EUROPEAN CENTRAL BANK

BANKING SUPERVISION

ECB guide to internal models

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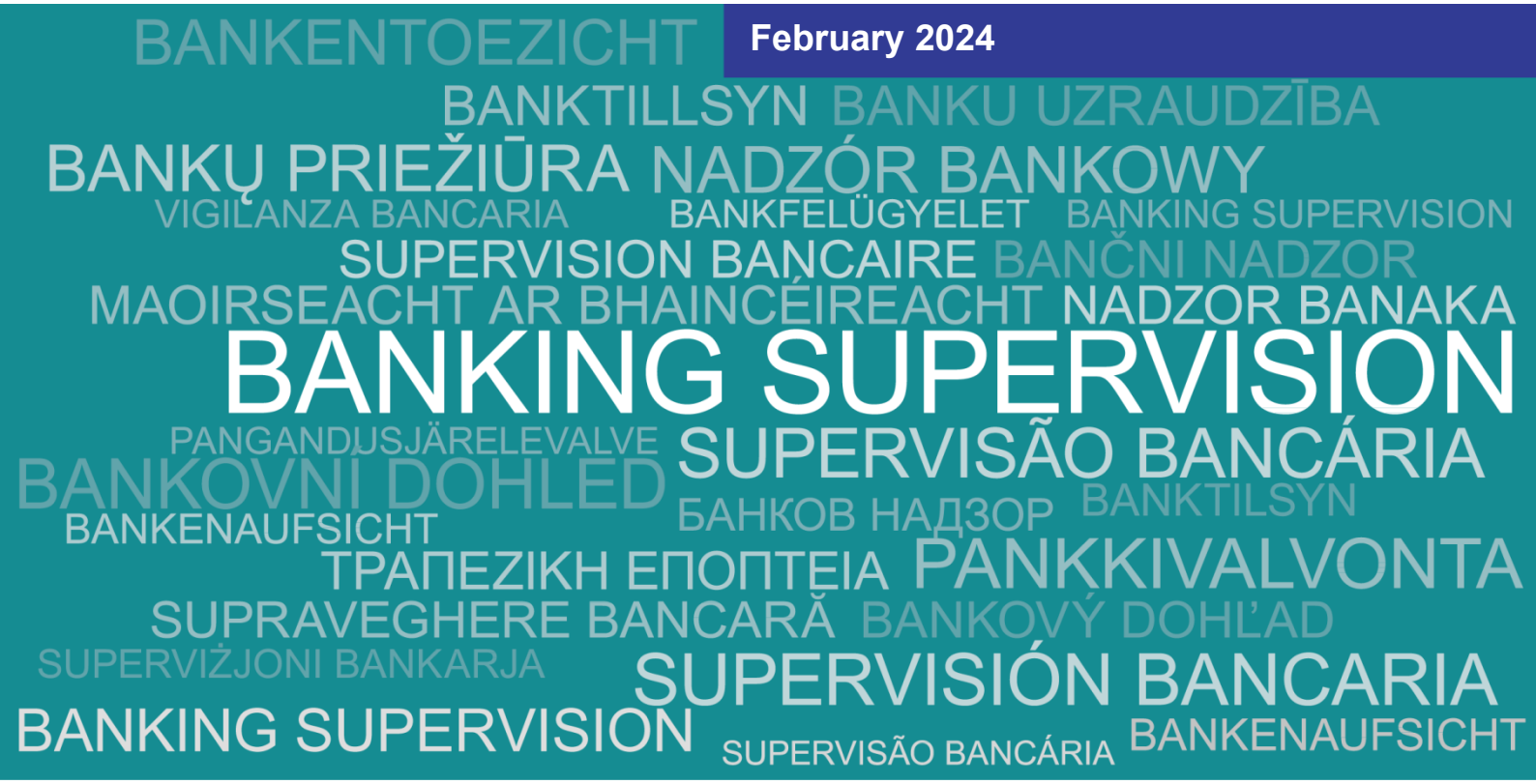

Document releases

Release	Date of issue	Release number	Sections/Chapters modified	Rationale underlying the release
Guide for the Targeted Review of Internal Models (TRIM) – First version	17/02/2017	1.0		-
Public Consultation – ECB guide to internal models – general topics chapter	28/03/2018	2.0a	General topics	Incorporation of institutions' feedback on version 1.0, outcomes of the supervisory review on general topics, and related horizontal analyses
Public Consultation – ECB guide to internal models – risk-type-specific chapters	07/09/2018	2.0b	Credit risk, market risk and counterparty credit risk	Incorporation of institutions' feedback on version 1.0 and experience gained with TRIM investigations; addition of dedicated principles for low-default portfolios
Revised ECB guide to internal models – general topics chapter	15/11/2018	2.1a	General topics	Inclusion of industry's feedback received during the public consultation
Revised ECB guide to internal models – risk-type-specific chapters	08/07/2019	2.1b	Credit risk, market risk and counterparty credit risk	Inclusion of industry's feedback received during the public consultation
Consolidated version	01/10/2019	2.2	Consolidated document	Compilation of the general topics and risk-type-specific chapters in one consolidated document
Public Consultation – Revised ECB guide to internal models	22/06/2023	3.0	Consolidated document	Inclusion of revisions to reflect developments in regulatory requirements and to reflect the experience of the use of the guide
ECB Guide to internal models	19/02/2024	3.1	Consolidated document	Inclusion of industry's feedback received during the public consultation

Contents

Foreword

1. Articles 143, 283 and 363 of Regulation (EU) No 575/2013 (CRR)[1] require the European Central Bank (ECB) to grant permission to use internal models for credit risk, counterparty credit risk and market risk where the requirements set out in the corresponding chapters of the CRR are met by the institution(s) concerned. Based on the current applicable European Union (EU) and national law, the ECB guide to internal models provides transparency on how the ECB understands those rules and how it intends to apply them when assessing whether institutions meet these requirements.

2. The guide is also intended as a document for the internal use of the different supervisory teams, with the aim of ensuring a common and consistent approach to matters related to internal models. When applying the relevant regulatory framework in specific cases, the ECB will take into due consideration the particular circumstances of the institution concerned.

3. This guide should not be construed as going beyond the current existing applicable EU law including, among others, adopted regulatory technical standards (RTS), and national law and therefore is not intended to replace or overrule applicable EU and national law.

   In accordance with the requirements set out in the CRR, the European Banking Authority (EBA) has drafted RTS. These include the Final draft RTS on the specification of the assessment methodology for competent authorities regarding compliance of an institution with the requirement to use internal models for market risk and assessment of significant share.[2] These specify how competent authorities should assess compliance with the regulatory framework defined in the CRR. The Final draft RTS have not yet been adopted by the European Commission, but those Final draft RTS are used in the guide as a basis for interpretative purposes. Some parts of this guide may require revision once the European Commission has adopted the RTS by means of a Delegated Regulation. The ECB will amend or delete those parts of the guide when the RTS enters into force.

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1 Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 (OJ L 176, 27.6.2013, p. 1), referred to in this guide as the “CRR”.

2 Final draft Regulatory Technical Standards on the specification of the assessment methodology for competent authorities regarding compliance of an institution with the requirements to use internal models for market risk and assessment of significant share under points (b) and (c) of Article 363(4) of Regulation (EU) No 575/2013 (EBA/RTS/2016/07), referred to in this guide as the “Final draft RTS on assessment methodology for IMA and significant share”.
Note that there are no RTS on assessment methodology mandated for the assessment of the Internal Model Method (IMM) for calculating counterparty credit risk (CCR) exposures.

In addition, based on drafts prepared by the EBA, the European Commission has adopted Commission Delegated Regulation (EU) No 2021/930[3] and Commission Delegated Regulation (EU) No 2022/439[4]. Some parts of this guide have been revised and amended in line with the adoption of these regulations.

The ECB provides in this guide its understanding of the CRR provisions which apply currently. This includes the amendments to the CRR introduced by Regulation (EU) 2019/876[5], except for those which relate to the alternative internal models approach (Chapter 1b). The amendments relating to the alternative internal models approach have been introduced as a specific reporting requirement for market risk as set out in Article 430b(3) of Regulation (EU) 2019/876. This specific reporting requirement will only come into force in the future (on the adoption of the relevant delegated acts referred to in Article 461a of the CRR).

4. The concept of "best practice" as used in this guide can be described as actions or measures which – in the view of the ECB – ensure compliance with certain prudential requirements in a prudentially sound manner. In this context, it should be noted that (i) there can also be other actions or measures that ensure compliance, and (ii) institutions are not required to apply that practice where compliance is ensured in another way.

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3 Commission Delegated Regulation (EU) 2021/930 of 1 March 2021 supplementing the CRR with regard to regulatory technical standards specifying the nature, severity and duration of an economic downturn referred to in Article 181(1), point (b), and Article 182(1), point (b), of that Regulation (OJ L 204, 10.6.2021, p. 1).

4 Commission Delegated Regulation (EU) 2022/439 of 20 October 2021 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for the specification of the assessment methodology competent authorities are to follow when assessing the compliance of credit institutions and investment firms with the requirements to use the Internal Ratings Based Approach (OJ L 90, 18.3.2022, p. 1).

5 Regulation (EU) 2019/876 of the European Parliament and of the Council of 20 May 2019 amending Regulation (EU) No 575/2013 as regards the leverage ratio, the net stable funding ratio, requirements for own funds and eligible liabilities, counterparty credit risk, market risk, exposures to central counterparties, exposures to collective investment undertakings, large exposures, reporting and disclosure requirements, and Regulation (EU) No 648/2012 (OJ L 150, 7.6.2019, p. 1).

General topics

1 Overarching principles for internal models

1.1 Relevant regulatory references

Table 1

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	3, 9, 10, 12, 13, 14, 16, 17, 30, 31, 32	
Commission Delegated Regulation (EU) No 529/2014[1]	12/03/2014	3	
CRD,[2] **as implemented in the relevant national law**	26/06/2013	1, 3, 76, 85	
CRR	26/06/2013	175, 179, 185, 189, 190, 191, 287, 288, 292, 293, 368	
Other references			
Final draft RTS on assessment methodology for IMA and significant share[3]	22/11/2016	7-34	
EBA Guidelines on SREP[4]	18/03/2022	235	
EBA Guidelines on internal governance[5]	21/03/2018	Section 22	

Currently the RTS on assessment methodology for IMA and significant share only exist in the final draft version. Once adopted, these RTS will become an additional relevant regulatory reference for this guide.

1. The principles listed in this section relate to internal models that are subject to supervisory approval for the calculation of own funds requirements for credit, market and counterparty credit risk (Pillar 1 models), unless stated otherwise.

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1 Commission Delegated Regulation (EU) No 529/2014 of 12 March 2014 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for assessing the materiality of extensions and changes of the Internal Ratings Based Approach and the Advanced Measurement Approach (OJ L 148, 20.5.2014, p. 36), referred to in this guide as "Commission Delegated Regulation (EU) No 529/2014".

2 Directive 2013/36/EU of the European Parliament and the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC (OJ L 176, 27.6.2013, p. 338), referred to in this guide as the "CRD".

3 Final draft Regulatory Technical Standards on the specification of the assessment methodology for competent authorities regarding compliance of an institution with the requirements to use internal models for market risk and assessment of significant share under points (b) and (c) of Article 363(4) of Regulation (EU) No 575/2013 (EBA/RTS/2016/07), referred to in this guide as the "Final draft RTS on assessment methodology for IMA and significant share".

4 EBA Guidelines on common procedures and methodologies for the supervisory review and evaluation process (SREP) and supervisory stress testing under Directive 2013/36/EU (EBA/GL/2022/03), referred to in this guide as the "EBA Guidelines on SREP".

5 EBA Guidelines on internal governance (EBA/GL/2017/11), referred to in this guide as the "EBA Guidelines on internal governance".

1.2 Guidelines at consolidated and subsidiary levels

2. An inconsistent implementation of internal model-related tasks within a banking group bears the risk of an inappropriate coverage of the risks measured by internal models at group level. Therefore, institutions should either develop binding group-wide (i.e. consolidated) principles and guidelines relating to the life cycle[6] of internal models[7], or ensure that each relevant entity has appropriate and independently audited principles and guidelines in place with a high degree of consistency between one another.

3. A consistent and integrated level of application of the group principles and guidelines in the relevant entities is expected. This could be ensured by applying controls that verify that these principles are implemented correctly in all relevant entities. Examples of such controls include periodic monitoring procedures by the parent entity on implementation at local level or a gap analysis between group-wide principles and local application, including local guidelines. These controls can be used to identify those gaps and to mitigate any associated risk. The group-level policies should clearly define under which circumstances deviations from the group-wide principles would be accepted. The parent entity should be informed about such deviations. The effective implementation of the policies should be periodically monitored and assessed.

1.3 Documentation of internal models

4. All internal models should be documented to allow a qualified third party to independently understand the methodology, assumptions, limitations and use of the model and to replicate its development and implementation.

5. The institution should therefore define principles and guidelines for model documentation. These should encompass guidance for the governance of the model documentation itself. The scope of the model documentation should be defined by type of model. In-scope areas should include at least the technical aspects of the model (methodology and assumptions), data (processes), instructions for model users and performance/validation (including the results of implementation testing).

6. The institution should be able to demonstrate how its documentation and the register of its internal models facilitate the internal and external understanding of the models. The institution can choose to have one or more registers for models in use, according to the different risk types (credit, market or counterparty credit risk). The register(s) should contain at least the following information for each model:[8] the model owner(s), range of application,

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6 The model life cycle generally includes the following steps: development (including data preparation), calibration (including data preparation), validation, supervisory approval (if necessary), implementation in internal processes, application and review of estimates.

7 In the case of credit risk, “internal models” should be read hereinafter as “IRB rating systems”.

8 Regarding credit risk, Article 32 of Commission Delegated Regulation (EU) No 2022/439 specifies the contents of a register of rating systems.

materiality, approval date, potential restrictions on the model's use (e.g. conditions), as well as the key model weaknesses, main changes applied and change versioning. The register should also include models purchased from third-party vendors.

7. Adequate controls of the register of the institution's internal models, together with an inventory of the documentation, including an annual review, should be in place. This includes a policy for document management that clearly states the roles and responsibilities involved in approving documents, as well as how changes in documentation are applied and communicated internally. In addition, the institution should have a policy regarding the adequate archiving and maintenance of information, access permissions and the assessment of the completeness and consistency of the information held.

8. Documentation should be kept up to date and the institution should keep documents for an appropriate period of time, taking into account legal or regulatory retention periods.

1.4 Implementation of a model risk management framework

9. Effective model risk management allows institutions to reduce the risk of potential losses and underestimation of own funds requirements as a result of flaws in the development, implementation or use of the models. To mitigate these risks, institutions should have a model risk management framework[9] in place that allows them to identify, understand and manage their model risk for internal models across the group. This framework should comprise, at least, the following:

   (a) A written model risk management policy. This policy should, as a minimum, include a concept or a definition of what constitutes a model, provide the institution's interpretation of model risk[10] and describe the model risk framework with reference to its different components (e.g. model governance, risk control function, validation function, internal audit) and their related documented policies.

   (b) A register of the institution's internal models, as described in paragraph 6. This register should facilitate a holistic understanding of the application and use of the models and provide the institution's management body and senior management with a comprehensive overview of the models in place.

   (c) Guidelines on identifying and mitigating any areas where measurement uncertainty and model deficiencies are known to exist, according to their

[9] Institutions are expected to implement an effective model risk management framework for all models in use. However, Section 1 focuses only on internal models approved for use for the calculation of own funds requirements for credit, market and counterparty credit risk and the respective requirements for a model risk management framework for these models.

[10] "Model risk" as defined in Article 3(1) sub-paragraph (11) of the CRD.

materiality. In particular, those elements that relate to qualitative aspects of model risk (such as data deficiencies, model misuse or implementation errors) should be considered. This methodology should be applied consistently across the group (e.g. in subsidiaries or regions).

(d) Guidelines and methodologies for the qualitative and/or quantitative assessment and measurement[11] of the institution's model risk.

(e) Guidelines with respect to the model life cycle as set out in paragraph 2.

(f) Procedures for model risk communication and reporting (internal and external).

(g) Definition of roles and responsibilities within the model risk management framework (e.g. define which unit(s) is/are in charge of or involved in independent reviews of risk estimates).

1.5 Identification of management body and senior management

10. Institutions should clearly define the roles and responsibilities of their management body and senior management as defined in Article 3(1) sub-paragraphs (7) and (9) of the CRD, as implemented in the relevant national law with regard to internal models and in relation to each risk type. The institution's internal documentation should also clearly describe the composition of the management body and the senior management.

11. The term "management body" could refer to the single board, in a one-tier system, or to the function of the management and supervisory boards in a two-tier corporate governance system. The institution should document the roles and responsibilities of each individual in the management body. For the purposes of this guide, the management body refers to the members of the management body in its management function (executive members).

12. The institution should assess the appropriateness of designated committees of the management body (if applicable) in order to ensure that they provide an adequate support function for effective decision-making procedures. This holds, in particular, for decisions concerning material aspects of the institution's internal models. The institution should clearly document the composition, mandate and reporting lines of committees responsible for internal model governance and oversight, as well as the decisions taken. These committees should be given a mandate by the management body; the mandate should clearly define their tasks and authority. In order for the designated committee to

[11] Article 85(1) of the CRD refers to model risk in operational risk. However, and specifically with regard to Pillar 1 models, the EBA Guidelines on SREP state that competent authorities should consider model risk as part of the assessment of specific risks to capital (e.g. IRB model deficiency is considered as part of the credit risk assessment) and for the capital adequacy assessment. In particular for IRB models, the expected range of estimation errors should be reflected in the margin of conservatism of the model, in accordance with Article 179(1)(f) of the CRR. The guidance for the calculation of the margin of conservatism for IRB models is defined in the credit risk chapter.

be set at an appropriate level, it should be chaired by a member of the management body.

13. The institution should also be able to identify which individuals constitute its senior management with respect to the credit, market and counterparty credit risk Pillar I model frameworks. In addition to the specifications of Article 3(1) sub-paragraphs (7) and (9) of the CRD, senior management can be deemed to constitute the highest hierarchical level(s) below the management body with a clearly defined responsibility for internal models.[12] The senior management should either report directly to the management body or be responsible for providing it with the necessary information to carry out its duties, especially with regard to its oversight role. The senior management's decision-making procedures relating to all aspects of internal models should be clearly documented.

1.6 General principles for internal validation

14. All internal models and internal estimates should be subject to an initial, and subsequently to an annual, internal validation. For the avoidance of doubt, the term "initial validation" in the guide refers to the validation of new models as well as the validation of material changes and extensions to approved models.

15. To ensure the effective independence of the internal validation function from the model development process (i.e. model design, development, implementation and monitoring), institutions should have appropriate organisational arrangements in place. The ECB understands that the possible organisational arrangements are as follows:[13]

    (a) separation into two different units reporting to different members of the senior management;

    (b) separation into two different units reporting to the same member of the senior management;

    (c) separate staff within the same unit.

    The decision on which organisational arrangement to adopt should take into account the nature, size and scale of the institution and the complexity of the risks inherent in its business model.

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12 This includes clarity on the role, authority and responsibilities of the various positions within senior management.

13 The principles set out in paragraphs 15 to 18 do not apply to the organisational structures for the management of counterparty credit risk due to the specific requirements of Article 287(1) and (2) and Article 293(1)(c) of the CRR. Further guidance is given in Section 9 of the counterparty credit risk chapter. Under Article 287(2) of the CRR, the risk control unit must be responsible for, among other things, the design and implementation of the institution's counterparty credit risk management system. Under Article 287(2)(d), this unit must also be independent from units responsible for originating, renewing or trading exposures and free from undue influence.

16. Consequently, the ECB understands that large and complex institutions should implement the most robust independence option.

17. With option (b) of paragraph 15, two different units report directly[14] to the same member of senior management, but act separately at any level below that. When using this second option, the institution should fulfil the additional requirements specified in Article 10(3) of Commission Delegated Regulation (EU) No 2022/439. The ECB considers it best practice if the institution fulfils Article 22(1)(e) of the Final draft RTS on assessment methodology for IMA and significant share. The internal audit should regularly assess whether these additional requirements are being met.

18. The ECB considers that option (c) of paragraph 15 could be suitable for small legal entities which are not classified as global systemically important institutions (G-SIIs) or other systemically important institutions (O-SIIs).[15] When using this option, the institution should fulfil the additional requirements specified in Article 10(4) of Commission Delegated Regulation (EU) No 2022/439. The ECB considers it best practice if the institution fulfils Article 22(2) of the Final draft RTS on assessment methodology for IMA and significant share, and in particular that the internal audit regularly assesses that these additional requirements are met.

19. A proper separation of the staff of the development function from the staff of the validation function enables institutions to limit the risk of conflicts of interest resulting in an ineffective challenge from the validation. To mitigate this risk, the institution should ensure that the staff of the validation function is separate from the staff involved in the model development process.[16]

20. The validation function[17] should be adequately staffed following the proportionality principle. It should have suitable resources and experienced,[18] qualified personnel (who have appropriate quantitative and qualitative knowledge) to enable it to conduct an effective independent challenge of the internal models and internal estimates and their performance.

1.7 General principles for internal audit

21. The CRR requires internal models to be subject to regular review by the internal audit or another comparable independent auditing unit (hereinafter internal audit).[19] In the understanding of the ECB, also taking into account the EBA

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14 Crossing the units' reporting lines on a lower level would impede fulfilling the requirement.

15 SIs not considered as O-SIIs are those not included in the list available on the EBA banking website.

16 In particular regarding option (c) of paragraph 15, this means different sub-teams with different tasks.

17 Regardless of whether the related validation tasks are allocated internally or delegated to a third party.

18 The use of external resources has to comply with the institution's internal validation guidelines. See also Section 8.3.1 of this chapter.

19 See also Articles 191, 288 and 368(h) of the CRR.

Guidelines on internal governance[20], this regular review needs to be efficient and effective to meet that objective.

22. To enable an objective assessment, the internal audit should be granted an adequate level of independence from the processes and units reviewed to ensure that:

    (a) there is an effective separation of the internal audit from the staff involved in the operations of the internal models, e.g. the validation function, the risk control unit and all other relevant business areas;

    (b) it reports directly to the management body[21];

    (c) no undue influence is exerted on the staff responsible for the audit conclusions.

23. To enable a sufficient number and adequate scope of internal model reviews the internal audit should:

    (a) have adequate resources[22] and experienced, qualified personnel (with the appropriate quantitative and qualitative knowledge) to undertake all relevant activities;

    (b) be adequately equipped and managed in proportion to the nature, size and degree of complexity of the institution's business and organisational structure.

24. In the follow-up process to the internal audit conclusions and findings and to ensure that the internal audit reviews have a timely and effective impact, the following are considered to be best practice:

    (a) Conclusions, findings and recommendations should be reported to the audit committee[23] and/or the appropriate[24] management level of the audited areas.

    (b) Where weaknesses are identified, action plans and related measures should be approved by the audit committee and/or the appropriate[25] management level of the audited areas. The internal audit function should monitor whether the audited areas implement the corrective measures in a timely manner. The institution should use appropriate information technology (IT) tools in order to ensure the effectiveness of the monitoring procedures.

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20 See Section 22 "Internal audit function" of the EBA Guidelines on internal governance.

21 Definition provided in paragraph 11.

22 The use of external resources should comply with the institution's internal audit guidelines. See also Section 8.3.1 of this chapter.

23 As defined in Article 76(3), sub-paragraph 4, of the CRD.

24 The appropriate level of management (the management body or senior management) depends on the corporate governance model and the severity of the results.

25 The appropriate level of management (the management body or senior management) depends on the corporate governance model and the severity of the results.

(c) Regular (at least annual) status reports should be prepared and the results discussed in the appropriate committees to ensure the timely and proper implementation of follow-up actions. Institutions should submit a summary of the outcomes of the relevant audit reports, action plans and the status of findings to the competent authority.

1.8 General principles on climate-related and environmental risks

25. Institutions should assess the materiality of all risks in the life cycle of their internal models as set out in paragraph 2 of this chapter, including climate-related and environmental risks.[26] Where climate-related and environmental risks drivers are found to be relevant and material, institutions should include such risk drivers in their internal models approved for use for the calculation of own funds requirements for credit and market risk.

1.9 General principles for the implementation of a changed or extended model

26. Under Article 3(5) of Commission Delegated Regulation (EU) No 529/2014, institutions must calculate the own funds requirements based on the approved material change or extension from the date specified in the new permission (the "implementation date") which must replace the prior one. In general, it is expected that institutions will be capable of implementing the material change or extension in a timely manner upon receiving permission and in any case without undue delay. Therefore, when setting the implementation date, the ECB considers that the implementation should happen within a reasonable time frame starting from the date of the notification of the permission.[27] [28] The ECB generally expects this time frame to be no longer than three months from the date of the notification. Exceptions to this expectation should be requested by the institution in question as early as possible (for example, when filing the application but not later than when submitting comments as part of the model decision process), which should provide reasons for the request, and can only be granted under specific circumstances (for instance in the case of an implementation requiring a staggered approach, such as the implementation across different jurisdictions, or in the case of joint implementation or of technical constraints inherent to the IT framework).[29] [30] Note that the above

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[26] This principle is defined in the context of the Guide on climate-related and environmental risks.

[27] If the ECB decision on the material change or extension includes a condition suspending the effect of (parts of) the decision, the date of the notification (for the part of the decision subject to the condition) should generally be understood to be the date when the ECB further notifies the institution about the removal of the condition.

[28] Unless specified differently in the ECB decision, ancillary provisions such as limitations are applicable as of the implementation date, while obligation deadlines are counted from the date of the notification.

[29] Article 3(6) of Commission Delegated Regulation (EU) No 529/2014 also applies in this context.

[30] Institutions with internal models approved for the calculation of own funds requirements for credit risk should still fulfil the principles on the re-rating process set out in Section 7.6 of this chapter. In particular, the re-rating process for the purpose of calculating own funds requirements is expected to start at the implementation date.

guidance on the implementation date is given without prejudice to the expectations set out in Section 2.2.2 of the credit risk chapter of this guide. In addition, where there is a request to reverse the use of less sophisticated approaches in accordance with Article 149 of the CRR, the ECB equally expects that institutions will be capable of implementing the approach requested according to the same criteria defined above for material model changes and extensions.

