Study on Internal Rating Based (IRB) models in Europe

Residential Mortgages
STUDY ON INTERNAL RATING BASED MODELS IN EUROPE – RESIDENTIAL MORTGAGES

This EBF\(^1\) report has been prepared by the EBF Risk Assessment Working Group within the scope of the EBF Banking Supervision Committee\(^2\). It portrays the experience in development and validation of residential mortgage internal rating based models of a wide sample of experts from European banks. The information shown across this report has been obtained from an EBF questionnaire supported by supplementary evidence where it is available. The questionnaire was completed during the first quarter of 2012 by experts from 42 banks and 14 banking associations across Europe.

The Basel II Accord was conceived as a global standard for capital adequacy. It condenses the expertise of supervisors, academics and bankers from across the world, with the objective to overcome the limitations of the previous standard of Basel I. European banks have shown continued commitment to the implementation of the Basel Committee standards and the EU took a political decision to adopt the Basel II framework throughout Europe from the outset in 2008. Since then, banks in Europe have been building up their expertise with internal rating systems that comprise all of the methods, processes, controls, and data collection and IT systems that support the assessment of credit risk, the assignment of internal risk ratings, and the quantification of default and loss estimates.

---

\(^1\) Launched in 1960, the European Banking Federation is the voice of the European banking sector from the European Union and European Free Trade Association countries. The EBF represents the interests of almost 5000 banks, large and small, wholesale and retail, local and cross-border financial institutions. Together, these banks account for over 80% of the total assets and deposits and some 80% of all bank loans in the EU only.

\(^2\) Contact person: Gonzalo Gasos (g.gasos@ebf-fbe.eu).
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREAMBLE</td>
<td>4</td>
</tr>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>5</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>7</td>
</tr>
<tr>
<td>SCOPE OF THE STUDY</td>
<td>8</td>
</tr>
<tr>
<td>OVERVIEW OF THE EUROPEAN RESIDENTIAL MORTGAGE MARKET</td>
<td>9</td>
</tr>
<tr>
<td>ANALYSIS OF CREDIT RISK DRIVERS</td>
<td>12</td>
</tr>
<tr>
<td>DEFINITION OF DEFAULT</td>
<td>12</td>
</tr>
<tr>
<td>MACROECONOMIC FACTORS</td>
<td>13</td>
</tr>
<tr>
<td>THE PROBABILITY OF DEFAULT (PD)</td>
<td>16</td>
</tr>
<tr>
<td>THE LOSS GIVEN DEFAULT (LGD)</td>
<td>23</td>
</tr>
<tr>
<td>TREATMENT OF DEFAULT PORTFOLIOS</td>
<td>31</td>
</tr>
<tr>
<td>SPECIFIC ISSUES</td>
<td>32</td>
</tr>
<tr>
<td>INSURANCE SCHEMES</td>
<td>32</td>
</tr>
<tr>
<td>COVERED BONDS</td>
<td>35</td>
</tr>
<tr>
<td>SECURITISATION</td>
<td>36</td>
</tr>
<tr>
<td>FOREIGN CURRENCY LENDING</td>
<td>37</td>
</tr>
<tr>
<td>FURTHER SUPERVISORY GUIDANCE</td>
<td>40</td>
</tr>
<tr>
<td>MODEL GOVERNANCE</td>
<td>40</td>
</tr>
<tr>
<td>MODEL ADD-ONS</td>
<td>40</td>
</tr>
<tr>
<td>MODEL APPROVAL</td>
<td>40</td>
</tr>
<tr>
<td>USE TEST COMPLIANCE</td>
<td>41</td>
</tr>
<tr>
<td>HOME-HOST SUPERVISORY DIVERGENCE</td>
<td>42</td>
</tr>
<tr>
<td>BANKS’ ASSESSMENT ON THE IMPACT OF SUPERVISORY AND MODELLING DIFFERENCES</td>
<td>46</td>
</tr>
<tr>
<td>TABLES</td>
<td>47</td>
</tr>
<tr>
<td>CHARTS</td>
<td>47</td>
</tr>
<tr>
<td>ANNEXES</td>
<td>48</td>
</tr>
<tr>
<td>ANNEX I – Acronyms</td>
<td>48</td>
</tr>
<tr>
<td>ANNEX II – Risk weight densities</td>
<td>49</td>
</tr>
<tr>
<td>ANNEX III – Comparison of residential mortgage markets in the EU and the US</td>
<td>50</td>
</tr>
<tr>
<td>ANNEX IV – Definition of default in CRD 2</td>
<td>51</td>
</tr>
<tr>
<td>ANNEX V – Member States abbreviations</td>
<td>52</td>
</tr>
<tr>
<td>APENDIX – Residential mortgage risk modelling EBF questionnaire</td>
<td>52</td>
</tr>
</tbody>
</table>
In this study, the European Banking Federation (EBF) examines the risk modelling practices of a sample of European banks that apply internal rating based (IRB) approaches for the calculation of the regulatory capital requirement for credit risk in residential mortgages. Credit risk drivers are analysed in the context of the European mortgage market characteristics. Differences in supervisory practices across European borders are examined according to the experience of the participating banking groups.

The main elements that characterise residential mortgage portfolios and the associated IRB models across Europe are reviewed. Common practices and divergences are commented on throughout the report, including those arising from the drivers of credit risk parameters, notably probability of default (PD) and loss given default (LGD). The information shown across this report has been obtained from an EBF questionnaire supported by supplementary evidence where it is available.

This study is meant to be complementary to other papers that are being (or have been) prepared by analysts and institutions, e.g. the IMF. In addition, articles and comments have been recently published concerning the level of risk weighted assets (RWA) across jurisdictions. It is important to note that straight comparisons between the RWA figures in Europe and other jurisdictions miss a lot of information that needs to be taken into account for a well-informed interpretation. This study sheds light on factors and circumstances that explain the state of play of residential mortgage IRB models across Europe and the resulting risk weighting of such assets. The objective of this study is two-fold: (i) to examine the features of IRB methodologies that are widely used by European banks, based on their experience and continued commitment to the development of advanced risk models within the Basel II framework, and (ii) to contribute to the identification of areas of divergence. This is a preliminary look at the banks’ experience in residential mortgage IRB modelling to be used to inform discussions with policy makers, regulators and supervisors by showing:

a. How the models used by firms reflect the underlying risks in their markets;
b. Differences due to market and portfolio characteristics; and
c. Differences due to modelling and supervisory divergent practices.

1 The scope of the study is the European Economic Area (EEA) plus Switzerland.
2 PD is the probability of a borrower entering the default status under a given definition (Capital Requirements Directive in the EU).
3 LGD is the final economic loss of an account once the recovery process has come to an end.
4 APPENDIX I – Residential mortgage risk modelling EBF questionnaire.
5 “Revisiting risk weighted assets: Why do RWAs differ across countries and what can be done about it?”, Vanessa Le Leslé and Sofiya Avramova (IMF), March 2012.
EXECUTIVE SUMMARY

The European residential mortgage market is at the core of the European banking industry overall risk profile as it represents 23% of total loans and 75% of loans to households. European residential mortgage debt per capita, i.e. household mortgage indebtedness, is relatively low on average, however there is considerable variation between countries. The legal framework in Europe, in conjunction with, in some cases, the existence of sizeable insurance and guarantee schemes, make residential mortgages a relatively safe asset class for European banks. All in all, the originate-to-hold business model is the backbone of the bulk of the European residential mortgage market. These characteristics are particular to Europe and explain to a large extent the differences with other jurisdictions in terms of average risk weights. There also exist significant differences within the European mortgage markets, and these are clearly and justifiably reflected in RWA outcomes.

As displayed in Annex II, the picture of total RWA densities across European IRB banks shows a large variation: from 17% to 84% in a sample of 66 banks (see chart 20), according to pillar 3 disclosures. For the same sample of 66 banks, the average total assets risk weight by country ranges from 20% to 64% (see chart 21).

In particular, the factors that determine the risk profile of the residential mortgage asset class in Europe include the macro environment, the legal and social frameworks, the foreclosure procedures, the volatility of house prices, risk mitigation in the form of insurance and guarantee systems and the fact that the vast majority of mortgages are held on banks’ balance sheets until maturity. These characteristics explain to a large extent the differences with other jurisdictions in terms of risk weights.

The variability observed in risk weights across countries and banks is mainly due to market and portfolio characteristics, as well as firms’ specific approaches towards risk management and risk appetite. The Basel II framework rightfully requires a series of controls and supervisory authorisation. Therefore, banks cannot use or change the models themselves without duly securing the supervisors’ approval. Regulatory capital requirements for residential mortgages are the result of mechanical calculations based on the past track record of losses. Nevertheless, different modelling practices either due to Basel II eligible modelling choices or as a result of divergent supervisory guidance also have an impact on risk weights. Some of these differences might be revisited by supervisory authorities both in the context of the stated objective of a single rulebook in the EU and in the context of RWA studies aimed at achieving effective and comparable RWA computation. The qualitative assessment of the experts from the 42 participating banks as to the impact of a number of identified areas on the RWA outcomes is summarised in the chart below.

Chart 1 – Individual bank qualitative assessment of the impact of different factors on RWA outcomes

RWA density is the quotient of RWA over total assets expressed in percentage.
As for the underlying macro characteristics, there is no prudential foundation to resolving divergences caused by differences in market or portfolio characteristics. These differences in risk weights are explainable and motivated.

As regards differences in modelling and supervisory practices the survey points to the following differences:

Firstly, RWA comparability and transparency is hampered by inconsistent approaches across Europe to model add-ons and layers of conservatism related to, among others, model uncertainty, model risk, data issues, a-cyclicality adjustments, generic capital adequacy or other issues. The pure results of the models are mixed with layers of conservatism of different sorts. This hampers the clarity, the comparability and the meaningfulness of models. Preferably, add-ons, if any, could be implemented post-modelling outside the internal model environment by way of fully transparent adjustments.

Secondly, the following areas show material differences unrelated to portfolio or macro characteristics:

- The survey points to significant differences in used data history and in approaches to downturn LGD. Respondents cited differences in data series as well as conceptual cycle interpretation issues. The economic cycle adjustment is another source of significant variability in the calculation of the probability of default and thus in the resulting risk weights. According to the responses to the EBF questionnaire, only half of respondents apply a through-the-cycle adjustment. Of these, not all use the same methodology. Some banks apply their own developed methodology, others follow regulatory requirements and methodologies. Many regulators do not appear to have published specific guidance on rating philosophy and many do not require a cycle adjustment.

- The survey indicates that firms’ LGD modelling approaches differ across a range of components - use of empirical data (different time periods, lack of defaults), use of discount rates, application and allowed number of loan-to-value (LTV) bands. Many of these approaches are not bank specific, but derived from supervisory guidance.

- Respondents advise that the LGD regulatory floor has been interpreted in different ways i.e. at portfolio, segment or individual asset level or a combination thereof. This creates unnecessary divergence in RWA and while respondents consider the application of the LGD regulatory floor to be of secondary importance in terms of its capital impact, its effect in combination with the default definition (the number of past-due days) might lead to an unintended distortion of the level playing field.

- The treatment of defaulted assets in terms of the approach to assigning an Expected Loss Best Estimate (ELBE) value and its interaction with capital deductions, or absence thereof.

Thirdly, the EBF Risk Assessment Working Group (RAWG) that conducted the analysis of responses has identified areas where divergences exist between banks operating even in the same jurisdiction:

- Respondents have highlighted differences in the definition of default they use, reflecting EU specificities as well as supervisory guidance including the treatment of forbearance. This is an area which impacts PD, LGD and supervisory experience. According to respondents, supervisors are applying different criteria of default to banks in the same country thus hindering comparability and fair interpretation of financial statements.
By and large, European banks have shown a continued commitment to the development of advanced internal rating based models within the Basel II framework. The implementation and maintenance of these models has brought about broad improvements to risk management including the availability of long track records of a wide range of data items that otherwise would have been missed. As envisaged in the Basel II framework: The term “rating system” comprises all of the methods, processes, controls, and data collection and IT systems that support the assessment of credit risk, the assignment of internal risk ratings, and the quantification of default and loss estimates.

All in all, IRB models allow improvements that extend over all aspects of risk management and related bank operations. As presented in this report, IRB models are central to the risk management of residential mortgages in Europe, though improvements in consistency and transparency remain a challenge. The EBF stands ready to contribute and participate in this debate with the important experience accumulated by their member banks.

**INTRODUCTION**

The Basel II Accord was conceived as a global standard for capital adequacy. It is the result of a compendium of expertise from the banking sector’s stakeholders, including bank employees, central banks’ experts, academics and supervisors from across the world. More than seven years of research in various working groups and five quantitative impact studies were undertaken to produce the final paper in 2005. Within the Basel II Accord, IRB models are integral to the development of better informed risk decisions.

IRB models have contributed to a better understanding and measurement of risk profiles and have been a significant input to the continued development of risk management at large and, in particular, across the European banking industry. An important feature of IRB models is that, within an overall and consistent framework specified by regulators, idiosyncratic differences can be accommodated to reflect structural and other characteristics. These differences are due to a range of factors, the importance of which varies across Member States and between individual firms. They include:

a. Risk profiles, client segments, business models, portfolio composition, technology, recovery processes, risk management practices, recourse possibilities and historical losses;
b. legal, market structure or macroeconomic factors;
c. the nature and depth of the relationship between banker and customer, e.g. specialist mortgage lender versus relationship bank;
d. data and modelling approaches among firms;
e. differences in supervisory practices in the validation and approval processes within IRB portfolios.

Each of the above lead to inevitable divergences in RWA across institutions, though these are often not obvious from publicly disclosed information or existing Pillar III reporting and can only be explained by a detailed understanding of the underlying methodologies. While the latter applies across all asset classes to a greater or lesser extent, with this study the EBF has started by analysing the residential mortgage asset class because of its size and significance in the portfolios of European banks.

SCOPE OF THE STUDY

The study has been conducted by the Risk Assessment Working Group (RAWG) of the EBF with the collaboration of its constituent banking associations and banks. The working group was created in November 2011 with the main purpose of examining the status of the IRB modelling practices in Europe and identifying areas where further consistency would be necessary for the implementation of a single rulebook. The majority of members of the RAWG have long experience in the development of IRB models in European banks and have been involved in the validation of models with home and host supervisors from across Europe.

The RAWG started by focusing on residential mortgages. The EBF studies on IRB models are intended to be complementary to other overarching pieces of research and to contribute to the debate from a practitioner’s point of view.

The collection of information was organised in an EBF questionnaire8 structured into six sections which contain a series of quantitative and qualitative questions as follows:

- Section 1: Summary of model and market characteristics.
- Section 2: Macroeconomic elements of residential mortgage portfolios.
- Section 3: Legal mortgage market characteristics in the EU.
- Section 4: Modelling characteristics and approval processes of IRB models.
- Section 5: Differences between home and host supervisors in IRB approval processes.
- Section 6: Summary of core elements and their relevance.

The first three sections focus mainly on country-wide information and were completed by the national banking associations. Sections 4 to 6 examine modelling and supervisory validation practices and were completed by individual banks.

The scope of the study covers residential mortgage portfolios under IRB models. Only banks with IRB models for credit risk of this asset class have participated. The EBF questionnaire was completed during the first quarter of 2012 by 42 banks and 14 national banking associations from European countries9. The sample of banks includes parent and subsidiary banks of cross border banking groups as well as local banks. Domestic banks are included in the country of operation whether or not they belong to a foreign group.

---

8 APPENDIX I – Residential mortgage risk modelling EBF questionnaire.
9 The names of banks are not disclosed for confidentiality reasons. Participating banking associations are those of Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.
Residential mortgages in Europe present a number of varied features and details. Many of these have a bearing on the calculation of capital requirements and are therefore analysed across this study. Comparisons with the US are provided in an annex for a better understanding of the characteristics of the EU market by illustrating where the main similarities and differences lie. In particular, there are certain characteristics that need to be taken into account in understanding the pivotal role that residential mortgages play in the determination of European credit institutions’ total capital requirements for regulatory purposes, i.e. the value of the residential mortgage portfolio in terms of risk weighted assets.

The first characteristic of the residential mortgage market in the EU is its significant size. With outstanding exposure of €6.4 trillion, it represents 23.1% of total loans (see Chart 2) and 75.3% of loans to households (Table 1). In countries such as Denmark, Estonia, Sweden, Portugal and Poland, it represents more than one third of total loans granted by credit institutions.

The volume of the residential mortgage market increased sharply during the run-up to the financial crisis at an annual compound rate of 7.8% from 2002 to 2007; the relative size of residential mortgages in the EU economy, however, is still less important than in other developed economies: The residential mortgages share of GDP ratio stands at an average of 52.4% in the EU, with an unequal distribution by country as can be seen in Table 1. Only five out of the 27 EU countries (The Netherlands, Denmark, Ireland, the UK and Sweden) show a residential mortgage portfolio above 75% of their respective GDP figures.

<table>
<thead>
<tr>
<th>% of residential mortgage over total loans</th>
<th>over loans to households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>14%</td>
</tr>
<tr>
<td>Belgium</td>
<td>15%</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>14%</td>
</tr>
<tr>
<td>Cyprus</td>
<td>16%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>29%</td>
</tr>
<tr>
<td>Denmark</td>
<td>44%</td>
</tr>
<tr>
<td>Estonia</td>
<td>40%</td>
</tr>
<tr>
<td>Finland</td>
<td>29%</td>
</tr>
<tr>
<td>France</td>
<td>19%</td>
</tr>
<tr>
<td>Germany</td>
<td>21%</td>
</tr>
<tr>
<td>Greece</td>
<td>25%</td>
</tr>
<tr>
<td>Hungary</td>
<td>18%</td>
</tr>
<tr>
<td>Ireland</td>
<td>15%</td>
</tr>
<tr>
<td>Italy</td>
<td>15%</td>
</tr>
<tr>
<td>Latvia</td>
<td>32%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>31%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>4%</td>
</tr>
<tr>
<td>Malta</td>
<td>18%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>27%</td>
</tr>
<tr>
<td>Poland</td>
<td>33%</td>
</tr>
<tr>
<td>Portugal</td>
<td>35%</td>
</tr>
<tr>
<td>Romania</td>
<td>11%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>32%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>13%</td>
</tr>
<tr>
<td>Spain</td>
<td>29%</td>
</tr>
<tr>
<td>Sweden</td>
<td>37%</td>
</tr>
<tr>
<td>UK</td>
<td>29%</td>
</tr>
<tr>
<td>Total-EU27</td>
<td>23.1%</td>
</tr>
</tbody>
</table>

Source: BankStat, EBF

See Annex III.

