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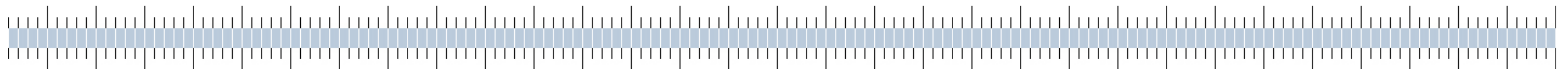
EUROSYSTEM

Requirements for IRB Approaches

Quantitative Minimum Requirements

Jens Bruderhausen



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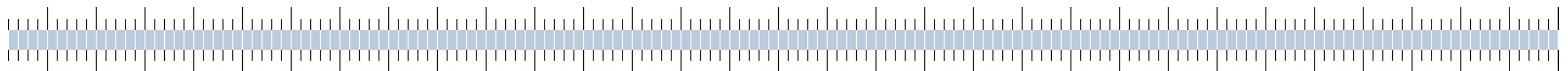
RATING SYSTEM DESIGN



Rating system design

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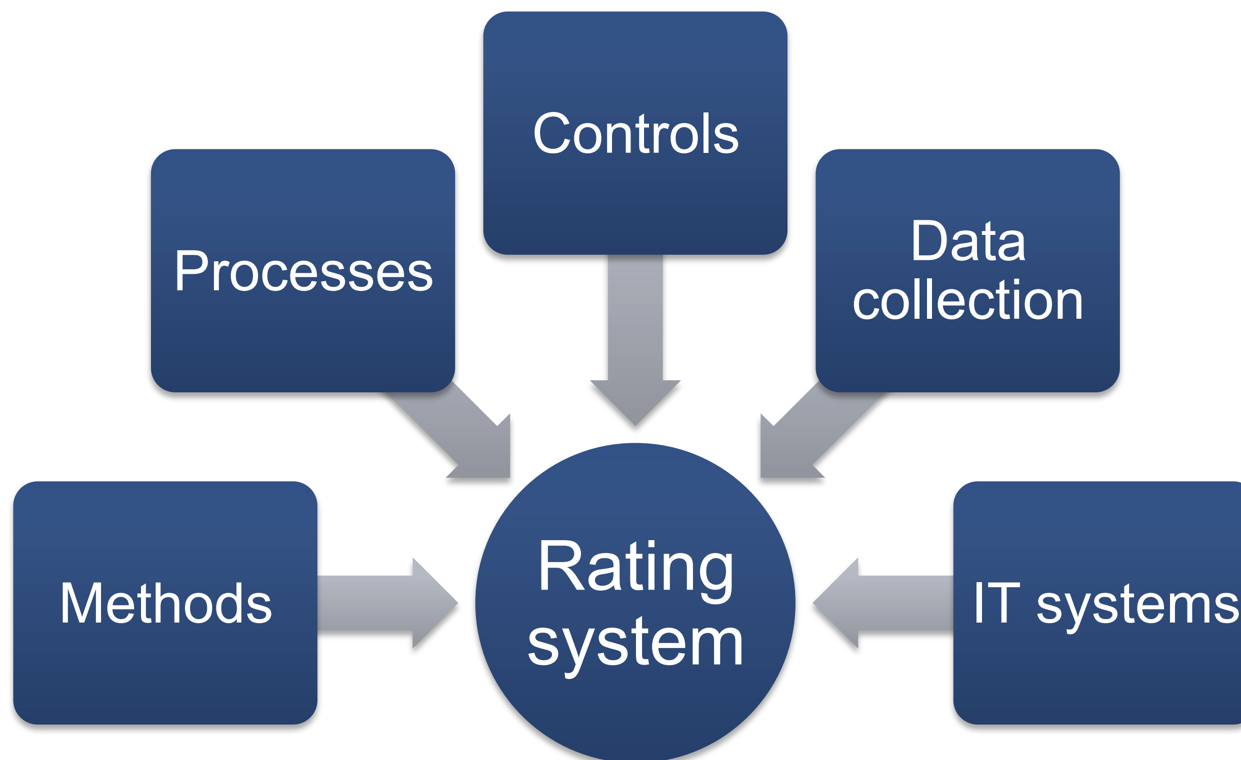

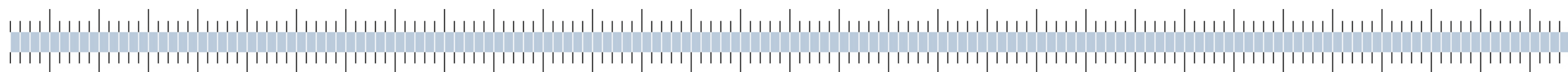

Rating System Design

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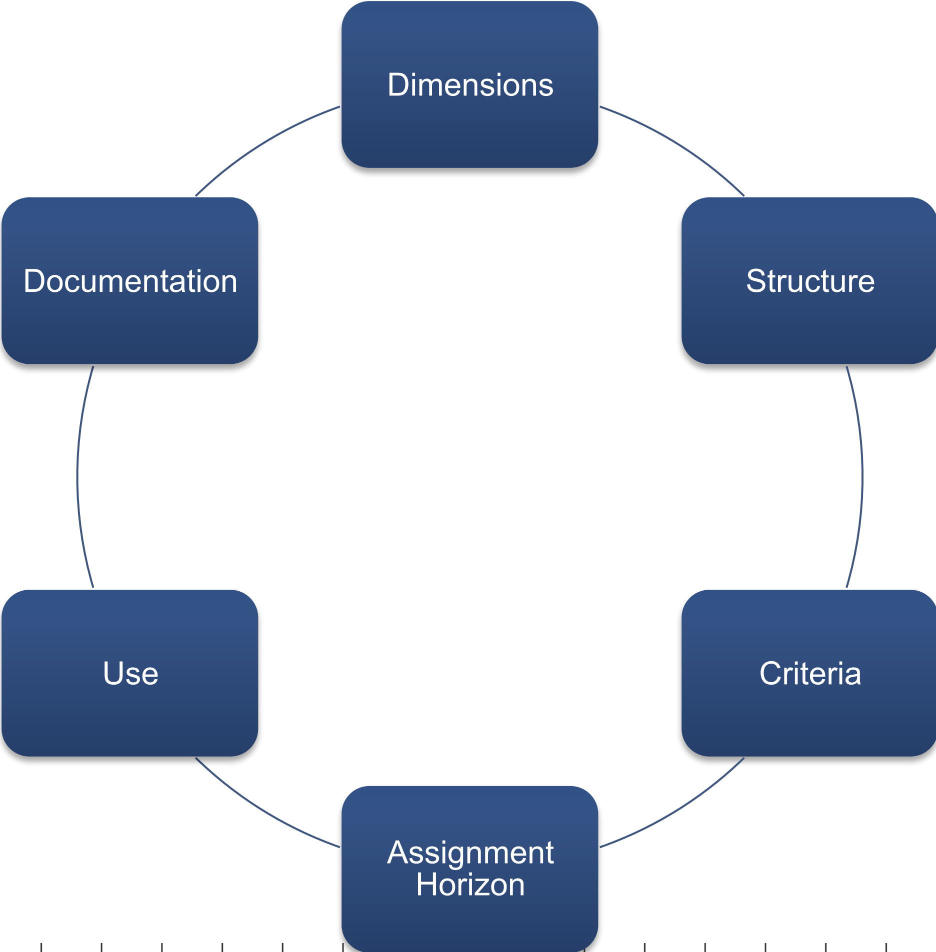
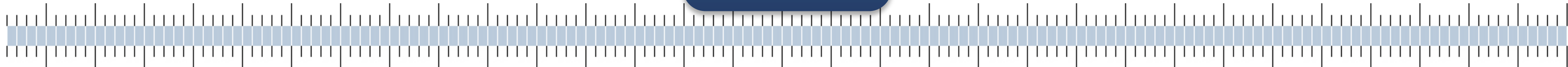
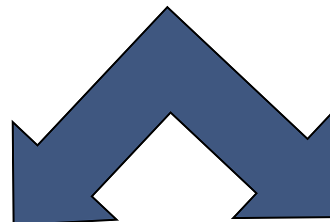




Rating dimensions
Corporate, sovereign, and bank exposures

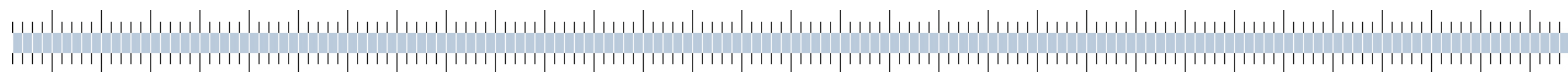


Borrower default

- Seperate exposures to the same borrower
- Associated guarantees
- Relationship between borrower grades

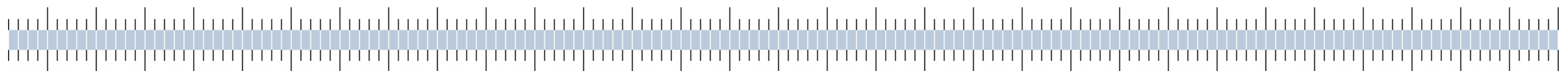
Transaction-specific factors

- Collateral
- Seniority
- Product type etc.



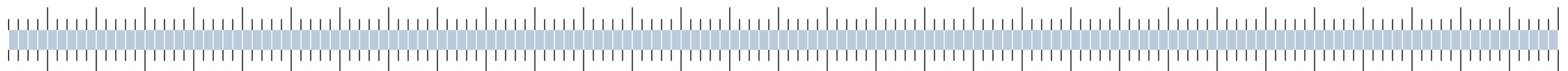
Borrower default
Corporate, sovereign, and bank exposures

- **397. Separate exposures to the same borrower must be assigned to the same borrower grade, irrespective of any differences in the nature of each specific transaction.**
  - Firstly, in the case of country transfer risk, where a bank may assign different borrower grades depending on whether the facility is denominated in local or foreign currency.
  - Secondly, when the treatment of associated guarantees to a facility may be reflected in an adjusted borrower grade.
  - In either case, separate exposures may result in multiple grades for the same borrower. A bank must articulate in its credit policy the relationship between borrower grades in terms of the level of risk each grade implies. Perceived and measured risk must increase as credit quality declines from one grade to the next. The policy must articulate the risk of each grade in terms of both a description of the probability of default risk typical for borrowers assigned the grade and the criteria used to distinguish that level of credit risk.



Transaction specific factors
Corporate, sovereign, and bank exposures

- **399. For foundation IRB banks, this requirement can be fulfilled by the existence of a facility dimension, which reflects both borrower and transaction-specific factors.**
- **400. For banks using the advanced approach, facility ratings must reflect exclusively LGD.**
  - These ratings can reflect any and all factors that can influence LGD including, but not limited to, the type of collateral, product, industry, and purpose.