2 Roll-out and permanent partial use

2.1 Relevant regulatory references

Table 2

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	1, 6, 7, 8	
CRR	26/06/2013	148, 149, 150, 189	
Commission Delegated Regulation (EU) No 529/2014	12/03/2014		
SSM Regulation[31]	15/10/2013	10	
Other references			
ECB's Guide on the supervisory approach to consolidation in the banking sector	12/01/2021		

2.2 Application of the IRB approach

27. In accordance with Article 148 of the CRR, institutions must implement the internal ratings-based (IRB) approach for all exposures, unless they have received the permission of the competent authority to permanently use the standardised approach (SA) on some exposure classes or some types of exposures.

28. The criteria used to define the scope of application and sequential implementation of the IRB approach should be clearly documented and agreed with the competent authority. The ECB understands that these criteria include the following:

    (a) Quantitative aspects: as a minimum, the materiality and risk profile of the exposures and internal thresholds/ratios (for both exposure at default (EAD) value and risk-weighted exposure amounts (RWEAs)) for the initial and targeted IRB coverage. For institutions for which the ECB is the

[31] Council Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions (OJ L 287, 29.10.2013, p. 63), referred to in this guide as the "SSM Regulation".

competent authority of the consolidated entity, the initial IRB coverage ratio (rating systems included in the initial IRB application) is expected to be above 50% (in terms of both EAD and RWEAs[32]) at consolidated level. This takes into account that institutions must implement the IRB approach for all exposures included in the roll-out plan in a reasonable time period.[33]

(b) Qualitative aspects: importance of the exposure classes or types of exposures for the institution's business model, data availability, operational capacity, staffing, length of experience and homogeneity of treatment of similar exposures.

29. Institutions which have already received permission to use the IRB approach are also expected to reach a 50% minimum IRB coverage ratio (in terms of both EAD and RWEAs) in the implementation of the approved roll-out plan.

30. The IRB approach can be implemented sequentially across the different exposure classes or types of exposures, across different business units or for the use of own estimates of losses given default (LGDs) and conversion factors (CCFs) (roll-out). The ECB considers that the time frame for the initially approved roll-out plan should generally not exceed five years.[34]

31. In the light of the ECB's need to know the regulatory treatment of all exposures for its ongoing supervision, institutions are expected to provide the competent authority with full transparency and regular communications regarding this treatment.[35] These communications should include information on all subsidiaries and all portfolios (together with clear exposure assignment criteria). Institutions should receive explicit permission from the competent authority to use the SA for exposure classes or types of exposures that are not in the scope of the IRB approach, following the requirements established under Article 150 of the CRR.

32. Decisions of the institutions on the application and sequential implementation of the IRB approach should be triggered by internal criteria (as defined in paragraph 28) with the main purpose of enhancing risk management and risk sensitivity. In particular, sequential implementation should not be selectively used for the purpose of achieving reduced own funds requirements.[36]

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[32] The EAD and RWEAs should be calculated by the institution in accordance with the regulatory approach envisaged for the calculation of own funds requirements in the initial approval request.

[33] For the computation of the IRB ratio, institutions should exclude the following exposures

- equity exposures as referred to in Articles 133(1) and 147(6) of the CRR;
- exposures covered under Article 150(1) paragraphs (d), (e), (f), (i) and (j) of the CRR;
- exposures classified as "other non-credit obligation assets" and "items representing securitisation positions" under Article 147(2) paragraphs (f) and (g) of the CRR;
- exposures classified as "other items" under Article 112(q) of the CRR.

The rationale for these exclusions is to limit the scope to exposures for which the CRR envisages the implementation of a rating system.

[34] See Article 148(2) of the CRR.

[35] Under Article 10 of the SSM Regulation, the ECB can request all relevant information.

[36] See Article 148(3) of the CRR.

33. If, as the result of a merger or other type of transaction, an entity becomes a parent entity or an entity that intends to apply the IRB, the IRB coverage ratio of the post-merger legal entity should meet the expectations set out in paragraph 28(a) of this chapter.

2.3 Governance of the roll-out plan for the IRB approach

34. "All material aspects of the rating and estimation processes shall be approved by the institution's management body or a designated committee thereof and senior management."[37] As the roll-out plan determines the intended application of the IRB approach and its sequential implementation, it too should be approved by the institution's senior management and management body (or a designated committee thereof).

35. As a corollary and in accordance with Article 189(2)(a) of the CRR, the ECB understands that the reporting by senior management on the status and progress of the sequential implementation of the IRB approach should be a regular agenda item for the management body or designated committee. The ECB would consider the following to be best practice: that the status of the roll-out plan is reported frequently (at least annually) and that such reports include the exact scope of application (exposure class), the planned dates of approval and/or use, and the "initial, current and planned"[38] exposure amounts and RWEAs.

36. To ensure compliance with Article 189(1) of the CRR with respect to the roll-out plan, institutions should have a framework or policy for the governance of their roll-out plan that includes, as mentioned above, the following:

    (a) indication of which internal bodies, including the management body or other committees and persons, are responsible for approving the roll-out plan and any changes to it;

    (b) the frequency of reporting on the implementation of the roll-out plan to the management body (or designated committee) and to the competent authority;

    (c) the criteria used for introducing changes to the roll-out plan (see also Section 2.4, below);

    (d) controls to assess compliance with the roll-out plan, for example second line of defence attestation or internal audit review (see also paragraph 92).

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37 See Article 189(1) of the CRR.

38 Where "initial" refers to the initial application, "current" to the moment the roll-out plan is updated and "planned" to the target level.

2.4 Changes to the roll-out plan for the IRB approach

37. Under Article 148(2) of the CRR, institutions are required to follow the roll-out plan approved by the competent authorities. In the event that a change in the approved roll-out plan is necessary, this change needs to be subject to a supervisory decision.

38. Article 7(3) of Commission Delegated Regulation (EU) No 2022/439[39] sets out the conditions under which competent authorities may approve any changes to the sequence and time period of the plan. The ECB intends to assess any application for a change to a roll-out plan against these conditions, on the basis of the documentation provided by the institution regarding the rationale for the change, the materiality of the portfolios affected, and governance arrangements for the change (e.g. which body will approve it). In addition, when assessing an application for a change to the roll-out plan, the competent authority will determine, if necessary, whether the proposed amendment to the time frame for the implementation of the roll-out plan is acceptable. If institutions have already completed the implementation of their roll-out plan but would like to extend the use of the IRB approach (for instance following a merger or acquisition), they should also seek approval[40] from the competent authority.

39. Furthermore, institutions should pay attention to the following:

    (a) Resource constraints and re-prioritisation may affect their operational capability to develop and maintain rating systems. Institutions should seek to minimise disruptions to the implementation of the roll-out plan as a result of such factors, taking appropriate mitigation or contingency actions to demonstrate compliance with the CRR requirements.

    (b) General uncertainty caused by potential changes to the IRB regulatory requirements should not be considered a valid reason for changing the roll-out plan (or for delaying its implementation). If such regulatory changes take place and become binding, the institution can then reflect the impact on its plan by submitting a revised roll-out plan for approval.

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[39] "When assessing the institution's compliance with the plan for sequential implementation of the IRB Approach, which has been subject to permission of the competent authorities in accordance with Article 148 of Regulation (EU) No 575/2013, competent authorities may consider changes to the sequence and time period appropriate only if one or more of the following conditions are met:

a) there are significant changes in the business environment and in particular changes in strategy, mergers and acquisitions;

b) there are significant changes in the relevant regulatory requirements;

c) material weaknesses in rating systems have been identified by the competent authority, or by the internal audit or the validation function;

d) the elements referred to in paragraph 2 have changed significantly, or any of the elements referred to in paragraph 2 were not taken into account adequately in the plan for sequential implementation of the IRB Approach which was approved."

[40] In line with the requirements of Commission Delegated Regulation (EU) No 529/2014 for model changes and extensions in the scope of that regulation.

2.5 Monitoring of compliance with permanent partial use provisions

40. Since permanent partial use (PPU) requires compliance with certain conditions, institutions need to ensure on an ongoing basis that exposures under PPU fall within the categories listed in Article 150(1) of the CRR.[41] To avoid a risk of non-compliance with these requirements, the ECB is of the view that institutions should implement the following:

    (a) Measures and triggers for a re-assessment of the suitability for PPU of PPU-authorised exposure classes, types of exposures or business units. Examples of measures that could be used include the number of obligors, EAD, proportion of group EAD, and average risk weight.

    (b) A reporting process monitoring the materiality (in terms of both EAD and RWEAs) of the exposure classes, types of exposures or business units in PPU over time. The PPU reporting should identify any changes in PPU exposures and RWEAs over time as well as the exposure classes, types of exposures or business units that are at risk of no longer fulfilling the PPU conditions.

    (c) Processes and guidelines to assess whether further exposure classes, types of exposures or business units – currently treated under the IRB approach – may become eligible for PPU (e.g. business in run-off or planned to be discontinued, excessive maintenance costs induced by the regulatory requirements vis-à-vis number of obligors).

41. Where a new type of exposure is created, the institution should verify if the new type of exposure (1) falls under the scope of an approved rating system, (2) falls under the scope of an approved permanent partial use of SA, and (3) requires any notification or request to the competent authority in line with Commission Delegated Regulation (EU) No 529/2014.[42] Similarly, where a new business unit is created (e.g. consolidation of a new legal entity), institutions should verify the suitability for PPU according to the criteria established in their relevant internal policy, and take action accordingly.

2.6 Reversion to a less sophisticated approach

42. Institutions that use the IRB approach for a particular exposure class or type of exposure may be permitted to stop using that approach and use the SA for the calculation of RWEAs instead if the conditions described in Article 149(1) and (3) of the CRR are met.[43] Similarly, institutions which have obtained permission to use own estimates of LGDs and conversion factors under Article 151(9) of

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41 See also Article 8(3) of Commission Delegated Regulation (EU) No 2022/439.

42 Where new exposure types are created by splitting existing exposure types, the ECB expects institutions to provide convincing evidence that the newly created exposure types fulfil the definition set out in Article 142(1)(2) of the CRR.

43 In such cases, the conditions for PPU set out in Article 150 of the CRR, as well as the conditions set out in Article 148 of the CRR, must also be fulfilled.

the CRR may be permitted to revert to the use of LGD values and conversion factors referred to in Article 151(8) (the foundation-IRB (F-IRB) approach) if the conditions described in Article 149(2) and (3) of the CRR are met.

43. In order to fulfil the requirements of Article 149 of the CRR, institutions should, among other things[44], document the rationale for reverting to a less sophisticated approach (the SA or the F-IRB approach). This means that an institution should document any reasons or impediments that arose after the original authorisation and led the institution to reconsider the use of an advanced approach. Depending on the features of the exposure class and/or type of exposure affected, institutions should in particular define and formalise objective and intuitive criteria for deciding which of the different approaches should be used for the calculation of own funds requirements across the whole portfolio. In doing so, they should take the following into account as part of a group-wide internal models strategy:

    (a) the required operational capability and cost for the institution to maintain a rating system for the respective exposure class and/or type of exposure in relation to the size of the institution and the strategic/non-strategic nature and scale of its activities;

    (b) the availability of minimum representative data for redeveloping a model or for developing another admissible approach (for example, in the case of reversion to the SA, institutions should first consider whether other admissible IRB approaches, such as the F-IRB or, where relevant, the approach under Article 153(5) of the CRR known as the supervisory slotting criteria approach (SSCA) could be developed without disproportionate effort);

    (c) where Article 149(1) of the CRR applies, the possibility of using another available IRB approach (such as the simple risk weight method for equity exposures);

    (d) the impact[45] of the reversion on own funds requirements by comparing:

        (i) the capital requirements produced by the approach currently used, including the effects of potential supervisory measures (such as limitations);

        (ii) the capital requirements produced by the use of the less sophisticated approach requested (the SA or the F-IRB approach).

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[44] Other relevant conditions for reverting to the use of a less sophisticated approach are (i) that the institution has demonstrated to the satisfaction of the competent authority that the use of a less sophisticated approach would not have a material adverse impact on the solvency of the institution or its ability to manage risk effectively, and (ii) that the institution has received the prior permission of the competent authority.

[45] Including effects stemming from both risk-weighted assets and, where relevant, expected loss components.

Where the reversion leads to a non-negligible reduction of capital requirements, institutions should provide convincing evidence that there is no intention to reduce own funds requirements.

44. Institutions should consistently apply across exposure classes and/or exposure types with similar features in terms of modelling (in particular with regard to points (a) and (b) of paragraph 43 above) the criteria defined to assess whether the requirements set out in Article 149(1) and (2) of the CRR have been met. Where a request is made to revert to a different approach (the SA or the F-IRB approach) for similar exposures of this kind, institutions are also expected to provide convincing evidence that the request is not being made in order to reduce own funds requirements. For instance, providing information on the own funds requirements (or a proxy of these requirements) produced by using another admissible approach for the related exposures may help to inform the assessment as to whether the request is being made in order to reduce own funds requirements.

45. Where institutions envisage several applications linked to a new internal model strategy, the ECB expects that submitting a single comprehensive and consistent request for all the rating systems in line with the strategy will usually ensure a more efficient assessment and approval process.

46. More specifically, in the case of requests to revert to the SA for specialised lending exposures:

    (a) regarding the "necessity" condition referred to in Article 149(1)(a) of the CRR, namely that the reversion is necessary on the basis of nature and complexity of the institution's total exposures of this type, the institution should demonstrate that the use of the SSCA is not feasible or proportionate given, for example, the immateriality of the affected exposures, and that it can no longer build a rating system that would provide a meaningful differentiation of risk;

    (b) regarding the condition referred to in Article 149(1)(a) of the CRR that the use of the SA is not proposed in order to reduce the institution's own funds requirements, the impact on own funds requirements of using the SA should also be compared with the own funds requirements produced by using the SSCA (or a proxy of it), unless the institution has already provided sufficient convincing evidence that the use of this approach is not feasible.

2.7 Internal models in the context of consolidations

47. The principles listed in this section are applicable to Pillar 1 internal models for credit, market and counterparty credit risk.

48. The general treatment of internal models in the case of consolidations, i.e. mergers and acquisitions, is set out in Section 3.4 of the ECB's Guide on the

supervisory approach to consolidation in the banking sector. Paragraph 36 of that document acknowledges that compliance issues regarding the continued use of internal models may arise in the event of a business combination. Paragraph 37 of the same document envisages the use of existing internal models in such cases "subject to a clear model mapping and a credible internal models roll-out plan to address the specific internal model issues created through the merger, as well as other conditions where appropriate".

49. In order to implement this guidance, a separate ECB decision is needed for each individual case, including details of compliance issues arising at the transaction date, the actions the institution will take to return to compliance[46], and necessary transitional arrangements related to the RWEA calculation while the return to compliance plan (see next paragraph) is implemented.

50. Institutions are expected to submit a "return to compliance plan" explaining how they will return to compliance with regard to model-related compliance issues. The return to compliance plan should clarify the strategy that the bank will follow to restore compliance and should include details of the following in particular:

    - the internal models landscape of the banks participating in the merger, the use of internal model approaches or of the SA, and the scope of the models;
    - the target internal model landscape of the post-merger legal entity;
    - the concrete actions, with their associated timelines, that the bank plans to take to achieve the target internal model landscape, in particular model extensions, requests for initial model approvals and PPU requests;
    - how the post-consolidation legal entity intends to calculate RWEAs until the return to full compliance, taking into account the capability of the acquiring bank to use the models of the target, in particular before and after any potential IT integration.

[46] In the context of IRB models, see Article 146 of the CRR.

3 Internal governance

3.1 Relevant regulatory references

Table 3

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	2, 14, 15, 16, 32	
CRR	26/06/2013	175, 179, 187, 189, 190	
Other references			
Basel Committee on Banking Supervision (BCBS) 328[47]	08/07/2015		Principles 1, 2, 3, 4, 5, 6

51. The principles on internal governance have been organised along the following lines:

    (a) the materiality of rating systems (Section 3.2);

    (b) the management body and senior management:

        (i) decision-making responsibilities (Section 3.3);

        (ii) management reporting (Section 3.4);

        (iii) understanding of the rating systems (Section 3.5);

    (c) responsibilities of the credit risk control unit (CRCU) (Section 3.6).

3.2 Materiality of rating systems

52. Whether a rating system is material depends on quantitative criteria (such as the share of total EAD and RWEA covered by the material rating systems) and qualitative criteria (such as the type, riskiness and strategic importance of the exposures, the complexity of the rating systems and risk parameters, and the model risk – in alignment with the model risk management framework). The more material a rating system is, the higher are the risks resulting from any potential shortcomings in it. Consequently, materiality should be an essential consideration in model risk management and the rating systems classified as material by the institution should be subject to particular scrutiny.

53. In line with the above, institutions should assess and determine the materiality of their rating systems and communicate it to the competent authority. Material rating systems should at least include the rating systems covering material types of exposure. As the classification of the rating systems according to their

[47] Basel Committee on Banking Supervision "Guidelines: Corporate governance principles for banks", referred to in this guide as "Basel Committee on Banking Supervision (BCBS) 328".

materiality may be subject to changes resulting from internal or external factors (e.g. changes in economic factors, changes in business strategy), institutions should review their classification on a regular basis.

54. Although the same requirements apply to all rating systems throughout the model life cycle, additional requirements may apply to material rating systems, in particular with regard to management reporting (see Section 3.4 of this chapter) and internal validation (see Section 4.3 of this chapter). This concept, that additional requirements may apply for material rating systems, is supported by the higher potential risk resulting from material rating systems and by Article 189 of the CRR, which also embeds the concept of materiality.[48]

3.3 Decision-making responsibilities

55. In accordance with Article 189(1) of the CRR, material aspects of all rating and estimation processes must be approved by the institution's management body or a committee designated by it, as well as by senior management.[49] The ECB considers that Article 14(b) of Commission Delegated Regulation (EU) No 2022/439 provides a good understanding of the aspects that should at least be considered as material, and should therefore be approved at both levels.

56. The ECB understands that the approval process envisaged by Article 189(1) of the CRR should include the documentation of the approvals, so that they can be made available for review at the request of the institution's internal audit or the competent authority.

57. The institution should define which policies should be approved at both levels (management body and senior management) and this should be clarified in their respective mandates. At a minimum, the following should be considered as requiring approval at both levels: (i) risk management policies that could have a material impact on the institution's rating systems and risk estimates, and (ii) policies covering the risk of a third-party provider for model-related tasks ceasing to operate (in relation to IT infrastructure and contingency planning).[50]

58. Senior management must provide notice to the management body or a designated committee thereof of material changes or exceptions from established policies.[51] Consequently, institutions should be able to demonstrate which material changes or exceptions from established policies are communicated to the management body or a committee designated by it, and how this is done. To ensure compliance with this provision each institution should, in the ECB's view, have a policy in place which defines material

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48 See Article 189(1) and (3) of the CRR.

49 If the decision-making process takes place in the same forum where management body and senior management members meet, institutions should ensure that the information is approved beforehand by senior management and that senior management is responsible for presenting it to the forum.

50 This view of the ECB coincides with Article 14(b) of Commission Delegated Regulation (EU) No 2022/439.

51 See Article 189(2)(a) of the CRR.

changes or exceptions. They may use quantitative and/or qualitative criteria to do so. The use of expert judgement within the classification process should be clearly explained and documented.

3.4 Management reporting

59. To ensure consistent oversight of the functioning of the rating systems, the CRR requires management reporting on their performance.[52]

60. To comply with this reporting requirement, institutions should determine the level of detail of the information and data to be presented to senior management and the management body (or designated committee thereof), and the frequency of the reporting. In view of proportionality, the level of detail of the information and data and the frequency of reporting may differ depending on the recipient and the materiality of the rating systems concerned (see Section 3.2 of this chapter on the materiality of rating systems). Reports regarding non-material rating systems may be provided in a more aggregated form. The procedures encompassing reporting for non-material rating systems should be clearly defined in the institution's policies and differences with respect to the reporting of material rating systems should be clearly identified.

61. The ECB considers that Article 15 of Commission Delegated Regulation (EU) No 2022/439 provides a good understanding of the elements to be included as part of the institution's management reporting.[53] In particular, these reports should include information regarding the materiality of each rating system, its perceived strengths and limitations, and its current status in the light of validation and/or audit actions.

62. As regards the level of detail of content, reports to the management body are expected to be more concise than reports to senior management. They should, however, include the necessary information for sound and appropriate decision-

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52 See Article 189(2), sub-paragraph 2, and Article 189(3) of the CRR.

53 "When assessing the adequacy of the management reporting as referred to in Article 189 of Regulation (EU) No 575/2013, competent authorities shall verify that:

(a) the management reporting includes information about all of the following:
  (i) the risk profile of the obligors or exposures, by grade;
  (ii) the migration across grades;
  (iii) an estimation of the relevant risk parameters per grade;
  (iv) a comparison of realised default rates, and, where own estimates are used, of realised LGDs and realised conversion factors against expectations;
  (v) stress test assumptions and results;
  (vi) the performance of the rating process, areas needing improvement and the status of efforts to improve previously identified deficiencies of the rating systems;
  (vii) validation reports;

(b) the form and the frequency of management reporting are adequate having regard to the significance and the type of the information and to the level the recipient occupies in the hierarchy, taking into account the institution's organisational structure;

(c) the management reporting facilitates the senior management's monitoring of the credit risk in the overall portfolio of exposures covered by the IRB Approach;

(d) the management reporting is proportionate to the nature, size, and degree of complexity of the institution's business and organisational structure."

making. As regards frequency, institutions should provide reports to senior management as often as, or more frequently than, to the management body (or designated committee). Risk profiles and the comparison of estimated probability of default (PD) with realised default rates should be reported to senior management more frequently than annually (at least for material rating systems – see also paragraph 54) to enable senior management to ensure, on an ongoing basis, that the rating systems are operating properly in accordance with Article 189(2)(c) of the CRR and to avoid risks that could justify supervisory measures.

63. At least annually, both senior management and the management body should receive an aggregated overview of the validation results for each rating system (see also paragraph 82).

3.5 Understanding of the rating systems

64. The management body must possess a general understanding of the rating systems and senior management must have a good understanding of the rating systems designs and operations.[54] Institutions should therefore be able to provide evidence of the processes they use to improve and maintain the management body and senior management's understanding of the rating systems, including those implemented after receiving permission to use the IRB approach.

65. The format and content of these processes (for example workshops, seminars or dedicated training on IRB models) should match the roles and responsibilities of the management body and senior management, in particular those related to the model approval process. Especially for the management body, an adequate balance between collective and individual knowledge should be ensured. In the case of third-party involvement (see Section 8 of this chapter), the institution should maintain adequate internal knowledge of the outsourced tasks.

66. While reporting or monitoring can be considered as part of the management body and senior management's knowledge-building process, it is expected that these will not be the only means of ensuring that they have an adequate understanding of the rating systems.

67. One outcome of an effective internal understanding of the rating system is that the management body or the designated committee should be able to hold an objective debate on, and challenge, the rating systems. This applies in particular to the approval of material changes or the escalation process contemplated in paragraph 84. In the ECB's view, it is best practice if the evidence of such debates is visible in the minutes of management body or designated committee meetings in which such a challenge is raised, as the

[54] See Article 189(1) and (2)(b) of the CRR.

management body or the designated committee should be able to discuss the outcomes, use, strengths and limitations of the IRB models.

3.6 The credit risk control unit (CRCU)

68. To ensure that the CRCU is independent from the personnel and management functions responsible for originating and renewing exposures,[55] institutions should clearly determine which individuals and/or teams make up the credit risk control function and which personnel and/or units are responsible for originating and renewing exposures,[56] and why they are independent from one another. In addition, institutions need to ensure a direct line of reporting of the CRCU to senior management in accordance with Article 190(1) of the CRR.

69. Institutions should have a clear written mandate for their CRCU which clarifies its roles and responsibilities in order to ensure that they are aligned to the responsibilities mentioned in Article 190(2) of the CRR. Institutions should also determine which units are responsible for performing which subset of the tasks allocated to the CRCU(s),[57] especially those tasks related to model design and development and the ongoing monitoring of the rating systems.

70. The CRCU is responsible for ensuring the satisfactory performance of the rating systems and their ongoing maintenance. The CRCU may provide the validation function, when required and in line with paragraph 78, with the necessary input for the validation of internal estimates. In addition, the CRCU should address any deficiencies identified by the validation function and conduct the approved remediation activities as described in paragraph 83.

3.7 Review of estimates

71. In accordance with Article 179(1)(c) of the CRR, risk estimates should be reviewed[58] when new information comes to light but at least on an annual basis. The ECB considers it best practice to do this on the basis of:

    (a) the ongoing monitoring performed by the CRCU;

    (b) the annual validation of internal estimates performed by the validation function (as described in Section 4 of this chapter).

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55 See Article 190(1) of the CRR.

56 This refers in particular to those persons with authority or direct responsibility for decisions to originate or renew facility or obligor-level credit lines (for example by underwriting).

57 See Article 190(2) of the CRR.

58 See the credit risk chapter.

4 Internal validation

4.1 Relevant regulatory references

Table 4

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	10	(1)(a), (b) and (c), (2)(a)
		11	(1)(b), (2)(c), (4)
		12	(a), (c), (d), (e)
		13	(b)
		14	(b), (d)
		15, 33, 36	
CRR	26/06/2013	144	(1)(f)
		143, 170, 172, 174, 185, 189	
Commission Delegated Regulation (EU) No 529/2014	Annex 1 Part 2 Section 1 and 2		
Other references			
Basel Committee on Banking Supervision (BCBS) – Newsletter No. 4[59]	01/2005		
Basel Committee on Banking Supervision (BCBS) Regulatory Consistency Assessment Programme (RCAP)[60]	04/2016		

72. In the context of rating systems, the term “validation” encompasses a range of processes and activities that contribute to an assessment of whether ratings adequately differentiate risk, and whether estimates of risk parameters (such as PD, LGD and CCF) appropriately characterise the relevant aspects of risk.

73. The main role of the validation function is to perform a consistent and meaningful assessment of the performance of internal rating and risk estimation systems. The term “validation function” encompasses the personnel responsible for performing the validation.

4.2 Validation level and responsibilities

74. In general, internal validation should be performed at all relevant levels. In particular, institutions should pay attention to the following:

59 Basel Committee Newsletter No. 4 (January 2005), “Update on work of the Accord Implementation Group related to validation under the Basel II Framework”, referred to in this guide as “Basel Committee on Banking Supervision (BCBS) - Newsletter No. 4”.

60 Basel Committee on Banking Supervision “Regulatory Consistency Assessment Programme (RCAP) – Analysis of risk-weighted assets for credit risk in the banking book”, referred to in this guide as “Basel Committee on Banking Supervision (BCBS) - Regulatory consistency assessment programme (RCAP)”.

(a) If the institution has approval for a rating system on a consolidated basis only, the validation of that rating system should be performed at least at consolidated level.