Source: European Mortgage Federation (EMF).
The share of residential mortgage debt per capita can be considered relatively low in the EU (€ 12,880). This level is partially explained by the fact that the share of households with a mortgage is rather low in Europe. In the UK around 40% of the households have a mortgage while the share is around 20% in the Eurozone. Household debt relative to disposable income reveals the same pattern: It stands at 100% in the Eurozone while it is 177% in the UK. All in all, it can be concluded that the mortgage indebtedness of EU households is relatively low on average but with an asymmetric distribution by countries.

An important singularity of the EU is that the bulk of the residential mortgage exposure remains on banks’ balance sheets. This fact has a sizeable effect on the calculation of capital requirements as residential mortgages is recognised as one of the lowest risk asset classes, therefore pulling down the banks’ overall average risk weight.

Of the other elements considered to influence risk weights from IRB models, the EU presents regular values: The average loan-to-value ratio in the EU is 73% and the owner occupation rate 69%. Original maturity is commonly between 20 and 25 years, however countries with the lowest interest rates show shorter maturities, for example Switzerland where it is under 10 years. Behavioural maturity falls rapidly in countries with lenient early repayment conditions and tax deduction incentives. A case in point is Spain, where the average observed maturity is as low as 7.7 years compared to the original contractual maturity of 25 years.

As regards the type of interest rate, there are varied practices across Europe: Fixed rates are customary in France and Switzerland. Also in Germany and the Netherlands, however rates are reviewed after around 10 years when they are re-fixed or converted to floating rates. In other countries, variable rates from the beginning are more common. As for the cost of borrowing, the typical mortgage interest rate for residential purposes is rather low in Europe (see Table 2) notably after the crisis. This is an indication of the safer environment for banks in the EU residential mortgage portfolio since such a reduced rate would not be possible with high credit losses.

Foreclosure procedures also help to ensure banks have a high level of protection against credit losses. As confirmed in the responses of participating banks, EU borrowers are fully liable on the entire amount of the mortgage debt. By and large, the repayment of mortgage loans takes priority over any other debt of the same borrower and, in most cases, any other positive balance that the borrower holds in the same credit institution could be legally used to repay the potential arrears on a mortgage loan. The main problem in Europe, however, is the lengthy time span often required for the recovery of a bad debt. According to our survey, the average duration of the legal process from default to foreclosure regularly exceeds two years in many EU countries. Sweden and the UK may be the countries with the shortest duration process after default with a period of around one year, but these observed time spans could be substantially delayed in downturn conditions.

13The business model in the EU is ‘originate-to-hold’ as opposed the ‘originate-to-distribute’ model of other jurisdictions.
There appears to be a rationale in the characteristics analysed so far:

1. Stricter liability of borrowers in the EU, together with other factors, which explains the lower households’ indebtedness as borrowers may not be willing to take on as much risk as they would under more borrower-friendly conditions, e.g. the walk away option which exists in some other jurisdictions.

2. Lower indebtedness of households combined with safer conditions for banks, including insurance schemes and foreclosure procedures, keep credit losses under tighter control and allow for lower interest rates in the residential mortgage market which, in turn, leads to a reduced burden for borrowers through an increased capacity to manage repayments.

Another important characteristic of a mortgage market is the source of funding. The collateralised bond market represents a direct source of funding for banks via specific instruments, notably mortgage covered bonds and residential mortgage-backed securities (RMBS). In the EU, the Netherlands (€125 billion) and the UK (€88 billion) are the only significant issuers of RMBS. Covered bonds are the predominant instrument in the EU with an outstanding amount of €1,673 billion with residential mortgage as underlying asset. By way of comparison, residential mortgage-backed securities is the preferred option in the US with issuances equivalent to €1,102 billion.

The way residential mortgages are funded, e.g. by saving deposits, unsecured bonds, covered bonds or securitisation, does not have an impact on the risk profile of the underlying mortgages. In all cases the same sound mortgage origination process is conducted and PD/LGD is based on the risk parameters of the specific mortgage.

In the past securitisation was used as a tool to achieve regulatory capital relief. Currently securitisation is – in almost all cases - used for funding and liquidity purposes. Even in case of capital relief this has an impact on the total risk on a bank’s balance sheet but it does not alter the specific risk of underlying mortgages and thus the RWA model for mortgages. However, the decision to include or exclude the securitised assets from the PD/LGD calculations could affect the outcome in terms of risk weights.

| Source: European Mortgage Federation, National Central Banks |

### Table 2 – Representative interest rates on new mortgage loans

<table>
<thead>
<tr>
<th></th>
<th>2006</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>3.80%</td>
<td>2.71%</td>
</tr>
<tr>
<td>Belgium</td>
<td>5.40%</td>
<td>3.84%</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>8.50%</td>
<td>8.34%</td>
</tr>
<tr>
<td>Cyprus</td>
<td>5.74%</td>
<td>5.16%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>4.36%</td>
<td>4.23%</td>
</tr>
<tr>
<td>Denmark</td>
<td>5.22%</td>
<td>4.68%</td>
</tr>
<tr>
<td>Estonia</td>
<td>4.40%</td>
<td>3.00%</td>
</tr>
<tr>
<td>Finland</td>
<td>4.21%</td>
<td>2.17%</td>
</tr>
<tr>
<td>France</td>
<td>3.90%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Germany</td>
<td>4.64%</td>
<td>3.70%</td>
</tr>
<tr>
<td>Greece</td>
<td>4.41%</td>
<td>3.79%</td>
</tr>
<tr>
<td>Hungary</td>
<td>5.82%</td>
<td>9.44%</td>
</tr>
<tr>
<td>Ireland</td>
<td>4.57%</td>
<td>3.01%</td>
</tr>
<tr>
<td>Italy</td>
<td>4.87%</td>
<td>2.97%</td>
</tr>
<tr>
<td>Latvia</td>
<td>5.55%</td>
<td>4.15%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>4.66%</td>
<td>3.21%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>4.51%</td>
<td>3.88%</td>
</tr>
<tr>
<td>Malta</td>
<td>4.95%</td>
<td>3.46%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>4.61%</td>
<td>4.57%</td>
</tr>
<tr>
<td>Poland</td>
<td>5.70%</td>
<td>6.10%</td>
</tr>
<tr>
<td>Portugal</td>
<td>4.40%</td>
<td>2.96%</td>
</tr>
<tr>
<td>Romania</td>
<td>n/a</td>
<td>5.23%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>6.30%</td>
<td>5.04%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>5.64%</td>
<td>3.21%</td>
</tr>
<tr>
<td>Spain</td>
<td>4.49%</td>
<td>2.54%</td>
</tr>
<tr>
<td>Sweden</td>
<td>3.64%</td>
<td>2.78%</td>
</tr>
<tr>
<td>UK</td>
<td>5.12%</td>
<td>3.75%</td>
</tr>
<tr>
<td>Norway</td>
<td>5.08%</td>
<td>4.08%</td>
</tr>
</tbody>
</table>

14Almost all current securitisation transactions are used for funding and liquidity purposes. Due to the requirements laid down in Article 122a of the CRD, EU banks are required to maintain at least a 5% net economic interest. Banks tend to keep the first loss tranche on their books, which captures almost the entire RWA of the securitisation transaction, so these transactions may not significantly impact the total risk on a banks’ balance sheet. In some cases, the securitised loans are no longer taken in the calibration of credit risk parameters (PD and LGD) of the residential mortgage portfolio. In other cases securitisation has no impact.
The definition of default is a fundamental building block of all IRB approaches. The survey has confirmed that all countries have applied the Capital Requirements Directive (CRD) as the basis for the definition of default for risk modelling and regulatory capital calculation\textsuperscript{15}.

That said, this is an area where there is scope for a higher degree of uniformity and consistency between firms, within countries and across countries. However, differences between national housing markets combined with the subjective element of the definition militate against a “one size fits all” approach. There are subtle differences that exist below the high level in terms of how countries, and individual firms within countries, have interpreted and applied the rule, taking account of EU specificities, either where they are subject to a different “home country” rule, or where their risk modelling and processes dictate variations in approach.

The key areas where differences arise are:

- Days past due: All countries use either 90 days or 180 days as the basis for their days past due backstop for the residential mortgage portfolio, with some limited differences existing at an individual firm level mainly due to the concurrence of different home and host supervisory criteria in subsidiary banks of cross border groups.
  - nine countries (Czech Republic, Denmark, Finland, Germany, Hungary, the Netherlands, Spain, Sweden and Switzerland) use 90 days as a days past due measure\textsuperscript{16};
  - three countries (France, Italy, UK) use 180 days\textsuperscript{17};

- Customer vs. product level definition: The CRD allows firms to specify if their default is on a “per customer” or “per product” level. Practice differs according to market protocols as well as practical matters such as the extent to which systems and internal management information is “joined up”. This is an important aspect that will influence RWAs. While overall loss amounts should remain unchanged, the default count and treatment of customer’s indebtedness is different creating timing and other differences in PD and LGD estimates. This aspect is further commented upon in the section on Home-host supervisory divergence.

- Treatment of small (immaterial positions): Most firms have developed pragmatic approaches towards dealing with small value based defaults. Small value items are typically disregarded where they are less than a certain size (typically €100 to €200). Our survey shows that the treatment and timing of such items is different between banks, driven by systems, regulatory preference or pragmatism. While we consider that this is unlikely to be a major source of RWA divergence between firms, further investigation is beyond the scope of our survey. As the count of defaults has a direct impact on PD values and thus on risk weights, this is an area where EBA guidance could be given i.e. establishing consistent measures based upon the higher of a minimum amount in EUR or a percentage relative to average loan amount in the bank or in the domestic market.

- Transfer to recovery unit: Some firms include internal transfer to recovery as part of the definition of default. This means differences arise simply as a result of a firm’s internal risk practices and policy. Items in default from an operational perspective will create timing as well as actual differences. Only where such items are individually material is it likely that these will be separated. For immaterial exposures the process of setting the position to default might be aligned to the time of transfer to the recovery unit which may last up to several months.

- Return to “in order” status and forbearance: This is an area where there are marked differences. 75% of respondents return accounts to the “good book” as soon as the account returns to order, with the remain-

\textsuperscript{15} See ANNEX IV – Definition of default in CRD 2.
\textsuperscript{16}Denmark and Sweden use unlikeliness to pay triggers as the primary driver which is earlier than 90 days in most cases.
\textsuperscript{17}Not all banks use 180 days where home regulatory or operational considerations apply.
ing 25% waiting for a period of time before restoring to “in order” status. In general these differences are evident at country level although there is some evidence of firm specific differences also. Firms also report differences in their approach to estimating PD once default has occurred, with almost three quarters of respondents advising that a “normal” PD is applied once the account has returned to order and 28% applying a penalised PD score, either for a limited period of time, typically less than 12 months, or on a case-by-case basis in discussion with the credit officers. In 3% of cases, these are carried as defaults for regulatory capital purposes. Where firms have used a normal PD, the majority of firms told us that past default would be considered as a factor in their models. The UK has a strict definition of forbearance where certain accounts are treated as being in default for regulatory capital purposes, even if the account may have been re-stored to “in order” status. In other countries (e.g. Spain, Germany), forbearance is considered as a primary risk driver in model build, but not treated as default. In other cases, no adjustment is made for accounts in forbearance either in regulatory capital treatment or for modelling purposes.

• Government support schemes: This is another area where practice differs. For example in the UK this is treated as default for regulatory capital (RWA) purposes, whereas elsewhere these customers are viewed as part of the “in order” population.

MACROECONOMIC FACTORS

When comparing mortgage portfolios, differences in RWA values are to be expected and can be justified, based on:

• Varying macroeconomic environments;
• Jurisdictional differences in policies (including fiscal treatment and the social welfare systems);
• Diverging risk profiles of housing markets and
• Firm-specific approaches towards risk management and risk appetite.

This section starts by covering differences between housing markets. Secondly the impact of geographical differences is investigated from a portfolio perspective, followed by a qualitative analysis of the impact firm specific policies have on portfolio performance. Finally, we will provide an overview of the most important sources of divergence between the risks associated with mortgage portfolios, and therefore differences in RWA values.

a. Differences in the housing markets

First of all, the home ownership rate is below 40% for two countries and among 40% and 60% for a few other countries, while in the rest of Europe it is over 60%, with a peak at 90% for Hungary.

As far as house prices are concerned, the generalised economic crisis has not affected the housing market in the same way: While most countries (8 out of 13) experienced a strong or at least moderate increase, in two cases prices have actually decreased. In particular the Spanish house price index showed a 18% reduction in the period 2008-2010.

The most common housing type is definitely a house (detached or terraced) in northern countries, while apartments prevail in central and southern Europe. Chart 6 shows results for countries that reported a full split, in Spain an apartment is indicated as the prevailing housing type and for the Netherlands a terraced (or not detached) house.
Average house prices vary considerably across Europe: in Switzerland and to a lesser extent Norway average prices are significantly higher than the rest of Europe; prices in the other northern and central European countries average between € 200,000 and € 250,000; in Spain and Italy prices average just over € 150,000; while prices in the two eastern countries are materially lower. A similar pattern is true for average loan size, even if the ratio between loan size and house price shows high disparity (ranging from 51% to 92%), as is discussed later on in this document.

Regarding the impact of geographical factors on the RWAs allocated to mortgage portfolio, the variations in the risk characteristics described above drive differences in the RWA values across regions.

**b. Demographics and regional differences**

Demographics are an important driver of risk. Two major demographic factors in this area are the composition of the population (in terms of wealth, age, composition of house occupants) and the changes that occur in the population (i.e. birth- and mortality rates, migration, etc.).
Demographic developments also impact the state of the housing market, as they are a key driver of supply and demand. Next to the demographic element, government policy also has a substantial influence on the housing market. In areas where governments put limits to the construction of new houses, supply is more restricted in comparison to jurisdictions that apply looser policies. The more restrictions, the more limited is the construction activity and the longer is the lead time. As a consequence, the time lag between an increase in economic demand for new houses and the actual delivery of those houses to the market is longer in more restrictive markets. Longer lead times and lower availability of new houses will result in a higher aggregated demand for existing houses thus increasing prices.

In regards to the portfolio composition, the regional dispersion is an important factor in the riskiness. In many countries in the EU, the demand for property in urban areas is in aggregate higher in comparison to rural areas. This will impact price levels and price volatility. Also, the type of economic activity in urban and rural areas differs significantly (both in type of activities as well as the volatility of these activities), impacting the dynamics of the housing markets, which creates different risks.

As can be concluded from the responses to the survey (Table 3), the availability and scope of government or social sponsored schemes, such as mortgage insurance schemes, varies greatly among EEA member states. As these schemes all act as risk mitigants, the impact on aggregate risks taken by financial institutions and inherent in mortgage portfolios is significant. See the section on insurance schemes for further details.

c. Fiscal treatment of mortgage interest payments

The replies to questions concerning the fiscal treatment of mortgage related interest show differences in the taxation of mortgage interest rate payments. Tax deductibility of mortgage interest payments influences the repayment capacity of borrowers and has an impact on the associated risks. It is common practice in the EU but to varying degrees across countries.

---

18The average house price was estimated on the basis of the price per m2, considering a 110 m2 house or apartment. Average loan size was not available for Norway and Sweden. Source: EBF questionnaire
d. Social welfare schemes and the flexibility of the labour market

Different government policies in the sphere of social welfare and the flexibility of the labour market impact the development of unemployment rates, as well as the capacity of those who are unemployed to continue meeting the monthly installments related to their mortgage loan. In countries with a less collectivised social welfare system, labour markets tend to be more dynamic, both in phases of growth and of downturn. This dynamism causes relatively larger amounts of defaults, reflected in higher PDs. In countries with higher levels of social welfare and countries that offer more protection to employees, swings in defaults tend to be more dampened, which is in turn reflected in observed PDs.

Table 3 - Availability of government or social sponsored schemes that might influence the mortgage market

<table>
<thead>
<tr>
<th>Country</th>
<th>Availability of government or social sponsored schemes that might influence the mortgage market</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPAIN</td>
<td>Yes, but only for very low income individuals.</td>
</tr>
<tr>
<td>SWITZERLAND</td>
<td>No.</td>
</tr>
<tr>
<td>NORWAY</td>
<td>Yes, basic loans, startup loans and housing grants.</td>
</tr>
<tr>
<td>SWEDEN</td>
<td>Yes, unemployment benefits and job seeker allowances.</td>
</tr>
<tr>
<td>CZECH REPUBLIC</td>
<td>Yes, most importantly tax deduction of mortgage interest payments.</td>
</tr>
<tr>
<td>UNITED KINGDOM</td>
<td>Yes, support for mortgage interest.</td>
</tr>
<tr>
<td>DENMARK</td>
<td>No.</td>
</tr>
<tr>
<td>GERMANY</td>
<td>No.</td>
</tr>
<tr>
<td>HUNGARY</td>
<td>Yes, for public servants.</td>
</tr>
<tr>
<td>FRANCE</td>
<td>Yes. Low interest loans for first time buyers and social programs.</td>
</tr>
<tr>
<td>FINLAND</td>
<td>No.</td>
</tr>
<tr>
<td>NETHERLANDS</td>
<td>Yes, both national and council sponsored schemes exist.</td>
</tr>
</tbody>
</table>

THE PROBABILITY OF DEFAULT (PD)

This section discusses the impact of firm specific risk appetite and portfolio management policies. Both the risk appetite of a bank during mortgage origination and the portfolio management practices have an influence on the portfolio composition and performance. The quality of portfolios of more aggressive players will be lower than those of more conservative institutions. Differences in the credit quality of borrowers are reflected in default rates and recovery rates and therefore in RWA values. Similarly, back-office practices related to portfolio management also influence credit quality. A bank that maintains a close relationship with the customer and is stricter in the monitoring of arrears experiences lower default and recovery rates, thus improving portfolio performance. This means that even in the same market, policies and practices adopted by individual institutions can give rise to differences in RWA values.