Rating dimensions
Retail exposures

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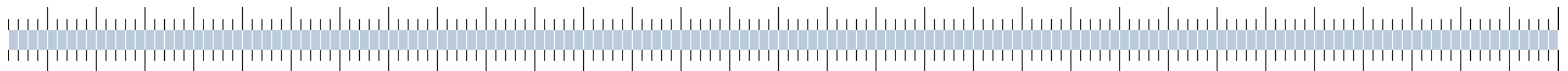
Borrower default +

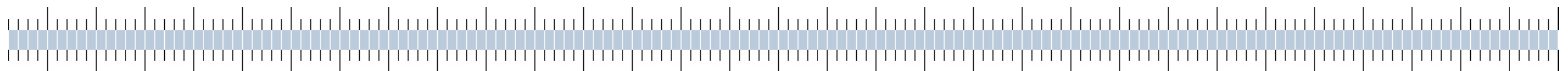
Transaction specific characteristics

- Assign each exposure into a particular pool
- Estimation of default at pool level
- Estimation of loss characteristics at pool level



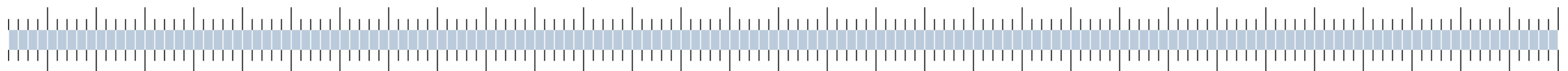
Rating dimensions
Retail exposures

- **402. For each pool, banks must estimate PD, LGD, and EAD.**
- **402. At a minimum, banks should consider the following risk drivers when assigning exposures to a pool:**
  - Borrower risk characteristics (e.g. borrower type, demographics such as age/ occupation);
  - Transaction risk characteristics, including product and/or collateral types (e.g. loan to value measures, seasoning, guarantees; and seniority (first vs. second lien)). Banks must explicitly address cross-collateral provisions where present.
  - Delinquency of exposure: Banks are expected to separately identify exposures that are delinquent and those that are not.



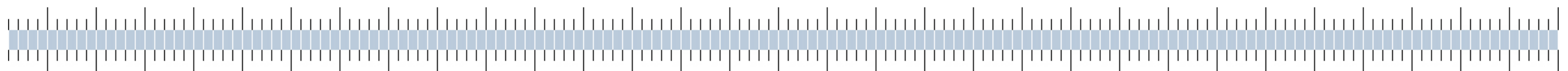
Rating structure
Corporate, sovereign, and bank exposures

- **403. A bank must have a meaningful distribution of exposures across grades with no excessive concentrations, on both its borrower-rating and its facility-rating scales.**
  - Minimum of seven borrower grades for non-defaulted borrowers and
  - One for those that have defaulted.
- **405. A borrower grade is defined as an assessment of borrower risk on the basis of a specified and distinct set of rating criteria, from which estimates of PD are derived.**
  - Description of the degree of default risk typical for borrowers assigned the grade
  - Criteria used to distinguish that level of credit risk.
- **406. Enough grades to avoid undue concentrations of borrowers in particular grades. Significant concentrations within a single grade or grades must be supported by convincing empirical evidence**



Rating structure
Retail exposures

- **409. For each pool identified, the bank must be able to provide quantitative measures of loss characteristics (PD, LGD, and EAD) for that pool.**
  - The level of differentiation for IRB purposes must ensure that the number of exposures in a given pool is sufficient so as to allow for meaningful quantification and validation of the loss characteristics at the pool level.
  - There must be a meaningful distribution of borrowers and exposures across pools.
  - A single pool must not include an undue concentration of the bank's total retail exposure.



Rating criteria

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- **410. A bank must have specific rating definitions, processes and criteria for assigning exposures to grades within a rating system.**
- **410. The rating definitions and criteria must be both plausible and intuitive and must result in a meaningful differentiation of risk.**
  - Grade descriptions and criteria must be sufficiently detailed
  - Consistency across lines of business, departments and geographic locations.
  - If rating criteria and procedures differ for different types of borrowers or facilities, the bank must monitor for possible inconsistency, and must alter rating criteria to improve consistency when appropriate.
  - Written rating definitions
  - Criteria must also be consistent with the bank's internal lending standards and its policies for handling troubled borrowers and facilities.
- **411. The less information a bank has, the more conservative must be its assignments of exposures to borrower and facility grades or pools.**
- **411. An external rating can be the primary factor determining an internal rating assignment; however, the bank must ensure that it considers other relevant information.**

Rating assignment horizon

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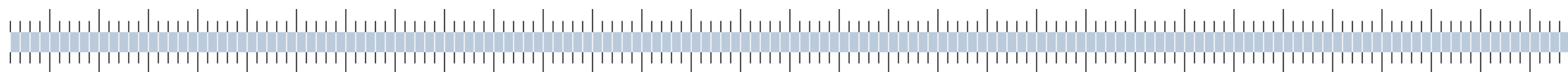
- **Time horizon used in PD estimation is one year ...**
- **... but banks are expected to use a longer time horizon in assigning ratings**
- **Borrower rating must represent assessment of**
  - ability and willingness to pay (contractually perform despite adverse conditions)
  - alternatively characteristics that are reflective of the borrower's vulnerability to adverse conditions
  - The range of (adverse) conditions that are considered when making assessments must be consistent with current conditions and those that are likely to occur over a business cycle within the respective industry/geographic region.
- **Given the difficulties in forecasting future events and the influence they will have on a particular borrower's financial condition, a bank must take a conservative view of projected information.**
- **Furthermore, where limited data are available, a bank must adopt a conservative bias to its analysis.**



Use of models

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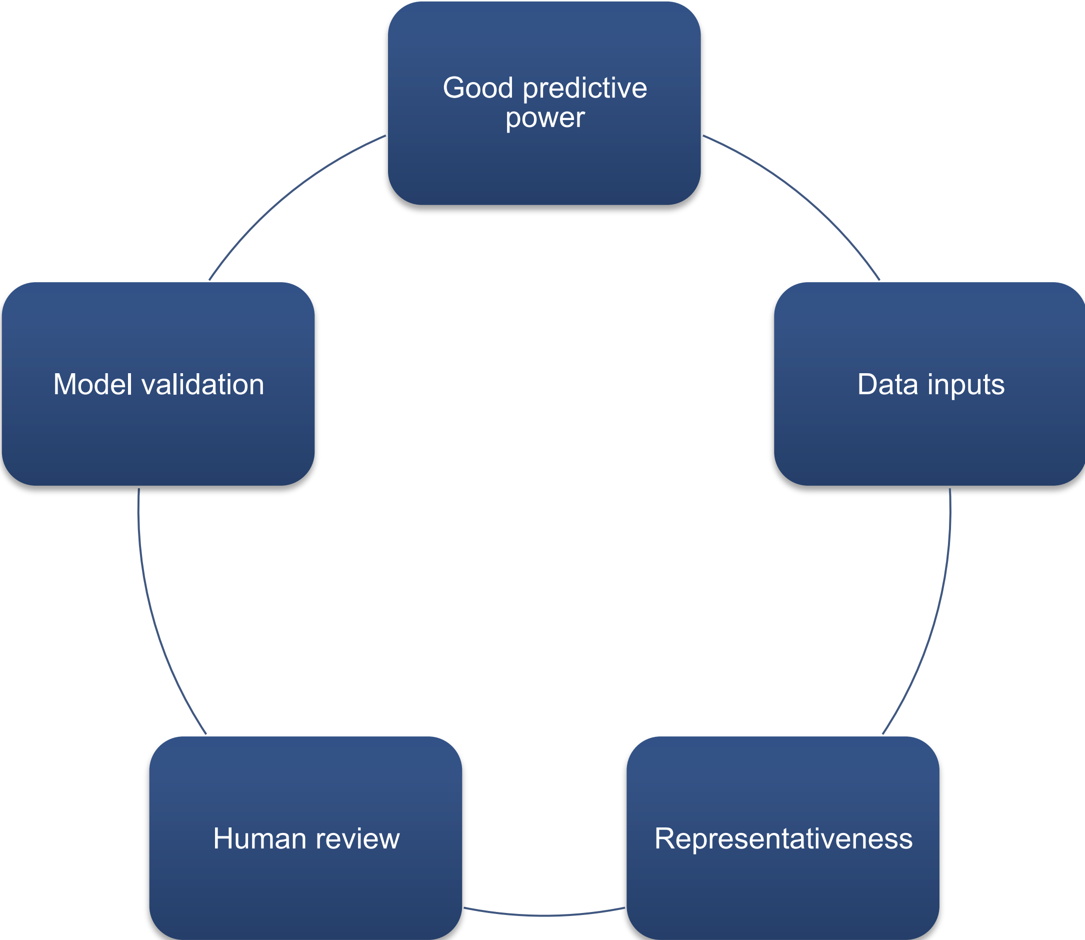

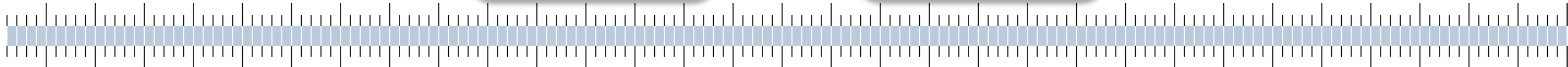

Use of models

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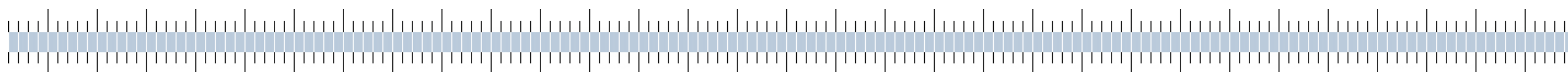
- The burden is on the bank to satisfy its supervisor that a model or procedure has good predictive power and that regulatory capital requirements will not be distorted as a result of its use. The variables that are input to the model must form a reasonable set of predictors. The model must be accurate on average across the range of borrowers or facilities to which the bank is exposed and there must be no known material biases.
- The bank must have in place a process for vetting data inputs into a statistical default or loss prediction model which includes an assessment of the accuracy, completeness and appropriateness of the data specific to the assignment of an approved rating.
- The bank must demonstrate that the data used to build the model are representative of the population of the bank's actual borrowers or facilities.



