maximum default rate: the maximum observed default rate included in the observed default rates data used by banks when calibrating their PD models.

Case-weighted default rate: the average observed default rate (weighted by default case) of the observed default rates data used by banks when calibrating their PD models.

Observed default rate in 2011: the default rate observed by the bank for 2011 for the cases included in its PD model. For representation purposes we use the log transformation of this variable (log of the observed default rate in 2011).

EAD-weighted average PD 2012: the average PD calculated in 2012 weighted by the EAD corresponding to each PD.

Date of the model development: the date (often reported as the month of a year) at which the PD model was developed.

Date of the last calibration: the date (often reported as the month of a year) at which the PD model has been calibrated for the last time.

Number of years for the model development: the number of years that were used to develop the model.

Number of years for the calibration: the number of years in banks' internal time series of default rates used for the last calibration.

Number of stressed years for the calibration: the number of distressed years that are included in the time series used for the last calibration.

Rating philosophy: how the banks characterise the intended dynamic properties of their rating process used for PD assignment (PiT, TTC or hybrid). The criterion given was the expected variation of the PDs assigned to obligors with broader changes in actual default rates, assuming no change in the composition of exposures within the portfolio.

Observed level of cyclicality: the assessment of the bank of the observed level of cyclicality of its PD model following internal definition, the only guidance being that the most TTC model will be assigned a zero value whereas most PiT models will be set at one.

Current position in the cycle: over the long term, the banks assessed their position in the cycle on a five bucket scale.

12.2.2 LGD model

Date of the model development: date of the last calibration, number of years for the model development, number of year for the calibration, and number of stressed years for the calibration are the same as for PD model.

Observed recovery rate (= recovery rate): the lifetime average recovery rate, meaning the percentage of EAD recovered when an account does not cure. The information was requested by type of collateral.

Length of recovery period: the average observed length of recovery. The information was requested by type of collateral.

Estimated probability of repossession: the probability of repossession as estimated by the LGD model. The information was requested by type of collateral.

Observed repossession rate: the average number of accounts which went into default and were subsequently repossessed. The information was requested by type of collateral.

Time for repossession after default (in months): average time between entry into default and repossession. The information was requested by type of collateral.

Haircut on the market value of the collateral: the haircut applied on the market value of the collateral when calculating the LGD. The information was requested by type of collateral and as estimates of the LGD model.

Observed cure rates: the lifetime average cure rate, meaning the average number of accounts which went into default and subsequently cured.

Discount rate: the rate of interest used to determine the present value of future cash flows. The information was requested by type of collateral.

Adm., legal and workout costs: all additional observed costs that may occur during the recovery process for non-cured assets. The information was requested by type of collateral.

12.3 Annex III: Aggregated statistics on GC and RWs

Figure 82: Observed initial statistics for GC and RWs, IRB and SA exposures

	Retail and SME corporate portfolios	RM	SME Retail	SME Corporate
Defaulted and non-defaulted exposures				
GC				
Weighted average	67.4%	31.8%	112.6%	130.9%
Simple average	75.2%	33.7%	110.1%	146.8%
Standard deviation (based on simple average)	44.1%	23.6%	68.2%	79.9%
RW				
Weighted average	32.4%	19.6%	39.9%	57.3%
Simple average	33.3%	18.9%	45.7%	65.8%
Standard deviation (based on simple average)	14.4%	10.0%	20.0%	26.7%
Non defaulted exposures				
GC				
Weighted average	37.7%	21.9%	50.3%	69.9%
Simple average	38.9%	20.9%	55.6%	80.6%
Standard deviation (based on simple average)	17.2%	10.3%	22.6%	35.7%
RW				
Weighted average	32.0%	18.6%	40.6%	61.7%
Simple average	33.3%	18.0%	45.8%	70.5%
Standard deviation (based on simple average)	15.3%	8.9%	19.8%	29.5%

	Retail and SME corporate portfolios	RM	SME Retail	SME Corporate
Defaulted exposures				
GC				
Weighted average	548.2%	372.7%	629.1%	567.2%
Simple average	522.3%	347.1%	562.6%	572.9%
Standard deviation (based on simple average)	136.4%	182.6%	214.9%	127.1%
RW				
Weighted average	40.5%	54.7%	33.1%	23.4%
Simple average	53.8%	61.3%	69.7%	41.7%
Standard deviation (based on simple average)	51.2%	61.0%	71.5%	52.7%

Source: EBA data collection (reference date: December 2012), EBA calculation