The main sources of PD variability can be summarised as follows:

- National housing markets’ features.
- Firms’ specific risk management and policies.
- Regulatory issues such as the definition of default, the cycle adjustment, or the use of continuous master scales.
- Different methods of calibration: computation of Observed Default Frequencies (ODFs) and cycle adjustments.
- Discretionary choices of banks: cure periods, thresholds or treatment of loans with multiple holders.
- The length of internal databases.

A key input in the IRB capital formula is the probability of default (PD). Different definitions of default and methodologies of PD calculations may result in different outputs in the capital. Although RWA increases as PD rises, the impact in the capital formula is not proportional, and a large increase in the PD will not become an increase of similar magnitude in capital. Several factors may explain variations in PD estimates ranging from quality and quantity of data, modelling practices and supervisory/regulatory constraints.
The aim of this section is to analyse the main drivers of PD and explain variations in PD estimates in European banks. Among the most relevant factors are the following:

a. Data series / data samples: The length and thickness of the database (repository of data) used in the calibration.

b. Scoring models: Banks use behavioural and application models to appraise the risk of mortgage loans. The use of the former entails more point-in-time score estimations compared with the use of application models, which are normally linked to a more through-the-cycle approach. This is very relevant in retail mortgage portfolios where in most countries the type of banking entails an established and extended relationship with the client, theoretically allowing the building of behavioural models. Additionally, among other issues related to the models, albeit with a secondary role, is the treatment of loans with more than one borrower or the treatment of acquired mortgage portfolios.

c. PD calibration and cyclical adjustment: The crux of the matter is how PD is assigned to the scores of the models. In the calibration, one important step is which type of cyclical adjustment methodology is used by the entities in order to obtain a long-term PD.

d. Regulatory/supervisory constraints: Supervisory practices also influence the calculation of PDs, and therefore of capital requirements through specific local requirements such as the use of a continuous master scale to compute capital requirements, the need for specific requirements in the portfolio segmentation or the determination of additional capital add-ons.

e. The scope of the definition of default used by banks: Leaving aside the different definitions of default, which are widely analysed in the previous section, it is also important to take into account whether an explicit cure period has been used in the calibration or treatment of refinanced exposures.

f. The importance of back-testing.

Chart 8 - Historical Data Used to Calculate PD across banks
a. Data series / data samples:

This subsection examines the differences existing in Europe as to the data series used for the construction of the models and for the calibration of the PDs, notably the data series’ historical length or the supervisory requirement for using specific samples, as happens in some countries. These data samples may also be affected by the quality/exclusions of data, the mergers of banks through time or the acquisition of new portfolios by an institution.

According to the responses, data periods vary significantly between model building and model calibration purposes. At present, it is a wide-spread practice (80% of surveyed banks) to use different time periods for model construction and for model calibration purposes.

Most of the banks participating in the questionnaire use historical data starting from 2005, as shown in Chart 8, though there is a broad range of practices with some banks enlarging the period for calibration due to supervisory requirements geared to cover the recession of the early nineties. As a result, two recessions are included in the sample the one of the early nineties and the current one, and only one expansion period. Therefore, those banks which have been required to include data from the beginning of the nineties must tend to produce more conservative outputs.

Broadly considered, portfolio characteristics and available data (quality and historical length) limit modelling choices. In this regard, as a general practice in most jurisdictions, regulators require a minimum number of years for the analysis, which is different across countries, and determine exclusions of some historical data – for example, the period 2009-10 – or the inclusion of some assumptions. Altogether, this creates differences in RWA calculations.

Another element to be taken into account is the weighting method for the different years included in the sample. When calibrating, most banks (80%) give the same weight to all the available years with the rest following alternative approaches.

in the following are areas of divergence:

- The length of the time span used.
- The methodologies to infer past values where no real data is available.
- The weight assigned to yearly observations.

b. Scoring models:

Some banks have developed models for new clients, existing clients distinguishing between those with enough financial information from those without, clients with some form of delinquency and employees. Therefore, banks may have in use a big array of models for retail mortgage portfolios, and the resulting segmentation may have an effect on RWAs.

At the time when Basel II was implemented in Europe, regulators admitted different types of scoring models. For retail portfolios, it is very common to find behavioral and application models, which are used to assign a score to the obligor and/or the operation. In general, banks develop both types of models; whereas the behavioral models use most recent information and therefore are considered more pro-cyclical, the application models only take into account information at one point in time.

10 This is due to the type of variables they incorporate.
However, of the 35 banks which have responded to the question there are 30 with behavioral models, and two national regulators (Germany and Hungary) require the use of them for retail portfolios.

Additionally, there are two cases which have a close link between the use and implementation of models that may trigger discrepancies in the final PD, namely the treatment of exposures with more than one borrower and the acquisitions of portfolios.

• Treatment of exposures with more than one borrower. Whereas banks of some countries take only the main holder into account, others take all the holders when assigning a rating to the operation, as shown in Chart 9. In other cases, the treatment of co-holders’ exposures in banks is based on the best PD, whereas the use of the worst PD is considered in some exceptional cases (3% of surveyed banks). As a result, practices in the treatment of co-holder exposures show a lack of harmonisation.

• The acquisition of mortgage portfolios in a single operation or in a merger. This is very common practice among major European banks. The acquired portfolios are originated with a different strategy or under different risk management policies, so the internal risk models of the acquiring institution might not be necessarily appropriate. Different practices are followed: In some cases, the purchasing bank decided to have the acquired portfolio run off gradually. In other cases, supervisors could indicate the need for developing new models for the acquired portfolio, the acceptance or not of existing IRB models for the acquired portfolio and the time granted to develop a new model for the acquired portfolio, or to integrate both the existing and the acquired portfolio into one single portfolio for the purpose of modelling. All have in built complexities, and are solved in many different ways, potentially impacting on the resulting RWA.

C. PD calibration:

Once a score is given to an operation/borrower, the following step is the assignment of PD to the score. This process could be broken down in two stages: the computation of Observed Default Frequencies (ODF) and the transformation of ODF into PD, taking into account the cycle adjustments. Model calibration is a source of RWA variation mainly due to how ODFs are computed (simple average, average by operation or by borrower, the treatment of withdrawn operations,...) and the different methodologies for cycle adjustment, which could be due to either the choice of the financial entity or to regulatory requirements.

Regarding the first step, most of the banks compute PD as simple averages, but in some cases they choose a customer weighted method.

As was mentioned previously, most banks have behavioral scorecards, which are by nature more pro-cyclical. However, banks consider the nature of their PD mortgage models as mixed or hybrid mainly due to the way they compute their PD, which is linked to the second step of the calibration process.

In relation to the cycle adjustment, only 50% of the banks carry it out, which is consistent with the number of banks which have reported to have mixed models in Table 420. The banks make use of different methodologies when computing the cycle adjustment, which is another source of variability in the PD and consequently in the RWA. Among the most common methodologies used by the banks are the following:

• Variable scalar methodologies.
• Add-on capital requirement or increase of PD.
• Usage of longer historic data series.

It is important to point out that most of the regulators do not appear to have disclosed guidance on how to calculate it21. This is clearly a source of variability in the PD of mortgage portfolios in European banks.

Table 4 – Type of model used for PD

<table>
<thead>
<tr>
<th>Type of model</th>
<th>Number of banks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed</td>
<td>16</td>
</tr>
<tr>
<td>PIT</td>
<td>14</td>
</tr>
<tr>
<td>TTC</td>
<td>2</td>
</tr>
<tr>
<td>n.a.</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: EBF Questionnaire

20 Those banks that have answered to having a mixed or a hybrid PD model have behavioural models in place.

21 According to EBF information sources, the Bank of Spain is known to be working on a document, and the UK FSA published a document on variable scalar. Also, in a validation roundtable Italian banks said their regulator had forced them to switch from point-in-time to through-the-cycle models. In turn, many supervisors may be giving instructions in this area, albeit verbally.
Another element which could bring variability to RWA is the frequency of recalibration. Most of the banks recalibrate annually or quarterly, but there are other institutions that do it with a lesser frequency.

d. Regulatory/supervisory constraints:

In the previous points, the onus of the differences is put on decisions taken by the banks, subject to data availability or methodological choices. However, in the following paragraphs the focus will be moved to elements imposed by the regulators. Regulatory decisions may constitute an important source of RWA variation, which may have impact on many aspects of the calibration of the PD, such as the:

1. Number of buckets, due to the allowance or disallowance of a continuous master scale for capital computation.
2. Type of scoring.
3. Period of time to be considered when calibrating the PD, and the methodology for calculating the cycle adjustments.
4. Size of the PD by the imposition of add-ons.

In first place, the use of a master scale is a common tool among the banks participating in the questionnaire. However, while only some banks use a master scale in the computation of capital requirements, other banks use it for transparency and reporting reasons.

When European banks have to compute capital requirements, they face different requirements because some national supervisors allow the use of a continuous scale and others impose the gathering of operations in buckets/rating grades, imposing the use of a common PD for all the operations assigned to those bucket/rating grades. In addition, for those banks whose supervisors impose the use of buckets, the responses to the EBF questionnaire show that there is no common number of buckets. On the contrary, banks report they use between 8 and 50 buckets. The search for an optimal number of buckets has to combine high discrimination capacity and low concentration in one bucket (see Chart 11).

---

22Some banks do not have a master scale, and other banks have different master scales for regulatory purposes and for management reasons. There are also banks with a different master scale for each country.

23The use of buckets can be interpreted as the use of a discrete scale.
Half of the national regulators of the banks participating in the EBF questionnaire allow banks to calculate PDs on continuous scale, rather than assigning a discrete number of values for PD. A continuous scale for PD will lead to more accurate, but generally lower capital requirements than an approach relying on a limited number of discrete values.

Next, regarding the type of model used to rate mortgages, behaviour or application, there are two countries where regulators require banks to use behavioural models for retail portfolios.

Further restrictions European regulators impose when developing models are in the choice of years to be used. In some countries regulators require that the years used in the calibration are scaled up to incorporate certain years where there was a crisis in the jurisdiction. Due to the fact that internal series are not available to compute through-the-cycle, banks need to calculate cycle adjustments. The way these cycle adjustments are computed creates another potential source of variability.

Finally, another source of PD variability due to supervisory practices is the imposition of add-ons. According to the EBF questionnaire, 16 out of 42 banks have additional add-ons imposed by the regulators, on top of the regulatory floors for PD (0.03%) and LGD (10%) or the add-ons imposed in Pillar 2. However, some banks have to face additional add-ons that may be imposed on:

- Their RWA,
- Their PD for model risk, or applied on non-domestic portfolios,
- The exposure for mortgage loans denominated in foreign currencies.

e. The definition of default used by the banks:

The definition of default used by banks to compute their PDs follows the definition of default of Basel 3, in some cases complemented by guidance from national authorities. However, in addition, the entities may internally decide on the definition of cure periods or amount of threshold, which have an impact on the number of defaults and therefore on the final PD. In this regard, only 35% of the banks participating in the questionnaire use explicit cure periods, whose range varies from 90 days to 4.5 years, as shown in Chart 12, how long a defaulted loan is required to be maintained in default status before being reclassified as performing is very different across banks, which results in a source of RWA variability.

When it comes to the threshold amount used for the definition of default, this is low or insignificant. Another issue is whether there is default contagion from one product to another of the same customer. Continuing with the cured operations, according to the survey more than half of the banks do not penalise cured accounts with a higher PD. On the other hand, 20% of the banks in the survey assign a higher PD and the remaining banks only assign a higher PD depending on the type of default. However, it must be taken into account that those banks that do not increase the PD have behavioural scorecards which indirectly penalise past delinquency.

24 According to the answers, the authorities in some countries are having on-going discussions about the implementation of new add-ons.
As mentioned previously, the other potential source of variability in the PD is the treatment of refinancing operations. During the crisis, refinancing management activity has acquired great relevance. Local regulators have been paying attention to these practices, in particular to their treatment under capital rules with specific risk model approaches imposed in some jurisdictions. As an example, four different PD levels could be assigned to refinancing non-performing loans:

a. Past due transactions of more than 90 days that have paid regular interest and have provided effective collateral.
b. Past due transactions of more than 90 days that have not paid regular interest and/or have not provided effective collateral.
c. Past due transactions of less than 90 days with moratorium granted or expanded – interest or principal – and that have not been re-written in the previous 12 months.
d. Past due transactions of less than 90 days with moratorium granted or expanded – interest or principal – and that have been re-written in the previous 12 months.

Among the participating banks, only 2 out of the 42 banks participating in the survey have implemented specific refinancing models for their refinancing operations. The treatment of forbearance and whether refinancing constitutes default have been commented in the section of definition of default.

THE IMPORTANCE OF BACK TESTING

When looking at the various factors that can cause variations in the performance of mortgage portfolios, even within jurisdictions, it is clear that no single modelling approach will be the same.

This is also what the Basel Committee intended when it introduced more risk sensitive approaches in Basel II. It is not the alignment of modelling methodologies that should be sought after; the emphasis should be put on making sure IRB models across regions and jurisdictions all perform as well as possible, based on the state of modelling techniques, the data availability and data quality for the construction of models, etc. As the variables discussed in this section all generate increased rates of risk-variance, differences in RWA (as well as PD and LGD) are to be expected, both in terms of observed and estimated levels of risk.

As the objective of IRB modelling is to make sure banks succeed in developing models that best reflect the actual risks in their portfolios, the modelling techniques that best fit the underlying portfolio, will vary case by case. Since diverging RWAs are to be expected, testing model accuracy is of the essence. For this purpose, banks are required to perform back tests\textsuperscript{25}, which are used for internal purposes, but they also have to be disclosed to the competent authority. In case of a well-functioning IRB model, back testing should prove that the model generates accurate estimations of behavior that is based on observed data. Accurate estimations can only be achieved if IRB models produce accurate PD and LGD estimations. If a model does not score well in back testing, the predictive power of the IRB model is suboptimal. In such a situation the bank will re-develop its model. In the meantime a layer of conservatism could be applied, until the next back testing provides evidence of sufficient model quality. The competent authority has the tools to either impose a layer of conservatism or even force the bank to move the portfolio from an advanced IRB to the standardised approach.

\textsuperscript{25}There is a vast array of statistical techniques available to perform back tests, such as the GINI score.
THE LOSS GIVEN DEFAULT (LGD)

Overview
The survey indicates that European banks have built their LGD models to reflect a number of underlying drivers. Though the exact impact that each driver has on LGD cannot be estimated precisely, the differences largely arise in the following areas:

a. Structural differences – for example, the customer and geographic mix, the range and flexibility of product offerings, collection strategy and treatment of customers in financial difficulty, the extent of associated security and the extent and nature of any government support for home owners;

b. Differences in methodology - for example, different data periods, how downturn effects are accommodated, the modelling approach (data driven, statistical, expert judgment based) and resulting accuracy of models. Further model differences that arise include, but are not limited to:
   i. The definition of default may be different;
   ii. The timing for final write off i.e. the point at which no economic recovery is viable;
   iii. principal and interest treatment;
   iv. discount rate used to reflect time value of money and future realisation assessments;
   v. customer vs. product definitions.

c. The extent of regulatory intervention – in some countries there is quite specific guidance that provides further interpretation of the CRD and how this should be applied, in others there is no such guidance, which means firms are able to interpret according to the underlying characteristics. One prominent example of this is in how the LGD floor is applied, either at portfolio, segment or individual level.
d. The extent and means by which conservatism is applied – this may be in direct response to regulatory intervention, or more simply what can be described as prudential risk management. This is especially the case where data is limited and conservative assumptions are applied during the model build stage. In a pure retail model context, firms will seek to establish the best achievable model using the data available, subject to the regulatory rules. In most cases for LGD, firms do not have rich datasets and so have to develop assumptions to supplement such deficiencies. It is also inherent that firms are faced with choices and options around how they go about building models for which there is no correct answer; in general, firms consider it is better to err on the side of caution but the specific choices they make may well result in different LGD outcomes for ostensibly similar portfolios. Model accuracy results can help guide this, but where defaults are rare events it is not possible to build perfect models and some element of interpretation and judgment is necessary to provide usable results.

In its construction, our survey seeks to identify potential sources of variance within LGD approaches but it is not possible to be categorical as to the significance of some of these differences as that would require a more granular analysis of underlying approaches and will be sensitive to underlying confidentiality concerns. There are many differences in approach and market characteristics which are reflected in the LGDs that firms are using.

That different LGDs may be ascribed to what may seem on the face of it to be similar portfolios is to be expected. A different LGD does not mean the LGD is wrong. Our survey shows that firms are able to, and regularly do, differentiate LGD values so that they are risk sensitive relative to their market place and conditions in order to provide meaningful information internally and also to regulators, investors and other stakeholders about the level of risk firms are running.
The survey indicates that banks across Europe build LGD models which are based on empirical experience – a key regulatory requirement - and to align their models with risk management objectives. Empirical experience differs between firms, some make use of relatively short datasets spanning the latest 3 to 5 years, while others are drawing on much longer experience. But empirical experience can only tell part of the story, especially in low risk market segments, and it is clear that firm’s methodologies are more granular in terms of risk drivers than they would be if built by purely statistical means. In other words, models reflect expert judgment and experience as well as statistically proven “facts”.

Benchmarking may have a role to play, but the problem with this is that no two mortgage markets are identical, and customer differences and approach are subjective assessments that are difficult to model.

**Analysis of results**

The vast majority of firms (79%) describe their approaches as empirical, i.e. they have an empirical method based on their recovery experience. However, there are banks which have mixed or theoretical models, which have an adjusted assessment of the collateral based on price indices in the absence of sufficient internal default data or to supplement this in terms of enhancing model accuracy.

Around half of the firms responding to our survey base their approaches on around 10 year data. A quarter can draw on substantially longer data series and a quarter is utilising histories spanning shorter period (see Chart 14).