Use of models

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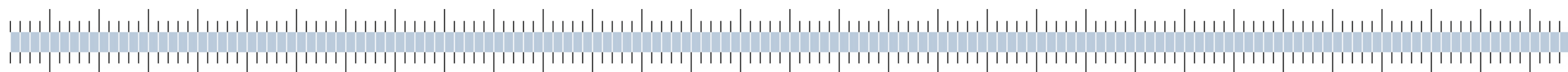
- When combining model results with human judgement, the judgement must take into account all relevant and material information not considered by the model. The bank must have written guidance describing how human judgement and model results are to be combined.
- The bank must have procedures for human review of model-based rating assignments. Such procedures should focus on finding and limiting errors associated with known model weaknesses and must also include credible ongoing efforts to improve the model's performance.
- The bank must have a regular cycle of model validation that includes monitoring of model performance and stability; review of model relationships; and testing of model outputs against outcomes.



Documentation of rating design

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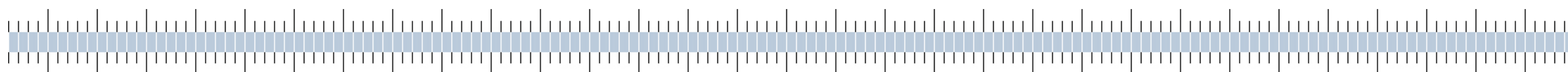
- **Banks must document in writing their rating systems' design and operational details.**
- **The documentation must evidence banks'**
  - compliance with the minimum standards, and must address topics such as
  - portfolio differentiation,
  - rating criteria,
  - responsibilities of parties that rate borrowers and facilities,
  - definition of what constitutes a rating exception,
  - parties that have authority to approve exceptions,
  - frequency of rating reviews, and
  - management oversight of the rating process.



Documentation of rating design

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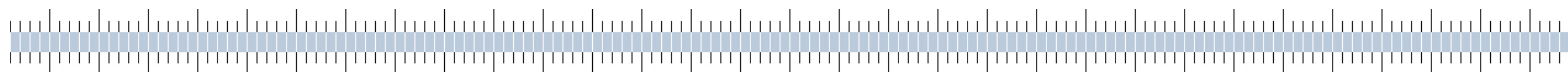
- **If the bank employs statistical models in the rating process, the bank must document their methodologies. This material must:**
  - Provide a detailed outline of the theory, assumptions and/or mathematical and empirical basis of the assignment of estimates to grades, individual obligors, exposures, or pools, and the data source(s) used to estimate the model;
  - Establish a rigorous statistical process (including out-of-time and out-of-sample performance tests) for validating the model; and
  - Indicate any circumstances under which the model does not work effectively.
- **Use of a model obtained from a third-party vendor that claims proprietary technology is not a justification for exemption from documentation or any other of the requirements for internal rating systems.**



Risk rating system operations

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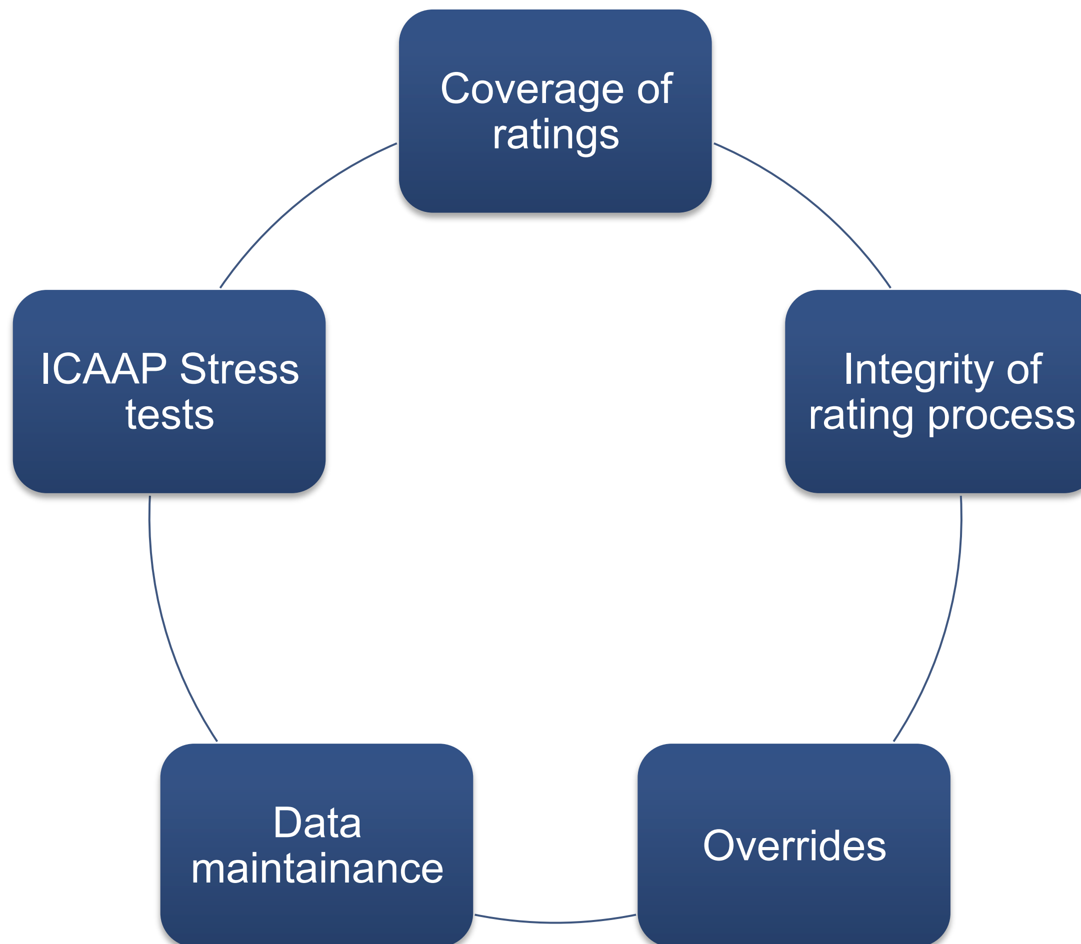
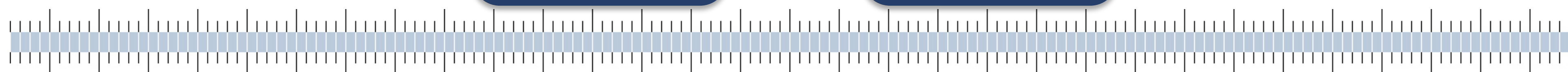
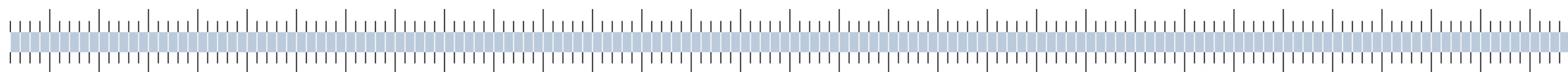




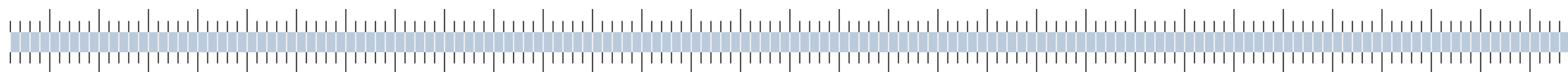
Coverage of ratings

- For corporate, sovereign, and bank exposures, each borrower and all recognised guarantors must be assigned a rating and each exposure must be associated with a facility rating as part of the loan approval process.
- Similarly, for retail, each exposure must be assigned to a pool as part of the loan approval process.
- Each separate legal entity to which the bank is exposed must be separately rated.
- A bank must have policies acceptable to its supervisor regarding the treatment of individual entities in a connected group including circumstances under which the same rating may or may not be assigned to some or all related entities.



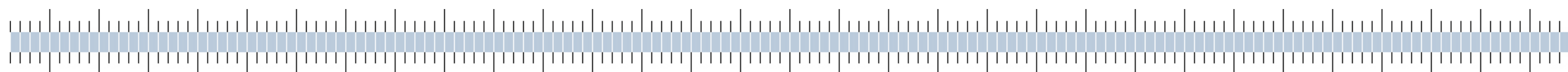
Integrity of the rating process

- **Corporate, sovereign, and bank exposures**
  - Rating assignments and periodic rating reviews must be completed or approved by a party that does not directly stand to benefit from the extension of credit. These operational processes must be documented in the bank's procedures and incorporated into bank policies. Credit policies and underwriting procedures must reinforce and foster the independence of the rating process.
  - Borrowers and facilities must have their ratings refreshed at least on an annual basis. In addition, banks must initiate a new rating if material information on the borrower or facility comes to light.
  - The bank must have an effective process to obtain and update relevant and material information on the borrower's financial condition, and on facility characteristics that affect LGDs and EADs (such as the condition of collateral). Upon receipt, the bank needs to have a procedure to update the borrower's rating in a timely fashion.



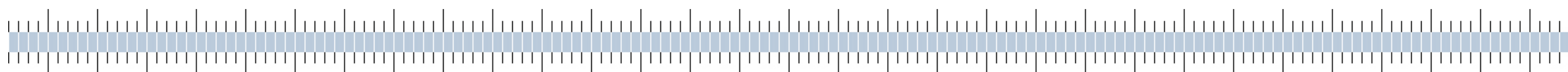
Integrity of the rating process

- **Retail exposures**
  - A bank must review the loss characteristics and delinquency status of each identified risk pool on at least an annual basis.
  - It must also review the status of individual borrowers within each pool as a means of ensuring that exposures continue to be assigned to the correct pool.
  - This requirement may be satisfied by review of a representative sample of exposures in the pool.



Overrides

- For rating assignments based on expert judgement, banks must clearly articulate the situations in which bank officers may override the outputs of the rating process, including how and to what extent such overrides can be used and by whom.
- For model-based ratings, the bank must have guidelines and processes for monitoring cases where human judgement has overridden the model's rating, variables were excluded or inputs were altered.
- These guidelines must include identifying personnel that are responsible for approving these overrides.
- Banks must identify overrides and separately track their performance.



Data maintainance

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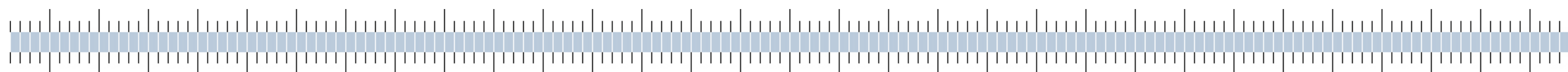
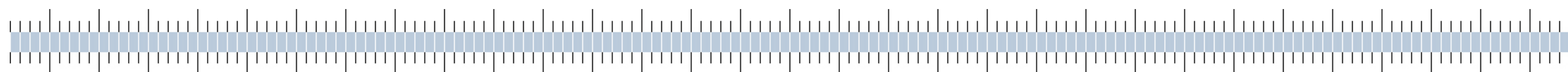
- A bank must collect and store data on key borrower and facility characteristics to provide effective support to its internal credit risk measurement and management process, to enable the bank to meet the other requirements in this document, and to serve as a basis for supervisory reporting.
- These data should be sufficiently detailed to allow retrospective re- allocation of obligors and facilities to grades, for example if increasing sophistication of the internal rating system suggests that finer segregation of portfolios can be achieved.