(b) If the institution has approval for a rating system on a consolidated basis as well as on a sub-consolidated and/or individual basis, the validation of that rating system should be performed at the consolidated as well as on the sub-consolidated and/or individual levels. The results of the validation at the sub-consolidated and/or individual levels should be taken into account for consistency reasons in the validation performed at consolidated level.

75. In order to ensure consistency in validation activities across the different levels, the group validation function can provide support to validation functions at lower levels (sub-consolidated and/or individual level). However, responsibility for the validation tasks should be retained at the level at which the rating system is approved (sub-consolidated and/or individual level). See also Section 8.3.1 on internal and external outsourcing of internal validation and internal audit tasks and Section 8.3.5 on in-house knowledge of this chapter.

4.3 Content and frequency of tasks of the validation function

76. To meet the requirements of Article 185 of the CRR with regard to the assessment of the performance of the internal rating and risk estimates by the validation function, the ECB understands that institutions should implement the following:

77. Validation policy
Institutions should have internal validation policies involving proven procedures and methods which adequately validate the accuracy, robustness and stability of their estimation of all relevant risk parameters.[61] The procedures and methods stipulated in the validation policy should be in line with the institution's classification of material and non-material rating systems as defined in paragraphs 52 and 54. Institutions should follow their internal validation policy when carrying out validations.

78. Validation process and content:

(a) The validation process should assess the performance of the rating systems by means of qualitative and quantitative methods, in particular with regard to the ranking of borrowers by creditworthiness (ranking power) and risk parameter estimation (calibration appropriateness).

(b) To be able to meaningfully and consistently assess the performance of the rating systems, the content of the validation process should be consistent

[61] Validation policies are assumed by Article 185(d) of the CRR, which stipulates that the methods and data used for quantitative validation must be documented and consistent through time.

across rating systems and through time.[62] The analyses and tests described in this paragraph should be considered as the minimum activities required to ensure that the assessment is meaningful. However, the implementation of all of these analyses and tests does not necessarily mean that the validation requirements according to CRR have been fulfilled, nor should it prevent the institution from developing additional tests when deemed relevant.

(c) The content of the validation process should include quantitative analyses, which in turn should include thresholds. If such thresholds are breached, further investigation should be initiated and, if necessary, adequate measures or actions should be triggered.

(d) All analyses and tests should be performed in such a way that the validation function is in a position to propose an effective and independent challenge to model development and use. To that end, the institution should ensure that the validation function has its own access to the relevant databases.[63] The results of the validation analyses and tests should be documented (validation report) and verifiable by third-party experts (e.g. the internal audit and the competent authority). This also includes the preparation of the validation data.

(e) It is not expected that institutions develop a uniform validation process, as the relevant tests and their frequency may differ from one rating system to another (e.g. corporate vs. retail rating systems or material vs. non-material rating systems).

(f) To ensure that the systems in place to validate the accuracy and consistency of rating systems are sufficiently robust,[64] institutions should ensure that any statistical tests or confidence intervals that they use are appropriate from a methodological point of view and sufficiently conservative.

(g) A meaningful validation of the rating systems requires (as also anticipated by Article 185(b) of the CRR with respect to certain elements) not only an initial validation but also assessment on a regular basis. In line with Article 185(b) of the CRR, these assessments should be carried out annually.[65] Therefore, the validation analyses listed hereinafter should be carried out annually, unless otherwise advised below. As mentioned in paragraph 14 the term “initial validation” in the guide refers to the validation of new models as well as the validation of material changes and extensions to approved models. In the case of material changes and extensions the

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62 See Article 185(a) of the CRR for “consistently and meaningfully” and Article 185(d) for “consistent through time”.

63 When an institution is using rating systems developed from pooled data, the validation function should have access to all relevant internal data of that institution. In addition, any third party involved may assist the institution in its validation activities by performing those validation tasks which require access to pooled data (see also paragraphs 144 and 147(d)).

64 See Article 185(a) of the CRR.

65 See Article 174(d) of the CRR.

validation should be conducted on those aspects directly or indirectly affected by the change.[66]

(h) In addition, and to ensure a robust validation, the analyses should be performed by the validation function without considering input from the CRCU[67] unless otherwise specified below.

(i) Back-testing[68]

For the annual validation of non-material rating systems, the validation function can also take into account the back-testing analyses performed by the CRCU.

(ii) Discriminatory power

(ii.a) Analyses of discriminatory power for PD models should be designed to ensure that the ranking of obligors/facilities resulting from the rating methodology appropriately separates riskier and less risky obligors/facilities.[69] Similarly, analyses of discriminatory power for LGD (respective CCF) models should be designed to ensure that the LGD (respective CCF) model is able to discriminate between facilities with high values of LGD (respective CCF) and those with low values of LGD (respective CCF).

(ii.b) These analyses should be performed at least at the level of the overall model and, when relevant, at the level of individual risk factors and other possible segments including, for example, scorecards and modules.

(ii.c) For the annual validation of non-material rating systems, the validation function can also take into account the analyses of discriminatory power performed by the CRCU.

(iii) Analyses of representativeness

(iii.a) The data used to build the model must be representative of the actual obligors or exposures (Article 174(c) of the CRR). This should include the following checks:

- Ensuring that the range of application of the model is in line with the approved one, in accordance with Article 143(3) of the CRR. Obligor characteristics should be compared for PD models, and facility types and

66 See also Article 11(4) of Commission Delegated Regulation (EU) No 2022/439.

67 Or credit risk control function for institutions using option (c) of paragraph 15.

68 Comparison of risk estimates with realised default rates, in accordance with Article 185(b) of the CRR.

69 Further elaborated in Article 170(1), sub-paragraphs (d), (e) and (f), and 170(3)(c) of the CRR.

characteristics should be compared for LGD and CCF models.

- Monitoring the changes made to the definition of default, with the aim of identifying any changes that would affect the representativeness of the dataset with respect to the obligors or facilities within the range of application of the model.

- Analysing lending standards or workout procedures, external market and economic conditions, and other relevant characteristics surrounding the model development process.

(iii.b) Where an institution uses data that are pooled across institutions, the analyses should also cover the requirements of Article 179(2) paragraphs (a) and (b) of the CRR.

(iii.c) For the annual validation of rating systems, the validation function can also take into account the analyses of representativeness performed by the CRCU.

(iv) Analyses of overrides

(iv.a) Overrides should not only be monitored but also assessed as part of the validation process (Article 172(3) of the CRR). See also Section 6.6.2 of this chapter.

(iv.b) Analyses of overrides should be conducted on an annual basis (and not at initial validation). The validation function can also take into account the analyses of overrides performed by the CRCU.

(v) Stability analyses of the internal ratings and risk parameters over time[70]

(v.a) Examples for analysing the stability of internal ratings and risk parameters over a specific observation period for PD estimates can be the following:

- obligor/facility migrations;

- stability of the migration matrix;

- concentration in rating grades.

(v.b) Institutions should justify excessive or unexpected variability.

[70] This is required by Article 174(d) of the CRR.

(v.c) For the annual validation of non-material rating systems, the validation function can also take into account the stability analyses performed by the CRCU.

(vi) Analyses of model design stability[71]

(vi.a) The institution should analyse:

- the differences between the original weights of the risk drivers (derived from the development sample) and the weights estimated from a different sample (longer or more recent historical sample);
- the continued homogeneity[72] of rating grades or pools used as a basis for the estimation of risk parameters.

(vi.b) Institutions should justify excessive or unexpected variability.

(vi.c) These analyses should be performed at initial validation and at an adequate frequency thereafter, but at least every three years. The validation function can also take into account the analyses performed by the CRCU for non-material rating systems, except at initial validation.

(vii) Evaluation of input data[73]

(vii.a) This should ensure all of the following:

- that the data treatment process is reliable and well-founded;
- that the necessary information is available and up to date for the majority of the application portfolio's[74] obligors and facilities by tracking the age of model input data, especially in the case of financial statements;
- that all defaults that occurred in the institution within the scope of application of the model are correctly identified and fully documented and registered in the appropriate and intended IT systems;
- that the number and reasons for technical past-due situations are tracked.

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71 This is required by Article 174(d) of the CRR on "monitoring of model performance and stability" and "review of model specifications".

72 The term "homogeneity" is used here as defined in Article 36 of Commission Delegated Regulation (EU) No 2022/439.

73 See Article 174(b) of the CRR.

74 "Application portfolio" means the actual portfolio of exposures within the range of application of the PD or LGD model at the time of estimation of a risk parameter.

(vii.b) For the annual validation of the rating systems, the validation function can also take into account the evaluation of the input data performed by the CRCU.

(viii) Benchmarking analyses

(viii.a) The institution should carry out comparisons with up-to-date data from representative and comparable external data sources, in particular with regard to low-default portfolios (Article 185(c) of the CRR). The institution should provide sufficient evidence in the event that no usable external data are available.

(viii.b) Benchmarking analyses should be performed at initial validation and at an adequate frequency thereafter, but at least every three years. For benchmarking analyses at initial validation the validation function can take into account the benchmarking analyses performed by the CRCU.

(ix) Data cleansing analyses[75]

(ix.a) These analyses refer to the exclusion of observations (and the reasons behind this) from the risk database for the construction of the reference dataset (RDS) for the modelling.

(ix.b) These analyses should be performed at least at initial validation.

(x) Review of the model specification

(x.a) This analysis should include challenging the model design, assumptions and methodology, based on the applicable regulation. A stepwise initial validation process involving interaction with the model development at each step of the development phase may not be sufficient to perform this challenge effectively. Regardless of the validation approach followed, the validation unit should provide an overall conclusion on the model to ensure that individual model strengths and weaknesses are evaluated on an overall basis.

(x.b) This analysis should be performed at least at initial validation.

(xi) Quality assurance of the computer codes used

(xi.a) This should include at least the following:

[75] The rationale for these analyses is set out in Article 174(c) of the CRR.

- that the implementation of the rating system in the relevant IT system is compliant with and reproduces exactly the documented model under review;[76]
- that the descriptions of the data sources, variables and risk drivers used for development purposes are properly documented.

(xi.b) These analyses should be performed at least at initial validation.

(xii) Additional qualitative analyses[77]

(xii.a) These analyses should include, among other things, the following:

- qualitative assessments of assumptions and expert-based estimates and of the integrity of the rating assignment process;
- assessment of the use of the models and their correct application in practice;
- assessment of legal or macroeconomic changes that may impact the risk parameters;
- assessment of downturn phases and the correct application of margins of conservatism.

(xii.b) Not all of the above-mentioned qualitative analyses need to be performed annually, but institutions should have a clear policy in place defining the appropriate frequency of each assessment.

79. The duration from the start (reference date of data) to the end (approval of the validation results) of the yearly validation should not be more than one year. Deviations from this requirement should be clearly justified and documented by the institution and also reported to senior management.

80. Quantitative thresholds (see paragraph 78(c)) should be set up for at least the following tests:

(a) back-testing;

(b) discriminatory power;

(c) analyses of overrides;

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[76] See also Article 144(1) of the CRR, which requires that the institution's systems for the management and rating of credit risk exposures be sound and implemented with integrity.

[77] This is contemplated in Article 174(e) of the CRR.

(d) stability analyses of the internal ratings and risk parameters over time.

81. In particular for tests where no thresholds are applied, a consistent qualitative assessment of the results should be performed and documented. In the event of a negative qualitative assessment, adequate measures or actions should be triggered.

4.4 Reporting and follow-up

82. Institutions should ensure that senior management and the management body (or the committee designated by it) are informed about the conclusions and recommendations of the validation results as set out in the rating systems' validation reports, and in particular about any exceeded thresholds and deficiencies identified, as this is required by Article 189(2), sub-paragraph 2, of the CRR. Such information should be provided, where appropriate,[78] in a summary document (or documents) to ensure that a sufficient level of information is provided to senior management and to the management body and to enable them to assess the performance of the rating systems. This summary document (or documents) should present an aggregated view and comparison of the results for all the rating systems.

83. Institutions should be able to demonstrate that, on the basis of the validation results and recommendations, measures are initiated to remedy the identified deficiencies of the rating systems (e.g. model change, recalibration) as contemplated by Article 189(2), sub-paragraph 2, of the CRR.

84. Article 189(2)(c) of the CRR requires senior management to ensure, on an ongoing basis, that the rating systems are operating properly. Article 189(2), sub-paragraph 2, of the CRR requires senior management to be informed of the status of the measures to remedy any previously identified deficiencies. From this, it can be inferred that institutions should have a process in place (e.g. through a committee or another comparable body) to decide on such measures, who will be responsible for them, and the timelines for their implementation, on the basis of the validation results and recommendations. To ensure sufficient senior management engagement as contemplated by Article 189(2) of the CRR, the ECB is of the view that at least for material rating systems the direct involvement of senior management should be envisaged (e.g. by senior management chairing the committee). The process should involve persons with the appropriate level of seniority and responsibility from both the CRCU and the validation function. If affected, business units should also be involved. An escalation process up to management body level should be in place in the event of conflicts between the validation function, the CRCU and/or business units.

[78] Such a summary document (or documents) is (are) expected to be appropriate, for example in the case of institutions with a significant number of rating systems.

85. Institutions should have adequate processes in place for tracking the status of the measures adopted to remedy deficiencies.[79]

86. Institutions should always apply to/notify the competent authority in the event of changes to their validation methodology and/or processes in accordance with Annex 1 Part 2 Section 1 (material model change) or Section 2 (ex ante notification) of Commission Delegated Regulation (EU) No 529/2014.

5 Internal audit

5.1 Relevant regulatory references

Table 5

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	17	
CRR	26/06/2013	145, 175, 191	
Commission Delegated Regulation (EU) No 529/2014		8	
Other references			
Basel Committee on Banking Supervision (BCBS) 328	08/07/2015	43, 139, 140, 141, 142, 143	
EBA Guidelines on internal governance	26/09/2017	V. 22. 201, 202, 204, 205, 206, 207	

5.2 Scope and frequency of the review of the rating systems

87. In accordance with the existing regulatory requirements under Article 191 of the CRR, the internal audit or another comparable independent auditing unit (hereinafter internal audit) must review the institution's rating systems and its operations at least annually. The areas for review must include adherence to all applicable requirements.

88. The ECB considers that an institution fulfils the above-mentioned requirements of Article 191 of the CRR if the internal audit carries out, annually and on the basis of up-to-date information, a general risk assessment of all aspects of the rating systems for the purpose of drawing up the appropriate internal audit work plan, as elaborated in paragraphs 89 to 91, and executes this plan.

89. Depending on the outcome of the general risk assessment, the intensity and frequency of the audit assignments[80] may differ between specific areas.

[79] See Article 189(2), subparagraph 2, of the CRR.

[80] An audit assignment can refer to a separate audit, a range of audits or themes of audits.

(a) An area showing signs of increased/high risk in the general risk assessment is subject to a thorough audit assignment ("deep dive"). Reasons for the increased risk might include, but are not limited to, new processes, new regulatory requirements, new types of exposures in the range of application of a rating system, material model changes, findings by the competent authority or by any other function, open issues and areas with high risk identified in previous risk assessments. The audit assignments should be included in the annual audit work plan established on the basis of the general risk assessment.

(b) Areas not showing any sign of an increased/high risk are subject to a deep dive mission at least every three years in order to provide a thorough update of the internal audit opinion on them.[81]

90. For the purpose of the general risk assessment, the internal audit should develop its own opinion on the areas of rating systems to be reviewed but can take into consideration the analysis performed by the internal validation function where appropriate. This general risk assessment should include at least the opinion of the internal audit unit on the following aspects:

(a) The development[82] and performance[83] of the rating systems.

(b) The use of the models. The assessment of model use shows that the rating systems play an essential role in the most significant areas of the institution's risk management, decision-making, credit approval, internal capital allocation and corporate governance functions.

(c) The process for the materiality classification,[84] the impact assessment and the compliance with regulatory requirements of all changes to the rating systems as well as their consequent implementation. The internal audit is informed of all changes to the rating systems.

(d) The quality of the data used for the quantification of risk parameters.

(e) The integrity of the rating assignment process.

(f) The validation function, in particular with regard to its independence from the CRCU as described in paragraphs 17 and 18 of this chapter, as well as the scope and suitability of the tasks performed and outputs obtained.

(g) The process for calculating own funds requirements.

91. The procedures and results of the general risk assessment and prioritisation, the annual work plan, the guidelines, and the subsequent production of the

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81 These deep dives may be either thematic, covering one area for several rating systems (e.g. rating assignment process, data quality management, definition of default), or targeted on a specific rating system.

82 The scope should include the initial validation tasks described in the internal validation principles.

83 The scope should include the annual/regular basic tasks described in the internal validation principles.

84 The internal audit function may be involved in the classification as an independent function confirming the assessment of materiality, as set out in Section 7.4 of this chapter.

internal audit reports should be properly documented and approved by the management body. The auditing techniques used and applied by the institution should be documented to ensure that assessments are consistent.[85]

92. To avoid delays in the procedures related to an initial IRB application or an application to extend the IRB approach to an exposure class or a type of exposure that is currently treated using the SA, it is beneficial if the internal audit provides the competent authority with an independent assessment of the compliance of the initial IRB application or extension package with all applicable requirements. This applies in particular to compliance with the experience test requirements of Article 145 of the CRR. The benefit of carrying out an internal review of this nature is that shortcomings can be addressed by the institution before submitting the application, and the completeness of the initial IRB application or extension package can be ensured.

93. For extensions and changes to the IRB approach,[86] institutions must submit, among other things, and together with the application, reports of their independent review or validation.[87] In the case of material changes in the validation methodology and/or validation processes or process-related aspects of changes in the definition of default, the review of those aspects should be independently assessed by the internal audit function.

85 See Article 175(1) and (2) of the CRR.

86 See Section 7.3 “Notification” of this chapter on suggested templates to be used.

87 Article 8(1)(e) of Commission Delegated Regulation (EU) No 529/2014.

6 Model use

6.1 Relevant regulatory references

Table 6

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	18, 19, 20, 21	
		22	(1)(a) and (b)
		23	(1)(a)
		24	2(a), (b), (c), (d) and (e)
		25	2(a), (b) and (c)
		39	
CRR	26/06/2013	143	(3)
		144	(1)(b) and (h)
		145	
		148	(1)
		150	
		171	(2)
		172	(3)
		173	(1)(b), 2
		174	(e)
		179	(1)
		189	(3)
Other references			
Basel Committee on Banking Supervision (BCBS) - Newsletter No. 9[88]	18/09/2006	Principles: 1, 2, 3, 4	

6.2 Use test requirement

94. The ECB acknowledges that the degree of use of internal ratings and default and loss estimates in the institution's risk management and decision-making process, and in its credit approval, internal capital allocation and corporate governance functions, is more extensive for PD/internal ratings than for LGD/loss estimates and CCFs.

95. Moreover, the IRB risk parameters can be used in an adjusted form or indirectly through relevant risk measures/indicators stemming from the rating systems, provided that differences from the regulatory parameters are fully justified and properly documented.[89] For example, institutions may use adjusted or

[88] Basel Committee Newsletter No. 9 (September 2006), "The IRB Use Test: Background and Implementation", referred to in this guide as "Basel Committee on Banking Supervision (BCBS) - Newsletter No. 9".

[89] See Article 179(1), sub-paragraph 2, of the CRR.

transformed IRB parameters by removing certain constraints (e.g. downturn effect, conservative add-on, floor) or adjusting the time horizon.

96. The use of IRB risk parameters and their inclusion in internal policies and procedures enables institutions to continuously improve their accuracy and reliability by receiving feedback from model users. The conditions for an effective and beneficial feedback loop include a good understanding of the model, its assumptions and constraints and an adequate level of interaction between users, the CRCU and the validation function.

97. Where an institution requests initial permission to use the IRB approach or initial permission to use own estimates of LGD or CCF in the context of sequential implementation of the IRB approach, the institution should provide evidence that rating systems which are broadly in line with the IRB requirements of the CRR have been used for risk management, decision-making and credit approval processes for at least three years as part of the prior experience requirement set out in Article 145(1) and (2) of the CRR and Article 22 of Commission Delegated Regulation (EU) No 2022/439.

98. Where an institution makes a request to extend the IRB approach to a new legal entity (that is not yet using the IRB approach) or to extend it to additional exposures, Article 145(3) of the CRR provides that if the use of the rating systems is extended to exposures that are significantly different from the scope of existing coverage, such that the existing experience cannot be reasonably assumed to be sufficient to the requirements of Article 145(1) and (2) of the CRR, the institution should provide evidence that the requirements of Article 145(1) and (2) of the CRR have been met. If the use of the rating systems is extended to additional exposures that are not significantly different from the scope of the existing coverage, it is the ECB's understanding that:

    (a) if the request is for calculation of own funds requirements at consolidated level only, the conditions of Article 145(1) and (2) of the CRR may be considered as having been met considering the existing experience of the institution;

    (b) if the request is for calculation of own funds requirements at consolidated and individual levels, the institution should provide evidence that the conditions of Article 145(1) and (2) of the CRR have been met for the new legal entity.

    Where, following the consolidation and while the institution is returning to compliance, a single exposure is in the scope of the IRB rating systems of the acquirer and of the target, the institution should have appropriate processes in place to prevent a rating system from being used for the purpose of reducing own funds requirements.

6.3 Risk management, credit approval and decision-making process

99. As set out in Article 144(1)(b) of the CRR, internal ratings and default and loss estimates produced by the rating systems must play an essential role in the risk management and decision-making process and in credit approval. To ensure that they are able to play this essential role, institutions should use internal ratings and default and loss estimates in the approval, restructuring and renewal of credit facilities, and in lending policies and the monitoring process for obligors and exposures. This should be formally included in the institution's internal policies.

    (a) Credit approval
    The ECB considers that institutions comply with the requirement to use the internal ratings and default and loss estimates in the approval, restructuring and renewal of credit facilities if they establish the following:

        (i) Institutions incorporate the internal rating systems in the overall credit granting, restructuring and renewal process. Related policies are calibrated on the basis of rating classes or groups of rating classes or risk parameters.

        (ii) For the incorporation of internal rating systems to be beneficial, staff involved in the credit granting, restructuring and renewal process need to have sufficient knowledge of the rating systems, including their strengths and limitations. This encompasses the inclusion of rating system users' feedback in model development and maintenance as well as having appropriate training programmes in place.

        (iii) The assignment or updating of ratings is a prerequisite for the assessment underlying the granting and reviewing of credit lines.

    The ECB considers that institutions comply with the requirement to use the internal ratings and default and loss estimates in their lending policies, including exposure limits and mitigation techniques, if those policies have the following features:

        (iv) Lending policies include specific references to the use of internal rating systems and related parameters (for instance, use of a grid of parameters in the decision-making process). These parameters serve as an indicator of riskiness (e.g. in terms of expected loss (EL)). They may be differentiated by institutions' portfolios (e.g. retail/non-retail) and by facility type.

    (b) Risk management – monitoring process for obligors and exposures

    The ECB considers that institutions comply with the requirement to use their internal ratings and default and loss estimates in respect of the monitoring process for obligors and exposures if the following is established:

Individuals in charge of the monitoring process are promptly provided with adequate information on the development of counterparties' credit risk as expressed by ratings, so that the relevant information can be easily incorporated in the process and trigger appropriate actions.

100. In addition, institutions should consider taking into account the internal ratings and default and loss estimates produced by the rating systems in the five areas shown below. If an institution decides to take into account the internal ratings and default and loss estimates in any of these five areas, this should be formally included in its internal policies.[90] If an institution is not using internal ratings or risk parameters in one or several of these areas, it should properly document and justify the rationale for that to ensure that discrepancies are explained in a sound and understandable manner.

(a) Pricing of transactions

(i) Internal ratings and risk estimates can be considered in the pricing of transactions, in particular for non-retail exposures.

(ii) The methodology underlying pricing can be documented and the use of risk-adjusted performance indicators (e.g. return on risk-adjusted capital – RORAC) or adjusted IRB parameters is considered best practice for pricing estimation.

(b) Early warning systems

(i) Early warning systems can be applied to all the institution's exposures and can be tailored to its specific sub-portfolios (with at least a distinction between retail and non-retail exposures).

(ii) PD/ratings dynamics (i.e. downgrades) and other indicators linked to other risk measures (e.g. EL, loan-to-value, overdraft) can be taken into account in the institution's early warning system – at least for the most relevant portfolios. Whenever an anomaly is detected, appropriate risk management decisions can be triggered. This process can be adjusted depending on the persistency and intensity of the warning. It can also be designed according to other variables such as exposure size or facility type.

(c) Collection and recovery policies and processes

(i) Regarding the collection process, institutions can have risk management procedures in place which are triggered in advance of the exposure's default (e.g. early collection calls) and are based – among other indicators – on their internal ratings or risk drivers.

(ii) Regarding the recovery process, institutions can have in place rules, strategies or procedures that take into consideration, inter alia, their

[90] See Article 19(2) of Commission Delegated Regulation (EU) No 2022/439.

LGD/expected loss best estimate (EL_{BE}) values, as well as their set-aside provisions.

(d) Credit risk adjustments

(i) The credit risk adjustments methodology for both performing exposures and exposures in default (or share of exposures in default) can be aligned to the calculation of own funds requirements, although some adjustments might be needed to comply with accounting standards (for example, International Financial Reporting Standards 9 (IFRS 9)). The institution should justify and document any significant deviations to ensure that the rationale for discrepancies is sound and understandable.

(e) Allocation or delegation of competence for the approval process

(i) Along with the materiality of credit lines, the delegation of competences for credit approval can take risk estimates into account through one or several IRB parameters or through EL (for example, an increase of some EL-driven measures above a pre-defined threshold should typically trigger an escalation process).

(ii) The allocation and delegation process can include the criterion of proportionality, taking into account portfolio risk and facility types.

6.4 Internal capital assessment and allocation

101. Internal ratings and the default and loss estimates produced by the rating systems play an important role in the assessment, calculation and allocation of institutions' internal capital[91] under the framework of the internal capital adequacy assessment process (RWEAs can also be used as an additional driver). This role should be reflected within the institutions' internal policies and procedures on internal capital assessment and allocation.

6.5 Corporate governance functions

102. Internal ratings and the default and loss estimates produced by the rating systems play an important role in the institution's corporate governance functions.[92] To ensure that they are able to play this essential role, institutions should use internal ratings and default and loss estimates, in particular in their management reporting and portfolio credit risk monitoring procedures. This role should be reflected within the institutions' internal policies.