The majority of respondents apply the portfolio LGD floor by adjusting all LGDs by an incremental factor. Roughly a quarter of respondents told us that their average LGDs are already significantly above the floor. Around 15% of respondents told us that their LGDs would be materially lower without the floor. A further 10% of respondents say they apply the floor in such a way that their final LGDs are more conservative, for example by applying the 10% floor to each sub-portfolio rather than at the overall portfolio level. Roughly half of the firms reported that they do not have a downturn LGD approach which references a specific time period. Four firms which do, most reference the experience of the early 1990s generally in response to the requirements of their regulator (notably Scandinavia and the UK). However, four firms said they base their downturn LGD on the very recent past.

Around half of the firms in the survey indicated that stressed indices play a key role in their downturn methodology. Nine firms told us they base downturn projections on macro-economic models but a further five firms said they relied on inbuilt conservatism or expert judgement to satisfy downturn LGD requirements.

Fourteen firms either did not specify an approach to LGD segmentation or said they had no segmentation in their models. Eight include a regional dimension to their segmentation and this is the most prevalent means of differentiation reported. The next most widespread form of segmentation is by LTV (six firms), though the presence of a guarantee from a mutual assurer was cited by three French banks.
There are a number of features that present themselves from the responses to our survey. Some are intuitive and obvious; others are more subtle and reflective of EU specificities in the housing market. These are described in more detail below:

1. Long recovery periods should mean higher LGDs

Recovery periods reflect the type of asset being financed, the legal system within which a firm operates and the social (or other) attitude toward repossession and sale of an individual’s house. Our survey showed a range of practices and different elapsed time between default, mortgage execution (forced sale) and write off. In France, for example, mortgage execution is generally within twenty four months after the last payment has been received with write off seven to nine years after default. In Germany the average time between default and write off is just under six years whereas in Norway the average is considerably shorter and takes about nine to fifteen months depending on circumstances.

In the case of a mortgage default, the time to mortgage execution is not generally less than 18 months but in some cases it is reported to be three years, in others five and others much longer. Attributing accurate asset values under such uncertain and prolonged recovery situations is challenging and this greater uncertainty manifests itself in higher LGD values reflecting the time to realise assets and the time value of money adjustment as well as leading to imposed model add-ons and conservatism.

As shown in Chart 15 below, 32% recover in 12 months or less, a further 28% in 2 years with 8% of cases taking more than 5 years to recover. Differences in RWA arise from the length of time that firms have used to estimate LGD values. As shown in Chart 16, these fall into three broad groups as noted above, about half of the firms responding to our survey base their approaches on approximately 10 years of data. A quarter can draw on substantially longer data series and a quarter is utilising histories spanning a shorter period since 2006 in line with the CRD 4 minimum periods.

Our respondents felt this was a particularly challenging aspect, recognising that economic cycles are likely to differ between jurisdictions as well as in terms of representativeness of data series. Notwithstanding, our respondents felt this is an area where greater harmonisation in practice is desirable, and especially where and how historic downturn period data is used, including the criteria for when this should no longer be considered relevant to help improve consistency and comparability between firms results. This could be a useful area of EBA focus.

While economic cycles differ between jurisdictions in terms of both their duration and intensity, this is undoubtedly an area where greater harmonisation in practice is desirable to help improve consistency and comparability, and to understand better divergent supervisory requirements. Basic differences in terms of cycle duration, the number of peaks and troughs, as well as meaning and weight attributed to historic estimates are all elements that lead to a potentially materially different RWA outcome. Experience also differs during periods of economic downturn where some firms have observed and factor in changes in collections strategy.
For example, survey responses noted recoveries taking longer, probabilities of foreclosure being higher and house price reductions that directly affect the amount recovered. In other cases, respondents reported no noticeable change in practice or outcome.

What is clear is that in times of economic stress, recovery takes longer as housing markets are less active and so asset realisations tend to be more protracted. Best practice LGD models will reflect these differences.

**2. Large past reductions in house prices may be linked to higher LGDs**

Firms calibrate their LGD models differently, some use recent past, others use indices (mixed and theoretical models), while others have calibrated to a fixed period when house prices have been lower than they are today. Past experience is definitely an influence in associating values in the model, either directly by the firm or indirectly by the authorities who are minded to look to past experience (typically calibrations based upon the downturn of the early 1990s).

Firms’ use of indices and forward looking measures is limited by such past conservatism, and where sizeable corrections have arisen it tends to play a significant role in shaping future LGD values, almost in defiance of the mantra “past performance is not necessarily the best guide to the future”. The haircuts associated with house price falls are such that larger haircuts (and hence higher LGDs) are seen where house prices are more volatile in the desire to ground risk models in observed data.

Conversely, where such past reductions have not been observed, or do not form part of the data series being used, haircuts are lower with the result that LGD values are lower.
3. Interest only mortgages may be linked to higher LGDs

Mortgages are typically available as a variant of repayment, interest-only or flexible terms depending upon market characteristics and product offerings. Most respondents advise that the bulk of mortgages in their market were repayment based, with only Switzerland (c. 80-85%), Denmark (47%), UK (28%), Norway (27%) and Germany (10%) reporting significant interest-only market share.

In the UK, where interest-only mortgages account for almost 30% of the total mortgage products, firms suggest LGD rates may be higher for interest-only products compared with repayment or flexible factor products. This may be due to a number of factors, but in prolonged periods of low interest rates coupled with economic distress, customers are able to maintain interest payments, possibly by realising other assets, as the full extent of their financial circumstances only becomes apparent when the final settlements are due. If these are dependent upon (say) stock exchange related assets that have underperformed, there may not be sufficient capacity to offset. In these cases a higher LGD will result.

It is clear that each case needs to be assessed independently and in consideration of national singularities. For example, in Switzerland it is customary to split the total mortgage debt into two tranches. The first tranche (usually no higher than 65% of the market value of the residential property) is not repaid as borrowers prefer to save (i.e. in pension schemes) as it is advantageous under Swiss tax regime. The second tranche (around 15% of market value) is usually amortised over 20 years or until retirement. The exceptionally high percentage (80-85%) of interest-only mortgages in Switzerland is therefore due to national tax legislation and has no impact on the (very low) mortgage default experience.

4. Conservative LTV positions may be associated with lower LGDs

It is apparent from our survey that firms build into their LGD methodologies an explicit link between low LTV and actual LGD. This is likely to be because the margin of cover is greater and better able to withstand shocks in house price movements or wider economic distress as home owners are able to settle outstanding commitments from the sale of the property.

Limitations on LTV are in place in some countries for instance the Netherlands, Greece, Austria and Poland and Sweden; and several other countries (e.g. Denmark, Germany, Spain and Sweden) make maximum LTV ratios a condition of eligibility for covered bond programmes. It would appear from the survey that this constraint translates in lower average LGD assumptions as reported by the banks.

Our survey suggests that firms include LTV as a factor within their models in a variety of ways, and although there is some differentiation by LTV in models it is not necessarily seen as a main driver of LGD.

5. Is there a link between the ratio of average house prices and average salaries and the average level of LGD?

From the limited data available from our survey, there is some evidence to suggest that in addition to a linkage to PD, there may also be a link between affordability and general affluence and LGD values. However, the results are not conclusive which is in part influenced by the regulatory floor. Countries with high average house prices such as Switzerland, where the average price for an owner occupier house is €660,000 have LGD in the range of 10-22% (with 10% set by the regulatory floor) and have potentially lower LGD values than (say) Hungary where the average house price is between €25,000 and 35,000 and the LGD 22% and the Czech Republic where the average house price is €70,000 and the LGD is between 15% and 22%. All countries report the potential for sizeable regional differences. Germany is a potential outlier, although it is not clear if this is because the data has been supplied on a consistent basis or if there is a structural difference in salaries relative to the rest of Europe that needs to be understood. While further analysis would be required, there appears to be correlation between average house prices, income and LGD. It is also apparent that in countries such as Germany and Switzerland where only a relative few take out a mortgage there are reflecting fundamental differences in patterns of home ownership in EU markets.
6. Other factors

Some banks reported that the following factors played a part in their LGD methodologies. However, we do not have means of quantifying their impact alongside the many factors at work in LGD methodologies.

Is there a link between product (flexi vs. traditional) and LGD?

In the same way that interest only products point to a differentiated risk profile and pattern of LGDs, the same can be said for observed differences between flexible and traditional (repayment and interest only) products. This manifests itself in two main ways:

a. Flexible products allow customers the scope to manage their affairs through good and bad times in a more structured way. Customers are better able to take control of their personal finances and manage their affairs throughout the life of the product thereby managing periods of financial distress; and

b. Traditional products require a steadier pattern of income in order to maintain repayment patterns without tripping into default or other forbearance.

The LGD patterns are thus different; in the former case, it is more likely that default when it occurs will potentially be more material so isolated cases with a higher LGD, whereas the second will be relatively more frequent and so a more observed or empirical approach is likely to exist.

In both cases, it will be crucial to see how this has been applied to the wider population and the degree of segmentation as the former case will have the vast majority of cases with “zero” observed LGD and the latter will have “zero or low” observed cases. This point correlates with what respondents have told us regarding the link between LGD and fixed vs. floating interest rate mortgages.

Limited customer liability may increase LGD

Jurisdictions appear to differ on the topic of customer liability according to our survey. In countries where the lender cannot pursue the borrower for debts that exceed the value of the property mortgaged property and in effect, the borrower can settle their liability by relinquishing his or her property. LGD should be higher in the second instance and the responses to our survey indicate that this may be the case.

Our survey also suggests a significant difference between LGDs from customers who are “single product mortgage” customers and those from customers who access a wider range of services, especially the current account.

In the case where banks (and other mortgage providers) are able to develop more detailed and current behavioural information to monitor changes in credit standing throughout the life of the product it is possible to manage customer situations more dynamically, heading off customer detriment, and more sensitively in terms of LGD realisations by looking at consolidating wider positions based on the customer liability.

Credit bureaux and external information providers can be used to supplement this, but our survey suggests the extent and pattern of use is varied across Member States with respondents reporting a range of practices in this regard.
An early definition of default may increase RWA

Earlier default definitions result in more customers “curing” or returning to non default status. An early definition of default implies higher PD and lower LGD, where the combined result is likely to be an increased risk weight as long as the 10% LGD floor is more likely to be touched thus limiting the decrease of LGD associated to an earlier definition of default whereas the PD increases.

Where there are significantly more “cures”, modelling is made more complex, even though the result should be a lower LGD assuming that total expected loss (EL) remains unchanged. Our survey responses suggest a range of practices with some respondents suggesting they were not taking this into account as data is limited, whereas others adjust for these differences at the portfolio or aggregate level. There will be artificial influences on this, for example the imposition of a regulatory floor, as well as timing differences between PD and LGD components being realised.

Government Support and the presence of favourable social security schemes may reduce losses and overall LGD

The most significant examples of this are France and the Netherlands where in the event of default, the mortgage provider is able to submit its claim for settlement to a government sponsored body (but not necessarily direct support), which means two things:

a. There is greater certainty of outcome as all debt is removed from the mortgage provider and LGD is assured, and

b. The LGD tends to be lower as it is set at the outset in return for a premium based upon the amount of risk a firm is prepared to hold on its balance sheet.

It must be noted that these types of arrangements are by no means universal across Europe, and some are more explicit than others, but they do result in a more certain and often lower LGD value, all other things being equal. The effects of risk mitigation are further analysed in the section on insurance schemes.

Mortgage Insurance Schemes and other forms of Mitigation may warrant lower LGDs

An extension to the above is where an insurance company will create a mortgage guarantee scheme. The same elements apply i.e. greater certainty of outcome and a risk premium against which to set LGD expectations.

An interesting phenomenon on assigned LGD values is the extent to which regulators have been prepared to endorse such approaches. There are examples of where this type of practice is endorsed and encouraged in one Member State, whereas in others the same transaction is disallowed, thereby resulting in a more penal LGD for the same transaction based upon supervisory interpretation.

With most mortgage products there is an underlying challenge of insufficient defaults to develop robust statistical LGD models and so it is apparent that such differences in supervisory treatment may result in materially different LGD values for “legitimate” mortgage insurance and guarantee schemes.

That is not to say all such schemes have the same standing, but rather points to another reason for differentiation in LGD values with lower values where such schemes exist.
Conservative regulatory requirements may result in higher average LGDs

There is no doubt that supervisors have adopted very different approaches toward LGD modelling with some Member States required to follow prescribed (and often excessively conservative) processes whereas other Member States are left to develop “unbiased” LGD models based upon the data and information available.

The most obvious example is in the treatment of downturn LGD where the extent of supervisory guidance varies considerably. In some Member States supervisors have been quite prescriptive as to the approach that has to be followed, including the period for calibration, whereas others make no adjustment. Another example in LGD is regulatory guidance over the floor; some apply this at individual asset level, others at sub-portfolio and others at aggregate level.

The consequence of these adjustments is a bias towards a LGD value that is higher relative to an unbiased LGD value, with the result that average LGDs tend to be higher. See also the section on Home-host supervisory divergence.

A crisis in the local market (e.g. collapse in foreign currency mortgages) may lead to higher LGDs

LGD approaches take account of recent experience to incorporate changes into the modelled results. A number of banks in our survey have told us that they are applying LGDs that reflect recent heavy house price declines in their home markets. Exposure to and losses on foreign currency mortgages have also differed between Member States and, in some cases, mortgage lenders have been vulnerable to external factors with a resultant increase in the costs of funding beyond viable levels. In some cases government measures have had an effect on LGD values, for example in Hungary where variations in FX affected not only PD, EAD but also LGD measures. This has resulted in deterioration in LTV rates and increased funding costs which in turn fed into higher LGD values.

Non modelled values are treated differently

Not all inputs can be scientifically assigned; judgment is needed to affect the outcome and derive the most appropriate LGD values. There is some suggestion that firms’ approaches differ considerably in this regard which can have a (potentially) significant impact on the final RWA result.

Differences in LGD floor treatment impact LGD outcomes

Our survey indicates major differences in RWA could arise from the different basis being used to apply the regulatory floor.

There are three main ways in which the LGD floor has been interpreted and applied, either as a result of firm specific interpretation or in response to supervisory guidance. This is an aspect that potentially can have a material impact on firms overall capital requirements and as such respondents felt was an area where greater harmonization could be beneficial, especially as this aspect does not directly impact model build.

The interplay with the definition of default is a further aspect, i.e. earlier default will lead to a higher PD and lower LGD (as more assets cure), thereby causing the LGD floor to be more of a constraint.

In addition, respondents considered that the LGD floor was potentially a useful macro-prudential tool for the authorities as it provides a direct lever for influencing systemic risk concerns that might arise from the mortgage activity of firms on an EU-wide basis.
TREATMENT OF DEFAULT PORTFOLIOS

This is an area that may be a source of material differences in the IRB banks. On the one hand, IRB banks have to compute RWA for those positions according to a regulatory formula, and in addition, they must also calculate the gap between the expected losses (EL) of those defaulted positions and their total allocated (eligible) provisions.

RWA for defaulted exposures:

According to the CRD, RWA of non-performing loans are computed as the maximum of

\[ \text{Max} \{0.125 \times (\text{LGD} - \text{ELBE})\} \]

ELBE being the best estimate of expected loss

Neither the CRD, nor Basel framework nor the CEBS guidelines (GL10) give precise instructions as to how banks must compute the parameters, and therefore this is an area where banks may show greater differences.

The treatment of defaulted exposures is a source of some RWA variation as European regulators have not been prescriptive on how to set ELBE. Setting a low value for ELBE would give rise to a high RWA under Pillar I. On the other hand, setting ELBE at or near LGD would reduce or eliminate the need for RWAs against defaulted assets.

According to the responses to the questionnaires, this assumption seems to be true: 7 out 35 respondent banks have ELBEs equal to their LGDs; therefore, these banks have no capital requirements for these exposures. In addition, regarding how it is calculated, almost half of the banks of the questionnaire derive their ELBE from their specific provisions; whereas the rest of the banks compute in a different way such as, for instance, a long-run average.

Differences between expected losses and provisions (IRB provision shortfall):

As commented above, IRB banks must compute the difference between their EL and the allocated provisions for those exposures. If the EL amount is lower than the provisions of the bank, it should be allocated in Tier 2, but should specific provisions exceed the EL amount on defaulted assets, then the gap should be deducted 50% from Tier 1 and 50% from Tier 2. Though this calculation must be done in an aggregated way with all the other IRB portfolios and encompassing defaulted and non-defaulted exposures, the greatest impact comes from the defaulted exposures which are the focus of the following lines.

Taking into account that there is not any explicit question in relation to the treatment of this shortfall, the existence of a shortfall can be deduced from the responses of the questionnaire.

The value chosen for ELBE thus creates a trade-off between a higher capital requirement (if a low ELBE is set) and a higher capital deduction (if a high ELBE is set). However, this is true unless ELBE is computed based on specific provisions because a bank may have zero RWA (because ELBE is equal to LGD) and have no deduction of capital (because ELBE is computed based on specific provisions).

Due to the fact that around half of the banks have calculated their ELBE based on specific provisions, the gap between EL and provisions will be zero and no capital deduction will be required for their defaulted assets. There is also a bank that claims to have an excess of EL over provisions, in addition to zero RWA.

However, for banks that do not consider the accounting information to estimate their ELBE, the result is uncertain because EL may be higher, equal or lower than provisions.

It is interesting to note that on the questionnaire banks within the same jurisdiction have different approaches, which is a clear sign of the lack of harmonization in this area.
The following section focuses on insurance and guarantees on mortgage loans.

Mortgage insurance and mortgage guarantee are insurance policies which compensate lenders for losses due to the default of a mortgage loan. For clarity purpose, the following definition for insurance and guarantee will be used:

On the one hand, insurance schemes can cover different events:

- Unemployment,
- Casualties,
- Decease.

These events do not necessarily lead to default of the borrower. Insurers do not often have recourse to the borrower.

On the other hand, guarantee schemes will be exerted after default of the borrower. Guarantors often have recourse to the borrower after default:

- Without recourse, if the funds recouped from sale of the mortgaged property are insufficient to cover the outstanding debt, the insurer or guarantor will not have recourse to the borrower after default.
- With recourse, the borrower remains responsible for any remaining debt.

This report assesses the relevance of each type of insurance in the European market and their potential impact on RWA.

European insurance schemes are characterized by the diversity of products which is the consequence of diverging legal requirements specific to each country.