Data maintainance

- **Corporate, sovereign, and bank exposures**
  - Banks must maintain rating histories on borrowers and recognised guarantors, including the rating since the borrower/guarantor was assigned an internal grade, the dates the ratings were assigned, the methodology and key data used to derive the rating and the person/model responsible.
  - The identity of borrowers and facilities that default, and the timing and circumstances of such defaults, must be retained.
  - Banks must also retain data on the PDs and realised default rates associated with rating grades and ratings migration in order to track the predictive power of the borrower rating system.



Data maintainance

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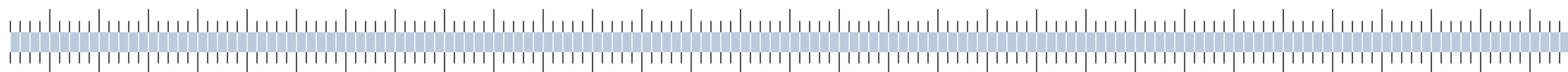
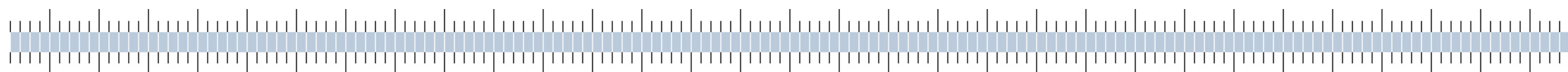
- **Corporate, sovereign, and bank exposures (advanced IRB)**
  - Banks using the advanced IRB approach must also collect and store a complete history of data on the LGD and EAD estimates associated with each facility and the key data used to derive the estimate and the person/model responsible.
  - Banks must also collect data on the estimated and realised LGDs and EADs associated with each defaulted facility.
  - Banks that reflect the credit risk mitigating effects of guarantees/credit derivatives through LGD must retain data on the LGD of the facility before and after evaluation of the effects of the guarantee/credit derivative.
  - Information about the components of loss or recovery for each defaulted exposure must be retained, such as amounts recovered, source of recovery (e.g. collateral, liquidation proceeds and guarantees), time period required for recovery, and administrative costs.



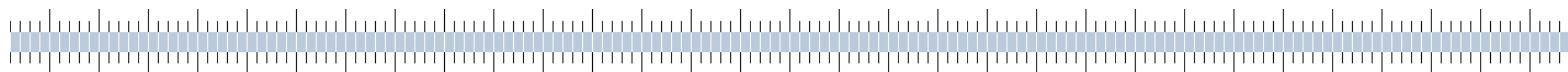
Data maintainance

- **Corporate, sovereign, and bank exposures (Foundation IRB)**
  - Banks under the foundation approach which utilise supervisory estimates are encouraged to retain the relevant data (i.e. data on loss and recovery experience for corporate exposures under the foundation approach, data on realised losses for banks using the supervisory slotting criteria for SL).



Data maintainance

- **Retail exposures**
  - Banks must retain data used in the process of allocating exposures to pools, including data on borrower and transaction risk characteristics used either directly or through use of a model, as well as data on delinquency.
  - Banks must also retain data on the estimated PDs, LGDs and EADs, associated with pools of exposures.
  - For defaulted exposures, banks must retain the data on the pools to which the exposure was assigned over the year prior to default and the realised outcomes on LGD and EAD.



ICAAP stress tests

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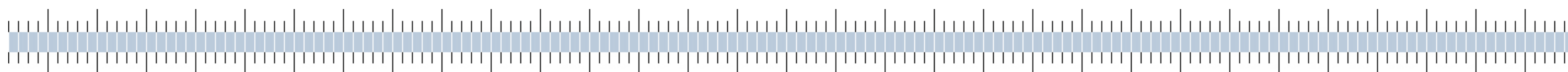
- An IRB bank must have in place sound stress testing processes for use in the assessment of capital adequacy.
- Stress testing must involve identifying possible events or future changes in economic conditions that could have unfavourable effects on a bank's credit exposures and assessment of the bank's ability to withstand such changes.
- In addition to the more general tests described above, the bank must perform a credit risk stress test to assess the effect of certain specific conditions on its IRB regulatory capital requirements.
- For this purpose, the objective is not to require banks to consider worst-case scenarios. The bank's stress test in this context should, however, consider at least the effect of mild recession scenarios.



ICAAP stress tests

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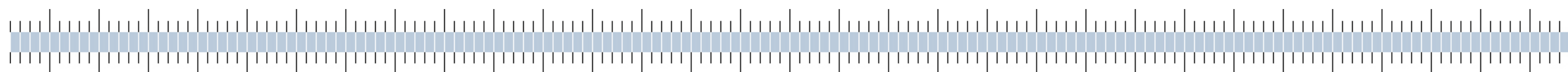
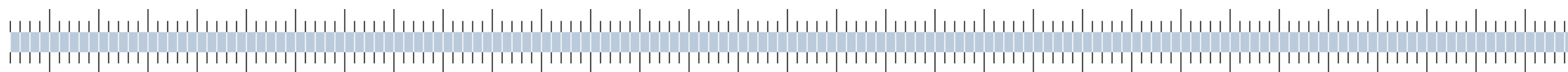
- **Whatever method is used, the bank must include a consideration of the following sources of information.**
  - First, a bank’s own data should allow estimation of the ratings migration of at least some of its exposures.
  - Second, banks should consider information about the impact of smaller deterioration in the credit environment on a bank’s ratings, giving some information on the likely effect of bigger, stress circumstances.
  - Third, banks should evaluate evidence of ratings migration in external ratings. This would include the bank broadly matching its buckets to rating categories.



RISK QUANTIFICATION



Risk quantification

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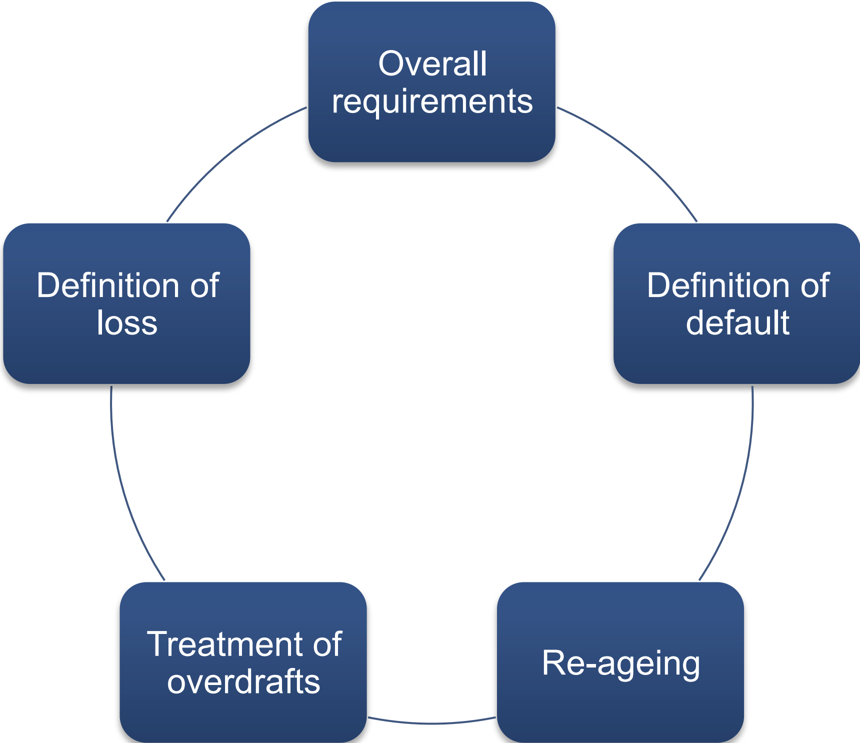

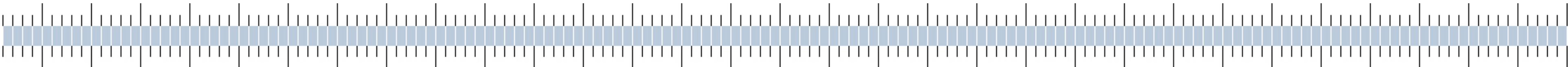

Overall requirements for estimation

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- 448. Estimates of PD, LGD, and EAD must incorporate all relevant, material and available data, information and methods.
- 448. A bank may utilise internal data and data from external sources, including pooled data.
- 449. Estimates must be grounded in historical experience and empirical evidence.
- 449. Estimates must promplty reflect the implications of technical advances and new data and other information, as it becomes available.
- 449. Review estimates on a yearly basis, at least.
- 450. Population of exposures represented in the data used for estimation, and lending standards in use when the data were generated, and other relevant characteristics should be closely matched to or at least comparable with those of the bank's exposures and standards.
- 450. Demonstrate that economic or market conditions that underlie the data are relevant to current and foreseeable conditions.
- 451. Add margin of conservatism related to the likely range of errors.
- 451. Data collected beyond the date of implementation must conform the the minimum standards.

Definition of default

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- **452. A default is considered to have occurred with regard to a particular obligor when either or both of the two following events have taken place.**
  - The bank considers that the obligor is unlikely to pay its credit obligations to the banking group in full, without recourse by the bank to actions such as realising security (if held).
  - The obligor is past due more than 90 days on any material credit obligation to the banking group.
  - Overdrafts will be considered as being past due once the customer has breached an advised limit or been advised of a limit smaller than current outstandings.
- **455. For retail exposures, the definition of default can be applied at the level of a particular facility, rather than at the level of the obligor. As such, default by a borrower on one obligation does not require a bank to treat all other obligations to the banking group as defaulted.**
- **457. If the bank considers that a previously defaulted exposure's status is such that no trigger of the reference definition any longer applies, the bank must rate the borrower and estimate LGD as they would for a non-defaulted facility.**

Unlikeliness to pay

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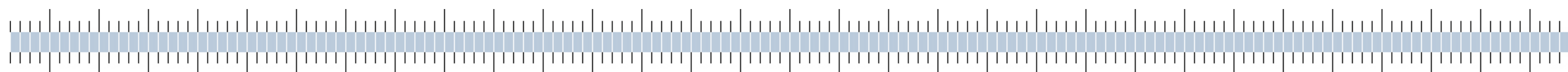
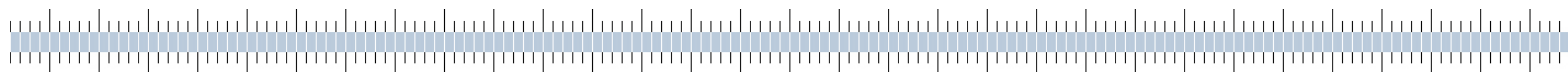
- **453. The elements to be taken as indications of unlikeliness to pay include:**
  - The bank puts the credit obligation on non-accrued status.
  - The bank makes a charge-off or account-specific provision resulting from a significant perceived decline in credit quality subsequent to the bank taking on the exposure.
  - The bank sells the credit obligation at a material credit-related economic loss.
  - The bank 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.
  - The bank has filed for the obligor's bankruptcy or a similar order in respect of the obligor's credit obligation to the banking group.
  - The obligor has sought or has been placed in bankruptcy or similar protection where this would avoid or delay repayment of the credit obligation to the banking group.