91 See Article 144(1)(b) of the CRR.

92 See Article 144(1)(b) of the CRR.

103. The ECB considers that institutions comply with the requirement to use the internal ratings and default and loss estimates in their corporate governance functions if they establish the following:

(a) Institutions' management reporting[93]

(i) Institutions have a structured reporting system on risk measured by their IRB risk parameters. This reporting framework contains information about frequency, recipients and contents (if possible, broken down by segment, portfolio and product).

(ii) The reports are accompanied by comments and explanations on the numbers provided as well as by qualitative assessments, to enable recipients to fully understand the potential underlying risks.

(b) Portfolio credit risk monitoring

(i) In its ongoing model monitoring function, the CRCU performs descriptive analyses of portfolio riskiness (distribution of exposures among rating classes, average risk estimates and their realisations, ELs). These analyses are progressively refined to include the analytical insights derived from the information on ratings.[94]

(ii) Reporting to senior management provides a concise but complete overview of the relevant variables[95] so that the evolution of credit risk can be monitored at portfolio level.

6.6 Assignment of exposures to grades or pools

6.6.1 Non-rated exposures and outdated ratings

104. Article 144(1)(h) of the CRR requires institutions to assign and continue with assigning each exposure in the range of application of a rating system to a rating grade or pool of this rating system. Furthermore, and in accordance with Article 173(1)(b) of the CRR, institutions must review those assignments at least annually. Nevertheless, the ECB observes that institutions' portfolios occasionally show a certain proportion of non-rated exposures and/or outdated ratings. The ECB considers that this should be properly investigated, justified, documented and monitored.

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93 See also Section 3.4 of this chapter for further details.

94 For example: highlighting, in aggregate terms, the volume of credits whose rating has worsened by more than one class ("double downgrade"); rating stability; the speed and frequency of rating modifications; the incidence of defaults; the relationship between "upgrade" and "downgrade" at portfolio level in a given period of time; and changes in rating by line of business, market segment or type of credit line.

95 At least those defined in Article 189(3) of the CRR.

(a) Root causes

(i) Non-rated exposures are temporary exceptions to the “ordinary” rating assignment process and should therefore be investigated, documented and justified in detail.

(ii) Outdated ratings include both ratings that have not been updated within the 12-month period following the last rating date[96] and ratings based on outdated information.[97]

(b) Materiality

(i) Non-rated exposures and outdated ratings present a risk for institutions of not being compliant with the CRR requirements related to rating systems. To mitigate that risk, institutions should implement specific policies and procedures to identify these non-rated exposures and outdated ratings and monitor their materiality (in terms of number, EAD and RWEAs). A formal check should be carried out on these issues, at least annually, and reported to senior management. These items should also be reviewed periodically by the internal validation function.

105. With regard to ratings not updated within the 12-month period following the most recent rating date, a transition period during which the current rating is carried forward can be considered provided all the following conditions are met:

(a) the transition period begins 12 months after the date the current rating was assigned or when new material information on the obligor or exposure became available (if earlier);

(b) the transition period does not exceed three months;

(c) the transition period applies:

(i) to wholesale exposures whose rating assignment relies on external information (e.g. financial statements), which may be available/published not exactly 12 months apart; or

(ii) in the presence of exceptional internal impediments that affect the timely review of the rating assignment;

(d) adequate monitoring and reporting policies, together with escalation procedures, are implemented to ensure a rapid return to compliance; restrictions to credit granting or to delegation of powers for credit approval are also envisaged for those counterparties whose rating falls within the transition period;

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96 See related requirements in Article 173(1)(b) and 173(2) of the CRR.

97 For instance, when financial information is used in the rating assignment process, it should be taken from financial statements dating back no more than two years.

(e) conservative treatments apply after three months, as detailed in paragraph 106.

106. All exposures within the range of application[98] of an IRB rating system must eventually be rated[99] and are not expected to be treated under the SA, unless they have received the permission of the competent authority to be permanently treated under that approach in accordance with Article 150 of the CRR.[100] Non-rated exposures and outdated ratings present a risk of potential underestimation of own funds requirements. To mitigate that risk, institutions should adhere to the following guidance:

(a) Institutions should have internal policies in place establishing a process to monitor and manage non-rated exposures and outdated ratings prudentially. In particular, they should be able to prove that their procedures allow for a conservative measure of risk, such as time-dependent downgrading for outdated ratings and the application of the worst-performing rating grade for unrated exposures.[101]

(b) The calibration of the prudential treatment should be validated at least annually (evidence of conservativeness).

6.6.2 Analysis of overrides

107. For grade and pool assignments institutions must document the situations in which human judgement may override the inputs or outputs of the rating system and the personnel responsible for approving these overrides.

108. For the purposes of this subsection, instances of overruling of internal policies and/or procedures are not considered as overrides. If institutions overrule internal policies and/or procedures, they should, as in the case of overrides, document these instances and report them to the relevant functions (e.g. CRCU, internal validation function). The functions concerned should assess the performance of the exposures affected by the overruling and its potential impact on the rating systems.

109. As a general principle, the rating of retail exposures is less likely to be affected by an override process, given the high degree of standardisation of information processing – including in qualitative terms – and the small margins of discretion in the evaluation.

110. “For grade and pool assignments institutions shall document those situations in which human judgement may override the inputs or outputs of the assignment

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98 The range of application refers to Article 143(3) of the CRR and thus to all exposures of the relevant type of exposure for which that rating system has been developed and approved.

99 See Article 144(1)(h) of the CRR.

100 See Article 148(1) of the CRR.

101 To avoid any distortion of risk estimates, institutions should ensure that these ex-post conservative adjustments are not included in the calibration dataset.

process."[102] Accordingly, institutions should have documented policies that incorporate the following principles:

(a) the policies include clear and exhaustive justifications for triggering the override process on the basis of pertinent and significant information for an accurate assessment of the counterparty's creditworthiness;

(b) the policies define the maximum extent of overrides (in terms of, for example, maximum number of notches up[103] and maximum share of overridden exposures), also considering model/portfolio specificities; institutions should aim to be more restrictive with positive overrides than with negative ones.

111. Institutions must document each override.[104] To this end, they should retain the quantitative and qualitative information concerning each phase of the rating process. In particular, all decisions taken throughout the process – including interim ratings – should be recorded, as should the reasons for any override. The information should be proportionate to the severity and extent of the override.

112. "Institutions shall analyse the performance of those exposures whose assignments have been overridden."[105] To comply with this requirement, the institutions should carry out the following procedures:

(a) Performance analysis of the rating systems, to assess whether the judgemental adjustments improve their discriminatory power. The analysis may be extended to all of the underlying components (modules) of the rating system. It is deemed particularly useful to measure the difference in terms of performance and impact of the "pre-override" and "post-override" stages.

(b) Other analyses, including the assessment of the distribution of overrides by override root cause, i.e. if there is a situation that systematically triggers an adjustment and that could justify an adjustment to the model (for example the inclusion of a specific risk driver).

113. To mitigate the risks identified through the aforementioned analysis (paragraph 112), institutions should identify specific criteria for assessing whether or not the number of and justifications for overrides indicate significant weaknesses in the rating system and whether this is a reason to take ad hoc actions (e.g. a model change). In general, situations where there are too many overrides could be a strong indicator of weaknesses in the model (i.e. systematic and material adjustments can be the consequence of a misspecification of the model).

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102 See Article 172(3) of the CRR.

103 Where "up" refers to the direction of non-conservative overwrites.

104 See Article 172(3) of the CRR.

105 See Article 172(3) of the CRR.

7 Management of changes to the IRB approach

7.1 Relevant regulatory references

Table 7

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	83, 84	
CRR	26/06/2013	143	(3) and (4)
Commission Delegated Regulation (EU) No 529/2014	12/03/2014	2, 3, 4, 5, 8, Annex 1	

114. Changes to a rating system's range of application or to a rating system itself are subject to approval by the competent authorities if assessed as material, or to ex ante or ex post notification if non-material.

115. Commission Delegated Regulation (EU) No 529/2014 requires institutions to assess and classify the materiality of changes to rating systems. To comply with these requirements in a comprehensive and consistent way, institutions should establish a policy related to changes to the IRB approach ("change policy"). In line with the above, this policy should include, in particular, detailed criteria to ensure that the classification of changes is consistent and that any arbitrage in that regard is avoided. Institutions are encouraged to share their policy with the competent authority and to inform the latter about any implemented modifications to it, in order for both sides to have a common understanding of the classification process.

7.2 Content of the change policy

116. The change policy should include provisions relating to the operationalisation of the requirements of Commission Delegated Regulation (EU) No 529/2014 with respect to the materiality assessment, classification, impact assessment, notification and documentation of changes and extensions.[106] To that end, it should include, in particular, the following:[107]

    (a) Responsibilities, reporting lines and procedures for the internal approval of changes, taking into account the institution's organisational characteristics. This policy should define at least the unit(s) responsible for the assessment and classification of changes or extensions, as well as the function/committee responsible for confirming and countersigning the classification.

[106] Articles 2, 3, 4, 5 and 8 of Commission Delegated Regulation (EU) No 529/2014.

[107] Article 84 of Commission Delegated Regulation (EU) No 2022/439 provides for a comparable set of policy elements.

(b) Definitions, methods and, where applicable, metrics and significance levels for the impact assessment, threshold calculation and classification of changes; in particular, the quantitative/qualitative criteria referred to in Commission Delegated Regulation (EU) No 529/2014. In addition, as required by Annex 1, Part 2, Section 1 of this Regulation and to ensure consistency, the following should be observed:

(i) the institution should specify metrics and significance levels that define the significance/materiality of changes in the distribution across rating grades produced by changes to the rating methodology (paragraph 2(d)(ii) of Annex 1, Part 2, Section 1); these metrics and significance levels should be complementary to those of Article 4(2) and (3) and Article 5(2) of the same Regulation;

(ii) the institution should specify metrics and significance levels that define the significance/materiality of rating migrations produced by changes in the rating system's assumptions on the impact of economic conditions (paragraph 2(c) of Annex 1, Part 2, Section 1);

(iii) the institution should specify metrics and significance levels that define the significance/materiality of changes in the rank ordering of clients/exposures (paragraph 2(d)(i) of Annex 1, Part 2, Section 1);

(iv) in its change policy, the institution should define which changes constitute a change in the fundamental methodology for estimating PDs, LGDs (including best estimate of EL) and CCFs and are considered as material in the sense of paragraph 2(f) of Annex 1, Part 2, Section 1 (as opposed to the changes referred to in paragraph 2(h) of Annex 1, Part 2, Section 2);

(v) the institution's change policy should include a definition of changes in the validation methodology and/or validation processes which lead to changes in its judgement of the accuracy and consistency of the estimation of the relevant risk parameters, the rating processes or the performance of the rating systems (paragraph 4 of Annex 1, Part 2, Section 1).

(c) Procedures to identify and monitor changes, and to notify and apply to the competent authorities for permission to make such changes. In particular, institutions should establish an end-to-end process from identification to notification/application and describe how they perform the activities at each step.

(d) Procedures for the implementation of changes, including their documentation; in particular, the re-rating process should be defined (if no other document is already in place).

7.3 Notification

117. To facilitate the process for submitting the documentation package defined under Article 8 of Commission Delegated Regulation (EU) No 529/2014, on the ECB Banking Supervision website the ECB has made available to institutions standardised templates for notifying ex ante and ex post non-material changes/extensions and for submitting applications for material model changes/extensions. Institutions are invited to use these templates to facilitate the process and to ensure consistency and completeness.[108]

7.4 Classification

118. For the reasons mentioned in paragraph 115, institutions should have processes in place which specify, in detail, that the classification of a change/extension is adequate and consistent with the classification of other changes/extensions. The institution should ensure that the classification process is not subject to any arbitrage. In line with Article 3(3) of Commission Delegated Regulation (EU) No 529/2014, "one material extension or change shall not be split into several changes or extensions of lower materiality". Similarly, an extension or change that requires notification before its implementation (ex ante) should not be split into several changes or extensions to produce one that is notified after implementation (ex post). Nor should several unrelated changes/extensions be combined to produce one change of lower materiality (e.g. two different model changes that affect RWEAs in opposite ways).

119. In accordance with Article 3(4) of Commission Delegated Regulation (EU) No 529/2014, "in case of doubt institutions shall assign extensions and changes to the category of the highest potential materiality".

120. To ensure the accuracy of the impact assessment and the correctness and consistency of the resulting classification, the institution should establish a four-eye principle. This means that the assessment and classification should be confirmed by a unit independent of the one responsible for the assessment and classification of the change/extension.

7.5 Impact assessment

121. The impact assessment process must fulfil the requirements of Commission Delegated Regulation (EU) No 529/2014. It should consist of a quantitative and a qualitative assessment.

122. The quantitative assessment focuses on the impact of the change or extension on RWEAs. Before and after the change or extension the institution should

[108] In addition, further forms and guidelines have been made available on the Single Supervisory Mechanism (SSM) website to support institutions in the pre-application process.

calculate the difference in these amounts for credit and dilution risk associated with the range of application of the internal rating system.

123. This quantitative impact assessment is based on the specifications of Article 4(2) and (3) and Article 5(2) of Commission Delegated Regulation (EU) No 529/2014. The institution should use transparent definitions and internal procedures.

    (a) The institution should document the relevant reference date on which the calculations are based. In accordance with Article 3(2)(a) of Commission Delegated Regulation (EU) No 529/2014, the institution should use the most recent data available. In the case of material change or ex ante notification the time between the reference date and the date of notification should not exceed nine months.[109]

    (b) The institution should give a precise definition of the range of application of the rating system applied in the calculations as referred to in Article 4(1)(c) and Article 5(1)(a)(iii) of Commission Delegated Regulation (EU) No 529/2014. It should ensure that the change to the IRB approach is directly related to exposures within the range of application of the rating system.

    (c) The institution should generally perform a precise impact assessment[110] (all exposures of the relevant range of application) when the rating system is automatic and does not require any human judgement of the qualitative variables (e.g. behavioural scoring).

    (d) If the institution applies Article 3(2)(b) of Commission Delegated Regulation (EU) No 529/2014 and performs an impact assessment based on the re-rating of a representative sample of the population (only possible for rating systems that require qualitative assessment to define the final rating/score), this sample and its relation to the population should be described in detail (number of observations/exposures, minimum/maximum exposure amount, mean/median exposure amount, first/third quartile). The representativeness of the sample should be documented.

    (e) If the institution applies Article 3(2)(b) of Commission Delegated Regulation (EU) No 529/2014 and performs an impact assessment based on other reliable inference methodologies, these methods should be described in detail and their reliability corroborated by qualitative and quantitative means.

124. The qualitative assessment is based on the specifications of Article 4(1)(a) and (b) and Article 5(1)(a) points (i) and (ii) of Commission Delegated Regulation (EU) No 529/2014, which refer to the Annex I of that same Regulation. The institution should thoroughly examine each of these criteria. In addition, as reported in the change policy and to ensure consistency, institutions should

[109] For impact assessments provided during an on-site inspection, the most recent data should be used.

[110] As derived from Article 3(2) of Commission Delegated Regulation (EU) No 529/2014.

examine the metrics and significance levels for the impact assessment and threshold calculation (see also Section 7.2, content of the change policy).

125. If a criterion specified in Annex 1 of Commission Delegated Regulation (EU) No 529/2014 may be applicable a priori (and within reason) to a change or an extension and the institution's assessment concludes that this particular criterion is not fulfilled, the institution should document this conclusion in the notification.

7.5.1 User acceptance test

126. To avoid the risk of having unexpected consequences in the use of the changed rating system (e.g. altered role of the changed rating system in the risk management of credit exposures), institutions should assess and document the impact of a material change/extension on the use of the parameters and ensure that the related internal policies and procedures for the areas described in Section 6.3 of this chapter remain relevant.

127. In the context of rating systems which contain qualitative inputs and/or any expert judgement component, the exposures of the representative sample referred to in point (d) of paragraph 123 should be fully re-rated under the amended rating system (including the material change or extension); adherence to the entire rating assignment process should be ensured. The feedback received from users on the application of the amended rating system and on the rating results is expected to be analysed and documented.

128. Changes or extensions that are classified as non-material do not generally require the preparation of a use test sample, unless there is evidence of a potential impact on the use of the parameters.

7.6 Re-rating process

129. Where competent authorities have provided their permission in relation to a material extension or change, Article 3(5) of Commission Delegated Regulation (EU) No 529/2014 requires institutions to calculate their own funds requirements on the basis of this approved extension or change from the date specified in the new permission. The ECB understands that this process (i.e. the re-rating process) should be covered in the institution's change policy.

130. Re-rating refers to the computation of a rating using the changed or extended rating system and the assignment of this new rating to an obligor previously rated using the rating system as it was before the change or extension.

131. In the context of changes or extensions that are classified as material, the change policy should ensure that the re-rating process is immediate. All former ratings and estimates should therefore be replaced by ratings and estimates calculated using the changed or extended model from the date specified in the

approval decision – if the conceptual design allows this. This applies, for example, to rating systems that are exclusively based on behavioural scoring or in the case of recalibration not affecting the rating process.

132. If an immediate re-rating is not possible (for example if the rating assignment requires new manual input and human judgement), and only for non-retail rating systems, the policy should ensure the following:

    (a) The obligors/exposures/facilities are rated using the amended rating system within the time frame of the yearly re-rating process, i.e. within a maximum of 12 months.

    (b) To mitigate the risk of underestimation of own funds requirements, in the event that a material change would lead to a material increase in the RWEA (i.e. more than 10% on the range of application of the rating system subject to change), the institution should apply the RWEA impact, simulated on the basis of the representative sample. The impact thus produced is the positive difference between the simulated RWEA after the material change and the RWEA before the material change approved by the competent authority. This should be done at the first Common Reporting date after the date of implementation.

    For the purpose of point (b) above, the ECB would consider the following approach as the most appropriate:

    - apply the simulated RWEA impact until all exposures within the range of application are rated using the changed model;
    - remove the simulated RWEA impact linearly, i.e. 25% every quarter.

133. The re-rating process for changes/extensions that are classified as non-material may take up to one year from the date of implementation.

8 Third-party involvement

8.1 Relevant regulatory references

Table 8

	Date of issue	Article	Paragraph/Point
Legal background			
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	4	(1) to (4)
CRR	26/06/2013	144	(1)
		171	
		179	(2)
		190	(3) and (4)
Other references			
EBA Guidelines on outsourcing[111]	25/02/2019		

8.2 Preliminary principles

134. Outsourcing, as defined in the EBA Guidelines on outsourcing, refers to an authorised entity's use of a third party (the "service provider") to perform activities that would normally be undertaken by the authorised entity itself, now or in the future. For the purposes of this section, outsourcing in the context of IRB models refers to the involvement of third parties in any IRB-related tasks, including data provisioning and the use of external data (e.g. development data, calibration data, external ratings as input for internal models, pooled data). The specific case of delegation of IRB-related tasks to different legal entities within the same group (internal outsourcing) is also considered as outsourcing and hence is subject to the expectations set out below.[112]

8.2.1 Contract requirements

135. All outsourcing arrangements for IRB-related tasks should be subject to a formal and comprehensive contract or similar documented agreement in accordance with the proportionality principle (in the case of internal outsourcing between different entities within the same group, provisions such as service level agreements (SLAs) or other written agreements may be considered as sufficient, subject to the criticality or importance of the tasks outsourced). Outsourcing institutions should take into account the aspects set out in Section

111 EBA Guidelines on outsourcing (EBA/GL/2019/02), referred to in this guide as the "EBA Guidelines on outsourcing".

112 For generic requirements on outsourcing, such as the existence of an outsourcing policy, contract requirements, monitoring of third-party performance and a contingency plan for interruption of service, institutions must take into consideration the generic guidelines set out in the EBA Guidelines on outsourcing.

13 of the EBA Guidelines on outsourcing when preparing written outsourcing contracts. To avoid operational risks which could hinder the performance and operations of the rating systems, outsourcing agreements should provide for the following:

(a) The agreed terms do not impede the institution in performing its validation activities.

(b) The agreed terms do not impede the necessary communication between the institution and the competent authorities in performing their supervisory duties. In this sense they should include:

  (i) full and timely access for competent authorities to all information required (e.g. all of the models' development details, where an externally developed rating system is used);

  (ii) a requirement for the third party to provide support to the institution in the event of a request for information by the competent authority.

(c) The agreed terms should ensure that the provider gives the institution access to relevant information in order to maintain sufficient in-house knowledge. The delivery of training and workshops is considered best practice.

8.3 Third-party involvement in internal functions and tasks

8.3.1 Internal validation and internal audit tasks

136. Although institutions are allowed to delegate some of their tasks, activities and functions to a third party, this should be done in accordance with all existing legal requirements and after due consideration of this guide, in particular the principles relating to internal validation and the internal audit included in this general topics chapter. If an institution plans to delegate certain internal validation or internal audit tasks to a third party that would perform them outside the EU, it should discuss this plan with the competent authority in advance.

137. The ECB considers that responsibility for delegated tasks should be retained by the outsourcing institution.[113] This understanding is also expressed in paragraph 35 of the EBA Guidelines on outsourcing.

138. To ensure consistency in the content, quality and governance of the activities performed internally and externally, the ECB understands that the following practices in particular should be observed:

[113] This also applies in the case of internal outsourcing.

(a) Reports should carry the logo and name of the institution and of the third party performing the tasks.

(b) Reports should be approved by the senior management and the members of the management body (or the designated committee thereof) responsible for the function within the institution.

(c) The institution should assess the quality/performance of the outsourced tasks.

(d) The independence requirements set out in Section 1.6 for internal validation and Section 1.7 for internal audit of this chapter also apply to external parties. Institutions must ensure that model reviews are independent and free from any undue influence, also when performed by third parties. In this respect institutions should establish independence guidelines/policies with regard to third parties and those participating in internal model tasks equivalent to the internal guidelines and rules set internally. In particular, third parties and individuals that have performed or are currently performing model development or CRCU tasks should not perform model validation tasks within the same institution until a prudent cool-off period has elapsed.[114],[115]

8.3.2 Use of external credit risk parameters/ratings

139. Although institutions are allowed to use external credit risk parameters as a component of their rating systems, the following practices should be observed:

(a) Internal ratings and estimates methodology should also take internal information into account.[116] When institutions use external ratings or parameters, they should ensure that these are incorporated in their estimation process in an appropriate manner and adjusted in accordance with the specificities of the institution.[117]

(b) Analogously to the requirements for data pooled across institutions,[118] the institution should demonstrate good knowledge of the work performed by the third party in producing the estimates. In particular, the institution should demonstrate a good understanding of the data cleansing process, assumptions used, methodological choices and resulting limitations. The institution should also monitor the performance of the rating systems involved and be able to audit them, and have clear triggers for requesting a model review.

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[114] In the case of internal outsourcing or delegation of tasks within different legal entities of the same group, “third party” refers to the unit/function that would perform the delegated tasks.

[115] In the light of Article 4(2)(c) of Commission Delegated Regulation (EU) No 2022/439, the third party may provide the institution with the information necessary to conduct the validation activities.

[116] See Article 171(2) of the CRR.

[117] See also the credit risk chapter on the use of external data.

[118] See Article 179(2) of the CRR and in particular subparagraph (e).

8.3.3 Model development and maintenance

140. When institutions delegate the development and/or maintenance of internal models, this should be done in accordance with all existing regulatory requirements and the institutions' internal guidelines and policies, also taking this guide into account. If an institution plans to delegate such tasks to a third party that would perform them outside the EU, it is encouraged to discuss this with the competent authority in advance.

141. As the ultimate model owners and users, institutions should do the following:

    (a) maintain an appropriate level of in-house knowledge (see Section 8.3.5 of this chapter);

    (b) have a robust contingency plan in place to ensure that they are prepared for the risk that could derive from insufficient maintenance of the rating systems.

8.3.4 Use of pool models

142. In accordance with Article 179(2)(d) of the CRR, an institution using pool models must remain responsible for the integrity of its rating systems. In particular, the institution is ultimately responsible for the performance of the internal validation activities as elaborated in Section 4 of this chapter.

143. To comply with the requirement to ensure integrity of the rating system specified in Article 179(2)(d) of the CRR, if deficiencies are identified in the pooled rating system at institution level, the institution should be able to independently trigger a procedure designed to amend the system, if necessary, at individual or pool level. This applies regardless of the performance of the rating system at the pool level or at the level of the other participating institutions.

144. Where a third party is involved in the tasks of developing a rating system and risk estimation for an institution, the institution should verify that the validation activities with regard to those rating system and those risk estimates are not performed by that third party. Where, for the purpose of developing a rating system and risk estimation, the institution uses data that is pooled across institutions and a third party is developing the rating system, the third party may assist the institution in its validation activities by performing those tasks of validation which require access to the pooled data.[119]

8.3.5 In-house knowledge

145. To ensure that institutions are able to identify, manage and monitor the risks connected with internal models, they should maintain adequate in-house

[119] See Article 4(3) of Commission Delegated Regulation (EU) No 2022/439.

knowledge and core competence, as they are ultimately responsible for outsourced tasks and functions. Institutions should have access to all relevant information; this will enable them to take direct control of an outsourced activity in extremis. Best practice to ensure that this in-house knowledge is maintained includes ad hoc training at all levels (not only at management level) and proper oversight of the outsourced activities.

146. In the relationship with the third party, and for the purpose of maintaining appropriate in-house knowledge and responsibilities, the ECB would consider the following practices as being advisable in the event of third-party involvement in IRB-related tasks:

    (a) the terms of the contract include transparency requirements;

    (b) the institution has full access to all relevant information regarding internal model-related topics;

    (c) the institution receives regular reports;

    (d) on request, the institution is provided with specific reports;

    (e) on request, the third party provides support and attends interviews with the competent authorities.

147. In cases where third parties are involved in model (re-)development and/or parameter (re-)calibration, to ensure that the institution maintains sufficient in-house knowledge and an adequate understanding of the rating system or that part of the rating system obtained from the third party[120], the ECB would consider the following practices as being advisable with regard to both the methodology and the data used for (re-)development and (re-)calibration:

    (a) The institution has access to all relevant information that enables it to understand the main model assumptions and risk estimation processes.

    (b) The institution has access to its own obligors' information.

    (c) In cases where pooled or external data are used for model development or calibration, the institution is able to assess to what degree the portfolio on which the model is based/developed is representative of its own portfolio, for the purposes of risk differentiation and risk quantification.

    (d) The institution has sufficient knowledge of the definition of default applied for the purposes of risk differentiation and risk quantification.

    (e) The institution has access to all necessary information to enable it to perform independent validation, including the validation of the model assumptions and performance of its own portfolio.