<table>
<thead>
<tr>
<th>Government guarantee scheme (% of outstanding of housing loans covered by the scheme)</th>
<th>Private guarantee scheme (% of outstanding of housing loans covered by the scheme)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE</td>
<td>1</td>
</tr>
<tr>
<td>DE</td>
<td>0</td>
</tr>
<tr>
<td>IE</td>
<td>0</td>
</tr>
<tr>
<td>EL</td>
<td>4</td>
</tr>
<tr>
<td>ES</td>
<td>0</td>
</tr>
<tr>
<td>FR</td>
<td>14</td>
</tr>
<tr>
<td>IT</td>
<td>0</td>
</tr>
<tr>
<td>CY</td>
<td>0</td>
</tr>
<tr>
<td>LU</td>
<td>0</td>
</tr>
<tr>
<td>MT</td>
<td>1</td>
</tr>
<tr>
<td>NL</td>
<td>13</td>
</tr>
<tr>
<td>AT</td>
<td>0</td>
</tr>
<tr>
<td>PT</td>
<td>0</td>
</tr>
<tr>
<td>SI</td>
<td>0</td>
</tr>
<tr>
<td>FI</td>
<td>5</td>
</tr>
<tr>
<td>Euro area</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: European Central Bank (2009)

See ANNEX V – Member States abbreviations

EBF member from the Netherlands questions that the figure of private guarantee scheme be zero as there exist the form of inkomensbescherming in the Netherlands.
Firstly, on unemployment insurance, according to data gathered by the questionnaire, in one country unemployment insurance is subscribed by 8% of the borrowers. In other countries, data are limited and/or this product does not seem to be relevant. The main finding on this topic is that unemployment insurance is not so common in Europe, with the exception of some countries. This may be a consequence of social policies in place, where some benefits are provided for a defined period of time in case of unemployment in most European countries.

For other type of insurance (e.g. mortgage life insurance, mortgage casualty insurance) associated with the establishment of mortgage loans the European Commission has collected the following information:

In many European countries, even if not compulsory, mortgages are covered with life/casualty insurance (see Table 7). This reduces the risk of default, protecting customers and lenders against decease as well as disability. This undoubtedly decreases RWA.

Apart from insurance, there are other guarantee schemes or mortgage mitigation instruments. They are usually defined at a country level and may be part of the national jurisdiction.

As reported in the above table, these are common in Austria, Belgium, Cyprus, Greece, France and The Netherlands (countries where more than 10% of housing loans are covered by these schemes). It should be noted that the British Government announced in the 2011 Housing Strategy a New Buy Guarantee scheme due to be launched in March 2012. This is a government guarantee to support an indemnity scheme that will allow higher LTV lending on new built properties. Two examples of countries with significant insurance schemes in place are described below for illustrative purposes: The Netherlands and France.

**The Netherlands**

The NHG (Nationale Hypotheek Garantie, or national mortgage guarantee) was created in 1995 to promote private home ownership in The Netherlands. The administrator is a guarantee fund called Stichting Waarborgfonds Eigen Woningen (WEW) and is rated ‘AAA/F1+’ by Fitch based on the backstop agreement with the Dutch state. The NHG is a significant form of state support for the Dutch housing market in addition to the mortgage interest tax deduction.

**How does it work?**

1. **Currently anyone buying their primary residence for less than EUR350,000 qualifies for the NHG guarantee.** It is normally advantageous for both the borrower and lender to take this guarantee. Borrowers pay a one-time fee (tax deductible) of about 55bp for the insurance. This fee is usually added on to the mortgage, avoiding any extra cash payout upfront for the borrower. In recognition of the lower risk of loss the lender faces, the borrower pays a reduced mortgage interest rate. This is usually about 40-50bp per annum. For the borrower the rate reduction easily makes up for the one-time fee paid. The responsibility to ensure the mortgage loan complies with NHG guidelines rests with the originator. The NHG only checks compliance with its eligibility conditions when a claim is made.

---

26Study on the costs and benefits of the different policy options for mortgage credit, November 2009, European Commission.
2. If the borrower defaults, the NHG will cover any loss suffered by the lender, subject to some caveats. From a borrower’s perspective, provided they did everything they could to minimise the loss, the WEW will write off any shortfall after the sale of the property. While the borrowers credit history will be stained this at least allows borrowers to start afresh without the liability for a shortfall for which they otherwise have been responsible.

In Europe, the Netherlands has among the most lender friendly legal systems. If a borrower defaults and does not co-operate with the lender, repossession and sale of property often happens within a year of first default. For the borrower the threat of losing their primary residence is hence very real and imminent, which ensures borrowers try their best to manage mortgage payments.

Borrowers have a strong incentive to maintain a good credit history because anyone with a poor credit history (e.g., severe mortgage arrears) is unlikely to get access to credit for a long time. Historical performance data demonstrates that due to stricter NHG underwriting standards, the NHG backed mortgages performed better than non-NHG mortgages.

**France**

The mortgage can be replaced by a guarantee issued by private entities. In such a case, guarantors, on the basis of the credit file analysis, may provide a full guarantee to lenders disconnected from the value of the property and a full recovery service. Lending banks recover 100% of the home loan plus all costs and expenses.

**How does it work?**
1. Guarantor analyze the mortgage application and is free to offer or not a guarantee.
2. A guarantee fee is paid upfront by the borrower when he is granted the mortgage loan.
3. Once the credit is repaid, part of the fee will be paid back to the borrower, according to the overall level of delinquencies supported by the guarantor on its entire portfolio of guaranteed mortgage loans.
4. In case of default, the guarantor is able to go to court in order to request a judicial mortgage on the property (“hypothèque judiciaire”) within one week.

*Chart 17 – Doubtful loans in French market vs Crédit Logement*

Guarantors are licensed and regulated by the French banking regulator. They have appropriate reserves called “Mutual Guarantee Fund”. Banks are usually their shareholders.

The existence in this process of a second risk review of the loan documentation and the solvency of the borrower by the lending bank and by the guarantor also contributes to reduce the risks of loss.
Furthermore, the criteria used to obtain a guarantee are more restrictive than in case of mortgage financing; in particular, they are centred on the solvency of the issuer instead on the property value. Around 20% of the loan applications are rejected when analysed a second time.

Due to very strict borrowing standards and to a system favouring risk mutualisation, guaranteed home loans present significantly lower default rates and higher recoveries than loans secured by traditional mortgages. This result is confirmed by a study realised by Crédit Logement, market leader for residential home loan guarantees in France. Chart 17 shows the significantly low default rates of loans guaranteed by Crédit Logement in comparison with the French market.

As a consequence, the overall credit losses suffered by lenders on mortgage loans covered with a guarantee are lower than the ones observed on the rest of the mortgage loans portfolio. RWA are also very low. 44% of French residential mortgage loans are covered by these guarantee schemes.

The insurance/guarantee products also have an impact on the portfolio profile: These schemes may be more favourable to some kind of customer (e.g. targeted customers are different in The Netherlands and in the French schemes) and they may be overweighted in the RWA calculation of one country, which justifies RWA natural discrepancies.

As a matter of conclusion, the offer of insurance and guarantee products on mortgages varies across European countries. And so do customers’ demand and practices. Guarantee schemes are also used by government as a mean to carry out national housing policy. Consequently, insurances and guarantees are a new element that adds safety in the European mortgage market, increasing its heterogeneity as well. However, thanks to insurances or guarantees, credit risk is transferred from the mortgage issuer to a third party, which may be a Government Sponsored Entity, an insurance company and/or its customers... For lenders, credit losses are therefore reduced. These schemes can have a significant impact on RWA, especially as the number of mortgages they cover, increases.

COVERED BONDS

Covered bonds are an important source of funding for the mortgage industry in Europe. At the end of 2010 the outstanding amount of covered bonds was Euro 2,500 bn. Almost three quarters of this was covered by mortgage loans. Among the countries participating in the survey, all but one country (Switzerland) has a market for covered bonds. The importance of covered bonds measured as a percentage of outstanding mortgage loans ranges between 6 % in the UK and 83 % in Denmark.

A covered bond means that a pool of assets is ring fenced for the issued bond. Legislation is in favor of the bond holder. One of the key aspects of covered bonds is that there is a strict legislation controlling eligible assets for the pool, maturity mismatch between assets and bonds, and other factors that strengthen the credit worthiness of covered bonds. Assets included in covered bonds must comply with a set of strict criteria. These often include a cap on LTV and treatment of late payments in the pool. Many jurisdictions in Europe incorporate possibilities for the lender to keep a dynamic pool, which in practice means that only performing loans will be eligible for the pool, while the rest will be removed from the pool. It is also common with public control over the activities in the pool as well as issuance of bonds.

There is no common regulation of covered bonds in Europe, but in every jurisdiction the legislative focus is on maintaining a high credit worthiness of covered bonds. For issuers it is important to have the highest rating (AAA/Aaa) on the bonds. Issuance of covered bonds also means that assets are kept on banks’ balance sheets and are included in the IRB models.
As only high quality credits enter the cover bond pool a general observation is that a presence of a large covered bond market is likely to contribute to a sound mortgage origination process and to restricting LTV’s. A strict credit process is also a prerequisite for having assets that can be included in the pool. It would therefore not be surprising if lenders with a large dependency on covered bonds also have low RWA for mortgage loans.

SECURITISATION

Besides covered bonds, securitisation is another important funding tool for mortgages in Europe. As this study focuses on IRB rating models for residential mortgages in Europe, this section will give an overview of the potential impact securitisations (RMBS’s) could have on IRB modelling practices. Contrary to the common market practice in the United States before the crisis, in Europe RMBSs are predominately used for funding and contingent liquidity purposes.

In regard to securitisation, two situations need to be differentiated. In the first situation a complete transfer of credit risk achieved by selling the notes of the majority of all tranches of the capital structure of a securitisation (whilst retaining 5%). In the other situation securitisation is primarily used for funding by selling only the notes of the senior tranche or contingency liquidity purposes by retaining all notes and having these available for repos with the central banks.

Out of the 14 European countries participating in the RWA survey, only 5 (Belgium, Italy, the Netherlands, Spain and the UK) report the existence of active and sizeable securitisation markets; in one additional jurisdiction securitisation is present on a small scale. The absence of securitisation as a funding instrument in some markets has to do with the fact that in some European countries capital markets are yet to be fully developed, or it is due to the (co-)existence of deep covered bonds markets.

European banks active in the origination of RMBSs indicated that almost no risk is transferred and therefore no significant RWA reduction is realised. The introduction of new requirements for securitisations through CRD2 has made it more difficult to use securitisation to achieve risk transfer and a reduction of RWA. Asset securitisation has no influence on data gathering and there is no impact on the data used to build IRB models for residential mortgage assets.

The impact of securitisation on RWA is an area that may merit further analysis. In Spain securitisation can impact PD and LGD model estimation. In the Netherlands, this is not the case. In some markets, notably outside the EU, RMBS issuance encompasses virtually all originated mortgage loans; in others, notably in Europe, covered bonds issuance is more common, and RMBS issuance is non-existent or only encompasses a part of the overall mortgage portfolio.

Generally speaking, however, average securitisation coverage rarely exceeds 30% of the overall domestic mortgage market. This is markedly different for covered bonds where coverage in the many active markets is up to almost 100%. It should be noted however that securitisation coverage (and thus encumbrance) levels differ largely not just between mortgage markets but also between banks active in those markets.
Generally speaking, however, average securitisation coverage rarely exceeds 30% of the overall domestic mortgage market. This is markedly different for covered bonds where coverage in the many active markets is up to almost 100%. It should be noted however that securitisation coverage (and thus encumbrance) levels differ largely not just between mortgage markets but also between banks active in those markets.

The marked difference in mortgage funding practices in Europe is not solely due to the existence of deep securitisation markets —something which has reduced significantly since the onset of the crisis—but obviously also depends on the market segments that banks are involved in as RMBS is mostly done on selective classes of mortgage assets. In some markets the viability of the mortgage business model even depends on the existence of deep RMBS or covered bonds markets procuring relatively cheap funding for low margin mortgage portfolios. This is typically the case for mature, overbanked markets where competition in mortgages is fierce.

**Conclusion**

The ultimate RWA density of a bank engaged in securitisation is not likely to be impacted due to the fact that in almost all cases securitisation is applied for funding and liquidity management purposes and a large part of the credit risk is retained.

However, in jurisdictions where securitisation impacts RWA model estimation, a fair comparison of different banks’ mortgage related RWA density cannot be done without verifying whether the involved portfolio has been constructed on the basis of securitised mortgage loans for which credit risk has been transferred or not. The differences in RWA density as a result of securitisation activity, although unlikely, should be duly noted and explored.

**FOREIGN CURRENCY LENDING**

In some (Eastern) European countries (notably in Poland, Hungary), it used to be quite common to grant mortgage loans in non domestic currencies (they were mainly Swiss franc and Euro denominated); it was felt that the latter currencies were more stable and would not expose borrowers to local interest rate volatility. Furthermore, savings could be achieved by borrowing in low interest rate currencies. Lenders and borrowers may not have foreseen the high impact of an increasing mismatch between local currency cash inflows (salaries) and foreign currency outflows (mortgage installments). The high LTV percentages resulting from soaring foreign currency exchange rates during the crisis lead to unsustainable debt burdens for some groups of borrowers. It is very difficult to model, to factor in these changes in the score cards, provisioning and other instruments because it is a one off event that has great impact on the quality of the portfolio.

Nowadays, the appetite for such foreign currency mortgages has waned, as loss rates on mortgages denominated in foreign currency have gone up continuously since the crisis. Depressed domestic housing markets and higher unemployment rates in conjunction with an unexpected appreciation of the foreign currencies in question, lead to a revaluation of the business by banks. The incentives being procured thereafter by local regulators and a changing capital treatment for such mortgages in CRD 3 exacerbated the situation. In many banks nowadays such portfolios are either in run off mode or the proportion on the total mortgage pool has been reduced substantially.

In the survey mortgages denominated in foreign currency do not have great importance in most participating countries.

- In 9 countries foreign currency mortgages represent a negligible amount (below 1% of overall market);
- In 3 countries the stake of foreign currency mortgages on total market is between 1% and 5%;
- 1 country reports major stakes.
Those numbers may however provide a somewhat distorted picture of the true situation in Europe due to the non participation in the questionnaire of certain European countries (e.g. Cyprus, Greece and Austria) and/or of countries where the majority of the banks operate under the standardised approach. The questionnaire further focused on the participating banks’ domestic market whereas foreign currency mortgages often were granted cross border.

Poland, a country where the value of foreign currency mortgages in some banks portfolios exceeds the value of domestic currency mortgages, did not participate in the questionnaire as most local banks report under the standardised approach and subsidiaries of international banks participated through their head offices.

Although the overall effect on European RWA of foreign currency mortgages may have been limited as many banks in those countries were reporting under the standardised approach of Basel II, and higher capital requirements for foreign currency denominated mortgages were only introduced under CRD 3, banks reporting under IRB already showed dissimilar RWA depending on whether the mortgages have been granted in local or foreign currency.

However, even though the disparity in exchange rates meant that the mismatch in income in local currency versus mortgage installments in foreign currency grew during the crisis, the risk profile of foreign currency mortgages is not by definition higher than the risk profile of domestic currency mortgages. Reason for this is twofold:

- A couple of banks adopted, from the onset, stricter admission policies for foreign currency mortgages regarding maximum LTVs and the selection of client segments. This even lead, in those banks, to foreign currency mortgages overall displaying better performance than domestic currency mortgages.

- Foreign currency mortgages can furthermore be a good practice for customers whose income is paid in a foreign currency, it procures the advantage of being able to borrow in the currency in which the customers income is paid, enabling the customer to avoid potentially expensive currency conversions.

Most banks engaged in this type of lending however only recently amended their credit policies either under influence of supervisory instructions or as a direct result of mounting losses.

Therefore, generally speaking, foreign currency lending leads to higher PD estimates; the effect on LGD is further exacerbated in countries like Hungary where the government has capped borrower losses.

In Hungary the proportion of foreign currency (mostly Swiss franc denominated) mortgages on total mortgages is around 75% with at least one bank above 90%, which is therefore having a major impact on the country’s average PDs and LGDs. On experiencing climbing loss rates due to depressed house prices and negative currency effects leading to LTVs above 100% being rather common, lending standards both imposed by the government and internally set by the banks have been updated in recent years.
On top of establishing maximum LTVs for newly originated mortgage loans in foreign currency the Hungarian government adopted a new law in September 2011 forcing lenders to take enormous losses on their books through legally decreed prices and exchange rates. The effects of this law presumably are yet to be fully reflected in Hungarian banks’ models and RWA. Interestingly, the question is whether supervisory validation would allow the models to be truly forward looking, ie not taking the historic data fully on board in behavioral scorecards impacting on PD estimates and in downturn LGDs, arguing that new, considerably stricter, lending policies would preclude such losses from happening again even in a new crisis. Foreign currency mortgages were furthermore common for secondary (holiday) homes with for instance many UK borrowers taking out Swiss franc or euro denominated mortgages. Ballooning mortgage payments for the holiday home coupled with the impossibility of selling it in the currently depressed markets make that not only the secondary home mortgages are impacted negatively but that it can equally have a knock-on effect on said borrowers’ primary home mortgages, and hence on the PDs and LGDs of UK banks having granted the primary home mortgage.

This is because the secondary home mortgage lenders can pursue money through the courts in their home country and the UK, putting the debtors’ assets, including their homes in Britain, at risk.

Switching from foreign currency to domestic currency mortgages has proven both costly in view of high penalties, or impossible due to situations of negative equity. Furthermore, it is not entirely clear how such switching has been modeled by the lending banks in question.
FURTHER SUPERVISORY GUIDANCE

MODEL GOVERNANCE

Differences in supervisory practices between jurisdictions may cause divergences in banks RWA, although the impact is very difficult to quantify.

There are several areas in which practices may differ between jurisdictions. These are related to the initial validation of models as well as the ongoing supervision of models and RWA classification methodology. Implementation practices also vary, for instance regarding methods for cycle adjustment and LGD downturn adjustment. Moreover, whether supervisors impose minimum floors or not on risk parameters or some asset classes through Pillar I will directly influence RWA. In contrast some supervisors may choose to address such risks in the Pillar II process, which does not impact RWA. The supervisory approach in this regard thus has an impact on RWA comparability between banks.