Record of actual defaults

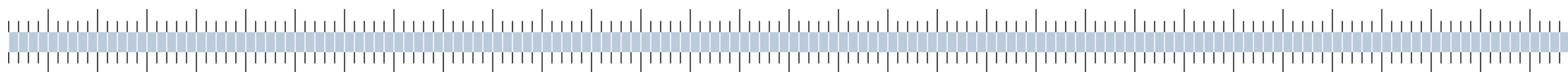
DEUTSCHE BUNDESBANK
EUROSYSTEM

- **456. A bank must record actual defaults on IRB exposure classes using this reference definition.**
- **456. A bank must also use the reference definition for its estimation of PDs, and (where relevant) LGDs and EADs.**
- **456. In arriving at these estimations, a bank may use external data available to it that is not itself consistent with that definition.**
  - However, in such cases, banks must demonstrate to their supervisors that appropriate adjustments to the data have been made to achieve broad equivalence with the reference definition.
  - This same condition would apply to any internal data used up to implementation of this Framework.
  - Internal data (including that pooled by banks) used in such estimates beyond the date of implementation of this Framework must be consistent with the reference definition.



Re-ageing

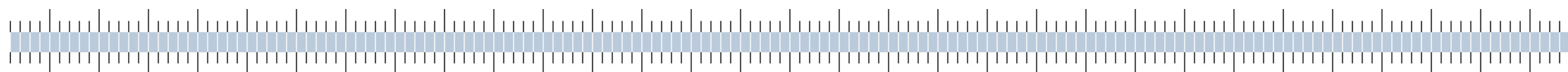
- **458. The bank must have clearly articulated and documented policies in respect of the counting of days past due, in particular in respect of the re-ageing of the facilities and the granting of extensions, deferrals, renewals and rewrites to existing accounts.**
  - approval authorities and reporting requirements;
  - minimum age of a facility before it is eligible for re-ageing;
  - delinquency levels of facilities that are eligible for re-ageing;
  - maximum number of re-ageings per facility; and
  - a reassessment of the borrower's capacity to repay.
- **458. These policies must be applied consistently over time, and must support the 'use test'.**



Overdrafts

DEUTSCHE BUNDESBANK
EUROSYSTEM

- **459. Authorised overdrafts must be subject to a credit limit set by the bank and brought to the knowledge of the client.**
  - Any break of this limit must be monitored;
  - if the account were not brought under the limit after 90 to 180 days (subject to the applicable past-due trigger), it would be considered as defaulted.
  - Non-authorised overdrafts will be associated with a zero limit for IRB purposes.
  - Banks must have in place rigorous internal policies for assessing the creditworthiness of customers who are offered overdraft accounts.



Definition of loss

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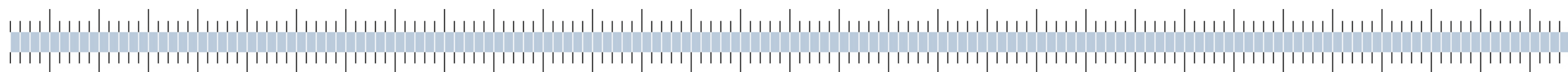
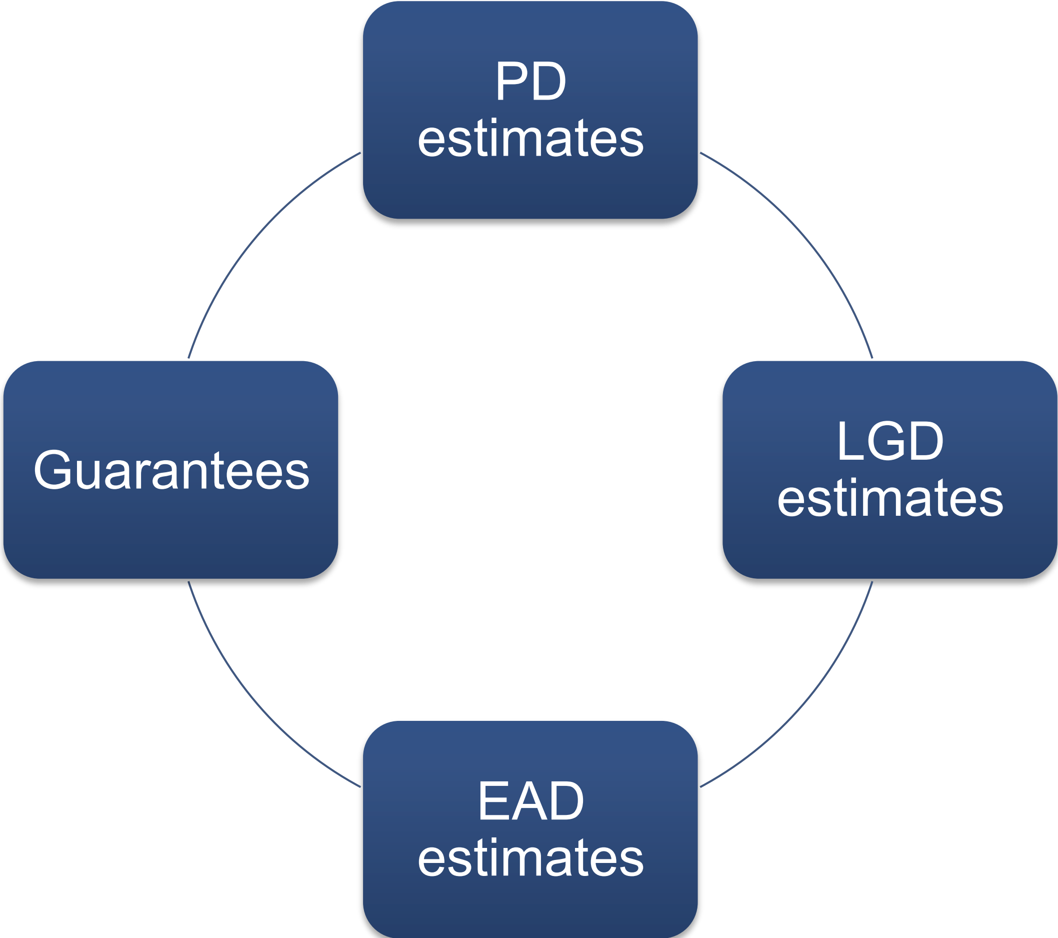
EUROSYSTEM

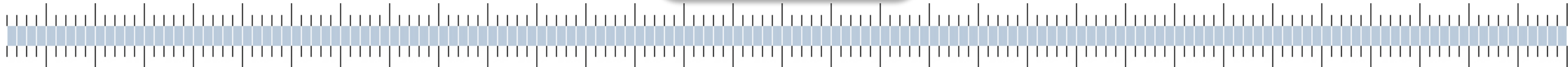
- 460. The definition of loss used in estimating LGD is economic loss.
- 460. When measuring economic loss, all relevant factors should be taken into account. This must include material discount effects and material direct and indirect costs associated with collecting on the exposure.
- 460. Banks must not simply measure the loss recorded in accounting records, although they must be able to compare accounting and economic losses.
- 460. The bank's own workout and collection expertise significantly influences their recovery rates and must be reflected in their LGD estimates, but adjustments to estimates for such expertise must be conservative until the bank has sufficient internal empirical evidence of the impact of its expertise.



Risk estimation

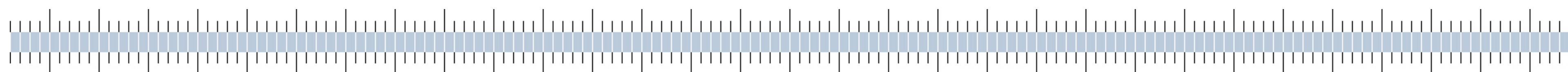
DEUTSCHE BUNDESBANK
EUROSYSTEM





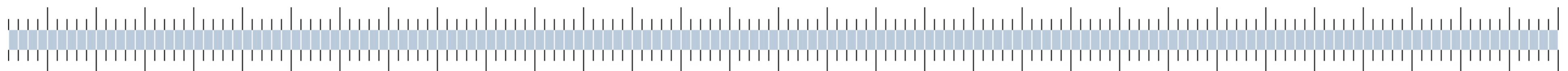
PD estimates
Corporate, sovereign, and bank exposures

- **Source of data**
  - internal
  - external
  - pooled
  - combination of the above
- **Techniques**
  - primary
  - additional secondary techniques



PD estimates
Corporate, sovereign, and bank exposures

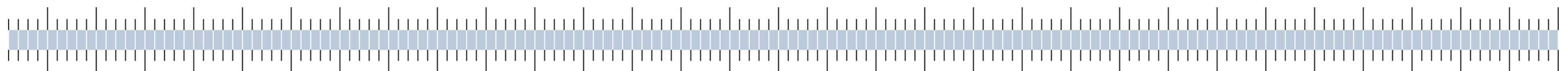
- **462. A bank may use data on internal default experience for the estimation of PD.**
- **462. A bank must demonstrate in its analysis that the**
  - estimates are reflective of underwriting standards and of
  - any differences in the rating system that generated the data and the current rating system.
- **462. Where only limited data are available, or where underwriting standards or rating systems have changed, the bank must add a greater margin of conservatism in its estimate of PD.**
- **462. The use of pooled data across institutions may also be recognised. A bank must demonstrate that the internal rating systems and criteria of other banks in the pool are comparable with its own.**



PD estimates

Corporate, sovereign, and bank exposures

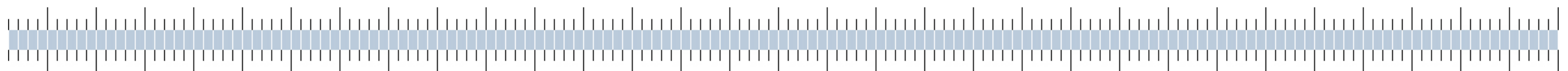
- **462. Banks may associate or map their internal grades to the scale used by an external credit assessment institution or similar institution and then attribute the default rate observed for the external institution's grades to the bank's grades.**
- **462. Mappings must be based on a comparison of internal rating criteria to the criteria used by the external institution and on a comparison of the internal and external ratings of any common borrowers.**
  - Biases or inconsistencies in the mapping approach or underlying data must be avoided.
  - The external institution's criteria underlying the data used for quantification must be oriented to the risk of the borrower and not reflect transaction characteristics. The bank's analysis must include a comparison of the default definitions used. The bank must document the basis for the mapping.