[120] See Article 4(1)(b) of Commission Delegated Regulation (EU) No 2022/439 and paragraph 143 of this chapter.

(f) The institution has a specific change policy in place for models developed by third parties.

(g) The institution is able to assess the need for a model change. The criteria that trigger a model change should be reflected in both the institution's model change policy and the contract with the third party, to ensure that the institution is able to make or request changes to the models.

8.3.6 Independent monitoring of third-party performance

148. To ensure that it is able to identify and manage the risks connected with internal model-related outsourced tasks, the institution should also independently monitor the performance of third parties and have appropriate processes in place in this regard. This practice reinforces the fact that the institutions are the ultimate users of the rating systems and thus have the ultimate responsibility for their operations.

149. The following are considered by the ECB as best practices with regard to monitoring third-party provisioning of external data:

(a) Similar data vetting should be performed as would be the case if the data or service were provided in-house. Data quality checks should be automated (IT/batch processes) when possible, and technical issues as well as reasonableness and consistency should be considered.

(b) Historical differences in the data provided should trigger inquiries if justified, or if there has been an error.

(c) Where external data are used, their representativeness, appropriateness and consistency with regard to the institution should be assessed.

(d) Cross-checks should be carried out between different databases (when available) or between different providers. This is a sign of consistency and robustness.

(e) SLAs/contract agreements should include the required specific key performance indicators (KPIs) and performance metrics.

(f) It should be recognised that the data quality of the information provided cannot be determined by its predictive power or by the performance of the model itself.

150. The following are considered by the ECB as best practices with regard to monitoring third-party IRB-related tasks:

(a) the same standards of monitoring and audit should be applied to external tasks as to those performed in-house;

(b) SLAs/contract agreements should include the specific KPIs and performance metrics that the service should include;

(c) specific bodies should be designated, with clear responsibilities regarding the monitoring of external IRB activities (such as a monitoring committee).

Credit risk

1 Scope of the credit risk chapter

1. The purpose of this chapter is to provide transparency on how the ECB understands a number of topics related to internal models used for the IRB approach, including an initial section covering data maintenance for this approach. It is important to note that this chapter does not aim to cover exhaustively all topics of the CRR for the IRB approach that could be subject to review during internal model investigations. On these selected topics, the chapter is aligned with the EBA Guidelines on PD and LGD.[1]

2 Data maintenance for the IRB approach

2.1 Relevant regulatory references

Table 9

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	142	(1)(1)
		144	
		174	(b)
		175	(1)
		176	
		189	(1), (2)(c)
		190	(4)
Commission Delegated Regulation (EU) No 2022/439[2]	20/10/2021	31, 32, 72, 73, 74, 75	
Other references			
Basel Committee on Banking Supervision (BCBS) 239[3]	09/01/2013	Principles 1-11	

2. In accordance with Article 144(1) of the CRR, an institution's systems for the management and rating of credit risk exposures must be sound and implemented with integrity. In particular, the institution must collect and store all relevant data to provide effective support to its credit risk measurement and

1 EBA Guidelines on PD estimation, LGD estimation and the treatment of defaulted exposures (EBA/GL/2017/16), referred to in this guide as the "EBA Guidelines on PD and LGD".

2 Commission Delegated Regulation (EU) No 2022/439 of 20 October 2022 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for the specification of the assessment methodology competent authorities are to follow when assessing the compliance of credit institutions and investment firms with the requirements to use the Internal Ratings Based Approach (OJ L 90, 18.3.2022, p. 1), referred to in this guide as "Commission Delegated Regulation (EU) No 2022/439".

3 Basel Committee on Banking Supervision "Principles for effective risk data aggregation and risk reporting", referred to in this guide as "Basel Committee on Banking Supervision (BCBS) 239".

management processes. The ECB understands that, in order to comply with these requirements, institutions should deploy robust, well-documented and adequately tested IT systems, together with sound data management practices.

3. Consequently, this section of the guide sets out the principles regarding the following elements for the management of IRB data:[4]

   (a) IT systems: infrastructure and implementation testing;

   (b) policies, roles and responsibilities in data processing and data quality management;

   (c) components of the data quality management framework.

2.2 IT systems: infrastructure and implementation testing

2.2.1 Infrastructure

4. Sound and robust IT infrastructures play an essential role in supporting the institution's rating systems. In addition, and in accordance with Article 175(1) of the CRR, institutions must document the design and operational details of their rating systems.

5. With regard to the soundness and robustness of institutions' IT infrastructure, the ECB considers that Article 75(2) and (3) of Commission Delegated Regulation (EU) No 2022/439 provides a good understanding of the elements that institutions should take into account in order to comply with the data-related requirements of the CRR.[5]

6. Furthermore, to comply with the documentation requirements for the rating systems as established under Article 144(1)(e) and Article 175(1) of the CRR, it is the ECB's view that institutions should document and keep an updated register of all current and past versions of the following elements of a rating system:

   (a) the model's data[6] flow (from data entry[7] to reporting and for both historical data and current exposure data), identifying the relevant workflows and procedures relating to data extraction, data collection, data storage and data transformations;

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4 The ECB acknowledges that there are other relevant elements of data management not covered in this guide which institutions should take into account.

5 See Articles 144(1)(d) and 176 of the CRR.

6 This refers to the model's internal data, external data or pooled data.

7 This refers to the first entry or registration of data in the institutions' systems and applications or in the core systems of the institutions where the raw data first originated.

(b) the relevant sources of data and the global map of IT systems and databases involved in the calculation systems used for the purposes of the IRB approach;

(c) the relevant functional specification of IT systems and databases, including their size, date of construction and data dictionaries, specifying the content of the fields and of the different valid data values that could be inserted in them, with clear definitions of data items;

(d) the relevant technical specification of IT systems and databases, including the type of database, tables, database management system, database architecture, and data models given in any standard data modelling notation;

(e) the audit trail for critical IT systems and databases.

To allow an independent knowledgeable third party to obtain a detailed outline of the different IT elements of the rating systems, the documentation produced by the institution should be clear and understandable.

To comply with the requirement to document its rating system and the rationale for its design,[8] the institution should keep the register of all rating systems, including all current and past versions of rating systems, updated for a period of at least three years and, whenever necessary, an extended period beyond that. This is also reflected in Article 32(1) of Commission Delegated Regulation (EU) No 2022/439. In any case, the institution should ensure that the elements mentioned in paragraph 6(a) to (e) for the current rating system are adequately recorded in the register and enable a clear understanding of all relevant data of the current rating system that must be stored by the institution.[9]

2.2.2 IT implementation of a new model or model change

7. When applying for an initial model approval or for roll-out of the IRB approach, the institution should provide evidence that it has implemented the proposed model into a live[10] or, if duly justified, non-live production environment[11]. In particular, this means that the institution:

(a) is able to produce risk parameter estimates for exposures in the scope of application;

(b) has successfully completed IT user acceptance tests;

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8 See Article 144(1)(e) of the CRR.

9 See Articles 144(1)(d) and 176 of the CRR.

10 In other words, a complete version of the IT environments described in paragraphs 7(a) to (f), where the institution will in fact implement the model and produce COREP reporting on the basis of the IRB approach once initial permission is granted.

11 The non-live production environment should be understood in this context as a parallel version of a live production environment that is already in place, as described in paragraph 8.

(c) is able to calculate under the IRB approach the own funds requirements resulting from its risk parameters estimates;

(d) is able to submit the respective COREP reporting (Article 144(1)(g) of the CRR);

(e) is able to use the model for internal risk measurement and management purposes;

(f) is ready to introduce a reporting system based on the risk parameters produced by the model.[12]

8. When applying for a material model change, the institution should provide evidence that it is able to provide a new version of the relevant IT systems ready to be put into production once the change is approved (i.e. when applying for a material model change, it should also be able to fully replicate the execution of the model and the calculation of own funds requirements according to the model change in a non-live production environment, fulfilling the points set out in paragraphs 7(a) to (f) above). In addition, it should be able to demonstrate that it has set up an appropriate process to ensure that the full IT implementation would be completed successfully with regard to the date of implementation of the changed model, in accordance with the principles set out in paragraph 26 of the general topics chapter.

2.2.3 Implementation testing

9. In order to ensure the integrity and robustness of IT systems[13] and in particular that, in terms of IT, the implementation of the models is successful and error-free, institutions should have in place a consistent process for testing the relevant IRB systems and applications upon first implementation and on an ongoing basis. This IT-testing process should be clearly defined and documented in an organisation-wide policy and procedure.

10. To achieve its objective the policy should consider all potential events that should trigger a testing procedure and their impact on the tests to be conducted. The trigger events that should be considered include: software releases or material IT-related changes, regulatory changes, model methodology changes and the extension of the range of application of a rating system.

11. IT implementation tests to be considered include the following:

(a) unit/component/module tests;

(b) integration tests (of units and between systems);

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12 This paragraph concerns only purely IT-related aspects. Please refer to Sections 3.4 and 6 of the general topics chapter of this guide for concrete expectations on model use/reporting topics.

13 See Article 144(1) of the CRR.

(c) system tests (this includes functionality, performance – in normal and stress scenarios – and security and portability tests);

(d) user acceptance testing (functional testing);

(e) regression testing.

12. In principle, the unit(s) responsible for performing the implementation tests should be clearly identified and the results of the tests should be documented. It is the ECB's view that as a general rule institutions should develop a standardised format for the documentation of test results.

2.3 Policies, roles and responsibilities in data processing and data quality management

13. For institutions to be able to comply with the requirement to collect and store all relevant data established under Article 144(1)(d) of the CRR, it is the ECB's understanding that policies and rules on data management should be defined at group level[14] for both of the following aspects: data processing (i.e. data collection, storage, validation, migration, actualisation and use), and data quality management (see Section 2.4 of this chapter).

14. As for data processing, and in particular with regard to manual interventions and data transfers, the following principles should be considered:

(a) to ensure that all data transformations are traceable and controlled, general guidelines and rules should be clearly formalised with regard to manual interventions within the data processing;

(b) to ensure timeliness and accountability, all data transfers should be formally agreed upon (for example by means of service level agreements) by data providers and data users (for both outsourced and in-house processes).

15. To ensure the integrity of the data processes, the policies and rules on data management should clearly set out the relevant data governance arrangements. It is also expected that these policies and rules will specify the different roles and responsibilities assigned to data management. These include data quality roles and responsibilities for both business owners and IT functions and data and systems ownership throughout the entire credit risk modelling life cycle (including all IT systems used). These policies should take into account the following principles.

(a) The responsibilities of business owners include:

[14] See Section1.2 of the general topics chapter for the definition and implementation of group-wide principles and guidelines.

(i) ensuring data are correctly entered, kept up to date and aligned with the institution's data definitions;

(ii) ensuring that data aggregation capabilities and reporting practices are consistent with the institution's policies.

(b) IT functions are responsible for supporting the operation of the systems for data collection, processing, transformation, storage and availability during the entire life cycle of the data.

(c) Different business owners and IT systems owners may be appointed throughout the data life cycle. However, each data source, IT system and process step should have an assigned business owner and/or IT systems owner that can be formally identified.

2.4 Data quality management framework

16. Institutions must have in place a process for vetting data inputs into the model. This must include an assessment of the accuracy, completeness and appropriateness of the data.[15] To comply with this requirement and to ensure the quality of the data used for credit risk measurement and management processes, it is the ECB's view that institutions should establish and implement an effective data quality management framework that is formalised in a set of policies and procedures. This framework should be applicable to all data used in IRB-related processes, i.e. internal data, external data and pooled data, if any. In addition, it should ensure that reliable risk information is available to enable an institution's risk profile to be assessed accurately and drive sound decision-making within the institution and by external stakeholders, including competent authorities.

17. The ECB considers that the data quality management framework is effective when it encompasses the following components:

(a) sound underlying governance principles (see Section 2.4.1 of this chapter), particularly those relating to the allocation and fulfilment of roles and responsibilities for the management of data quality in a manner that ensures that data quality management activities are independent of data processing activities;

(b) a description of the scope in terms of risk data coverage (see Section 2.4.2);

(c) data quality standards covering all relevant data quality dimensions, i.e. completeness, accuracy, consistency, timeliness, uniqueness, validity, availability and traceability (see Section 2.4.3);

[15] See Article 174(b) of the CRR.

(d) consistent criteria and a systematic metrics approach to assess compliance with data quality standards; this should be supported by sufficient data quality controls along the entire IRB data chain (see Section 2.4.4);

(e) procedures for constantly assessing and improving the quality of data (see Section 2.4.5);

(f) reporting procedures on data quality allowing for sufficient understanding of the quality of the data supporting the IRB models (see Section 2.4.6).

The following sections further develop the above-mentioned elements.

2.4.1 Governance principles for the data quality management framework

18. The data quality management framework:

(a) should be approved by the institution's management body or a designated committee thereof and senior management as part of their responsibilities;

(b) should be distributed throughout the organisation to the relevant staff;

(c) should be regularly assessed in order to verify its adequacy, and be updated and improved whenever necessary;

(d) should be subject to regular review by the internal audit function or another comparable independent auditing unit.[16]

19. The roles of the different units, internal bodies and staff involved in the data quality management process should be defined in such a way as to ensure that the data handling process is sufficiently independent of the data quality management process.

20. The ECB considers it best practice for institutions to have a dedicated independent unit with an overall view of and responsibility for the management of data quality. Where an independent unit is established, the size of this unit should be proportionate to the nature, size and degree of complexity of the institution's business and organisational structure.

2.4.2 Scope of the data quality management framework

21. The data quality management framework:

[16] For further details on the review of the rating systems by internal audit, see Section 5 of the general topics chapter of this guide.

(a) should cover all relevant data quality dimensions: completeness, accuracy, consistency, timeliness, uniqueness, validity, availability and traceability (see paragraph 16);

(b) should cover the whole data life cycle, from data entry to reporting, and encompass both historical data and current application databases.

22. If institutions use data provided by third parties, the ECB considers it best practice for them to ensure that the third party has data quality processes in place to ensure the accuracy, completeness and appropriateness of the data provided.[17]

2.4.3 Data quality standards in the data quality management framework

23. In accordance with Article 174(b) of the CRR, institutions must implement a process for vetting data inputs into the model which must include an assessment of the accuracy, completeness and appropriateness of data. The ECB understands that, in order to comply with this requirement, institutions should establish data quality standards that set the objectives and overall scope of the data quality management process. To this end, these standards should be defined for the following data quality dimensions[18] for all data inputs into the model and at each stage of the data life cycle:

(a) completeness (values are present in any attributes that require them);

(b) accuracy (data are substantively error-free);

(c) consistency (a given set of data can be matched across the institution's different data sources);

(d) timeliness (data values are up to date);

(e) uniqueness (aggregate data are free from any duplication arising from filters or other transformations of source data);

(f) validity (data are founded on an adequate and rigorous classification system that ensures their acceptance);

(g) availability/accessibility (data are made available to the relevant stakeholders);

(h) traceability (the history, processing and location of the data under consideration can be easily traced).

17 See Article 174(b) of the CRR.

18 It is the ECB's view that the CRR reference to appropriateness of data inputs encompasses the following additional data quality dimensions: consistency, timeliness, uniqueness, validity, availability/accessibility and traceability.

2.4.4 Data quality controls

24. Data quality should be measured in an integrated and systematic way. The measurement system and the frequency of its application should be formalised.

25. Indicators and their corresponding tolerance levels and thresholds should be set in order to monitor compliance with the standards established and should be combined with visual systems (e.g. red/amber/green traffic-light system) and dashboards for monitoring and reporting purposes.

26. Indicators should be supported by effective and sufficient data quality checks and controls throughout the data life cycle, from data entry to reporting, and for both historical data and current application data. Data quality checks and controls should include reconciliation across and within systems, including between accounting and IRB data. An effective control framework should therefore be in place to ensure that sound controls and related procedures are implemented, especially for manual processes.

2.4.5 Remediation of data quality issues

27. A process for the identification and remediation of data quality deficiencies should be in place in order to constantly improve data quality and promote compliance with the data quality standards.

28. Data quality assessments should be carried out independently (see paragraphs 19 and 20) and recommendations should be issued with an indication of their priority, based on the materiality of the incidents identified. All such data quality incidents should be recorded and monitored. For each of the data quality incidents, an owner responsible for resolving the incident should be appointed and an action plan for dealing with the incident drawn up on the basis of the priority assigned. Remediation timelines should depend on the severity and impact of the incident and the implementation timelines required to resolve it. Data quality incidents should be resolved at source level[19] or, if this is not possible, mitigated by taking a prudent approach.

2.4.6 Data quality reporting

29. In accordance with Article 189(2)(c) of the CRR, the institution's senior management must ensure, on an ongoing basis, that the ratings systems are working properly. To accomplish this, the ECB understands that a formal reporting process on the quality of risk data should be in place with the objective of improving the quality of data and enabling an assessment of the potential impact of data quality in own fund requirements calculations. In

[19] From the source system in which the incidents are present down to the IRB datasets or systems.

general, this reporting should be presented in a standardised format with clear and concise content, including the following:

(a) a comprehensive overview of the performance of the model in terms of data quality, including external data and pooled data, if any, at all stages of the IRB life cycle, from data entry to reporting, for both historical data and current exposure data;

(b) findings and, where applicable, recommendations to address detected weaknesses or shortfalls;

(c) sufficient and appropriate evidence that the recommendations have been adequately addressed and properly implemented (e.g. by means of a status report).

30. In accordance with Article 189(1) of the CRR, the management body or a designated committee thereof and senior management must possess a general understanding of the rating systems of the institution and a detailed comprehension of its associated management reports. To comply with this requirement, the ECB understands that reports on the quality of risk data should be submitted to these parties. In addition, the ECB considers it best practice for these reports to also be submitted to all other relevant staff, including modellers, internal validation, internal audit, data quality managers, data owners and other business units involved.

31. Data quality reports should be produced and submitted to senior management more frequently than annually to enable senior management to ensure, on an ongoing basis, that the rating systems are operating properly in accordance with Article 189(2)(c) of the CRR.

3 Use of data

3.1 Relevant regulatory references

Table 10

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	144	(1)(d)
		171	(1)(a), (b)
		172	(3)
		174	(b), (c), (e)
		176	
		178	(4)
		179	(1)(a), (c), (d), (2)(a), (b)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	42, 45, 47, 53	
EBA Guidelines on PD and LGD	20/11/2017		15-35

32. In accordance with Article 144(1)(d) of the CRR, institutions must collect and store all relevant data to provide effective support to their credit risk measurement and management processes. Furthermore, good data quality is a fundamental condition for developing a robust rating system. The ECB considers that, to comply with these requirements and ensure the quality of data, institutions should have sound policies, processes and methods in place, under paragraphs 15 to 34 of the EBA Guidelines on PD and LGD for assessing and improving the quality and representativeness of the data used in the modelling and risk quantification process.

33. Since the data-related requirements of the CRR also apply in cases where an institution estimates CCFs, paragraph 32 is also relevant for such institutions.

3.2 Use of external data

34. Data-related requirements established under the CRR apply to all data: internal, external or pooled. In the ECB's understanding, therefore, paragraph 32 is also relevant in the event that an institution uses external or pooled data. The principles on the collection and storage of data are relevant to the institutions' own data and to the data received from the pool.

35. To ensure that credit risk management and measurement processes are built on appropriate data, for the purposes of risk differentiation, risk quantification and review of estimates institutions should assess whether external data can be used to complement internal data when they consider they do not have sufficient available internal data.

36. In addition, when institutions use different data sources (including different external databases, whether or not combined with internal data) for the purpose of risk quantification, there could be a risk that the sources include common obligors among the data sources used for risk quantification. This could lead to bias or double-counting effects in the calculation of one-year default rates. To avoid this risk, institutions should develop the necessary processes in order to identify common obligors within these databases and ensure that each common obligor is only taken into account once in the calculation of one-year default rates.[20] When institutions are not able to identify common obligors, they should analyse potential bias or double-counting effects in the calculation of one-year default rates. These bias or double-counting effects should be reflected appropriately in the computation of one-year default rates and long-run average (LRA) default rates.

37. If an institution uses statistical models and other mechanical methods to assign exposures to obligors or facilities grades or pools, the data used to build the model must be representative of the population of the institution's actual obligors or facilities.[21] If external data are used, the same requirements with regard to representativeness[22] must be applicable vis-à-vis the bank's portfolio or portfolio subset for which the external data are used.

38. Proving representativeness in cases where an institution uses external data is generally more difficult, as internal data are scarce. If an institution cannot provide sufficient proof that the external data are representative, in the ECB's view it may still use external data if it shows (by quantitative analysis and/or qualitative argumentation) that the information gained from the use of the external data outweighs any drawbacks stemming from the deficiencies identified. For this purpose, institutions should provide evidence that the model's performance does not deteriorate when information derived from the external data is included, that the parameter estimates[23] are not biased and that an appropriate margin of conservatism (MoC) is applied. To assess these issues, the institution should conduct quantitative and qualitative analyses specifically designed for this purpose.

39. In accordance with Article 174(b) of the CRR, if an institution uses statistical models and other mechanical methods to assign exposures to obligors or facilities grades or pools, it must have in place a process for vetting data inputs to the model, which should include an assessment of the accuracy, completeness and appropriateness of the data. In addition, and in accordance with Article 179(1)(a), in quantifying the risk parameters to be associated with rating grades or pools institutions must incorporate all relevant data, information and methods. To comply with these requirements, institutions should ensure that, when external data are used for risk differentiation, risk quantification or

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20 If the default identification is at the level of an individual credit facility rather than at obligor level, this principle will not be relevant.

21 See Article 174(c) of the CRR.

22 As established under Articles 174(c) and 179(1)(d) of the CRR.

23 See paragraph 126 for the PD risk parameter.

review of estimates, they know the data sources and the most relevant data processing operations of the variables acting as direct model inputs performed by the data provider. Institutions should be able to differentiate between internal and external data and to document which information is internal and which information is received from external data sources. To ensure that the data remain appropriate, institutions should provide an adequate rationale in the event that, for the purpose of risk differentiation, risk quantification or review of estimates, they modify the external data acquired, select only part of a wider external database or use different external providers.

3.3 Use of external bureau scores or external ratings as input variables in the rating process

40. Where an institution uses external credit bureau scores or external ratings as input variables in the rating process, and in particular when externally sourced scores are the main (or one of the main) input variable(s) of the overall internal rating, there is a risk that an internal model may not consider all relevant information. In the ECB's understanding, institutions mitigate this risk when they comply with the following principles.

    (a) The external scores or ratings and/or data are regularly updated or refreshed, especially where credit bureau information is dynamic and is used not only for the application rating but also for the ongoing behavioural rating.

    (b) Institutions understand the structure and nature of external scores or ratings and their key drivers. They also regularly verify that the results of the credit bureau score continue to be appropriate input variables in their credit rating process, for example by reviewing any changes in the credit bureau score methodology. The greater the importance of the external scores or ratings, the greater understanding institutions should demonstrate of their structure, nature and key drivers and the higher the frequency that should be considered in monitoring the appropriateness of these external scores or ratings.

    (c) Validation requirements are similar to those applied to other internal and external input variables.

    (d) Even when the external score or rating is the main (or one of the main) driver(s) of the internal rating, the institution ensures that all relevant internal information regarding the creditworthiness of the obligor is taken into account with sufficient weighting in the internal rating. In addition, the institution demonstrates that the additional relevant internal information considered in the model and its weighting are sufficient to ensure that the internal rating does not merely take on the results of the external bureau scores or the external ratings used.

(e) When institutions make use of external scores or ratings or any other judgement-based assessment provided by a third party as input variables in the rating process, they should ensure that any potential correlation between the relevant risk drivers does not lead to bias or a double-counting effect in the risk parameter estimates. This can be especially relevant in these cases, due to the potential use of duplicated information.

(f) The institution remains responsible for the performance of the model.

3.4 Use of pooled data[24]

41. The use of pooled data is treated similarly to the situation where internal data are combined with data derived from a different (and external) set of obligors or facilities, as mentioned in Section 3.2.

42. In accordance with Article 179(2)(a) of the CRR, where an institution uses data that are pooled across institutions the rating systems and criteria of other institutions in the pool must be similar to its own. To comply with this requirement an institution should, among other things:

(a) ensure that there is a common definition of the key drivers and processes;

(b) ensure that policies and procedures considered for human judgement, including overrides[25], can be applied in a comparable and similar manner across all participating institutions.

3.5 Use of purchased rating systems or models (pool models[26] [27])

43. In accordance with the last sentence of Article 144(1) of the CRR, the requirements to use an IRB approach, including own estimates and CCFs, apply also where an institution has implemented a rating system, or model used within a rating system, that it has purchased from a third-party vendor. To comply with this provision, institutions should ensure in such cases that all relevant internal information for model development and parameter calibration is taken into account. In particular, LRAs of default rates, LGD and CCFs based only on internal data should always be computed and considered for calibration. The institution remains responsible for the performance of the rating system or model.

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24 The paragraphs below are also relevant in cases where institutions use pooled data from institutions belonging to the same banking group.

25 Article 172(3) of the CRR.

26 A “pool model” is deemed to be a model where institutions develop a shared or common rating model based on pooled data which is then applied by each participating institution to its portfolio(s). Institutions which pool their data may work together very closely, disclosing to each other more information than simply publicly available external data, and even sharing the same rating and validation processes.

27 The paragraphs below are also relevant in cases where institutions use pooled data that are generated from institutions belonging to the same banking group.

44. In addition, to ensure the integrity of the rating systems or internal models when institutions make use of pool models, and to comply with Article 144(1) of the CRR, the principles set out below should be followed.

    (a) If PD estimates are calculated using pooled data, institutions should verify that the data used for risk quantification meet the data requirements for default rate calculation as clarified in paragraph 121 below, or that the data are adjusted accordingly.

    (b) Where several institutions use a common pool model, each should ensure that its rating process is aligned to the extent that all input risk drivers are defined in the same way across all participating institutions. The institutions should also ensure that all assessments of the qualitative components of the rating model are performed in a comparable manner.

    (c) If a pool model is used for the estimation of risk parameters and the model-relevant parts of the process for managing distressed obligors (including the strategy before and after default) of the participating institutions are not aligned, these differences should be appropriately taken into account within the model or through an appropriate adjustment, in accordance with paragraph 37(a)(viii) of the EBA Guidelines on PD and LGD. In the case of a pool model for the estimation of LGD parameters, differences in the model-relevant parts of the workout processes should also be taken into account within the model or through an appropriate adjustment.

    (d) Institutions should ensure that all relevant internal information with respect to the creditworthiness of an obligor is taken into account and the rating is updated with new information in a timely manner.

    (e) Each institution should remain responsible for the performance of the rating model on its own portfolio.