In order to assess to which extent these instances exist banks were asked about:

- Any discretional model risk add on imposed by supervisors (Pillar I or Pillar II),
- model approval and model change policies,
- the use test.

MODEL ADD-ONS

CRD has established a floor on PD of 0.03% and a floor on LGD of 10 % for mortgages. Banks in their calculations of risk parameters also include statistical safety buffers to compensate for model uncertainties such as population size. Some regulators require an additional model risk add on to be included in risk parameters and RWA assessment.

From the responses in the survey it is evident that few jurisdictions have imposed a discretional add on for model risk through Pillar I. Only a few banks report a requirement of additional add on for model uncertainty or institution specific factors. There are, however, other sources of inconsistencies. These relate for instance to imposed floors on RWA or a higher LGD floor than the regulatory 10 % (as is reported by a couple of banks). Moreover, some banks are obliged to impose specific charges through the Pillar II process covering modelling uncertainties as well as other types of specific risks. Examples from the survey are charges for LGD models or exposures to mortgages in one particular country.

These results suggest that disparity in RWA from different supervisory approaches do exist, although the impact does not seem to be material. In particular, this concerns the choice between incorporating charges for different types of risks through the Pillar I and the Pillar II process.

MODEL APPROVAL

Another area which may influence RWA is practices regarding model approval and model changes approval. There is often a divergence across the EU regarding the internal model coverage, which may partly be due to different and stricter approval requirements or interpretations between supervisors. In order to measure risks and the capital requirement correctly IRB models need modification from time to time. Modifications are thus a natural part of the IRB process and also a regulatory requirement. Changes in IRB models require to a larger or lesser extent pre-approval by supervisors with diverging timelines for final regulatory approval. This can lead to short or long periods before changes can be implemented and thus will be reflected in RWA, although the ultimate impact on the RWA divergences is probably remote.
Most regulators, but not all, have published technical guidelines detailing requirements for IRB model approval. As these contain a varying degree of instructions there is room for interpretations and divergences in practices. One possible area of inconsistency is the definition of significant changes, which need preapproval by supervisors, and insignificant changes, which do not need supervisory consent. According to the answers in the questionnaire the threshold for material changes is generally interpreted as a 5% change in RWA, but other thresholds exist. For example in one jurisdiction most changes need preapproval. In another jurisdiction banks have to internally define significant/insignificant changes and document the criteria in an internal model change policy.

**USE TEST COMPLIANCE**

By including questions pertaining to use test compliance in supervisory model validation, it was investigated whether divergent application of use test criteria might influence RWA, either by imposition or implementation of factors impacting on modelling and on PD or LGD estimation, or, more indirectly, through rejection of IRB models and/or by withholding (timely) model approval.

Whilst in virtually all European countries included in the study written supervisory use test guidance more or less replicates CRD 2 and CEBS language, the in situ supervisory validation shows a very different picture ranging from supervisory authorities not reviewing use test compliance in practice, to others demanding extensive documentary evidence and audit trails verifying the comprehensive usage of risk parameters in all relevant internal processes.

On average the use of risk parameters (and underlying scoring models) in credit granting and related monitoring processes is a commonly required minimum. A few supervisors in addition require the evidenced use for pricing, product development, remuneration, and strategy decisions. One supervisor was reported to focus very much on senior management use, understanding and oversight of risk parameters. One bank further reported that it was required to demonstrate the discriminating character of the internal rating system in pricing by providing a regular global mortgage study.

In some jurisdictions use test compliance must be reviewed and reported annually by an independent control unit for each individual model.

For mortgages in particular most supervisors insist (but do not always verify) that the rating/scoring system has been applied as the prevailing instrument and governance of credit risk for an appropriate time period. The requirement of a verifiable link between risk parameter estimations and the terms and conditions of the mortgage loan and integration in capital allocation processes get less focus.

In two jurisdictions however, full, evidenced, coverage by IRB models is a pre-requisite for model approval; such could in theory lead to banks in those jurisdictions keeping a higher proportion of mortgage portfolios under the standardised approach. One bank in particular indicated that in its mortgage models it only uses predictive variables that are widely and readily available because un-scored contracts would impede on IRB approval. In this sense, use test criteria do impact on this firm’s internal modelling.

Even though studying IRB versus Standardised approach coverage within one firm does not form part of the present study, it merits some attention: mortgage related RWA could well be higher simply due to a proportion of mortgage portfolios or sub segments remaining under the standardised approach. Given that cherry picking of the Basel II approach by banks is prohibited in CRD 2, this leads to the conclusion that by definition banks with a high proportion of mortgage portfolios under the standardised approach report higher average mortgage RWA.
From the responses in the questionnaire it appears that compliance with use test criteria has not been a material factor for many banks for IRB approval nor on modelling choices. One exception is the much reported, imposed use of behavioural scorecards in PD calibration: this phenomenon however is analysed in the section on PD.

Notwithstanding widely divergent supervisory practices reported by the participating banks in this area, the responses therefore did not provide any evidence that these divergent practices in the use test may have a material impact on RWA.

**HOME HOST SUPERVISORY DIVERGENCE**

A recent IMF report relates a low intrusive supervisory control to higher risk weights as the margin of prudence has to be set at a high level by the supervisor whereas an intrusive supervisory regime would be in a position to set requirements at the level of the internal models. This theory however does not appear to be corroborated by RWA density analyses comparing average RWA density on a jurisdiction by jurisdiction basis. In jurisdictions where intrusive supervision (measured in number of inspectors in situ, number of supervisory guidance documents published overlaying CRD 2 / CEBS guidance and/or based on expert judgment) is in place, RWA density actually is not lower than average and caution should therefore be applied to such generalized observations.

What appears to be true however, at least based on the responses to the questionnaire, is that notwithstanding detailed rules and CEBS guidance, supervisory validation of IRB models can still take different forms and levels of intensity, and that this impacts on RWA.

On top of concrete model related guidance, the banks have equally reported on major differences in supervisory approaches, e.g. intrusiveness of validation exercise, overall level of prescriptiveness, model focus areas, and required supervisory vs. bank resource allocation. In the majority of cases, supervisory guidance tends to be more “principle based” as opposed to the more rules based approach of a couple of European supervisors.

The validation process carried out by the supervisors also differs from one jurisdiction to another. In some cases the supervisor replicates and reviews in detail the models where in other cases the focus is on the results, qualitative issues, and main methodology aspects.

From the previous sections in this report it becomes abundantly clear that one can identify various areas of discrepancy in risk parameter modelling, a considerable part of which seem driven by specific supervisory requirements.

In addition to these differences between supervisory instructions already identified in the previous Sections, the participating banks were requested to cite any areas of divergent approaches they had come across during their negotiations with the respective home and host supervisors. Only large international banks were able to list such divergence:

- Evidently, many banks have no mortgage portfolios outside their home country, or opt to report foreign mortgage portfolios under the standardised approach.

- Only banks where both home and host supervisors played an active role, and on top of that demanded active involvement of head office modelling and validation departments in the approval processes of local mortgage models, were able to observe and digest differences in approaches and opinions.
This Section should therefore be construed as complementary to the previous Sections in the sense that this Section contains an expert judgment based list on divergent supervisory guidance which is deemed relevant by the reporting banks for the ultimate RWA results.

From the responses received, one can easily distil four home host supervisory governance regimes related to the approval of mortgage IRB models in foreign subsidiaries:

1. A home host regime in which the host supervisor, deemed the expert on local mortgage markets, takes the lead, with little or no input from the home supervisor. In this regime the home supervisor retains the right of final legal approval of the rating system but tends to rely on the host supervisor approval rather than carry out additional checks, or, in one reported case, even formally delegates the right of approval to the host supervisor;

2. A home host regime in which the home supervisor, deemed the expert on the bank wide model methodologies, standards and central governance, takes the lead, with little or no input from the host supervisor;

3. A home host regime in which both home and host supervisors review the mortgage models and risk parameters and come up with a joint view and ultimate decision. At least one supervisor refuses to approve models in host countries for consolidated capital reporting unless the host supervisor actively engages in the host country model validation;

4. A home host regime where decisions pertaining to all models are collaboratively made by the College of Supervisors (often based on material prepared by the home supervisor).

Banks under the regime mentioned under 3 above often feel they have to comply with the highest possible standards which in some cases are not even the result of a joint position but reflect both independent views and requirements of the home and host supervisor. This regime seems to sit well with the intrusive supervision approaches taken in 4 European countries. One bank, although visibly under the 2nd regime, indicated also to have both host and home supervisors separately requiring changes to mortgage models. It is even not unusual for a bank to end up for the same mortgage portfolio with different RWA for consolidated capital and subsidiary capital purposes.

In this context it should be mentioned that there does not seem to be reciprocity when home and host supervisory roles are switched; for instance, if they work along the lines of the first mentioned regime in country X, it does not necessarily mean that they will follow the same pattern when they switch roles, i.e. when the home supervisor becomes host and vice versa.

The banks reported the following main areas of divergence in supervisory guidance on IRB mortgage models:

1. Definition of default
Some supervisors impose a mandatory 90 days-past-due trigger; others leave this at the bank’s discretion.

2. Governance related requirements
Whilst it is unclear how this plays out in practice and whether this produces far-reaching results, banks do report that they have observed different governance related model approval criteria between supervisors. For model changes different regulators apply different criteria regarding what is a “relevant change” that requires their approval before implementation. Therefore, a model change may be implemented without prior approval under home rules but would require approval by the host regulator.
3. Recalibration

Some supervisors require a mechanic annual recalibration whilst others expect regular model monitoring to identify the need for recalibration as required.

4. Rating philosophy

A few supervisors impose the mandatory use of a TTC or even ‘procyclicality’ approach for regulatory capital reporting; they may even require that economic capital computation is replicated, if not used, based on the same methodology. Some supervisors have in addition strict criteria for long run default data, in the absence of which a conservative prescribed approach is imposed.

The compulsory procyclicality approaches take different forms and scopes, e.g. variables scalar or a-cyclicality approaches. Banks under these supervisory regimes are disallowed to transpose their home approach to host mortgage portfolios.

5. Segmentation

In one particular case, a separate conservative segmentation of refinanced accounts and second mortgages was mandated by the host supervisor whereas the home supervisor left this at the bank’s discretion.

6. Data quality vs. data availability

Supervisory authorities seem to balance the quality of data with the availability of data in different ways. This leads to divergent approaches, among others, to data representativeness (e.g. of an economic downturn, or of a particular region, statistically significant time series for defaults etc).

For downturn or trough estimations, some insist upon the use of the latest data with extrapolation techniques; others prefer the data of the previous downturn period arguing that that it is more representative of a normal recession. One supervisor was reported to have asked firms to truncate data series.

According to the banks, in-built safety margins were not always found sufficient ground for relaxing supervisory standards due to a lack of complete, statistically relevant, data samples.

7. Use of behavioural models for PD calibration

One particular supervisor was reported to insist upon the implementation and use for PD calibration of behavioural models. Even though many banks have indeed such models in place, and use them for PD modelling, there are also cases where mortgage PD models have been approved without behavioural model inputs.

8. LGD Modelling

The banks actually reported a huge disparity in supervisor criteria in the area of LGD modelling:

• The spread used in the costs and expenses discount varies according to different supervisor criteria.

• Where some banks indicated to be restricted by some supervisors in the allowed number of LTV bands, and the mandatory use of LTV at origination (versus a dynamic LTV calculation), they found that other supervisors would not put any restrictions on such issues.
• Many supervisors are (de facto) prescriptive on the definition of economic downturn and – cycle; but they often give dissimilar instructions. Obviously, this partly is explained by the factual differences in economic cycles between different European jurisdictions impacting on local mortgage markets. See further the under point 5 above mentioned.

• The LGD for defaulted assets was in some cases required to be based on downturn LGD with a small stress on the ELBE, so that the level of RWAs on defaulted assets is very low but there is an offset in the form of a capital deduction. These instructions are not replicated by the banks in question other supervisors.

9. Application of LGD floors

The methodology to be used when calculating LGD floors differs per jurisdiction. In one country, there are effectively two LGD floors (at account and portfolio level) to be applied.

One bank defines default on a customer (not account) level which results in relatively high PDs and low LGDs. As a consequence, its regulator imposes a 11% LGD floor and is thus de facto forcing the bank to adopt an account-level default definition.

10. Minimum Use and Experience test requirements

A more rigid interpretation of the use test requirement, with some supervisors for instance demanding the demonstrated and audited use of internal ratings in origination processes was observed next to others applying the use test requirements more lightly. In some jurisdictions a one year experience test compliance is deemed sufficient; other supervisors strictly impose a 3 year requirement. One supervisor was said to focus much on senior management reporting on risk parameters.

The above categories are the key areas that were listed by more than one individual bank. However, anecdotal evidence seems to point to the existence of more areas that might need to be explored further. From the aforementioned in this Section, it can be concluded that

• Banks reported different home host supervisory co-operation regimes, ranging from emphasizing the importance of consistency of model standards (home supervisory leadership) to the inclusion of local flavour (host supervisory leadership).

• Banks that have undergone intensive supervisory validation processes with more than one supervisor have noted many areas of divergence in approach and imposition of standards. Written and verbal guidelines, other than what was prescribed in CRD 2 and CEBS Guidance 10, has been absent in some cases, and abundant in others. The reporting banks strongly believe this influences the ultimately reported RWA to a considerable extent.

• The more rules based approach and prescriptive nature of the supervisory regimes in a few European countries has a potentially high impact on RWA. Even though the participating banks have not provided sufficient data accommodating a quantitative impact analysis (such data deemed proprietary and confidential), the expert judgment based evidence provided by the banks hints at material impacts.

• Given its importance in the capital formula, observed LGD related discrepancies both in the internal modelling choices, and in associated supervisory guidance, merit further attention from regulatory bodies going forward.
BANKS’ ASSESSMENT ON THE IMPACT OF SUPERVISORY AND MODELLING DIFFERENCES

Participants in the survey were requested a cross-sectional assessment on the materiality of the underlying supervisory and modelling differences. The qualitative assessment provided by risk modelers sheds light on the degree of significant underlying differences, in terms of the outcome of IRB models, involved in every area analysed in the present study.

Respondents to the survey have identified the following factors as the most impacting ones on the RWA outcome of IRB models according to their experience (more than 50% of participants considered them to be highly impacting or important):

- Characteristics of the mortgage market (subsection 2-3 of the questionnaire)
- The legal framework (section 3)
- Definition of downturn LGD (subsection 4-11)
- Characteristics of housing markets (subsection 2-2)
- Criteria for cycle adjustment (subsection 4-7)
- LGD model approach, theoretical, empirical or mix (subsection 4-10)
- Length and thickness of the data series (subsection 4-3)
- Definition of default (subsection 4-1)
- Relevance of the mortgage market (subsection 2-1)
ANNEX I – Residential mortgage risk modelling questionnaire

CEBS   Committee of European Banking Supervisors
CRD    Capital Requirements Directive
EAD    Exposure At Default
EBA    European Banking Authority
EBF    European Banking Federation
ECB    European Central Bank
EEA    European Economic Area
EL     Expected Loss
ELBE   Expected Loss Best Estimate
FSA    Financial Services Authority
FX     Foreign Exchange
GDP    Gross Domestic Product
IMF    International Monetary Fund
IRB    Internal Rating Based
LGD    Loss Given Default
LTV    Loan To Value
NHG    Nationale Hypotheek Garantie (National Mortgage Guarantee)
ODF    Observed Default Frequency
PD     Probability of Default
PSE    Public Sector Entity
RAWG   Risk Assessment Working Group
RMBS   Residential Mortgage Backed Securities
RWA    Risk Weighted Assets
TTC    Through The Cycle
WEW    Stichting Waarborgfonds Eigen Woningen (Homeownership Guarantee Fund)

EBF document ref. M0099D-2011
ANNEX II – Risk weight densities

According to pillar 3 disclosures European IRB banks show a wide range of risk weights density in their total assets: from 17% to 84% in a sample of 66 selected banks (Chart 20). The average total assets risk weight of the same 66 banks by country ranges from 20% to 64% (Chart 21).

Chart 20 – Total RWA density by bank

Chart 21 – Total RWA density by country (%)
ANNEX III – Comparison of residential mortgage markets in the EU and the US

Relative size
The overall size of the residential mortgage market relative to GDP is considerably higher in the US than in the EU. The ratio stands at an average of 52.4% in the EU whereas it is 76.5% in the US. However, the distribution in the EU is unequal (Chart 3). Only 8 out the 27 EU countries (The Netherlands, Denmark, Ireland, the UK, Sweden, Cyprus, Portugal and Spain) show a ratio of residential mortgage over GDP from 60% to 110%, i.e. close around the 76.5% of the US. The rest of EU countries are below the level of 50%.

Household indebtedness
The share of residential mortgage outstanding debt per capita can be considered relatively low in the EU (€12,880) if compared with the US (€27,040). Again, the distribution in the EU is unequal: In the UK around 40% of the households have a mortgage while the share is around 20% in the Eurozone.

The role of Government Sponsored Entities (GSE)
The GSEs (i.e. Fannie Mae and Freddie Mac) play a crucial role in the US residential mortgage market by acquiring a significant volume of banks’ exposure. In turn, in the EU the bulk of the residential mortgage exposure remains on the balance sheet of banks. This structural difference between both markets is a deciding factor in the risk weights density as the residential mortgage portfolio is one of the lowest risk asset classes in any bank books, therefore pulling down the overall average risk weight.

Loan-to-value and owner occupation rate
Other elements with influence in the risk weights of IRB models present similar values in the EU and the US:
- The average loan-to-value ratio in the EU is 73%, virtually the same as in the US where it stands at 74%.
- The owner occupation rate is 69% and 67% in the EU and the US, respectively.

Liability of the borrower
At large, residential mortgages are safer for banks in the EU given that the walk away option, commonplace in the US, is not applicable across the EU. Therefore, it is not strange that the cost of borrowing be generally lower in EU countries.