PD estimates

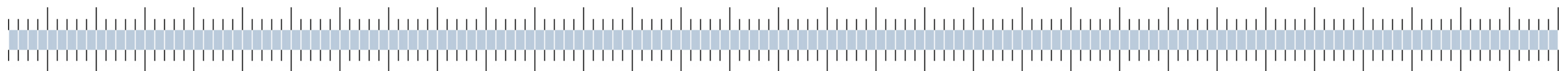
Corporate, sovereign, and bank exposures

- 462. A bank is allowed to use a simple average of default-probability estimates for individual borrowers in a given grade, where such estimates are drawn from statistical default prediction models.
- 463. Irrespective of whether a bank is using external, internal, or pooled data sources, or a combination of the three, for its PD estimation, the length of the underlying historical observation period used must be at least five years for at least one source.
- 463. If the available observation period spans a longer period for any source, and this data are relevant and material, this longer period must be used.



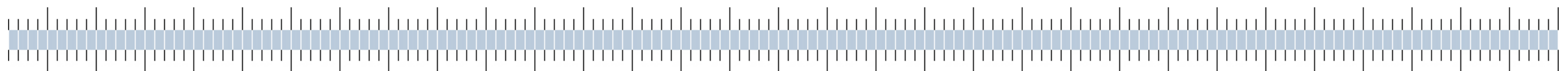
PD estimates
Retail exposures

- **464. Given the bank-specific basis of assigning exposures to pools, banks must regard internal data as the primary source of information for estimating loss characteristics.**
- **464. Banks are permitted to use external data or statistical models for quantification provided a strong link can be demonstrated between**
  - the bank’s process of assigning exposures to a pool and the process used by the external data source, and
  - between the bank’s internal risk profile and the composition of the external data. In all cases banks must use all relevant and material data sources as points of comparison.



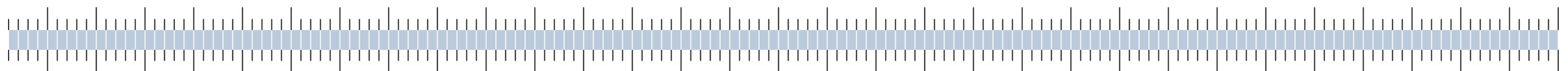
PD estimates
Retail exposures

- **465. One method for deriving long-run average estimates of PD and default-weighted average loss rates given default for retail would be based on an estimate of the expected long-run loss rate. A bank may**
  - use an appropriate PD estimate to infer the long-run def ault-weighted average loss rate given default, or
  - use a long-run default-weighted average loss rate given default to infer the appropriate PD.
- **465. In either case, it is important to recognise that the LGD used for the IRB capital calculation cannot be less than the long-run default-weighted average loss rate given default.**



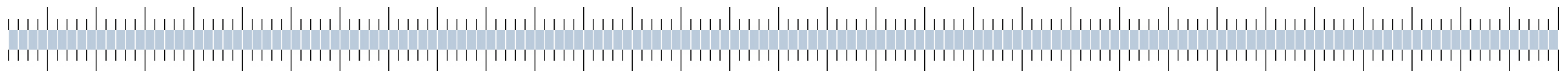
PD estimates
Retail exposures

- **466. Irrespective of whether banks are using external, internal, pooled data sources, or a combination of the three, for their estimation of loss characteristics, the length of the underlying historical observation period used must be at least five years.**
- **466. If the available observation spans a longer period for any source, and these data are relevant, this longer period must be used.**
- **466. A bank need not give equal importance to historic data if it can convince its supervisor that more recent data are a better predictor of loss rates.**



PD estimates
Retail exposures

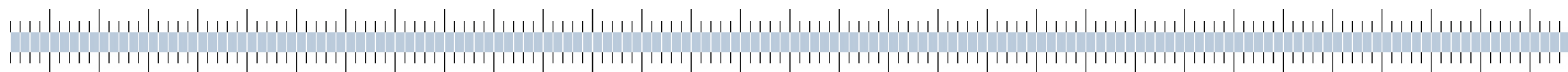
- **467. Seasoning can be quite material for some long-term retail exposures characterised by seasoning effects that peak several years after origination.**
- **467. Banks should anticipate the implications of rapid exposure growth and take steps to ensure that their estimation techniques are accurate, and that their current capital level and earnings and funding prospects are adequate to cover their future capital needs.**
- **467. In order to avoid gyrations in their required capital positions arising from short-term PD horizons, banks are also encouraged to adjust PD estimates upward for anticipated seasoning effects, provided such adjustments are applied in a consistent fashion over time.**



LGD estimates

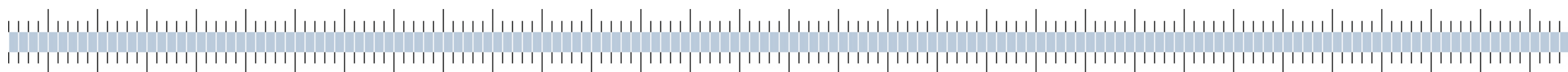
DEUTSCHE BUNDESBANK EUROSYSTEM

- 468. A bank must estimate an LGD for each facility that aims to reflect economic downturn conditions where necessary to capture the relevant risks.
- 468. This LGD cannot be less than the long-run default-weighted average loss rate given default calculated based on the average economic loss of all observed defaults within the data source for that type of facility.
- 468. In addition, a bank must take into account the potential for the LGD of the facility to be higher than the default-weighted average during a period when credit losses are substantially higher than average.



LGD estimates

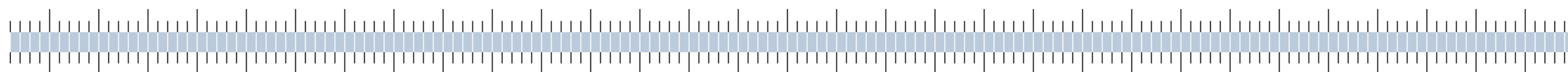
- 469. In its analysis, the bank must consider the extent of any dependence between the risk of the borrower and that of the collateral or collateral provider.
- 469. Cases where there is a significant degree of dependence must be addressed in a conservative manner.
- 469. Any currency mismatch between the underlying obligation and the collateral must also be considered and treated conservatively in the bank's assessment of LGD.
- 470. LGD estimates must be grounded in historical recovery rates and, when applicable, must not solely be based on the collateral's estimated market value.
- 470. To the extent, that LGD estimates take into account the existence of collateral, banks must establish internal requirements for collateral management, operational procedures, legal certainty and risk management process that are generally consistent with those required for the standardised approach.



LGD estimates

DEUTSCHE BUNDESBANK EUROSYSTEM

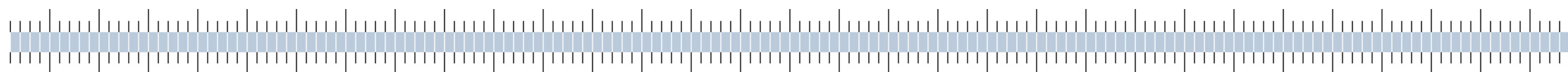
- 468. Banks may use averages of loss severities observed during periods of high credit losses, forecasts based on appropriately conservative assumptions, or other similar methods.
- 468. Appropriate estimates of LGD during periods of high credit losses might be formed using either internal and/or external data.
- 471. Recognising the principle that realised losses can at times systematically exceed expected levels, the LGD assigned to a defaulted asset should reflect the possibility that the bank would have to recognise additional, unexpected losses during the recovery period.
- 471. For each defaulted asset, the bank must also construct its best estimate of the expected loss on that asset based on current economic circumstances and facility status.



LGD estimates

DEUTSCHE BUNDESBANK EUROSYSTEM

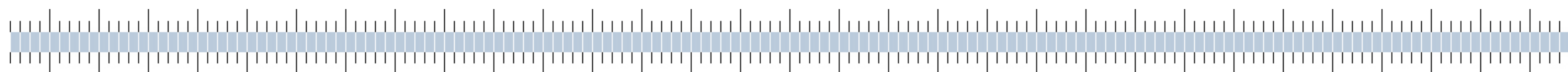
- **472. Additional standards for corporate, sovereign, and bank exposures**
  - Estimates of LGD must be based on a minimum data observation period that should ideally cover at least one complete economic cycle but must in any case be no shorter than a period of seven years for at least one source.
  - If the available observation period spans a longer period for any source, and the data are relevant, this longer period must be used.
- **473. Additional standards for retail exposures**
  - The minimum data observation period for LGD estimates for retail exposures is five years.
  - The less data a bank has, the more conservative it must be in its estimation.
  - A bank need not give equal importance to historic data if it can demonstrate to its supervisor that more recent data are a better predictor of loss rates.



EAD estimates

DEUTSCHE BUNDESBANK
EUROSYSTEM

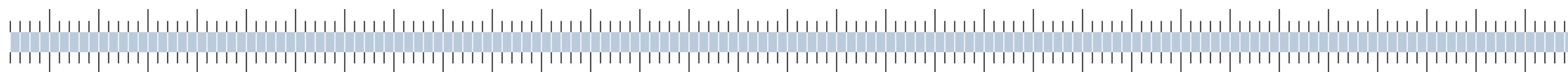
- **474. For on-balance sheet items, banks must estimate EAD at no less than the current drawn amount, subject to recognising the effects of on-balance sheet netting as specified in the foundation approach. (equal to foundation approach)**
- **474. Advanced approach banks must have established procedures in place for the estimation of EAD for off-balance sheet items.**
  - These must specify the estimates of EAD to be used for each facility type.
  - Banks estimates of EAD should reflect the possibility of additional drawings by the borrower up to and after the time a default event is triggered.
  - Where estimates of EAD differ by facility type, the delineation of these facilities must be clear and unambiguous.