45. To ensure that its ratings systems are operating properly on an ongoing basis, if an institution introduces systematic adjustments to the outputs of the pool model, the institution concerned should initiate internal procedures to analyse whether significant weaknesses in the model exist and whether a model change needs to be triggered.

3.6 Use of human judgement

46. In accordance with Article 171(1)(a) of the CRR, institutions must have specific definitions, processes and criteria for assigning exposures to grades or pools. The grade and pool definitions must be sufficiently detailed. To comply with this provision, institutions should ensure that, when human judgement is used in the assignment of exposures to grades or pools, there is a framework in place that establishes clear and detailed guidelines and procedures on the application of human judgement (e.g. through the use of pre-defined questionnaires). The use

of human judgement should be documented in a way that ensures the rating assignment can be understood and replicated by a third party.[28] To ensure the replicability and consistency of the rating assignment process, the principles set out below should be followed.

(a) The basic structure of the model[29] should be applied consistently and not modified by human judgement. It should, in particular, consist of:

(i) the minimum data sources to be used for the grade/pool assignment;

(ii) the complete list of pre-defined risk drivers which need to be assessed individually and for which the assessments need to be stored;

(iii) the importance of and the evaluation criteria for the risk drivers, particularly the functional relationship[30] between risk drivers and the assigned rating (before overrides);

(iv) the procedures and steps to be followed during the assessment, including the steps where overrides can be applied.

(b) Institutions should assess the consistency of the rating assignment process. To this end, they should define the tests and analyses in a way that is proportionate to the degree of human judgement applied. In cases where human judgement is the main component of the rating assignment process, these tests should at least include an analysis of consistency in a representative sample by having obligors re-rated independently by different analysts. The results of the ratings consistency assessment should be analysed against pre-defined thresholds as part of the framework for review of estimates.

47. In accordance with Article 172(3) of the CRR, for grade and pool assignments institutions must document the situations in which human judgement may override the inputs or outputs of the assignment process and the personnel responsible for approving these overrides. In the context of this requirement, the ECB understands that an override is a judgement-based and discretionary action that contributes to the assessment of the obligor's creditworthiness as obtained through pre-defined components of the rating system. These comprise both automatic/quantitative components[31] and qualitative variables[32]. An override constitutes a direct intervention to an input or to an intermediate[33] or

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28 Article 171(1)(b) of the CRR.

29 This concept is not intended to refer to pure statistical models and can encompass other methods for assigning exposures to grades or pools.

30 This refers to a relationship between different variables in order to form an output (and not necessarily a mathematical formula).

31 These components also include the "forcing rules", i.e. automatic adjustments to the rating carried out when certain conditions apply (e.g. more than 30 days past due).

32 As referred to in paragraph 201(a) of the EBA Guidelines on PD and LGD.

33 Intermediate outputs should be defined in the model specifications (e.g. results of the financial scorecard of a model).

final output of the rating assignment process, through an adjustment or replacement of that input or intermediate/final output which is obtained under the regular assignment process. Overrides should be limited to information relevant to the obligor's creditworthiness, if this is not captured well by the pre-defined components of the model.[34]

48. Within a rating assignment process, the use of pre-defined risk drivers in the form of qualitative model inputs should be distinguished from overrides. These judgement-based or qualitative variables are expected to be considered under the regular assignment process and as part of the pre-defined components of the rating system. Therefore, they are not themselves considered as overrides.[35]

49. Whenever the functional relationship between the risk drivers and the assigned rating as specified in paragraph 46(a)(iii) is circumvented, for example in cases where the last-assigned rating deviates from the rating that would be assigned on the basis of this functional relationship, it is considered to be an override. For the purposes of Article 172(3) of the CRR, it should therefore be specified in the policies and criteria for the use of overrides in the rating assignment process.

50. In accordance with Article 174(e) of the CRR, the results of the statistical model must be complemented by human judgement, especially by taking into account all information not included in the model. The higher the number of relevant observations, the more the institution should rely on the outcomes of the statistical model.

51. In addition, when human judgement is used for the purpose of model development, for example in setting the model's assumptions, the identification of risk drivers and determination of their weights, or the identification and combination of model components, there is a risk of the model-based assignments being inaccurate.[36] To mitigate this risk, institutions should ensure that the incorporation of human judgement is appropriately managed and proportionate to the number of relevant available observations.

52. For the purposes of quantifying the risk parameters to be associated with grades or pools, estimates must not be based purely on judgemental considerations.[37] To this end, where human judgement is used to a greater extent because of the low number of relevant available observations, institutions should apply a higher MoC to their estimates to account for additional uncertainty.

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34 This also applies to climate-related and environmental risks. Where climate-related and environmental risk drivers are assessed to be relevant and material and institutions do not have sufficient information related to these risk drivers, institutions should consider whether it would be appropriate to take a more conservative approach in the assignment of ratings to the related facilities or obligors by applying an override to the final output of the rating assignment process.

35 However, these qualitative input variables can be subject to overrides in accordance with paragraph 201(b) of the EBA Guidelines on PD and LGD.

36 Article 174(e) of the CRR.

37 Article 179(1)(a) of the CRR.

53. In addition, whenever human judgement is used in the estimation of risk parameters (for either risk differentiation or risk quantification purposes) institutions are expected to have in place a framework under paragraph 35 of the EBA Guidelines on PD and LGD.

3.7 Use of data in the case of consolidations

54. Consolidations, i.e. mergers and acquisitions, frequently lead to the acquirer's IRB models being extended to the target's portfolios. In such cases, the ECB understands that the combined default and loss histories of the acquirer and the target should be used to calibrate the IRB models following the extension.[38]

55. In particular, for loss data, where the acquiring bank's workout processes are different from those of the acquired bank, the acquiring bank should apply paragraphs 33 and 38 of the EBA Guidelines on PD and LGD. However, in line with paragraph 163 of the EBA Guidelines on PD and LGD, it is the ECB's understanding that the defaults relating to the acquired bank's portfolio should not be excluded.

56. Where the acquirer does not automatically have the legal right to access the default and loss histories of the acquired portfolios (e.g. in the case of a portfolio acquisition), the acquirer should nevertheless make reasonable efforts to acquire these data.

57. Where the acquirer has not been able to access the default and loss histories of the acquired portfolios or where the default and loss histories are limited in scope, length or quality, and where the acquirer cannot prove that the inability to access this data does not lead to bias, the acquirer should consider this as a data deficiency and apply an appropriate adjustment and MoC accordingly.

[38] Where the acquirer can show – by back-testing best estimates of risk parameters (excluding the MoC and downturn adjustment where applicable) in a way that includes the historical data of the target – that the risk parameters are still conservative, an immediate recalibration is not required. However, when checking whether the inclusion of recent data would have an impact on the calibration as part of the regular review of estimates, the historical and recent data of the target should be included in the analysis. Likewise, any further calibrations should be based on all data.

4 Definition of default

4.1 Relevant regulatory references

Table 11

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	178	(1), (2), (3), (4), (5)
Commission Delegated Regulation (EU) No 529/2014	12/03/2014	4	
		Annex I, Part II, Section 1(3)	
Commission Delegated Regulation (EU) No2022/439	20/10/2021	26, 27, 28, 29	
ECB Regulation on discretion on materiality threshold[39]	26/11/2018	3	
Corrigendum to the ECB Regulation on discretion on materiality threshold[40]	08/07/2020		
ECB Regulation on options and discretions[41]	24/03/2016	4	
EBA Guidelines on DoD[42]	28/09/2016		16-114
EBA Guidelines on PD and LGD	20/11/2017		23, 34, 36, 37, 38
EBA Guidelines on SRT[43]	07/07/2014		

58. Article 178(1) of the CRR gives a definition of default to be considered for risk quantification under the IRB approach.

59. According to Article 178(1) and (2)(d) of the CRR in conjunction with Article 3 of the ECB Regulation on discretion on materiality threshold and Article 4 of the ECB Regulation on options and discretions, a default must be considered to have occurred with regard to a particular obligor when either or both of the following have taken place:

    (a) the institution considers that the obligor is unlikely to pay its credit obligations to the institution, the parent undertaking or any of its subsidiaries in full, without recourse by the institution to actions such as realising security ("unlikeness to pay" criterion);

39 Regulation (EU) 2018/1845 of the European Central Bank of 21 November 2018 on the exercise of the discretion under Article 178(2)(d) of Regulation (EU) No 575/2013 in relation to the threshold for assessing the materiality of credit obligations past due (ECB/2018/26) (OJ L 299, 26.11.2018, p. 55), referred to in this guide as the "ECB Regulation on discretion on materiality threshold".

40 Corrigendum to Regulation (EU) 2018/1845 of the European Central Bank of 21 November 2018 on the exercise of the discretion under Article 178(2)(d) of Regulation (EU) No 575/2013 in relation to the threshold for assessing the materiality of credit obligations past due (ECB/2018/26) (Official Journal of the European Union L 299 of 26 November 2018) (OJ L 217 08.07.2020, p. 8), referred to in this guide as the "Corrigendum to the ECB Regulation on discretion on materiality threshold".

41 Regulation (EU) 2016/445 of the European Central Bank of 14 March 2016 on the exercise of options and discretions available in Union law (ECB/2016/4) (OJ L 78, 24.3.2016, p. 60), referred to in this guide as the "ECB Regulation on options and discretions".

42 EBA Guidelines on the application of the definition of default under Article 178 of Regulation (EU) No 575/2013 (EBA/GL/2016/07), referred to in this guide as the "EBA Guidelines on DoD".

43 EBA Guidelines on Significant Credit Risk Transfer relating to Articles 243 and Article 244 of Regulation 575/2013 (EBA/GL/2014/05), referred to in this guide as the "EBA Guidelines on SRT".

(b) the obligor is more than 90 consecutive days past due on any material credit obligation to the institution, the parent undertaking or any of its subsidiaries ("days past due" criterion), considering that a credit obligation past due is material when it:

(i) exceeds €100 if it is a retail exposure or €500 if it is an exposure other than retail exposure; and

(ii) represents more than 1% of the total amount of all on-balance sheet exposures to that obligor for the credit institution, the parent undertaking or any of its subsidiaries, excluding equity exposures.

4.2 Consistency of the application

60. Where the definition of default is applied at obligor level, both the days past due criterion and the unlikeness to pay criterion must be assessed with regard to all exposures of an obligor to the institution, the parent undertaking or any of its subsidiaries. This implies that, for a banking group, all information about the different exposures and the behaviour of the obligor across the banking group must be consolidated. This also applies in cases where the definition of default is applied at the level of an individual credit facility for those subsets of indications of unlikeness to pay that are related to the condition of the obligor rather than the status of a particular exposure e.g. bankruptcy status. A certain degree of leeway is granted with regard to the implementation of this group-wide view in identifying defaults, as described in paragraphs 81 and 82 of the EBA Guidelines on DoD.

61. Paragraph 82 of the EBA Guidelines on DoD acknowledges that mechanisms or procedures for the consistent identification of the default of an obligor need not be applied if it is too burdensome for institutions to verify the status of a client in all legal entities and at all geographical locations within the group. In such a case, institutions may not perform the check for consistency if they can demonstrate that the effect of non-compliance is immaterial because there are no or a very limited number of common clients among the relevant entities within a group and the exposure to these clients is immaterial. With a view to operationalising paragraph 82 of the EBA Guidelines on DoD, the ECB understands that it is best practice for the institution to have a regular process for monitoring common obligors so as to ensure on a regular basis that the conditions set out in paragraph 82 (continue to) apply. As a minimum, it is the ECB's understanding that the following points should be documented in the internal policies of the institution regarding this monitoring process:

(a) all assumptions made for the purpose of the regular analysis of common obligors should be clearly stated (in particular for the correct identification of common obligors across legal entities or geographies);

(b) the levels of the thresholds according to which the number of common obligors is deemed very limited and their exposure is deemed immaterial should be clearly stated, justified (at least qualitatively) and reasonable;

(c) the actions to be taken when the aforementioned thresholds are breached should be clearly described;

(d) the frequency of the monitoring process should be commensurate with the share of common obligors evaluated in both numbers and exposures, and in all cases should be no less than annual.

62. The materiality thresholds for the purpose of the definition of default applied by an institution outside the SSM area and a parent significant institution may be different, even if both belong to the same banking group, because a materiality threshold which differs from the one set by the ECB may apply under national law outside the SSM area. This scenario is one of those addressed by paragraphs 83 to 85 of the EBA Guidelines on DoD. Without prejudice to the provisions set out in the previous paragraph, if an obligor has exposures under both SSM and non-SSM jurisdictions, institutions should check both the ECB materiality threshold and the materiality threshold (if any) applicable in the other jurisdiction. The default will be triggered in the jurisdiction where the materiality threshold, computed on the basis of consolidated exposures and arrears, is first exceeded for more than 90 consecutive days, and institutions are then expected to apply additional unlikely to pay triggers, making use of the provisions set out in paragraph 58 of the EBA Guidelines on DoD, to achieve a consistent default status across all jurisdictions.

63. Paragraphs 95 to 105 of the EBA Guidelines on DoD clarify the treatment of joint credit obligations when the definition of default is applied at obligor level for retail exposures. In the ECB's understanding, it is best practice for institutions to foster consistency within the process related to the default identification by also applying these requirements to joint credit obligations[44] involving non-retail exposures.

64. Institutions should distinguish the concept of joint credit obligation from the concept of exposure secured by another individual or entity. In the latter case, if the guarantor has to step in to make payments not made by the obligor, then the obligor should be classified as defaulted because it failed to repay the credit obligation without recourse by the institution to the guarantor. Instead, in the case of a joint credit obligation, the joint obligor should be treated as a different obligor from each of the individual obligors, and the fact that one individual obligor pays the joint obligation in full does not lead to the automatic classification of the other individual obligor as defaulted. From a risk quantification perspective, since the joint obligors should be counted as separate obligors, a default on a joint credit obligation should be counted separately from the default of individual obligors in the default time series. Since defaults on joint obligors and related individual obligors will be correlated to

[44] As defined in paragraph 96 of the EBA Guidelines on DoD.

some extent, institutions should ensure this does not lead to biased results or wrong conclusions during the development or the validation of the PD model where one-year default rates are computed, particularly if this correlation implies a violation of the assumptions required by the underlying statistical methodologies (e.g. in the validation of model performance) under Article 180(1)(d) of the CRR.

4.3 Days past due criterion

65. The days past due criterion applies to all exposures, irrespective of their related repayment scheme and features. If an obligor holds products envisaging small interest payments compared with the outstanding exposures (e.g. bullet loans or interest-only mortgages) and becomes past due, then several missed payments would be needed to exceed the relative component of the materiality threshold and eventually trigger the default according to the past due criterion. Institutions that wish to anticipate the default recognition for this type of product should define appropriate additional indications of unlikeness to pay.

66. When the days past due criterion is met, institutions should classify the exposures to defaulted status without further ado. This means that at the onset of the 91st consecutive day after the materiality threshold is exceeded for the first time, the institution should activate the default flag for all affected exposures. Moreover, it is the ECB's understanding that the days past due criterion is driven by the exact number of days in which material past due amounts are present. Therefore, proxies in which defaults are triggered, for example, after three months of missed payments or three missed monthly payments ("months in arrears" approach) are not considered an appropriate implementation of this criterion.

67. The days past due criterion where the definition of default is applied at obligor level may, in some cases, lead to a default being identified despite no individual exposures being more than 90 consecutive days past due. This could happen, for instance, if an obligor repays some material past due exposures, but the number of days past due at obligor level keeps increasing – instead of being reset – because there are other material exposures that are just a few days past due at facility level. In that case, a default should be triggered when the counter at obligor level reaches 90 consecutive days, even if the remaining material exposures could be less than 90 consecutive days past due at facility level. However, in the specific case of factoring arrangements where the purchased receivables are recorded in the balance sheet of the institution, if the counter at obligor level reaches 90 but none of the receivables to the obligor is more than 30 consecutive days past due at facility level, then this should be recognised as a technical past due situation according to paragraph 23(d) of the EBA Guidelines on DoD and the default should not be triggered. In such a case, the counters at obligor and facility levels keep running (unless the obligor repays past due exposures) and default is triggered as soon as one receivable is more than 30 consecutive days past due.

68. If the past due amounts cease to be material then the counting of days past due is reset and if the default trigger represented by the days past due criterion was active, it ceases to apply. Past due amounts may cease to be material as a result of repayments from the obligor but also in cases where the obligor has an exposure of up to €50,000 and switches from retail to non-retail classification[45].

69. The absolute component of the materiality threshold set in the ECB Regulation on discretion on materiality threshold is expressed in euro and therefore institutions should convert all the relevant amounts to euro when applying the materiality threshold. For this purpose, significant institutions should convert exposures to euro using the exchange rate quoted every day in order to count the number of days that the threshold is exceeded and determine the exact day when default is triggered.

70. Institutions should recognise as a credit obligation past due any amount of principal, interest or fee that has not been paid at the date it was due in line with paragraph 16 of the EBA Guidelines on DoD. Fees in this context include maintenance fees for deposit accounts that remain unpaid because the accounts are empty. Written-off amounts should not be considered in the calculation of the obligor's total and past due exposures when assessing the materiality threshold, but institutions should assess, whenever a write-off occurs, whether this qualifies as an indication of unlikeness to pay according to paragraphs 36 to 40 of the EBA Guidelines on DoD.

71. Paragraph 19 of the EBA Guidelines on DoD describes the situation where repayment is subject to a dispute between the obligor and the institution, while paragraph 20 describes the situation of a merger between two obligors. In particular, for disputes, it is up to the institution to decide whether counting is suspended and whether the suspension is followed by an assessment of indications of unlikeness to pay. By contrast, the institution should always verify the presence of indications of unlikeliness to pay in cases where a payment is suspended by law or the obligor exercises a contractual right to suspend the payment as set out in paragraphs 17 and 18 of the EBA Guidelines on DoD.

72. In line with paragraph 21 of the EBA Guidelines on DoD, the calculation of the sum of all amounts past due should be performed with a frequency allowing timely identification of default. In any case, where the institution calculates days past due less often than daily, it should ensure that the date of default is identified as the date when the past due criterion has actually been fulfilled. In other words, the calculation of days past due can be performed less often than daily but it should then cover each day from the last calculation performed, in line with paragraph 106 of the EBA Guidelines on DoD. In general, institutions should ensure that the calculations of both days past due and default amounts

[45] The relative components of the materiality thresholds for retail and non-retail exposure are both 1%, while the absolute components are €100 and €500 respectively. This means that it is only for exposures up to €50,000, where the non-retail absolute component is dominant, that the shift from retail to non-retail may produce the reclassification of past due amounts from material to immaterial.

are up to date whenever they are used to support all relevant processes, including internal and external reporting.

73. Paragraph 23 of the EBA Guidelines on DoD specifies the definition and treatment of situations where the recognition of default results from technical issues. According to the EBA Guidelines on DoD, technical past due situations should not be considered as defaults in accordance with Article 178 of the CRR. It is the ECB's understanding that the technical issues referred to in point (a) of the same paragraph also include situations where the bank has approved a moratorium or restructuring for an obligor that is less than 90 days past due on material credit obligations but the resulting suspension or reset of days in the past due counter is applied in the systems with some delay when the counter has already reached 90 days. Moreover, it is the ECB's understanding that moratoria granted on the basis of applicable laws having retroactive effects from a period where the obligor was less than 90 days past due on material credit obligations may also be treated as a technical default where the credit decision approving the moratorium was taken when the days past due counter had already reached 90 consecutive days. Any situation other than those described in paragraph 23 should not be classified as technical defaults. This includes, for instance, issues with payments resulting from errors in the data or systems of the obligor and disputes under paragraph 19 of the EBA Guidelines on DoD. With regard to the latter, it is the ECB's understanding that a general treatment of disputes as technical past due situations, for instance because of the impossibility of suspending the counting of days past due in the systems, would lead to an unwarranted inflation of technical past due situations. An exception may be represented by disputes which fulfil the requirements set out in paragraph 19 of the EBA Guidelines on DoD and that are initiated before the default classification, where the corresponding suspension of the counting of days past due is recorded in the systems after the classification in default due to delays in the formal notification of the dispute. In such situations, it is the ECB's understanding that a treatment as technical default in accordance with paragraph 23(a) of the EBA Guidelines on DoD may be allowed.

74. The ECB has the following understanding of the application of the specific treatment set out in paragraphs 25 and 26 of the EBA Guidelines on DoD for exposures to central governments, local authorities and public sector entities. The specific treatment under paragraph 25 should be applied as soon as exposures have been materially past due for more than 90 consecutive days, and not before, but only where all conditions specified in paragraph 25 are met. The specific treatment implies that, in accordance with paragraph 26, these exposures are not treated as being defaulted and, from the time of the application of the specific treatment, those exposures have to be excluded from the calculation of the materiality threshold for all other exposures of the obligor. The exposures that are subject to the specific treatment need to be clearly documented. If, after the application of the specific treatment, the materiality threshold is still exceeded on account of other exposures past due which are not covered by the specific treatment, the obligor in question, and all of its exposures, are immediately regarded as having defaulted.

75. The days past due criterion should be applied to factoring and purchased receivables, taking into consideration the specific provisions set out in paragraphs 27 to 32 of the EBA Guidelines on DoD. Institutions should clearly specify in their policies the types of products offered to customers which are considered as factoring and purchased receivables. It is the ECB's understanding that institutions may align their definitions to the indications of which products are considered to be factoring in Commission Implementing Regulation (EU) No 2021/451, where "trade receivables" are defined.

76. Paragraph 34 of the EBA Guidelines on DoD sets out the condition under which institutions may add another trigger of unlikeness to pay in order to identify defaults on the basis of a lower materiality threshold than the one considered for the days past due criterion. It is the ECB's understanding that, in this case, institutions should monitor this additional unlikeliness to pay trigger together with the days past due criterion in the same way as described in paragraph 62.

4.4 Unlikeness to pay criterion

77. For the purposes of determining unlikeliness to pay in connection with the sale of credit obligations (Article 178(3)(c) of the CRR), according to paragraphs 42 and 43 of the EBA Guidelines on DoD, institutions should analyse the reasons for the sale of credit obligations and the reasons for any losses recognised thereby. If, based on this analysis, the sale is recognised as credit-related, the institution should calculate the materiality of the loss according to the formula set out in paragraph 44 of the EBA Guidelines on DoD to verify whether a default is triggered. When applying the formula, the sale price should be used without any type of adjustment. It should be noted that sales of credit obligations in the context of traditional securitisations where there is a significant risk transfer according to Article 244 of the CRR and the EBA Guidelines on SRT are also considered sales of credit obligations for the purposes of this unlikeliness to pay criterion.

78. [For the purposes of determining unlikeliness to pay in connection with a distressed restructuring (Article 178(3)(d) of the CRR),] in the formula defining the diminished financial obligation set out in paragraph 51 of the EBA Guidelines on DoD, NPV0 and NPV1 are the net present value of the expected cash flows, discounted using the customer's original effective interest rate based on the old and the new arrangements respectively. Cash flows in this context are all payments the obligor is legally bound to perform under the contractual terms. Therefore, NPV0 and NPV1 should not reflect any expected loss due to default or prepayment. Any approximation of the original effective interest rate or treatment of variable rates that is used for accounting purposes should also be used in the calculation of NPV0 and NPV1 for the purpose of default identification. Where the obligor has accumulated late fees or interest rate penalties before the restructuring, the ECB's understanding is as follows.

(a) If late fees and interest rate penalties that originated from a violation of the original schedule of payments were forgiven, they should not be included in the NPV1 calculation since they are not part of the new contractual schedule of payments.

(b) If late fees and interest rate penalties rates that originated from a violation of the original schedule of payments were not forgiven, they are consequently included in the obligor's new schedule of payments following the distressed restructuring (possibly with a postponement), and the respective amounts should therefore be included in the NPV1 calculation. This also holds when the institution applies (generic) fees and higher rates in the obligor's new schedule of payments as part of the distressed restructuring.

(c) Late fees and interest rate penalties should not in any case be included in the NPV0 calculation as they were not explicitly included in the original contractual schedule of payments.

(d) The NPV1 calculation assumes that payments duly respect the new schedule. Therefore, fees and penalties that would be triggered in case of violations of the (new) schedule should not be considered in NPV1.

In addition, it is the ECB's understanding that the calculation of the diminished financial obligation should only take into consideration expected cash flows. Cash flows having occurred in the past, for example the financed amount and past payments from the obligor, are not expected and should therefore not be considered.

79. The calculation of the diminished financial obligation should be performed for all distressed restructurings in accordance with paragraph 52 of the EBA Guidelines on DoD when the distressed restructuring is agreed. Hence, the calculation should also be performed in cases where the threshold is blatantly exceeded, for example if a large part of the principal is forgiven. In this regard, it should be noted that – for institutions using own LGD estimates – the calculated diminished financial obligation is also relevant for deriving the economic loss caused by a default whenever institutions open new facilities to replace previously defaulted facilities as part of a restructuring or for technical reasons (see paragraph 153(b) of this chapter), and the amount by which the financial obligation has diminished is included among the information that the reference dataset for LGD estimation should contain (see paragraph 109(c) of the EBA Guidelines on PD and LGD). If an institution applies a material change to its definition of default by reviewing the threshold for assessing the materiality of the diminished financial obligation, for the purpose of default detection processes the reviewed threshold should be applied to distressed restructurings that occur after the modification of the threshold and does not affect previous restructurings.

80. When applying paragraph 54 of the EBA Guidelines on DoD, which requires that any concession extended to an obligor already in default should lead to the

obligor being classified as a distressed restructuring, it is the ECB's understanding that institutions should understand the term "concession" in the same sense as in Article 47b(1) of the CRR.

81. When specifying in their internal policies and procedures other additional indications of unlikeliness to pay of an obligor, institutions should, in line with paragraph 58 of the EBA Guidelines on DoD, define and document additional indications of unlikeness to pay that are appropriate for the specific type of exposure. It is the ECB's understanding that considering only the indications of unlikeness to pay set out in points (a) to (f) of Article 178(3) of the CRR is in principle not deemed an appropriate and prudent approach. In order to define these additional indications, institutions may consider the list provided in paragraph 59 of the EBA Guidelines on DoD.

82. In line with paragraph 60 of the EBA Guidelines on DoD, institutions are expected to take into account external information, if available, in their default identification process. In doing so, institutions are free to determine the frequency of the update and monitoring of the external information, possibly differentiating among individual subsets of obligors, provided that the frequency determined for each subset eventually guarantees the timely identification of default.