Cost of borrowing
The representative interest rate of new residential mortgage loans was lower in most EU countries before and after the crisis (see Table 2). In 2006, the US rate stood at 6.41% whereas it ranged from 3.80% to 5.74% in the EU (with the exception of 3 Central and Eastern Europe new entrant countries: Bulgaria, Hungary and Slovakia). In 2010, when the US rate stands at 4.69%, the EU western countries rate varies from 1.88% to 4.68% with the most populated countries showing lower levels (Germany 3.70%, UK 3.75%, France 4.00% and Italy 2.97%).

Sources of funding
Another important characteristic in terms of calculation of credit risk parameters is the type of source of funding. Covered bonds are the predominant instrument in the EU with an outstanding amount of €1,673 billion. In turn, residential mortgage-backed securities (RMBS) is the preferred option in the US with issuances equivalent to €1,102 billion. In the calculation of risk weighted assets, the underlying mortgages of covered bonds remain on the balance sheet therefore are part of the calculation. In RMBS, this is not necessarily the case. The 5% retention clause recently applied will bring back to the bank a significant part of the risk, though by other asset classes.
ANNEX IV – Definition of default in CRD 2

CRD 2 Risk quantification s2.1: Definition of default

44. A ‘default’ shall be considered to have occurred with regard to a particular obligor when either or both of the two following events has taken place:
   (a) the credit institution considers that the obligor is unlikely to pay its credit obligations to the credit institution, the parent undertaking or any of its subsidiaries in full, without recourse by the credit institution to actions such as realising security (if held);
   (b) the obligor is past due more than 90 days on any material credit obligation to the credit institution, the parent undertaking or any of its subsidiaries.
In the case of retail exposures … the competent authorities shall set a number of days past due as specified in point 48.
   In the case of retail exposures credit institutions may apply the definition of default at a facility level.
In all cases, the exposure past due shall be above a threshold defined by the competent authorities and which reflects a reasonable level of risk.

45. Elements to be taken as indications of unlikeliness to pay shall include:
   (a) The credit institution puts the credit obligation on nonaccrued status,
   (b) The credit institution makes a value adjustment resulting from a significant perceived decline in credit quality subsequent to the credit institution taking on the exposure,
   (c) The credit institution sells the credit obligation at a material credit-related economic loss,
   (d) The credit institution consents to a distressed restructuring of the credit obligation where this is likely to result in a diminished financial obligation caused by the material forgiveness, or postponement, of principal, interest or (where relevant) fees. This includes, in the case of equity exposures assessed under a PD/LGD Approach, distressed restructuring of the equity itself,
   (e) The credit institution has filed for the obligor’s bankruptcy or a similar order in respect of an obligor’s credit obligation to the credit institution, the parent undertaking or any of its subsidiaries, and
   (f) The obligor has sought or has been placed in bankruptcy or similar protection where this would avoid or delay repayment of a credit obligation to the credit institution, the parent undertaking or any of its subsidiaries.

46. Credit institutions that use external data that is not itself consistent with the definition of default, shall demonstrate to their competent authorities that appropriate adjustments have been made to achieve broad equivalence with the definition of default.

47. If the credit institution considers that a previously defaulted exposure is such that no trigger of default continues to apply, the credit institution shall rate the obligor or facility as they would for a non-defaulted exposure. Should the definition of default subsequently be triggered, another default would be deemed to have occurred.

48. For retail and PSE exposures, the competent authorities of each Member State shall set the exact number of days past due that all credit institutions in its jurisdiction shall abide by under the definition of default set out in point 44, for exposures to such counterparts situated within this Member State. The specific number shall fall within 90-180 days and may differ across product lines. For exposures to such counterparts situated in the territories of other Member States, the competent authorities shall set a number of days past due which is not higher than the number set by the competent authority of the respective Member State.
### ANNEX V – Member States abbreviations

<table>
<thead>
<tr>
<th>Code</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>Austria</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
</tr>
<tr>
<td>CZ</td>
<td>Czech Republic</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
</tr>
<tr>
<td>DE</td>
<td>Germany</td>
</tr>
<tr>
<td>EE</td>
<td>Estonia</td>
</tr>
<tr>
<td>EL</td>
<td>Greece</td>
</tr>
<tr>
<td>ES</td>
<td>Spain</td>
</tr>
<tr>
<td>FR</td>
<td>France</td>
</tr>
<tr>
<td>IE</td>
<td>Ireland</td>
</tr>
<tr>
<td>IT</td>
<td>Italy</td>
</tr>
<tr>
<td>CY</td>
<td>Cyprus</td>
</tr>
<tr>
<td>LV</td>
<td>Latvia</td>
</tr>
<tr>
<td>LT</td>
<td>Lithuania</td>
</tr>
<tr>
<td>LU</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>HU</td>
<td>Hungary</td>
</tr>
<tr>
<td>MT</td>
<td>Malta</td>
</tr>
<tr>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>PL</td>
<td>Poland</td>
</tr>
<tr>
<td>PT</td>
<td>Portugal</td>
</tr>
<tr>
<td>RO</td>
<td>Romania</td>
</tr>
<tr>
<td>SI</td>
<td>Slovenia</td>
</tr>
<tr>
<td>SK</td>
<td>Slovakia</td>
</tr>
<tr>
<td>FI</td>
<td>Finland</td>
</tr>
<tr>
<td>SE</td>
<td>Sweden</td>
</tr>
<tr>
<td>UK</td>
<td>United Kingdom</td>
</tr>
</tbody>
</table>
EBF questionnaire on Internal Rating Based (IRB) models

Residential Mortgages

- FINAL –

COUNTRY: ______________________

BANK (number)¹: ____

PREAMBLE

Basel III, the prudential regulatory overhaul agreed by the Basel Committee, has focused on increasing the quality and quantity of capital in the banking system. However, the focus is moving increasingly to risk weighted assets (the denominator of the capital ratio). A new debate on the accuracy of the risk weights is starting in international policy making forums. In this context, the risk weighting methodologies within the Internal Rating Based (IRB) models will come under fresh scrutiny by regulators and analysts in 2012.

The Basel Committee’s Standards Implementation Group (SIG), supported by the Basel Secretariat, has the remit to ensure a consistent implementation of Basel III across the globe. One of the points of attention will be the risk methodologies used to estimate the capital needs, including the (rationale behind) identification of meaningful differences between jurisdictions and individual institutions. In this context, the EBF is willing to contribute to the debate providing inputs assembled by the European banking industry: Firstly, to build a case around the merits of internal rating based models (IRB) and, also, to identify areas in which legitimate differences exist versus areas where further consistency, both on the industry and supervisory side, should be sought.

Equally, the European Banking Authority has announced that it is to start work on the issue of Risk Weighted Assets (RWA). The aim of the EBF is to provide a meaningful contribution to the work of both aforementioned entities.

¹ National Associations may assign numbers to participating banks to respect anonymity.
**INTRODUCTION**

IRB models have contributed to a better understanding and measurement of risk profiles and have been a significant input to the continued development of risk management across the European banking industry. An important feature of IRB models is that, within an overall and consistent framework specified by regulators, idiosyncratic differences can be accommodated to reflect structural and other characteristics. These differences are due to a range of factors, the importance of which varies across member states and between individual firms and include:

a) risk profiles, business models, portfolio composition, technology, recovery processes and risk management practices;

b) legal, market structure or macroeconomic environmental factors;

c) the nature and depth of the relationship between banker and customer e.g. specialist mortgage lender versus relationship bank;

d) Data and modelling approaches among firms;

e) divergent supervisory practices in the validation and approval processes within IRB portfolios.

This leads to inevitable and legitimate divergences in RWA across institutions, which are not obvious from publicly disclosed information or existing Pillar III reporting and can only be explained by a detailed understanding of the underlying characteristics. While this applies across all asset classes to a greater or lesser extent, for the moment, it has been decided to assess, in first instance, similarities and differences in RWA outcomes related to the residential mortgages asset class.

**OBJECTIVE**

The objective is to explore the features and differences of IRB models at a granular level to develop a cross firm, cross EU, fact base for individual member states, and banks operating within these countries, to be used to inform the discussion with regulators by showing:

a) How the models used by firms capture the underlying risks in their markets;

b) where and how large the differences are;

c) areas where differences exist and it is acceptable to be different;

d) areas where differences exist for questionable reasons;

The questionnaire aims to provide a comprehensive and detailed list of existing elements that characterise residential mortgage portfolios and associated IRB models across the EU, both in terms of common practices and divergences, including those arising from the drivers of PD, EAD and LGD.

The information will be used to identify strengths, common practices and divergences between jurisdictions based on the cumulative experience among EU banks.
INSTRUCTIONS

National Associations and Firms are requested to complete the questionnaire as comprehensively as possible based upon their experiences. Where precise information is limited for a particular question, please use your experience to provide meaningful responses where in your assessment this may lead to material differences in RWA.

The questionnaire is structured into 6 sections containing a series of quantitative and qualitative questions as follows:

- **Section 1**: Summary of model and market characteristics.
- **Section 2**: Macroeconomic elements of residential mortgage portfolios.
- **Section 3**: Legal mortgage market characteristics in the EU.
- **Section 4**: Modelling characteristics and approval processes of IRB models.
- **Section 5**: Differences between home and host supervisor in IRB approval processes.
- **Section 6**: Summary of core elements and their relevance.

**Sections 1 to 3 should be compiled by National Associations.** Some questions should be completed by the National Association itself (in particular section 3 but also country-wide questions in other sections) whereas other questions should be gathered from a sample of banks in the jurisdiction and then consolidated by the National Association. The number of participating banks and their market share (within the IRB universe) should be sufficiently representative of the country’s residential mortgage portfolio.

When consolidating responses, National Associations should use weighted averages for quantitative items (e.g. parameters such as PD or LGD) if the values of respondents fall within a similar range. Otherwise, divergences in observed values should be indicated.

**Sections 4 to 6 should be completed only by individual banks.** Subsidiary banks should be included in the country where the subsidiary is domiciled. However, responses to questions in section 6 regarding the coordination between the home and the host supervisors should be prepared at group level.

Note that many of the data requested is publicly disclosed or can be deduced from national aggregate data, financial statements and pillar 3 reports of institutions, though formats might differ. Institutions are expected to also provide complementary (not public) data where needed. As a point of reference, the following documents provide with extensive information on the mortgage market of many countries:

OECD: [Housing markets and structural policies in OECD countries](https://www.oecd.org) (January 2011);


National Associations will find in the abovementioned documents relevant data which could also be contrasted with other national sources before completing the questionnaire.
**Time of data:** As a general rule and where applicable, data as of the end of 2011 should be used (if available). Otherwise, data should refer to the end of 2010 or June 2011 (please indicate the date).

**Currency:** for the sake of easier consolidation, it would be preferable to express all amounts in euro converted at the corresponding exchange rate.

**Portfolio scope:** In general, the scope should cover the whole **residential mortgage portfolio**. It is understood that, in many EU countries, the bulk of the residential mortgage exposure is concentrated in loans to borrowers who own and occupy the property. However, national associations and banks with a significant exposure to other types of residential mortgage loan (e.g. buy-to-let and secondary residence) are encouraged to also provide with a breakdown showing the main portfolios within the scope if and where such a detail is available across the questionnaire.

**Geographical scope:** The questionnaire should be completed on a country-wide basis covering the whole residential mortgage portfolio in the jurisdiction, whether domestic or foreign-owned. The sample of participating banks should include domestic banks and also subsidiaries of foreign banking groups. Where relevant, respondents are expected to say the role played (subsidiary or parent bank), notably in section 5 which refers to the differences between home and host supervisors in IRB approval processes.

**Confidentiality:** The aim of the questionnaire is to raise meaningful information without intruding into the specific details of individual models. The focus is put on the generic model approaches, instructions and requirements set by national supervisors. However, the questionnaire is not meant to unveil information on validation and approval processes between supervisors and banks pertaining to specific cases nor individual models.
SECTION 1: Summary of model and market characteristics

Purpose of this section: To provide a high level reference point to explain the size and type of mortgage market in your home country, the extent and type of IRB modeling and the main structural and other challenges that need to be addressed that might lead to differences in RWA. This should include all property secured by a mortgage on residential property which is to be occupied or let by the owner.

| 1. Size of residential mortgage market (euro bn) |
| 2. Please indicate whether it is customary in your jurisdiction to grant credit facilities backed by mortgage collateral\(^2\) (versus straight mortgage loans)? If so, how large is this market segment by estimation? |
| 3. Market share of participating bank(s) |
| 4. Total exposure (as at Dec 2011): |
| 4.1 IRB approach |
| 4.2 Standardised approach |
| 5. Total RWA (as at Dec 2011): |
| 5.1 IRB approach |
| 5.2 Standardised approach |
| 6. For IRB (as at Dec 2011)\(^3\) |
| 6.1. PD (%) |
| 6.2. EAD (euro bn) |
| 6.3. LGD (%) |
| 7. Maturity\(^2\) |
| 7.1. Contractual |
| 7.2. Behavioural |

\(^2\) in some jurisdictions, in addition to granting mortgage loans (primarily aimed at financing the purchase or renovation of residential property) it is customary for customers to take out other types of financing (e.g., overdrafts) whereby the lender secures this credit by taking a lien on the residential property owned by the customer. This generally generates a different risk profile. The question aims at finding whether this type of secured credit facilities are a common phenomenon across the EU in which case some further analysis could be warranted.

\(^3\) Weighted by exposure
8. **Type of mortgage (show split):**
   - 8.1. Repayment
   - 8.2. Interest Only
   - 8.3. Flexible
   - 8.4. Other (please describe)

9. **What are the main challenges to developing models for this asset class? E.g.- data availability**
   - cyclical nature
   - changing market
   - other, please specify
SECTION 2: Macroeconomic elements in residential mortgage portfolio

Purpose of this section: To explain the significance of the mortgage market in your country, highlighting the social and economic circumstances and other market characteristics that impact affordability, repayment and recovery in your market. This will help explain common market characteristics, tax treatments and other structural aspects that are likely to be important drivers of RWA difference.

Subsection 2-1: Relevance of the mortgage market

10. Please respond on the relevance of the mortgage debt in your country

Response → xxx % of GDP

11. Please describe the unemployment characteristics of your country that influence the housing and mortgage market

11.1. Are there any government or social sponsored schemes that might influence the mortgage market in your jurisdiction? e.g.:

11.2. Does the government pay unemployment benefits based on the number of years worked?
   If so, what is the maximum period? What % of the salary is covered?

11.3. Do unemployed mortgagees benefit from any other government allocation after that period?

11.4. How many days per worked year employers normally pay when they make an employee redundant?

11.5. What percentage of people take out mortgage insurance that continues to pay mortgage instalments in case of unemployment? →

Subsection 2-2: Characteristics of housing markets

12. Please describe the housing market in your country

12.1. Home ownership rate →

12.2. Change in house pricing indices over the last 5 years: Stable (less than 5% increase), moderate (less than 10% increase) and very large (more than 10%) →
12.3. Which is the most common housing type (apartment, houses, etc.)? Show splits.

12.4. If available, what is the average house price in your jurisdiction (in EUR)

12.5. If available, what is the average mortgage loan amount in the banks in your jurisdiction?

Subsection 2-3: Characteristics of mortgage markets

13. Please describe the mortgage market characteristics in your country

13.1. What proportion of mortgage loans are denominated in local currency vs. foreign currency (by volume and by value)

13.2. Is mortgage equity withdrawal possible? (no - yes but strictly limited - yes without any restraints until reaching maximum LTV)

13.3. What is the prevailing valuation method? (market vs. lending value)

13.4. Typical LTV for a first time house buyer in your country

13.5. Is there a maximum LTV due to laws in place (Yes / No)

13.6. If yes, what is the maximum LTV (%)?

13.7. Does your country impose any other metric than LTV concerning affordability?

13.8. Current average LTV

13.9. Typically initial maturity

13.10. Current average maturity

13.11. Prevailing type of interest (fixed, variable, mix)

13.12. Are there any other limits to interest rate such as usury rate? BF: what is that?

13.13. Average mortgage value over total gross household income

14. Please describe details of any transaction costs and tax relief in mortgage products in your country

14.1. Average transaction cost to borrower over total mortgage (%)

14.2. Average tax relief over total mortgage (%), where known

---

14.3. Please describe the housing market related taxation, where featured

- Tax on imputed rent
- Tax deductibility of interest payments
- Capital gain tax
- Inheritance tax
- Wealth tax
- Real state property tax
- Other, please describe

14.4. If interest payable tax is deductible, is it conditional or capped? Please describe.

---

15. Please describe your funding mortgage mechanism

15.1. Does your country have an active RMBS market (please justify with approximate data)?

15.2. Share of RMBS of total mortgage debt

15.3. Does your country have an active mortgage covered bond market?

15.4. Share of mortgage covered bond market over total mortgage debt

15.5. Please describe the main characteristics of your jurisdiction’s RMBS and covered bond regulations

---

16. Please describe any mortgage guarantee schemes or direct mortgage mitigation instruments that materially reduce the risk taken on by the bank (e.g. Crédit Logement in France)

16.1. Explain the coverage of the mitigation instrument:

16.2. What is the percentage of your overall mortgage portfolio that benefits from such mitigation?

16.3. Does this result in risks being transferred outside the banking industry in your market, if so to whom, please describe.

16.4. Please describe additional effects of the mortgage guarantee scheme (e.g. dual credit review).
17. Please indicate to what extent it is common in your mortgage market to impose any prepayment penalties and describe early repayment practices in your jurisdiction

17.1. Please describe prepayment practices (penalties, conditions...).

17.2. Is there any publicly available information (e.g. published by rating agencies or local supervisors):

17.3. What is the average mortgage prepayment rate in your jurisdiction?
SECTION 3: Legal mortgage market characteristics in the EU

Purpose of this section: To explain legal framework as it relates to mortgages, recovery and other impediments that will affect the level of LGD and hence RWA.

Legal frameworks, mortgage rules and loan terms differ between jurisdictions and are likely to explain part of the observed differences in default rates and loss rates in mortgage lending. In addition, in some European countries it is generally difficult for a borrower to discharge itself from the obligation to pay its mortgage loan even in the case of a residual debt.

This section highlights important legal as well as structural characteristics.

18. Please describe the mortgage recovery determinants that exist in your country.

18.1. Is the borrower fully liable for mortgage payments or does the property constitute the only collateral and thus mortgage repayment source in case of default?