EAD estimates

DEUTSCHE BUNDESBANK EUROSYSTEM

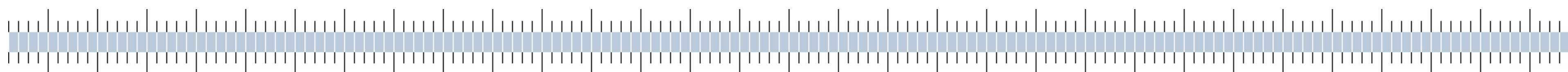
- **475. Assign an estimate of EAD for each facility that is an estimate of the long-run default-weighted average EAD for similar facilities and borrowers over a sufficiently long period of time, but with a margin of conservatism appropriate to the likely range of errors in the estimate.**
- **475. If a positive correlation can reasonably be expected between the default frequency and the magnitude of EAD, the EAD estimate must incorporate a larger margin of conservatism.**
- **475. Moreover, for exposures for which EAD estimates are volatile over the economic cycle, the bank must use EAD estimates that are appropriate for an economic downturn, if these are more conservative than the long- run average.**



EAD estimates

DEUTSCHE BUNDESBANK
EUROSYSTEM

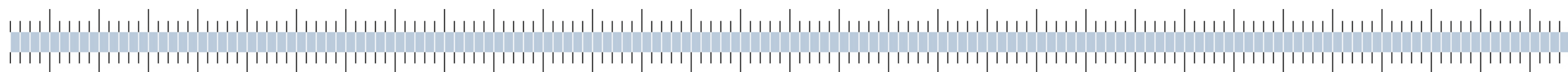
- **476. The choices must be supported by credible internal analysis by the bank.**
- **476. The bank must be able to provide a breakdown of its EAD experience by the factors it sees as the drivers of EAD.**
- **476. Due consideration must be paid by the bank to its specific policies and strategies adopted in respect of account monitoring and payment processing.**
- **477. Banks must also have adequate systems and procedures in place to monitor facility amounts, current outstandings against committed lines and changes in outstandings per borrower and per grade.**
- **477. The bank must be able to monitor outstanding balances on a daily basis.**
- **477(i). For transactions that expose banks to counterparty credit risk, estimates of EAD must fulfil the requirements set forth in Annex 4 of this Framework.**



EAD estimates

DEUTSCHE BUNDESBANK
EUROSYSTEM

- **478. Additional standards for corporate, sovereign, and bank exposures**
  - Estimates of EAD must be based on a time period that must ideally cover a complete economic cycle but must in any case be no shorter than a period of seven years.
  - EAD estimates must be calculated using a default- weighted average and not a time-weighted average.
- **479. Additional standards for retail exposures**
  - The minimum data observation period for EAD estimates for retail exposures is five years.
  - A bank need not give equal importance to historic data if it can demonstrate to its supervisor that more recent data are a better predictor of drawdowns.

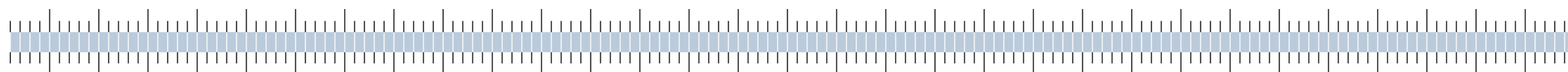


Guarantees

DEUTSCHE BUNDESBANK EUROSYSTEM

- **480. When a bank uses its own estimates of LGD, it may reflect the risk-mitigating effect of guarantees through an adjustment to PD or LGD estimates.**
- **481. In all cases, both the borrower and all recognised guarantors must be assigned a borrower rating at the outset and on an ongoing basis.**
- **482. In no case can the bank assign the guaranteed exposure an adjusted PD or LGD such that the adjusted risk weight would be lower than that of a comparable, direct exposure to the guarantor.**
- **482. The adjusted risk weight must not reflect the risk mitigation of "double default."**
- **480. For retail exposures,**
  - where guarantees exist, either in support of an individual obligation or a pool of exposures, a bank may reflect the risk-reducing effect either through its estimates of PD or LGD.
  - In the case of retail guarantees, guarantors must be assigned to a pool, and the estimation of PD.

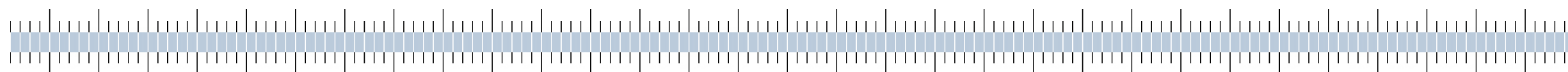
VALIDATION OF INTERNAL ESTIMATES



Validation of internal estimates

DEUTSCHE BUNDESBANK
EUROSYSTEM

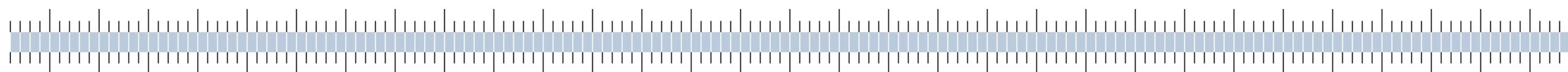
- **500. Banks must have a robust system in place to validate the accuracy and consistency of rating systems, processes, and the estimation of all relevant risk components.**
- **501. Banks must regularly compare realised default rates with estimated PDs for each grade and be able to demonstrate that the realised default rates are within the expected range for that grade.**
  - Banks using the advanced IRB approach must complete such analysis for their estimates of LGDs and EADs.
- **501. Such comparisons must make use of historical data that are over as long a period as possible.**
- **501. The methods and data used in such comparisons by the bank must be clearly documented by the bank.**
- **501. This analysis and documentation must be updated at least annually.**



Validation of internal estimates

DEUTSCHE BUNDESBANK
EUROSYSTEM

- **502. Banks must also use other quantitative validation tools and comparisons with relevant external data sources.**
  - The analysis must be based on data that are appropriate to the portfolio, are updated regularly, and cover a relevant observation period.
  - Banks' internal assessments of the performance of their own rating systems must be based on long data histories, covering a range of economic conditions, and ideally one or more complete business cycles.
- **503. Banks must demonstrate that quantitative testing methods and other validation methods do not vary systematically with the economic cycle.**
- **504. Banks must have well-articulated internal standards for situations where deviations in realised PDs, LGDs and EADs from expectations become significant enough to call the validity of the estimates into question.**
- **504. These standards must take account of business cycles and similar systematic variability in default experiences.**



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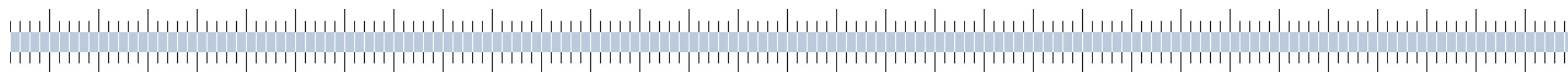
EUROSYSTEM

SUPERVISORY LGD AND EAD ESTIMATES



Supervisory LGD and EAD estimates

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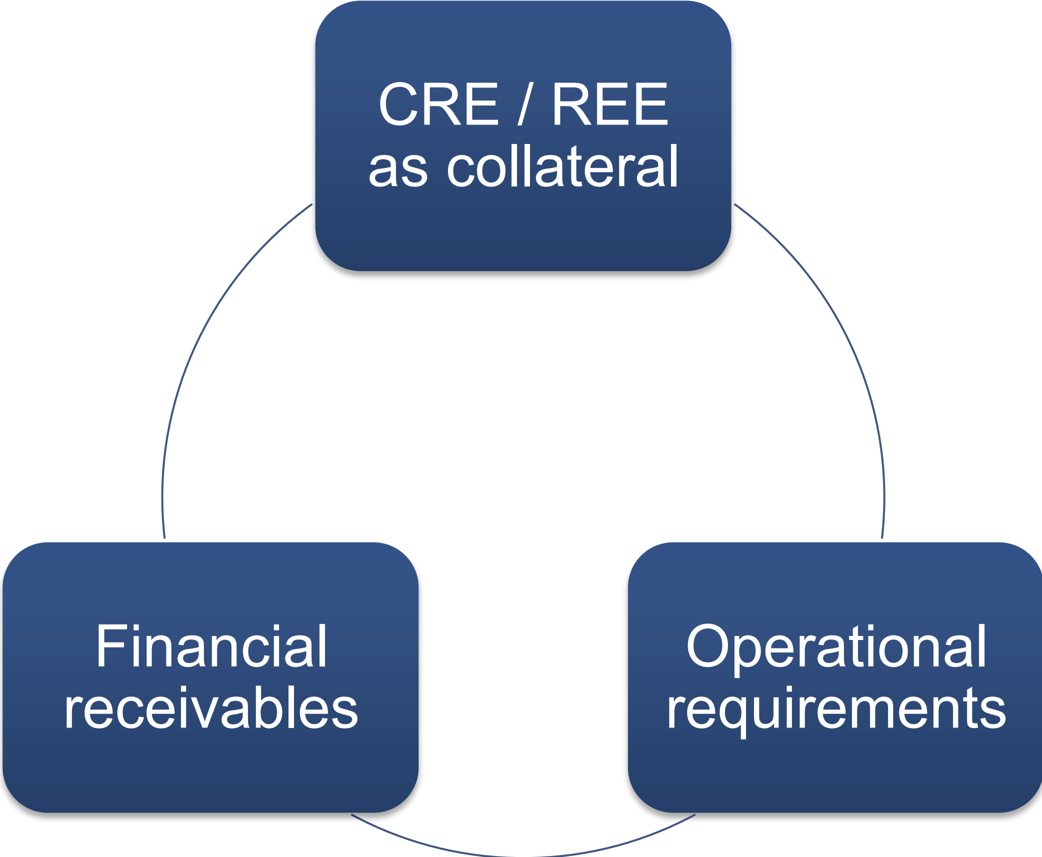
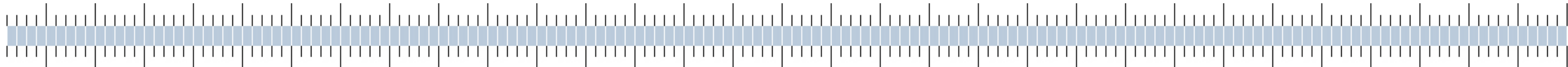
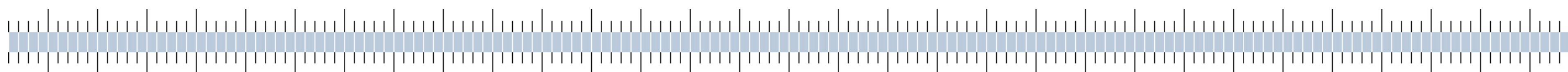
EUROSYSTEM