4.5 Return to non-defaulted status

83. Paragraphs 72 to 73 and 71 of the EBA Guidelines on DoD provide the minimum conditions for reclassification to non-defaulted status for exposures subject to distressed restructurings and for all other exposures respectively. In particular, for exposures subject to distressed restructurings the minimum probation period[46] is generally longer than for exposures not subject to distressed restructuring. This implies the following.

    (a) If the definition of default is applied at obligor level, institutions should monitor the conditions for reclassification to non-defaulted status that are applicable to each exposure of the obligor, and the obligor may return to non-defaulted status only when all exposures meet their respective conditions.

    (b) If the definition of default is applied at facility level, institutions should monitor the conditions for reclassification to non-defaulted status that are applicable to the facility, and when these are met then the facility may return to non-defaulted status. This means that different defaulted facilities belonging to the same obligor may possibly return to non-defaulted status at different moments in time. However, institutions may make use of the possibility of setting longer probation periods (as set out in paragraphs 71 and 72 of the EBA Guidelines on DoD) to ultimately align these moments.

[46] The minimum probation period is the minimum period of time over which a defaulted exposure and related obligor should be monitored before the exposure may possibly return to non-defaulted status.

84. In the case of exposures subject to distressed restructuring, one of the minimum conditions for the reclassification to non-defaulted status is that during the probation period a material payment has been made by the obligor. In this regard, paragraph 73(a) of the EBA Guidelines on DoD provides examples of material payments that should not be construed as mandatory conditions; institutions may define material payments otherwise. It is the ECB's understanding that the appropriateness of such a definition is one of the elements that institutions should consider when monitoring the effectiveness of the policy for the return to non-default status as described in paragraphs 76 to 78 of the EBA Guidelines on DoD.

85. Minimum conditions for returning to non-defaulted status with regard to past due amounts are different for exposures subject to distressed restructurings. These conditions are as follows.

    (a) Where distressed restructuring does not apply to a defaulted exposure, if all other conditions described in paragraph 71 of the EBA Guidelines on DoD are met, a defaulted exposure can be reclassified to non-defaulted status even if there are still past due amounts that are either not material or material but are less than 90 consecutive days past due.

    (b) Where distressed restructuring applies to a defaulted exposure, under paragraph 73 of the EBA Guidelines on DoD there should be no past due credit obligations according to the schedule applicable after the restructuring arrangements. Hence, it is the ECB's understanding that institutions should refrain from allowing the return to non-default status as long as exposures are subject to outstanding past due amounts, even if these past due amounts are immaterial or are material and less than 90 days past due. This condition ensures alignment between defaulted exposures subject to distressed restructuring and forborne non-performing exposures (as also required by paragraphs 54 and 107 of the EBA Guidelines on DoD).

86. The activation of new default triggers for already defaulted exposures has a different impact on the probation period depending on whether the exposure is subject to distressed restructuring or not. This is explained as follows.

    (a) Where distressed restructuring does not apply to a defaulted exposure, the probation period should last a minimum of three months from the moment that all default triggers cease to apply. According to the ECB's understanding, this means that if a new default trigger becomes applicable while the probation period is running, then the probation period is reset to zero and will start again when all default triggers, including the new one, will again cease to apply.

    (b) Where distressed restructuring applies to a defaulted exposure, the probation period should last a minimum of one year from the latest of the events specified in paragraph 72 of the EBA Guidelines on DoD and

should be reset in the circumstances described in EBA Q&A 2022_6527[47]. According to the ECB's understanding, in general, whenever a new default trigger becomes applicable while the probation period is running, then the probation period is reset to zero and immediately starts again.

4.6 Consistency of external data

87. In accordance with Article 178(4) of the CRR, institutions that, for the purpose of risk quantification, use external data that are not themselves consistent with the definition of default laid down in paragraph 1 of the same article must make appropriate adjustments to achieve broad equivalence. To comply with this requirement, institutions should ensure that when they make use of external data or pooled data they have a complete understanding of the definition of default applied to these data and demonstrate representativeness of data collected under a different definition of default in the same way as specified for external data in Chapter 6 of the EBA Guidelines on DoD. In this context it is the ECB's understanding that the following applies.

    (a) Where an institution demonstrates that the difference in definitions of default is negligible in terms of the impact on all risk parameters and own funds requirements in general, data based on a definition of default different from the one that is used internally for default identification may continue to be used in the risk quantification RDS without any adjustment.

    (b) Otherwise, institutions should perform appropriate adjustments to (i) the granular data used for risk quantification (as per paragraph 30 of the EBA Guidelines on PD and LGD in conjunction with paragraph 68(b) of the EBA Guidelines on DoD) and/or (ii) aggregated metrics, model components or the risk estimates (as per paragraphs 34, 36, 37 and 38 of the EBA Guidelines on PD and LGD).

    In addition, it is the ECB's understanding that, all other things being equal, the use of external data for the purpose of risk quantification results in a higher level of estimation uncertainty than when using data collected under the definition of default that is used internally for default identification for the relevant type of exposure. Therefore, it would be in line with best practice for institutions to apply a category A MoC in accordance with paragraph 37(a)(viii) of the EBA Guidelines on PD and LGD when using external data for the purpose of risk quantification.

88. For the purposes of model development, an RDS based on a definition of default different from the internal one may be acceptable under the conditions set out in paragraph 23 of the EBA Guidelines on PD and LGD and as long as institutions provide reasonable assurance that the use of a different definition of default does not have a negative impact on the structure and performance of

[47] https://www.eba.europa.eu/single-rule-book-qa/qna/view/publicId/2022_6527

the rating model in terms of risk differentiation and predictive power with respect to the internal definition of default.

4.7 Adjustments to risk estimates in the case of changes to the definition of default

89. A change to the definition of default should be understood as any change to any aspect of the definition of default set out in Article 178 of the CRR, namely changes to the counting of days past due, changes to the indications of unlikeness to pay or changes to the criteria for allowing the return to non-defaulted status of previously defaulted exposures.

90. Under the IRB approach, changes to the definition of default require prior approval from the competent authority before they can be implemented.[48] As a consequence, to avoid temporary mismatches in the definitions of default applied under the different approaches, it is advisable that institutions align the implementation timelines of changes for exposures under IRB and under SA so that changes are implemented for all exposures under IRB and under SA after the supervisory approval is granted for exposures treated under the IRB approach.

91. Where a change has been made to the definition of default, institutions should demonstrate the model's risk differentiation on a time series of realised default rates (or a time series of realised LGD or realised CCF) reflecting the new definition of default. Where institutions determine that their PD (or their LGD or CCF) models do not maintain good risk differentiation capacities with respect to the new definition of default, it is the ECB's understanding that a recalibration is not sufficient to adjust the models to the new definition of default and, in addition to the recalibration, institutions should redevelop[49] their models to the extent needed.

92. According to paragraph 11(b) of the EBA Guidelines on DoD and paragraph 30 of the EBA Guidelines on PD and LGD, where a change has been made to the definition of default, institutions should compare the new definition of default resulting from the change with the definitions underlying the observations included in the RDS used for risk quantification and assess the representativeness of such historical data in the same way as specified for external data in paragraph 87 of this chapter. It is the ECB's understanding that one prerequisite for such a comparison is the construction of an appropriate dataset reflecting the new definition of default. Generally, to assemble a reliable dataset reflecting the new definition of default before changing their definition of default, institutions can adjust historical granular data collected on the basis of the old definition of default in order to achieve broad equivalence to the new

[48] As required by Article 4(1)(b) in conjunction with Annex I, Part II, Section 1(3) of Commission Delegated Regulation (EU) No 529/2014.

[49] For rating systems based on a slotting approach under Article 153(5) of the CRR, institutions are expected to review and, if necessary, adjust the assignment to slots to reflect the new definition of default, although the risk parameters themselves are not affected.

definition of default by means of a parallel run (i.e. the implementation of the new definition of default in a parallel environment to the productive systems), a retrospective simulation (i.e. applying the new definition of default retrospectively to historical data) or a similar classification of data according to the new definition of default. Where the adjustments in granular data do not cover the entire historical observation period of the model, institutions may complement the missing periods by using simplifying assumptions such as applying correction factors to aggregated metrics, model components or risk estimates, provided that these assumptions are based on an RDS that covers at least two years of data adjusted at granular level by means of a retrospective simulation, parallel run or similar classification of data according to the new definition of default.

93. According to paragraphs 11(c) and 70 of the EBA Guidelines on DoD, where a change has been made to the definition of default, institutions should add a definition of default-related MoC that is appropriate and sufficient to cover the uncertainty caused by deficiencies in the RDS used for risk quantification owing to the impossibility of performing appropriate adjustments, as well as by uncertainties related to the quantification of appropriate adjustments (at granular or aggregate level) to account for the change in the definition of default in the model's risk quantification. Generally, it is the ECB's understanding that estimation uncertainty also increases in the infrequent cases where institutions do not apply appropriate adjustments to account for the change in the definition of default because they estimate that the impact of the new definition of default on all risk parameters and own funds requirements is negligible. As a consequence, in these situations too, institutions should apply a definition of default-related MoC[50].

[50] In exceptional cases, institutions may set such a MoC to zero. For this to be permitted, the conclusion that the change in the definition of default will have a negligible impact must be based on an RDS that, for the entire historical observation period, faithfully replicates the new definition of default after the model change, without any use of simplifying assumptions or correction factors applied at aggregate level. It is the ECB's understanding that, in such a situation, estimation uncertainty does not increase beyond what is already captured in the general estimation error.

5 Probability of default

5.1 Structure of PD models

5.1.1 Relevant regulatory references

Table 12

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	144	(1)(a), (e)
		161	(3)
		169	(1), (2)
		170	(1)(a) to (f), (2), (3)(a) to (c), (4)
		171	(2)
		172	(1)(a), (d)
		173	(1)(b)
		174	(1)(a), (c)
		179	(1)(a)
		180	(1)(a), (g), (2)(a)
		201, 202, 203, 236	
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	24	(3)(c)
		30	(3)(c), (e)
		33 to 36, 38	
EBA Guidelines on PD and LGD	20/11/2017		20-27, 56-69, 96, 97, 98(b)

94. In accordance with Article 179(1)(a) of the CRR, estimates must be based on the material drivers of the risk parameters.[51] The relevant material risk drivers and rating criteria may be taken into consideration in several ways:

    (a) when assigning exposures to different PD models;

    (b) at a PD model level when assigning exposures to different ranking/scoring methods;

    (c) as explanatory variables in ranking/scoring methods;

    (d) as drivers when defining calibration segments by splitting exposures covered by the same PD model into subsets carrying a significantly different level of risk;

[51] Institutions should consider all potential risk drivers in accordance with paragraph 57 of the EBA Guidelines on PD and LGD. These include but are not limited to climate-related and environmental risk drivers affecting the PD, where relevant and material.

(e) as drivers in the process for the assignment of facilities or obligors to grades or pools other than calibration segments.

95. When choosing the risk drivers for the models, there is a risk that those drivers that capture the characteristics of defaulted obligors might be inappropriately understood as relevant risk drivers for the portfolio, or that an inappropriate weight might be given to some of them. To mitigate this risk, institutions should take appropriate measures against model misspecification with regard to overfitting. This is particularly relevant where default data for the development of the model are scarce. Where an institution relies on one or more statistical models to define the process of assigning exposures to grades or pools (or parts of this process) in accordance with Article 175(4)(b) of the CRR, it is the ECB's understanding that for institutions to comply with the requirement, set out in Article 144(1)(a) of the CRR, that rating systems should provide for a meaningful differentiation of risk as further explained in letters (c) and (e) of Article 30(3) of Commission Delegated Regulation (EU) No 2022/439, the statistical process followed by the institution in selecting its model(s) should include assessing the performance of the model(s) on the basis of independent datasets (data points which were left out of the model fitting) in a way that limits the risk of overfitting. Independent datasets should correspond not only to random sampling (out-of-sample), but also to different time periods (out-of-time) unless there are no sufficient data available for the training sample. The expectations set out above in this paragraph are specifically related to the model development phase. Once the process for assigning exposures to grades or pools has been defined, the requirements related to the framework for the review of estimates under paragraphs 217 to 221 of the EBA Guidelines on PD and LGD apply together with the expectations set out in Section 9 of this chapter. In particular, in accordance with paragraph 218(b)(i) of the EBA Guidelines on PD and LGD, the institution must carry out an analysis to identify any potential deterioration in the model's performance, including the model's discriminatory power, by comparing its performance at the time of the development with its performance over each subsequent observation period.

96. In accordance with Article 144(1)(a) of the CRR, institutions' rating systems must provide for a meaningful assessment of obligor and transaction characteristics, a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk. To comply with this requirement, it is the ECB's understanding that PD models should perform adequately on economically significant and material sub-ranges of application.[52] The sub-ranges are identified by splitting the full range of application of the PD model into different parts on the basis of potential drivers for risk differentiation, including the following non-exhaustive list of drivers,[53] where relevant:

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[52] Where an institution has approval for a PD model on a consolidated basis as well as on a sub-consolidated and/or individual basis, it is the ECB's understanding that this PD model should perform adequately at these sub-consolidated and/or individual levels, as these are considered material sub-ranges of application.

[53] When external credit bureau scores or ratings are used as the main (or one of the main) driver(s) of the internal rating, the set of all exposures for which the external score or rating is not available should also be considered a significant sub-range of application.

(a) for PD models covering exposures to small and medium-sized enterprises (SMEs): country, industry (e.g. statistical classification of economic activities in the European Community (abbreviated as NACE[54]) code section classification A to U), size of obligor (e.g. different buckets in terms of total assets), past delinquency (e.g. obligors with delinquency events, i.e. days past due, in the last 12 months);

(b) for PD models covering retail exposures: client type (e.g. high net worth/private banking, other individuals, self-employed, SMEs), product type (e.g. consumer credit, credit card, other), region (e.g. nomenclature of territorial units for statistics (NUTS) 1, 2 or 3 as defined by Eurostat), past delinquency (e.g. obligors with delinquency events, i.e. days past due, in the last 12 months), maturity (e.g. original or remaining maturity);

(c) for PD models covering retail exposures secured by real estate: region (e.g. NUTS 1, 2 or 3 as defined by Eurostat), type of real estate (e.g. residential, commercial, other), past delinquency (e.g. obligors with delinquency events, i.e. days past due, in the last 12 months), maturity (e.g. original or remaining maturity);

(d) for PD models covering exposures to financial institutions: business model (deposit-taking institutions, investment banking, insurance firms, other), jurisdiction (or global region as appropriate) and size (defined buckets of total assets);

(e) for PD models covering exposures to large corporates: industry (e.g. NACE code section classification A to U), country (or global region as appropriate) and size (defined buckets of total turnover).

97. In accordance with Article 169(1) of the CRR, where an institution uses multiple rating systems, the rationale for assigning an obligor or a transaction to a rating system must be documented and applied in a manner that appropriately reflects the level of risk. To comply with this requirement institutions should, in terms of the range of application of a PD model:

(a) clearly describe its range of application (and sub-divisions into different ranking/scoring methods and calibration segments) and also include an explanation of the risk drivers which the institution considered when designing the process but has decided not to use for the assignment of the obligor to the rating system;

(b) ensure that there are no overlaps in the range of application of different PD models and that each obligor or facility to which the IRB approach should be applied can be clearly assigned to one particular PD model.

[54] *Nomenclature statistique des activités économiques dans la Communauté Européenne*.

5.1.2 Risk differentiation

Principles for all model types

98. Article 170 of the CRR lays down requirements related to the structure of rating systems. To comply with these requirements and with reference to Articles 34 to 36 of Commission Delegated Regulation (EU) No 2022/439, institutions should, among other things, ensure a meaningful differentiation of risk over time which takes into account (i) the distribution of obligors or facilities; (ii) the homogeneity of obligors or facilities assigned to the same grade or pool; and (iii) the different levels of risk across obligors or facilities assigned to different grades or pools to which a different PD is applied.

99. To ensure that the PD model performs adequately in terms of risk differentiation, institutions should adopt the following approach.

    (a) Define metrics (considering both their evolution over time and specific reference dates) with well-specified targets, taking into account tolerance levels that reflect the uncertainty of the metrics, and take action, where necessary, to rectify any deviations from these targets that exceed the tolerance levels. Separate targets and tolerances may be defined for initial development and ongoing performance.

    (b) Ensure that the tools used to assess risk differentiation are sound and adequate considering the available data. The risk differentiation is expected to be demonstrated on time series of realised default rates for grades or pools under different economic conditions.

Principles specific for grades and pools

100. A grade or pool is understood by the ECB to be the subset of obligors or facilities to which the same PD is applied for the calculation of regulatory capital requirements, irrespective of how this PD has been assigned (e.g. through the use of masterscales).

Distribution of obligors or facilities across grades or pools

101. Articles 170(1)(c) and (d) and 170(3)(b) and (c) of the CRR require, among other things, that the number of grades and pools is adequate to achieve meaningful risk differentiation and quantification of the PD at the grade or pool level. To comply with this requirement, institutions should:

    (a) justify the criteria applied when determining the number of grades or pools and the proportion of obligors or facilities assigned to each;

(b) ensure that the concentration of numbers of obligors or facilities is not excessive in any grade or pool; any significant concentrations should be supported by convincing empirical evidence of the homogeneity of risk for those obligors or facilities;

(c) ensure that no grade or pool has too few obligors or facilities, unless this is supported by convincing empirical evidence of the adequacy of the grouping of the exposures in question.

Homogeneity within grades

102. Articles 170(1)(b) and (d) and 170(3)(b) and (c) of the CRR require, among other things, that the structure of rating systems must ensure the homogeneity of obligors or facilities assigned to the same grade or pool. In accordance with this requirement and under paragraph 69 of the EBA Guidelines on PD and LGD:

(a) homogeneity is understood as obligors or facilities assigned to a grade having a reasonably similar default risk to ensure that the grade-level default rate is representative of all obligors or facilities in that grade;

(b) in cases where it is found (through the use of additional drivers or a different discretisation of the existing ones) that a material subset of obligors or facilities within a grade/pool yields a significantly different default rate to that of the rest of the grade or pool, this is considered to indicate a lack of homogeneity.

Risk differentiation across grades or pools

103. To comply with the requirement to ensure adequate risk differentiation across grades or pools,[55] institutions should ensure that there are no significant overlaps in the distribution of the default risk between grades or pools. This should be ensured through a meaningful differentiation of the default rates of each grade. In particular, the ECB expects that a very granular rating scale[56] will only be used in cases where the institution is able to empirically confirm the risk differentiation across grades as described in this paragraph.

Principles specific for direct estimates

104. See paragraph 141.

[55] As required by Articles 170(1)(b) and (d) and 170(3)(b) and (c) of the CRR.

[56] For continuous models, see paragraph 141.

5.1.3 Grade assignment dynamics

105. In order to ensure a meaningful assessment of obligor characteristics,[57] when assigning obligors or facilities to a grade or pool institutions should follow paragraphs 66 to 68 of the EBA Guidelines on PD and LGD. Although the time horizon used in PD estimation is one year, it is the ECB's understanding that the rating/grade/pool assignment process should also adequately anticipate and reflect risk over a longer time horizon and take into account plausible changes in economic conditions. In order to achieve this objective:

    (a) all relevant information should be included in the rating/grade/pool assignment process, giving an appropriate balance between drivers that are predictive only over a short time horizon and drivers that are predictive over a longer time horizon;

    (b) a horizon of two to three years is considered to be appropriate for most portfolios;

    (c) in accounting for plausible changes in economic conditions, the institution should consider at least past observed default patterns;

    (d) the model should perform under different economic conditions.

    As a consequence of the above, institutions' grade assignment dynamics should also adequately anticipate and reflect in the assignment of grades the risk over the longer time horizon. For clarity, this does not mean that grades remain stable over the longer time horizon in the event of changes in the risks that are specific to the obligor.

106. Additionally, the following principles apply under the specific situations considered in (a) to (c) below:

    (a) when using external scores or ratings (e.g. from an external bureau or external rating agency) as drivers for the purpose of risk differentiation within a specific model, institutions should identify the grade assignment dynamics embedded in the external rating and understand the effect on their own grade assignment dynamics, considering the other risk drivers used;

    (b) when using external ratings as target variables for the purpose of risk differentiation within a specific model (see Section 5.1.5), institutions should preserve their own grade assignment dynamics by taking the appropriate measures when necessary;

    (c) when mapping internal grades to external grades in order to use external default rates to estimate PD, institutions should ensure that the grade assignment dynamics of the external ratings are sufficiently similar to their

[57] Article 144(1)(a) of the CRR.

own internal grade assignment dynamics, or perform the necessary adjustments during risk quantification to compensate for any differences.

5.1.4 Use of ratings of third parties

107. In accordance with Article 172(1)(a) of the CRR, institutions must assign each obligor to a grade or pool as part of the credit approval process. To comply with this requirement, in accordance with paragraph 62 of the EBA Guidelines on PD and LGD, institutions should have clear policies specifying the conditions under which the rating of a third party which has a contractual or organisational relationship with an obligor of the institution (third-party support) may be taken into account in the risk assessment of that obligor. These policies should meet the following criteria.

    (a) They should specify in which situations the rating of a parent entity could be taken into account in the risk assessment of other entities of the group. In particular, the policies should specify those situations in which obligors are assigned to a better grade than their parent entities.

    (b) They should include provisions on the use of ratings of third parties that provide contractual support to more than one obligor. As a general rule, the policies should include, but not be limited to, possible prioritisation, eligibility, and the impact on the rating of the supporting third party.

108. It is the ECB's understanding that a "rating transfer" within the meaning of paragraph 62(a) of the EBA Guidelines on PD and LGD constitutes a mechanism that is distinct from the substitution effect referred to in Article 236 of the CRR. In addition, according to the ECB's interpretation, an "appropriate guarantee" within the meaning of paragraph 62(a) of the EBA Guidelines on PD and LGD should not be understood as credit risk mitigation within the meaning of Article 4(1)(57) of the CRR, but as a contractual agreement between the institution's obligor and the third party, fully covering the obligor by providing the obligor with a claim against the third party that is effective (i.e. it prevents the default) and enforceable (from a legal perspective) before the institution has to recognise a default event of the obligor. When, under paragraph 62(a) of the EBA Guidelines on PD and LGD, an institution performs a rating transfer across different rating systems that do not share the same obligor rating scale, it should ensure that the mapping between rating scales is performed in such a way that the PD estimate (including MoC) assigned to the guaranteed exposure amount is not better than the PD estimate (including MoC) being transferred from a third party. Article 171(2) of the CRR establishes that information used to assign obligors and facilities to grades or pools must be current. To comply with this requirement, if a material proportion of exposures or obligors within a rating system receives a rating from an approved IRB rating system as a result of rating transfers, institutions should ensure that the transferred ratings are automatically updated when the rating of the third party changes or when the PDs of the rating system to which the third party belongs are re-estimated.

109. In the situation described in paragraph 62(b) of the EBA Guidelines on PD and LGD, where a rating of a third party is being taken into account as an indication for an override of the assignment of the relevant obligor to a grade or pool, institutions should not assign a PD estimate (including MoC) to an obligor that is better than the PD estimate (including MoC) of the third party as a consequence of an override resulting solely from the existence of this third-party support. Furthermore, when third-party support is used extensively in the scope of application of a PD model as an indication for an override, institutions should consider its existence as a potential relevant driver for risk differentiation, in accordance with Section 5.1.2 of this chapter.

110. The ECB understands paragraph 62(c) of the EBA Guidelines on PD and LGD to be applicable not only in the presence of contractual support, but also in instances where there is an organisational relationship between the third party and the obligor. In accordance with Article 179(1)(a) of the CRR, estimates must be plausible and intuitive and must be based on the material drivers of the respective risk parameters. To comply with this requirement when the treatment specified in paragraph 62(c) of the EBA Guidelines on PD and LGD is used, institutions should have sufficient empirical evidence to justify situations where an obligor has an equal or better PD estimate (including MoC) than the third party providing support.

111. In addition, differences between the various forms of contractual support should be considered in the PD models unless there is sufficient empirical evidence that these differences are not relevant risk drivers. This understanding should also be taken into account if the rating of the third party is being considered as an indication for an override under paragraph 62(b) of the EBA Guidelines on PD and LGD.

112. Articles 201 to 203 of the CRR establish requirements for the eligibility of unfunded credit protection. To comply with these requirements, institutions may recognise the guarantee by applying the risk weight of the guarantor under the standardised approach to the covered part of the exposure, provided that no own estimates of LGD and CCFs are used (foundation IRB (F-IRB)). This applies when an obligor is guaranteed by a third party that is not in the range of application of a PD model and the guarantee fulfils all requirements for credit risk mitigation (CRM), consistently with paragraph 44 of the EBA Report on the CRM Framework. In such situations, under paragraph 74 of the EBA Guidelines on PD and LGD, the guaranteed obligor should be included in the calculation of the one-year default rate of the grade the obligor is assigned to, before the recognition of the guarantee.

113. In addition, when the institution reflects substitution effects[58] arising from CRM in the ratings assigned to a material number of exposures within a rating

[58] Substitution effects are understood as: the application of the treatment set out in Article 236 of the CRR (i.e. the possibility to replace the PD of the obligor with the PD of the protection provider, or with a PD between that of the borrower and that of the guarantor); or the recognition of a guarantee by applying the risk weight of the guarantor under the standardised approach to the covered part of the exposure, as described in paragraph 112 of this chapter.

system, there is a risk that the process of assigning exposures to grades or pools might not provide for a meaningful differentiation of risk, as a result of the inclusion of obligors with significantly different risk levels within the same rating grade.[59] To mitigate this risk, institutions should verify that obligors guaranteed by a third party do not carry a significantly different level of risk from those in the same rating grade without such a guarantee, and that no separate calibration segment as referred to in paragraph 97 of the EBA Guidelines on PD and LGD is required.

5.1.5 Use of shadow rating models

114. The ECB understands a shadow rating model (SRM) to be an internal rating approach that selects and weighs the risk drivers to be used for risk differentiation purposes by identifying the main factors that explain external ratings provided by an external credit assessment institution or similar organisation, rather than internal directly observed defaults.

115. In accordance with Article 144(1)(e) of the CRR, institutions must document the rationale for their rating systems. To comply with this requirement, institutions should justify and document the rationale for the use (and the continued use) of the SRM, instead of the internal default prediction model, and also document the alternative approaches that have been considered, in accordance with Article 38 of Commission Delegated Regulation (EU) No 2022/439. In addition, and without prejudice to the risk differentiation requirements, when developing the model institutions should set explicit threshold criteria in terms of capacity to explain the target ratings and take appropriate action when those thresholds are not met.