18.2. Is a bank entitled to use all positive balances in any account the client has in the bank in question to repay any money overdue to the bank? And, also if it is not placed in the same bank?

18.3. If not, comment on the existence of non-recourse mortgage agreements in the market or any legal obstacles preventing a lender from filing further claims after the property has been sold.

18.4. Describe the process for pledging of property collateral. Are there any legal barriers in place preventing execution of mortgage collateral, e.g. prohibition to evict people from their own home?

18.5. What rights of disposal of the collateral do the holders of second mortgages have, the holders of third mortgages, etc.

18.6. Describe if there are any legal structures for pledging of property collateral preventing fraud and enhancing transparency and efficiency in handling of mortgage deeds.

18.7. Is there any cooperation between banks (i.e. a credit information agency) on data concerning total debts and payment history of a private individual that are available in the credit process?

18.8. Are there any other legal considerations that you think are relevant?

18.9 What is approximately the average duration of the legal process from default to foreclosure?
SECTION 4: Modelling characteristics and approval processes of IRB models.

Subsection 4-1: Definition of Default

The current capital requirement directive states that ‘default’ shall be considered to have occurred with regard to a particular obligor when either or both of the two following events has taken place: a) the credit institution considers that the obligor is unlikely to pay its credit obligations to the credit institution, the parent undertaking or any of its subsidiaries in full, without recourse by the credit institution to actions such as realising security; b) the obligor is past due more than 90 days on any material credit obligation to the credit institution, the parent undertaking or any of its subsidiaries.

Banks and regulators usually require different past due days depending on products or business lines and includes amount or time “floors” to be consider a default. Such specific issues are desirable to disclosure in current report.

Assets that are approaching, or in default, attract a disproportionately large amount of RWA for any given portfolio. The definition is therefore very important, including items where terms and conditions are altered which in some jurisdictions the regulator insists are recorded as defaults for regulatory purposes (eg forbearance).

19. Please provide the default event criteria in your jurisdiction

Purpose of the question: to examine whether there is variation within and between jurisdictions around the criteria for default. One issue relates to whether firms employ monetary equivalent approximations of days past due and if so how they interpret partial payments in terms of days past due? Another relates to whether customer default is applied across products in some circumstances?

What is the definition of default for mortgages (including days past due, minimum amount of a defaulted loan to be reckoned in, customer or product/value based definition, etc.)?

20. Please provide additional information about the default criteria

Purpose of the question: We are interested in understanding what role definition of default is playing in the models built across the industry. Typical issues might be the extent to which firms have used partial or proxy definitions to build models and whether there is now pressure from regulators to phase these out? Whether the national regulator has enforced unlikeliness to pay criteria or distressed re-structuring aspects of the default definition and the part they play.

20.1. Are there any differences between regulatory capital and other business uses such as Economic capital, Raroc or other pricing tools, provisioning? If so, please describe.
20.2. Is there alignment between regulation and accounting, and, if not, what are the main areas of difference?

20.3. Does refinancing constitute default? How do you treat accounts where terms and conditions are altered, including forbearance?

20.4. Are there any additional criteria or definitions applied?

21. Please provide the treatment of default (once it has occurred)

Purpose of the question: We are interested in the degree to which regulators mandate particular approaches to the measurement of the risks associated with defaulted accounts, such as cure rate assumptions. Also we think there may be material differences in the ways banks are required to handle defaulted accounts by country leading to different risk weightings.

21.1. Do you use explicit cure periods? If yes, how do they affect the RWAs?

21.2. How long does a defaulted loan have to be returned to normal before being reclassified as performing?

21.3. When a loan is returned to normal situation after default – i.e. recovery actions have been a success-, does it receive a normal PD or a penalised one?

21.4 What is the average time between default, mortgage execution and write-offs in your portfolio?

Subsection 4-2: Treatment of refinancing operations

During the crisis, refinancing management activity has acquired great relevance within collection and recovery risk management policies. Some local regulators have been paying attention to these practices, in particular to their treatment under capital rules with specific risk model approaches imposed in some jurisdictions. As a matter of example, refinancing non-performing loans could be assigned 4 different PD:

a) Past due transactions more than 90 days which have paid regular interest and have provided effective collateral \( \Rightarrow \) PD < 100%

b) Past due transactions more than 90 days which have not paid regular interest and/or have not provided effective collateral \( \Rightarrow \) PD = 100%

c) Past due transactions less than 90 days with moratorium granted or expanded – interest or principal - and they have not been re-written in the previous 12 months \( \Rightarrow \) PD < 100%

d) Past due transactions less than 90 days with moratorium granted or expanded – interest or principal - and they have been re-written in the previous 12 months \( \Rightarrow \) PD < 100% + PD add-on.
22. *Please describe if you have implemented a specific refinancing model in your refinancing operations.*

**Purpose of the question:** Some regulators require banks to build separate and distinct PD models for customers subject to a mortgage refinancing and we would like to understand if this requirement exists in other jurisdictions or whether any European banks have developed bespoke models on restructured accounts for themselves.

What refinancing models or model changes have you applied for those parts of your mortgage portfolio?

---

**Subsection 4-3: Data used - Length and thickness of data series**

**Purpose of the section:** The regulatory requirements contain various provisions to accommodate variations in data quality, availability and coverage. This section seeks to examine the sort of differences which exist in practice and the impact that they have.

Portfolio characteristics and available data (quality and historical length) limit risk modeling choices. In this regard, regulators may require different minimum years length and historical data –exclude 2009-10- or include some assumptions that enhances differences in RWA comparisons.

See next figure as example of different historical data used by banks in order to model risk parameters.
23. Please describe what data you have available and also how your home or host regulator imposes any specific restrictions in length and data to model PD, EAD, and LGD in the mortgage portfolio. Please also describe instances where you employ add-ons or other techniques to mitigate data weaknesses.

### PD:

23.1. Historical data since xxx to xxx. Restriction/data exclusions: xxxx

23.2. Do some years have a higher weight than others? Please describe. 

23.3. It is common practice to use different data periods for model building purposes and model calibration purposes. Please describe your firm’s approach in practice. How has this been influenced by regulatory requirements?

### EAD:

23.4. Historical data since xxx to xxx. Restriction/data exclusions: xxxx

23.5. Do some years have a higher weight than others? Please describe. 

### LGD:

23.6. Historical data since xxx to xxx. Restriction/data exclusions: xxxx

23.7. Do some years have a higher weight than others? Please describe. 

### Acquired Portfolios:

23.8 Please describe any major differences arising from acquired portfolios and describe how they are integrated in the models.?

---

5 Existing portfolios, after having been acquired by a third party, often undergo changes in origination strategy or risk management policies by the acquiring institution. When included in samples and thus historical data series of internal models, the integrated model might not be predictive of the future given that the institution that acquired the portfolio changed the way of doing business. They may even decide to have the acquired portfolio run off gradually. This question aims at finding out whether there are instructions given by supervisors about acquired portfolios and the models that were already in place for such portfolios: such instructions can be given in the form of requirements pertaining to the necessity of developing new models for the acquired portfolio, the (non-)acceptance of existing models for the acquired portfolio (ie does the IRB model move with the portfolio), the time granted to develop a new model or integrate existing and acquired portfolios into one for the purpose of modeling etc.
Subsection 4-4: Model approval and model change policies

Purpose of the Section: There is often a divergence across the EU regarding the internal model coverage. In part, this may be due to different (stricter) approval requirements or interpretations between supervisors. Some regulators have published technical guidelines detailing specific requirements for IRB model approval. This section seeks to identify where these instances exist and the degree to which they impact on RWAs.

24. Please describe any regulator published model approval and change model requirements

Response:
Please, include the link to the document: xxxxx

Subsection 4-5: Treatment default portfolios - Differences between expected losses and provisions

Purpose of the Section: The treatment of non-performing loans is one area of material potential difference between countries, giving rise to significant divergences in total RWA increasing differences between expected losses and provisions across banks and countries. CRD states that RWA should be the maximum of:

\{0, 12.5 \times (LGD-ELBE)\}.

However, we know that there are different ways of determining LGD and ELBE (for example, the LGD may derive from long run recovery data or be directly related to impairment estimates) each with different capital implications.

25. Please describe your local specific treatment of default exposures.

Response

26. Please describe circumstances in which cases LGD is lower than ELBE in your market.

What is your LGD vs ELBE for defaulted assets?

---

6 Additionally, supervisory imposed model change policies require to a larger or lesser extent pre-approval by supervisors for small or more material model changes with diverging timelines for final regulatory approval. This can lead to short or long periods before changes can be implemented and thus will be reflected in RWA.

7 Best estimate of expected loss
Subsection 4-6: Use test acceptance requirements

Basel II Framework paragraph 444 states “Internal ratings and default and loss estimates must play an essential role in the credit approval, risk management, internal capital allocation and corporate governance functions of banks using the IRB approach”. Complete implementation of use test takes a long time and it requires a cultural change in some internal process.

In that sense, the prerequisites state by regulators to initially approval the model are lower than an expected complete use test framework. First steps are focused in approval and monitoring and the latest steps usually cover governance functions like remuneration.

27. Please outline the minimum use test requirements that your regulator states to obtain IRB approval

Purpose of the question: We are interested to identify whether the use test has, in practice, had a direct impact on IRB models including which aspects of the use test have been rigorously enforced by national authorities (sometimes even to the point of models being rejected as a consequence).

Response ➔

Are there any specific use test requirements that you are required to evidence?

Subsection 4-7: About PD: Criteria for economic cycle adjustment: PiT, TTC, hybrid approach

Purpose of the question: At the time when the Basel 2 framework was designed, regulators were open-minded about the rating philosophy which should underpin rating models. However, some jurisdictions have laid down strict requirements around the use of through-the-cycle models in their assessment of the probability of default (PD), while others appear to prefer the use of point-in-time methodologies. We are interested to know what rating philosophy underlies your models? Are they PiT, TTC or hybrid? How has your approach been constrained by regulatory requirements? Differences in estimations are likely to be greater in volatile macroeconomic conditions, creating divergences in RWA calculations.
28. Please describe the cycle adjustment criteria used in the mortgage portfolio

How would you describe the mortgage model, and why? - pure PIT model, mixed model, pure TTC model → xx

Are there any other specific requirements (use of variable scalar, a-cyclical not being variable scalar, etc.) → Please describe.

Are there any other points that might influence RWA?

29. Please describe how the cycle adjustment criteria have evolved over time. For example, did you change or re-calibrate models and was this driven by internal review or regulatory influence?

Response →

Subsection 4-8: About PD: Are certain methodologies in scorecard and PD models in approval processes imposed?

Purpose of the question: We are interested in exploring whether the nature of the models you build in practice has contributed to RWA variability. In some cases, local regulators require the use of certain modelling methodologies such as behaviour models in retail portfolios or simulation models, roll rate models⁸, etc. The imposition of a specific model may constrain the ability to develop the best risk estimate adversely impacting – data available and model accuracy. Alternatively, different approaches to modelling may have prevailed because of data availability or particular market structures.

30. Please describe any restrictions in your jurisdictions regarding the methodology used in developing models for the mortgage portfolio, and whether they arise from regulatory influence or other causes.

⁸ Roll Rate Analysis: involves comparing worst delinquency in a specified “previous x” months with that in the “next x” months, and then calculating the percentage of accounts that maintain their worst delinquency, get better, or “roll forward” into the next delinquency buckets. This methodology is accepted by some supervisors whilst disliked by others.
31. Please describe what kind of a PD methodology is used for calibrating model outputs to PDs used in RWA calculations. Also describe how models are calibrated, and if this is based on contracts – calibration is based on a simple mean - exposures –calibration based on weighted averages – or any other measure.

Purpose of the question: We are interested in understanding whether model calibration is a source of RWA variation. This may be due to regulatory prescription or other factors. For example, is your PD model calibrated to market level or business specific data and how frequently is the calibration reviewed?

Response

Subsection 4-9: About PD: Portfolio segmentation and use of master scale

Purpose of the question: There is a trade-off between data availability and richness versus data homogeneity. For that reason, some supervisors prefer a broader sample of data in each segment, thereby splitting the portfolio into a limited number of segments; whereas others tend to choose a greater number of segments, each with a limited number of data points but with a high degree of homogeneity. As a result, there is a distinction between models with a limited number of PD buckets with no direct relationship with ratings versus those with a one-on-one relationship between ratings and PDs. In this regard the number of sub-models and use of a master scale is a key elements in RWA comparability.

32. Please describe the sub-models used in the IRB mortgage portfolio. Please advise if these are regulator defined.

Response
33. Please describe the use of a master scale and the number of buckets in each master scale by portfolios –granularity-

Purpose of the question: In general, a more granular scale will give rise to lower capital requirements than a coarse scale.

Response

34. Does your National Regulator allow model outputs according to a continuous scale or require discrete values? Please explain.

Response

35. Please describe any special treatment for co-owned exposures

How do you define the risk grade for co-owned exposure? Which obligor rating is used?

Subsection 4-10: LGD model approach – theoretical, empirical or mixed-

Purpose of the question: LGD calculations can be modelled based on either historical recovery data storage over the last years or intrinsically based on the value of the collaterals or a mixed model with both approaches. Although BIS allows the possibility to choose the model that best fits each portfolio, some regulators may impose restrictions to LGD models.

36. Please describe the approach used in LGD modelling and any restrictions that are applied.

What type of model is used for LGD (theoretical⁹, empirical or mixed)
37. Please describe the impact of the LGD floor for residential mortgages as well as the calculation method imposed for floor calculation. It is meant to be a 10% floor but it can be calculated in different ways leading to divergent results. By way of example, the floor could apply to the whole portfolio or be calculated for every loan-to-value tranche.

Purpose of the question: We wish to examine whether variations in how the floor is applied drive RWA variation. Note, the 10% floor on mortgage LGD was originally conceived as a temporary one but CRDIV adopts the Basel Committee proposal for a permanent floor.

Response →

Subsection 4-11: About LGD: Definition of downturn

Calculation of downturn loss given default (LGD) and exposure at default (EAD) poses a challenge for most financial institutions and supervisors. Several approaches have been put in place using different cyclical indicators as reference – e.g., GDP growth, output gap… One case in point is mortgage portfolios for which different variables have been used in order to gauge the downturn of the housing market.

38. Please describe the approach and definition of downturn used in the mortgage portfolio.

Methodology used:
Variables used:
Period time used:
How are movements in house prices accommodated: annual updates on the basis of indices? stressed values? Other? Please describe. :
How does collection strategy change in periods of downturn, for example in terms of collateral holding?
39. Please describe any different downturn methodologies used in other (sub-)portfolios.

Response

Subsection 4-12: Granularity of LGD collateral segmentation

Purpose of this question: The risk drivers used in LGD are a key element of credit risk mitigation techniques in LGD models. In some cases, financial collateral modelling is based on geography and type of product and in other cases, the collateral LGD effects are different based on the client segment.

40. Are there any different sub-portfolios which may lead to material differences (e.g. different property types, different customer groups)? If so, please describe.

Response

Subsection 4-13: Discretional model risk add-on

Some regulators require an additional risk add-on to include in risk parameter –PD, LGD, CCF- and RWA assessment. For example, the FSA in the Financial Stability Report of December 2011 is proposing to include supplement model-based calculations with minimum risk weights for specific categories of assets.

41. Please describe any additional model risk add-ons for each portfolio/risk model required by your regulator (include also potential pillar 2 add-on’s).

Response
SECTION 5: Differences between home and host supervisor in IRB approval processes

Cross-border banks have to deal with different supervisors and regulatory frameworks in order to obtain IRB approval at local and consolidated level. Divergences and interactions between them may create difficulties in the IRB authorisation process as well as in the ongoing monitoring. Divergences, when not adequately and timely sorted out, may lead banks to face duplication of requirements (e.g. double calculations), overlapping requests (e.g. reporting in different formats) and breaches between regulatory and management information.

The purpose of the following questions is to list the main issues that cross-border banks have to face in the approval process when several supervisors are involved.

Please describe your experience in obtaining IRB mortgage approval in different host countries and include clear examples (e.g. through-the-cycle adjustments, calculation of floors, etc.).

| 42. What is the role of your home supervisor in a host model approval process? \( \Rightarrow \) |
| 43. Does your home supervisor include additional requirements in the host models? Do the host supervisors incorporate them? Please describe by approval area,; |
| - Data and IT requirements |
| - Model requirements (specify the parameters involved: PD, EAD, LGD, others) |
| - Use-test requirements |
| - Internal governance requirements (sign-off requirements and procedures) |

In case of different conclusions about the IRB approval process, how do home-host regulators tackle them?

Please provide any practical examples of differences that you are aware of.
**SECTION 6: Summary of core elements and their relevance**

Please evaluate, in your opinion, to what extent the previous matters give rise to significant differences in the outcome (RWAs) of IRB models. If you lack experience to give a response please say so in the comments column and leave that particular question blank.

<table>
<thead>
<tr>
<th>Subsection</th>
<th>Highly impacting differences</th>
<th>Important differences</th>
<th>Minor differences</th>
<th>Irrelevant differences (or none)</th>
<th>Observation/Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsection 2-1: Relevance of the mortgage market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 2-2: Characteristics of housing markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 2-3: Characteristics of mortgage markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SECTION 3: Legal mortgage market characteristics in the EU</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-1: Definition of Default</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-2: Treatment of refinancing operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-3: Data used - Length and thickness of data series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-4: Model approval and model change policies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-5: Treatment default portfolios - Differences between expected losses and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>provisions</td>
<td>Highly impacting differences</td>
<td>Important differences</td>
<td>Minor differences</td>
<td>Irrelevant differences (or none)</td>
<td>Observation/Comment</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------</td>
<td>------------------</td>
<td>---------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Subsection 4-6: Use test acceptance requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-7: About PD: Criteria for economic cycle adjustment: PiT, TTC, hybrid approach</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-8: About PD: Are certain methodologies in scorecard and PD models in approval processes imposed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-9: About PD: Portfolio segmentation and use of master scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-10: LGD model approach – theoretical, empirical or mix-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-11: About LGD: Definition of downturn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsection 4-12: Granularity of LGD collateral segmentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This questionnaire is intended to explore differences but should there be any other relevant issues you wish to raise, please develop them hereunder:

Response →