Supervisory LGD and EAD estimates

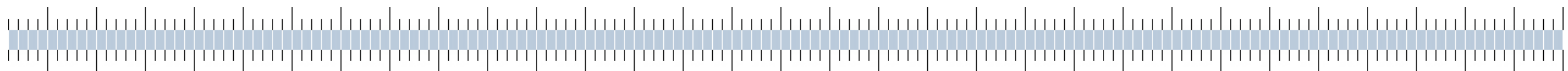
- **456. Banks under the foundation IRB approach, which do not meet the requirements for own-estimates of LGD and EAD, above, must meet the minimum requirements described in the standardised approach to receive recognition for eligible financial collateral**



Eligibility of CRE and RRE as collateral

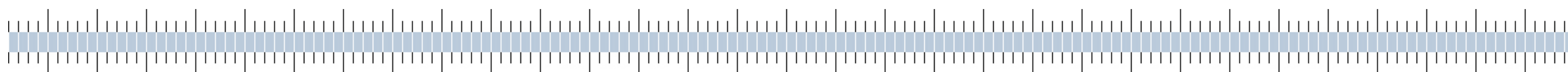
DEUTSCHE BUNDESBANK
EUROSYSTEM

- **507. Eligible CRE and RRE collateral for corporate, sovereign and bank exposures are defined as:**
  - Collateral where the risk of the borrower is not materially dependent upon the performance of the underlying property or project, but rather on the underlying capacity of the borrower to repay the debt from other sources. As such, repayment of the facility is not materially dependent on any cash flow generated by the underlying CRE/RRE serving as collateral and
  - Additionally, the value of the collateral pledged must not be materially dependent on the performance of the borrower. This requirement is not intended to preclude situations where purely macro-economic factors affect both the value of the collateral and the performance of the borrower.
- **508. Income producing real estate that falls under the SL asset class is specifically excluded from recognition as collateral for corporate exposures.**



Operational requirements for eligible CRE/RRE

- **509. CRE and RRE will be eligible for recognition as collateral for corporate claims only if all of the following operational requirements are met.**
  - Legal enforceability,
  - Objective market value of colateral,
  - Frequent revaluation, and
  - First charge.
- **510. Additional collateral management requirements are as follows:**
  - Documentation of the types of collateral / conditions
  - Insurance of collateral
  - Monitor permissible prior claims
  - Environmental liability of the bank arising in respect of the collateral
- **508. Income producing real estate that falls under the SL asset class is specifically excluded from recognition as collateral for corporate exposures.**



Operational requirements for eligible CRE/RRE

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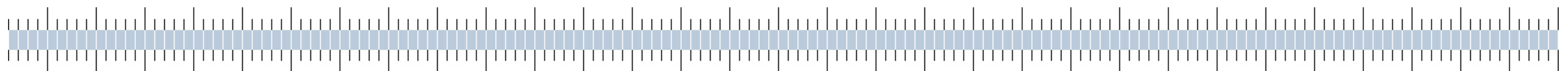
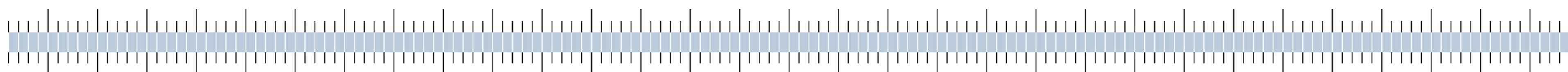
EUROSYSTEM

- **512. Legal enforceability**
  - Jurisdiction
  - Perfect lien
  - Reasonable time to realisation
- **Objective market value of the collateral**
- **Frequent revaluation**
  - Min. 1 year
  - Subject to frequency of market value change
  - Evaluation by qualified professional
- **Junior lien**
  - Legally enforceable
  - Efficient risk mitigant



Operational requirements for eligible CRE/RRE

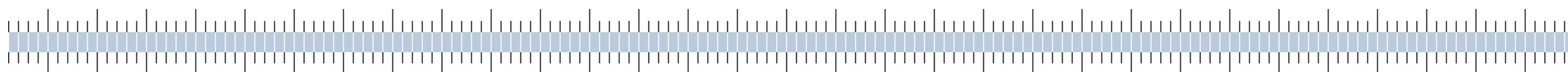
- **522. Collateral management**
  - The types of CRE and RRE collateral accepted by the bank and lending policies (advance rates) when this type of collateral is taken must be clearly documented.
  - The bank must take steps to ensure that the property taken as collateral is adequately insured against damage or deterioration.
  - The bank must monitor on an ongoing basis the extent of any permissible prior claims (e.g. tax) on the property.
  - The bank must appropriately monitor the risk of environmental liability arising in respect of the collateral, such as the presence of toxic material on a property.



Recognition of financial receivables

DEUTSCHE BUNDESBANK
EUROSYSTEM

- Eligible financial receivables are claims with an original maturity of less than or equal to one year where repayment will occur through the commercial or financial flows related to the underlying assets of the borrower.
- This includes both self-liquidating debt arising from the sale of goods or services linked to a commercial transaction and general amounts owed by buyers, suppliers, renters, national and local governmental authorities, or other non-affiliated parties not related to the sale of goods or services linked to a commercial transaction.
- Eligible receivables do not include those associated with securitisations, sub- participations or credit derivatives.



Operational Requirements

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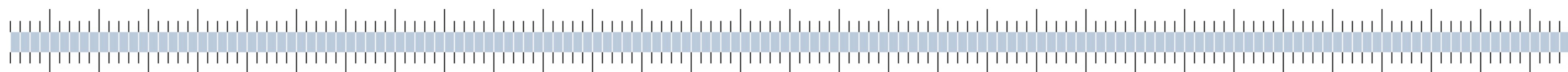
- **Legal certainty**
  - 512. The legal mechanism by which collateral is given must be robust and ensure that the lender has clear rights over the proceeds from the collateral.
  - 513. Banks must take all steps necessary to fulfil local requirements in respect of the enforceability of security interest.There should be a framework that allows the potential lender to have a perfected first priority claim over the collateral.
  - 514. All documentation used in collateralised transactions must be binding on all parties and legally enforceable in all relevant jurisdictions. Banks must have conducted sufficient legal review to verify this and have a well founded legal basis to reach this conclusion, and undertake such further review as necessary to ensure continuing enforceability.
  - 515. The collateral arrangements must be properly documented, with a clear and robust procedure for the timely collection of collateral proceeds. Banks' procedures should ensure that any legal conditions required for declaring the default of the customer and timely collection of collateral are observed. In the event of the obligor's financial distress or default, the bank should have legal authority to sell or assign the receivables to other parties without consent of the receivables' obligors.

Operational requirements

- **Risk management**
  - 516. Sound process for determining credit risk in receivables
    - Analysy of the borrower's business and industry
    - Types of customers with whom the borrower does business.
    - Where the bank relies on the borrower to ascertain the credit risk of the customers, the bank must review the borrower's credit policy to ascertain its soundness and credibility.
  - 517. The margin between the amount of the exposure and the value of the receivables must reflect all appropriate factors, including the cost of collection, concentration within the receivables pool pledged by an individual borrower, and potential concentration risk within the bank's total exposures.
  - 518. Monitoring process for the specific exposures
  - 519. Low correlation of the reivables with the borrower
  - 520. Collective receivables in distressed situations



Operational requirements

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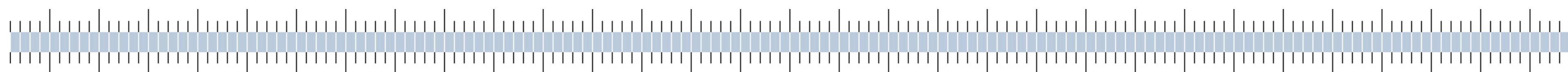
- **521 / 522.Recognition of other collateral**
  - First claim
  - The loan agreement must include detailed descriptions of the collateral plus detailed specifications of the manner and frequency of revaluation.
  - Physical collateral
  - Policies must address appropriate collateral requirements relative to the exposure amount, the ability to liquidate the collateral readily, the ability to establish objectively a price or market value, the frequency with which the value can readily be obtained (including a professional appraisal or valuation), and the volatility of the value of the collateral.
  - Periodic revaluation process
  - Physical inspections in cases of inventories



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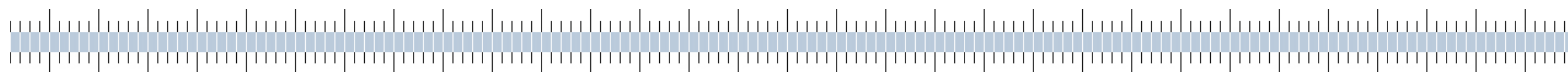
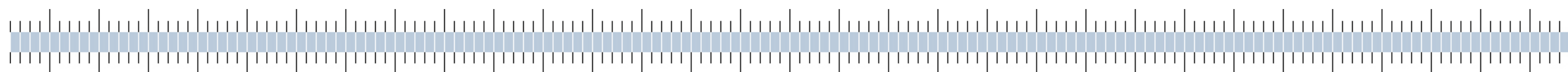
RECOGNITION OF LEASING



Recognition of leasing

DEUTSCHE BUNDESBANK EUROSYSTEM

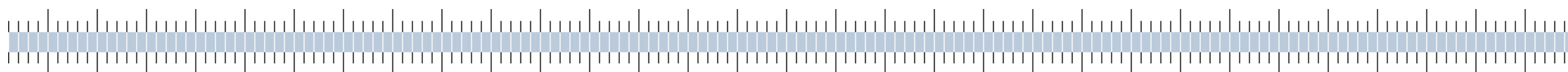
- **523. Leases other than those that expose the bank to residual value risk will be accorded the same treatment as exposures collateralised by the same type of collateral.**
- **523. In addition, the bank must also meet the following standards:**
  - Robust risk management on the part of the lessor with respect to the location of the asset, the use to which it is put, its age, and planned obsolescence;
  - A robust legal framework establishing the lessor's legal ownership of the asset and its ability to exercise its rights as owner in a timely fashion; and
  - The difference between the rate of depreciation of the physical asset and the rate of amortisation of the lease payments must not be so large as to overstate the CRM attributed to the leased assets.



Recognition of leasing

DEUTSCHE BUNDESBANK EUROSYSTEM

- 524. Leases that expose the bank to residual value risk will be treated in the following manner.
- 524. Residual value risk is the bank's exposure to potential loss due to the fair value of the equipment declining below its residual estimate at lease inception.
- 524. The discounted lease payment stream will receive a risk weight appropriate for the lessee's financial strength (PD) and supervisory or own-estimate of LGD, which ever is appropriate.
- 524. The residual value will be risk-weighted at 100%.



Common issues

- **PD issues**
  - Default count methodology not stringent
- **LGD issues**
  - Downturn period to use
- **EAD issues**
  - Correlation with business cycles