116. Assignment criteria and processes must be periodically reviewed to determine whether they remain appropriate for the current portfolio and external conditions.[60] To comply with this requirement, as part of the review of estimates institutions should take all reasonable steps to demonstrate how the model performs on the application population in terms of predicting defaults or, if that is not possible (when there are not enough internal default data), at least in terms of predicting the target ratings.

117. In accordance with Article 170(1)(b) of the CRR, institutions' rating systems must have an obligor rating scale which reflects exclusively the quantification of the risk of obligor default. To this end, institutions should adjust the ratings used as targets for their SRMs if they do not solely embed default risk. They should also document such adjustments.

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59 In accordance with Article 170(3)(c) of the CRR, the process of assigning exposures to grades or pools must provide for a meaningful differentiation of risk, for a grouping of sufficiently homogenous exposures, and must allow for accurate and consistent estimation of loss characteristics at grade or pool level.

60 Article 169(2) of the CRR.

118. In accordance with Article 174(1)(a) of the CRR, when an institution uses a statistical model and other mechanical methods to assign exposures to obligors or facilities, the input variables must form a reasonable and effective basis for the resulting predictions. To comply with this requirement, when the institution uses an SRM external ratings should not be used as risk drivers in addition to target variables.

119. When assigning obligors and facilities to grades or pools institutions must take all relevant information into account.[61] To comply with this requirement, when different information sources are used institutions should ensure that they understand the impact of any differences between these sources and establish adequate procedures to ensure that these differences are adequately addressed.

120. Furthermore, the data used to build the model must be representative of the population of the institution's actual obligors or exposures.[62] To comply with this requirement, institutions should analyse and provide evidence of the representativeness of the data used for model development consistently with paragraphs 20 to 27 of the EBA Guidelines on PD and LGD.

5.2 PD risk quantification

5.2.1 Relevant regulatory references

Table 13

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	4	(1)(78)
		144	(1)(a)
		169	(3)
		170	(1)(b)
		179	(1)(b)
		180	(1)(a), (f), (h), (2)(a), (e)
		185	(b)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	45, 46	
EBA Guidelines on PD and LGD	20/11/2017		70-99

121. In accordance with Article 180(1) of the CRR, for exposures to corporates, institutions, central governments and central banks and for equity exposures, institutions must estimate PDs by obligor grade from the LRA of one-year default rates. In accordance with Article 180(2) of the CRR, for retail exposures,

61 Article 171(2) of the CRR.

62 Article 174(c) of the CRR.

institutions must estimate PDs by obligor/facility grade or pool from LRAs of one-year default rates. To comply with these requirements, institutions should follow Sections 5.2.2 to 5.2.6 below.

5.2.2 Calculation of the one-year default rate and observed average default rates

122. For the calculation of the one-year default rate and observed average default rates, institutions should follow paragraphs 73 to 81 of the EBA Guidelines on PD and LGD, also considering the following.

(a) It is the ECB's understanding that, for retail exposures and when the definition of default is applied at facility level, paragraphs 73 to 81 of the EBA Guidelines on PD and LGD can be applied at facility level.

(b) It is the ECB's understanding that, whenever the definition of default is applied at obligor level, a joint obligor[63] should be considered as a separate obligor and the default on a joint credit obligation should be counted separately from the default of individual obligors. Consequently, a specific rating/PD should be assigned to the joint obligor and should be counted separately for the default rate and RWA calculation.

(c) Exposures for which there is no commitment (considering on-balance sheet exposures, off-balance sheet items and unadvised limits) at reference date should be excluded from the calculation of the default rate. Conversely, if there is an EAD estimate, then these exposures should be included in the calculation of the default rate.

(d) To calculate the one-year default rate in accordance with paragraph 73 of the EBA Guidelines on PD and LGD, it is the ECB's understanding that each obligor – or each facility in cases where point (a) above applies – existing and not defaulted at the beginning of the one-year observation period should be counted as one in the denominator and, if relevant, in the numerator of the one-year default rate calculation, even where the obligor – or the facility in cases where point (a) above applies – cannot be observed for the entire one-year observation period.

(e) It is the ECB's understanding that obligors – or facilities in cases where point (a) above applies – that cease to exist (for example because the relevant credit contractual relationship was terminated) during the one-year observation period should be included in the calculation of the one-year default rate without any adjustment or deviation from the method as described in point (d) above. This is without prejudice to appropriate adjustments and/or MoC following any identification of deficiencies in data representativeness as described in paragraphs 28 to 33 of the EBA

[63] In accordance with paragraph 104 of the EBA Guidelines on DoD, "joint obligor" means a specific set of individual obligors that have a joint obligation towards an institution.

Guidelines on PD and LGD and in line with paragraph 34 and Section 4.4 of the EBA Guidelines on PD and LGD.

(f) Under paragraph 76 of the EBA Guidelines on PD and LGD, institutions should analyse whether (i) the migrations to a different rating grade, pool or rating model, rating system or approach to calculation of capital requirements within the observation period, or (ii) sales of credit obligations during the observation period bias the default rate. To this end, institutions should do both of the following.

(i) Ensure that obligors – or facilities in cases where point (a) above applies – are tracked after their migration to a different rating grade, pool, rating model, rating system or approach to calculation of capital requirements, and that any default identified during the one-year observation period, even if after the migration, is duly counted for the one-year default rate calculation. In the ECB's understanding, the lack of such tracking is a data deficiency in the risk quantification that institutions need to address in line with paragraphs 36 to 52 of the EBA Guidelines on PD and LGD.

(ii) Analyse whether sales of credit obligations that occurred during the one-year observation period materially deviate from those that occurred for this portfolio during other observation periods of the dataset used for risk quantification. In the ECB's understanding, the occurrence of such sales of credit obligations during the one-year observation period is a source of increased uncertainty in the risk quantification that institutions need to address in line with paragraphs 36 to 52 of the EBA Guidelines on PD and LGD.

123. For clarity, the above-mentioned requirements for the calculation of one-year default rates also apply in case of external data for PD quantification being used at a more aggregated level than obligor or facility level. Where aggregated external data of a rating agency or similar organisation are used, institutions must ensure that the default rate calculation is aligned to the applicable regulations.

124. For the purpose of choosing an appropriate approach under paragraph 80 of the EBA Guidelines on PD and LGD, it is the ECB's understanding that overlapping one-year time windows should preferably be used when the analysis performed by the institution under paragraphs 80(a), 80(b) and/or 80(d) of the EBA Guidelines on PD and LGD reveals the observed average default rate using overlapping one-year time windows is significantly different from the observed average default rate using non-overlapping one-year time windows and either of the following:

(a) the proportion of short-term and terminated contracts and/or the respective distribution of default rates is not stable over time;

(b) there is a significant variation between the observed average default rates calculated using non-overlapping one-year time windows on different reference calculation dates within a year.

125. Institutions should quantify PDs taking their own internal data into consideration. In cases where institutions use external or pooled data series to complement their internal data for the purpose of PD quantification, the more internal default experience an institution has, the less importance it needs to give to external data. In addition, institutions should ensure that these external or pooled data series are representative in accordance with Section 3.2 of this guide.[64] To comply with the requirement for the data to be representative and as part of their representativeness analysis, institutions should ensure that the observed average default rates from external data or from the external part of the pooled data are calculated separately from, and compared with, those based on internal data.[65] This comparison should be made at the levels at which the observed average default rate is to be calculated.[66] In accordance with paragraph 79 of the EBA Guidelines on PD and LGD, the comparison should be made for each rating grade or pool and for the type of exposures covered by the relevant PD model, as well as for any relevant calibration segment. The direction and magnitude of the differences between these averages should be properly analysed and documented when calibrating the model, taking into account the distributions[67] of obligors across grades and calibration segments, where relevant, and including the need and adequacy of the category A MoC considered with regard to paragraph 37(a)(viii) of the EBA Guidelines on PD and LGD, and duly followed up in the review of estimates. Where the results of this comparison show material differences between the internal and external observed average default rates at any of the three levels mentioned which cannot be explained by differences in the distribution across grades and calibration segments, the ECB considers this is an indication that the representativeness of the external data is not proven.

126. To assess whether the parameter estimates are biased as per paragraph 38 of this chapter, institutions should compare the LRA default rate using only internal data with the average PD estimates (before adding an MoC) resulting from their application to the internal exposures over the set of all reference dates within the period representative of the likely range of variability. In the ECB's view, the estimates are biased if either of the following conditions are met: (a) at calibration segment level, there are material differences between the average of the two previous elements of comparison; or (b) at grade level, there are systematic differences (i.e. the direction of the differences is not random). It is the ECB's understanding that the identification of material differences in (a) and

64 See Article 179(1)(d) of the CRR.

65 If the internal data constitute just a small fraction of the pooled data and are not considered material in relation to the pooled data, for the purposes of this analysis the institution may perform a separate calculation of the average observed default rates with pooled data and a comparison with those calculated based on internal data only.

66 Considering the maximum common period possible between the internal and external or pooled data.

67 For instance, institutions might consider the average of the external default rate weighted by the internal distribution of exposures across grades for the relevant reference dates.

systematic differences in (b) should not rely only on considerations of statistical significance. In the ECB's view, the lack of statistical evidence that a PD estimate and the corresponding LRA default rate based on internal data (at calibration segment in (a) and grade level in (b)) are different is not sufficient to conclude that no material difference exists. For clarity, the ECB considers this quantitative analysis to be independent of and complementary to the calibration tests required by paragraph 87 of the EBA Guidelines on PD and LGD. These calibration tests should be performed on the data used for the calibration (including external/pooled data used in the calculation of the default rates and in the calculation of the average PD on the calibration sample).

5.2.3 Calibration to the LRA default rate

127. To calculate the LRA default rate, institutions should follow paragraphs 82 to 86 of the EBA Guidelines on PD and LGD. If an institution makes adjustments to the observed average default rates in order to obtain LRA default rates under paragraph 85(b) of the EBA Guidelines on PD and LGD, these adjustments should be based on (external) default rates, or – if no appropriate default rates are available – on other observed indicators relevant for the type of exposures considered.

128. For the purpose of assessing the representativeness of the historical observation period used for the likely range of variability of one-year default rates under paragraph 83 of the EBA Guidelines on PD and LGD, the following should be taken into account.

    (a) Where the scarcity of internal exposures and/or defaults might unduly influence the variability of internally observed default rates (i.e. where the variability driven by statistical uncertainty is so high in comparison with the structural variability of default rates that it hampers any analysis of them), institutions should assess whether external or pooled default rate series can be used to identify the relevant historical observation period for the likely range of variability of one-year default rates. The external or pooled default series used should be relevant for the specific portfolio at least in terms of geographical composition, sectoral distribution and other relevant risk drivers. When no relevant default rate series can be identified, the items described in paragraphs 83(b) and 83(c) of the EBA Guidelines on PD and LGD should play a crucial role in the assessment.

    (b) When taking into account the existence of one-year default rates relating to bad years as reflected in economic indicators that are relevant for the considered types of exposures within the historical observation period as referred to in paragraph 83(b) of the EBA Guidelines on PD and LGD, institutions should ensure that such indicators are relevant for the portfolio at least in the terms of geographical composition, sectoral distribution and other risk drivers relevant to the portfolio.

129. With respect to calibration to the LRA default rate, institutions should follow paragraphs 87 to 99 of the EBA Guidelines on PD and LGD.

130. For the purposes of complying with the provisions of paragraph 92 of the EBA Guidelines on PD and LGD, it is the ECB's understanding that all the following principles apply.

(a) Institutions should document the rationale of their adopted approach and provide evidence that, irrespective of whether the calibration considers (i) the LRA default rate at grade or pool level according to paragraph 92(a) of the EBA Guidelines on PD and LGD or (ii) the LRA default rate at calibration segment level according to paragraph 92(b) of the EBA Guidelines on PD and LGD, the PD estimates are adequate both at grade or pool level and at calibration segment level. In any case, all the requirements on risk differentiation referred to in the applicable regulation apply. The ECB's understanding of these requirements is set out in Section 5.1.2 of this chapter. In particular, it follows from the applicable rules that under no circumstances should an approach be adopted to overcome data scarcity at grade or pool level, lack of evidence of discriminatory capacity, homogeneity or heterogeneity across grades.

(b) Regardless of the level at which institutions consider the LRA default rate in accordance with paragraph 92 of the EBA Guidelines on PD and LGD, in the ECB's view the LRA default rate needs to be calculated at grade or pool level and at calibration segment level since these LRA default rates are required either directly for calibration purposes or indirectly in order to provide meaningful additional calibration tests.

(c) For the purposes of obtaining the LRA default rate at grade or pool level and at calibration segment level, the availability of long series of observed one-year default rates covering the full period representative of the likely range of variability of default rates is of utmost importance. The ECB expects institutions to take all reasonable efforts to obtain such long series with sufficient data quality in line with the provisions of paragraph 70 of the EBA Guidelines on PD and LGD.

In the specific case of changes in the method for assigning exposures to grades or pools, and in accordance with paragraph 98(a) of the EBA Guidelines on PD and LGD, institutions should make all reasonable efforts to recalculate the new assignment back through time covering the full period representative of the likely range of variability of default rates, as such grade or pool level information is necessary to obtain long series of one-year default rates at grade or pool level. Institutions should duly justify and document situations where backwards recalculation is not possible. Additionally, in the exceptional cases where such recalculation is not possible, institutions should assess whether the use of the historical rating assignments based on previous versions of the assignment methodology would be adequate.

(d) Without prejudice to the application of adequate methodologies to correct identified deficiencies in order to overcome biases in risk parameter estimates as required in paragraph 38 of the EBA Guidelines on PD and LGD, in cases where long series of one-year default rates are available at grade or pool level and calibration segment level covering the period representative of the likely range of variability of default rates, in accordance with paragraph 84 of the EBA Guidelines on PD and LGD the LRA default rate should be computed as the observed average of one-year default rates at grade or pool level and calibration segment level in that period.

(e) Where an institution is unable to obtain long series of one-year default rates as described in point (c) above, the underlying reasons should be duly justified and documented. In any case, in accordance with point (b) above, the ECB expects institutions to estimate the LRA default rate at grade or pool level, and calibration segment level by adjusting the observed average of one-year default rates, where necessary, in accordance with paragraph 85 of the EBA Guidelines on PD and LGD. The adjustment should at least be reflective[68] of the number of good and bad years in the available data with respect to the number of good and bad years applicable to the period representative of the likely range of variability. This means that where the number of bad years is under-represented in the available data, upward adjustments should be made to the observed average of one-year default rates, unless the institution is able to provide empirical evidence that the level of observed one-year default rates is unrelated to the years being good or bad. The adjustment must be reflective of the variability of the default rates, meaning that the larger the variability in the default rates, the larger the necessary adjustments might be. As a consequence, in the case of the LRA default rate at grade level, the necessary adjustment depends on the grade assignment dynamics among other things.

Moreover, institutions should duly analyse and document the need for an MoC in accordance with Article 46(3)(b) of Commission Delegated Regulation (EU) No 2022/439 and in accordance with paragraph 42 of the EBA Guidelines on PD and LGD, which requires the MoC to reflect in particular the uncertainty related to the deficiencies referred to in paragraph 37(a)(iii) and 37(a)(x) of the EBA Guidelines on PD and LGD. In the ECB's understanding, and in line with paragraph 43(a)(ii) of the EBA Guidelines on PD and LGD, the larger the adjustments to the observed average of one-year default rates and the larger the unavailable time period in proportion to the period representative of the likely range of variability of default rates, the larger the uncertainty of the adjustments and hence the greater the need for and magnitude of such an MoC.

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[68] This is also without prejudice to the application of adequate methodologies to correct identified deficiencies in order to overcome biases in risk parameter estimates as required in paragraph 38 of the EBA Guidelines on PD and LGD.

131. Where, for calibration purposes, the LRA default rate is considered at the level of grade or pool in accordance with paragraph 92(a) of the EBA Guidelines on PD and LGD, it is the ECB's understanding that the PD (before MoC) of each grade or pool should be equal to the LRA default rate of each grade or pool. This is without prejudice to the provisions of the next paragraph.

132. Where an institution adopts the approach referred to in paragraph 92(a) of the EBA Guidelines on PD and LGD, it should provide additional tests at the level of the relevant calibration segment. To this end, as part of the estimation and ongoing monitoring of its models, an institution should, at least, compare the LRA PD at calibration segment level with the LRA default rate at calibration segment. In performing this comparison, the institution should calculate the LRA PD at calibration segment level as the arithmetic[69] average across time[70] of the (arithmetic) average PD at calibration segment level for each reference date. Deviations should be analysed and documented, and should trigger adequate remedial action where necessary. Where an institution does not explicitly define calibration segments as subsets of the range of application of the PD model, a single calibration segment covering the whole range of application of the PD model must be considered for the above-mentioned test.

133. Where, for calibration purposes, the LRA default rate is considered at calibration segment level in accordance with paragraph 92(b) of the EBA Guidelines on PD and LGD, it is the ECB's understanding that institutions should be aware of situations where divergences between the LRA default rate at a grade level and the grade level PD value could arise. These situations include the following.

    (a) The use of a calibration sample for the purposes of obtaining the adjustment to be made to the scores/raw PDs at grade level in order to meet the LRA default rate at calibration segment level which is not fully representative of the likely range of variability of default rates may result in PD estimates at grade level which are lower than the LRA default rate at grade level. This could happen, for example, when the grade assignment is to some extent sensitive to the economic conditions[71], and bad years are over-represented in the calibration sample, in which case a biased adjustment may be obtained as a result of the distribution across grades of the calibration sample being overpopulated in riskier grades compared with the sample corresponding to the period of the LRA default rate.

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69 Unless the institution makes use of the weighting for retail exposures according to Article 180(2)(e) of the CRR.

70 Considering the same time frame and calculation dates as the LRA default rate, including any most recent calculation dates available when the tests are performed as part of the ongoing monitoring of the models.

71 This is without prejudice to the provisions set out in Section 5.1.3 of this chapter.

(b) The use of a calibration sample[72] for the purposes of obtaining the scores/raw PDs at grade level or the use of a calibration methodology where the discriminatory power implied by the PDs at grade level is not consistent with the discriminatory power implied by the observed average of the one-year default rates at grade level from the sample corresponding to the period of the LRA default rate[73] may result in PD estimates at grade level which do not reflect the LRA default rate at grade level.

134. The ECB expects that institutions will duly justify the choice of the calibration sample and methodology and in particular assess its adequacy in terms of situations (a) and (b) mentioned in the previous paragraph.

135. Where an institution adopts the approach referred to in paragraph 92(b) of the EBA Guidelines on PD and LGD, it should perform additional tests as part of the development and ongoing monitoring of its models to ensure that the final (post-calibration) PDs reflect the LRA default rate of each grade. Specifically, institutions should ensure that there are no systematic deviations when comparing the estimated PDs with the LRA default rate of the grades, i.e. the direction of divergences across grades should be random regardless of the materiality or statistical significance of the deviations. For example, deviations (statistically material or not) occurring in a given direction for a number of consecutive grades are understood by the ECB to be systematic deviations.

    In any case, even if the deviations are not systematic, the ECB expects institutions to demonstrate that such grade-level deviations do not distort the RWEA calculations. For that purpose, institutions should analyse any material difference between the RWEAs resulting from the current calibration and the RWEAs resulting from the application of alternative PDs calculated on the basis of the LRA default rate at grade level for the application portfolio, and reach a conclusion on the appropriateness of the adopted methodology on the basis of such a comparison.

136. Under paragraph 87 of the EBA Guidelines on PD and LGD, institutions should have sound and well-defined processes in place to ensure sound calibration including quantitative calibration tests and supplementary qualitative analyses. It is the ECB's understanding that, as part of these tests, institutions should compare the average PD (before MoC) at calibration segment level with the one-year default rate and with the LRA default rate at calibration segment level

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[72] The ECB understands that any sample used for calibration purposes should fulfil the requirements set out for the calibration sample. As such, the term "calibration sample" will be used here not only to refer to the sample on which "the resulting PD estimates correspond to the long-run average default rate at the level relevant for the applied method" (definition of PD calibration in paragraph 8 of the EBA Guidelines on PD and LGD) but also to any other sample used for calibration purposes.

[73] In other words, the slope of the obtained PD curve is not consistent with the slope of the curve of the LRA default rate at grade level. For example, one way in which the implied discriminatory power/slope can be numerically compared is by computing (a) the AUC (area under the ROC curve) that would be obtained on the basis of the number of exposures per grade in a given sample and the number of defaults per grade equal to the PD estimates times the number of exposures in the grade, and (b) the AUC that would be obtained on the basis of the number of exposures per grade in the same sample and the number of defaults per grade equal to the LRA default rate per grade times the number of exposures in the grade.

for each of the calculation dates adopted for LRA default rate calculation[74]. Institutions should reach a conclusion on the appropriateness of the final (post-calibration) PD level at calibration segment on the basis of such comparisons and by taking into consideration the grade assignment dynamics of the PD model.

137. Under paragraph 89 of the EBA Guidelines on PD and LGD, institutions should ensure that for the purpose of calibrating PD estimates to the LRA default rate, any overrides applied in the assignment of obligors to grades or pools are taken into account. However, where the appropriate consideration of overrides in the calibration process is not possible, institutions should apply an appropriate adjustment (AA) to the extent possible and a corresponding MoC to account for the uncertainty associated with the lack of consideration of overrides within the model calibration. In order to evaluate the need for an AA and an MoC and to quantify them, institutions may, for example, use the outcome of a re-rating of a representative sample (including the application of the new overrides policy if applicable) at a recent date. In addition, the appropriateness of this MoC should be reviewed during the review of estimates, also taking into consideration the impact of the overrides on the ratings of the whole portfolio after implementation of the new model in the production environment.

5.2.4 Weighting for retail exposures

138. Notwithstanding paragraph 127, for retail exposures institutions need not give equal importance to historical data if more recent data are a better predictor of loss rates.[75] In the understanding of the ECB an institution may consider that the more recent data are a better predictor of loss rates and may give more importance to recent historical data if the following apply.

    (a) There is a significant improvement in the predictive power when using the more recent data with respect to the predictive power resulting from the use of an arithmetic average under paragraph 81 of the EBA Guidelines on PD and LGD. This improvement should be evidenced by comparing the estimated PDs for each grade with the realised default rates covering as long a period as possible, in accordance with Article 185(b) of the CRR.

    (b) Older data are considered as non-representative as a result of specific policy or business changes in the bank, but not in order to reflect current trends in default rates directly related to macroeconomic conditions.

    (c) The weighting approach is used in a consistent manner over time and any change in the applied weights of historical data is appropriately justified.

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74 Following the expectations of paragraph 130(c) of this guide, if institutions duly justify and document situations where backwards recalculation of assignments in some historical reference dates is not possible, this comparison might be conducted in a shorter period.

75 Article 180(2)(e) of the CRR.

5.2.5 PD quantification based on mapping to external grades

139. The ECB interprets the possibility for institutions to attribute the default rate observed for the grades of a rating agency or similar organisation to its own grades in accordance with Article 180(1)(f) of the CRR as being equivalent to the use of external data for PD quantification at a more aggregated level (external grade) rather than at the obligor/facility level. Accordingly, Sections 3.2 and 5.2.2 of this chapter are relevant for institutions that do so.

140. In accordance with Article 180(1)(f) of the CRR, mappings must be based on a comparison of internal rating criteria with the criteria used by the external organisation and on a comparison of the internal and external ratings of any common obligors. Biases or inconsistencies in the mapping approach or underlying data must be avoided. To comply with these requirements, institutions should follow the paragraphs listed below.

    (a) Institutions should ensure that the quality of the mapping between internal and external rating scales at a given date and over time is consistent and provides for an adequate level of predictive ability.

    (b) When mapping internal grades to external grades, institutions should document and analyse any differences between the external and internal rating criteria.

    (c) The use of common obligors as a basis for the mapping should take into account their representativeness for the application portfolio.

    (d) Institutions should adjust the external rating scale if such rating scale does not solely embed default risk.[76] They should also document such adjustments.

    (e) When mapping internal grades to external grades and using the default rates of the external grades provided by the organisation, if the latter has a material number of entities for which it no longer provides a rating (withdrawn rating), the institution should take this into account. It should adjust the external default rates accordingly, if necessary, and take into consideration the provisions of paragraph 75 of the EBA Guidelines on PD and LGD. In the event that an adjustment is performed, the institution should add the necessary MoC.

5.2.6 Specific requirements for direct PD estimates

141. In order to use direct PD estimates for the calculation of own funds requirements in accordance with Article 169(3) of the CRR, institutions should follow paragraphs 96 and 98(b) of the EBA Guidelines on PD and LGD. To assess whether the theoretical assumptions of the probability model underlying

[76] In accordance with Article 170(1)(b) of the CRR, institutions' rating systems must have an obligor rating scale which reflects exclusively the quantification of the risk of obligor default.

the estimation methodology are satisfied to a sufficient extent in practice under paragraph 96 of the EBA Guidelines on PD and LGD, institutions should do the following.

(a) Ensure good risk differentiation properties across the full PD range of the rating system.

(b) Have an adequate and documented concept in place specifying the calibration function currently implemented (concrete functional form), including the underlying theoretical assumptions and the established processes to conduct the PD calibration. It is the ECB's understanding that institutions should ensure consistency between the score-inferred PDs and the observed default rates and should understand and justify the transformation of the scores into PD values.

(c) Ensure that any transformation of the scores resulting from the probability model that is applied during the calibration does not change the ranking of the obligors/facilities (in other words, co-monotonicity between scores/raw PDs and PD values should be ensured). Moreover, institutions should avoid any undue influence of extreme values of score-inferred PDs on the shape of the calibration function. Additionally, and when institutions use different calibration functions for different sub-ranges, they should ensure that this mix is appropriate (both in terms of the functional forms used and the cut-offs selected) and that it is appropriately justified.

(d) Ensure that there is a relevant number of observations across the whole range of score-inferred PDs. Particular interest should be paid to situations where the probability model is extended to ranges of PD values where there are not enough defaulted observations.

(e) Ensure that there are no excessive concentrations of exposures or obligors within the PD range of the rating system. In addition, high concentrations of observations in a specific range of score-inferred PDs should be properly analysed and justified in terms of homogeneity.

(f) For the purpose of performing the additional tests at grade level referred to in paragraph 92(b) of the EBA Guidelines on PD and LGD, grades should be understood as sub-ranges of PD values. These sub-ranges should be defined in a way that:

(i) represents sufficiently narrow ranges of PD values;

(ii) contains a sufficient number of observations to ensure a meaningful calculation of the LRA default rate of the sub-range.

142. In cases where institutions map the PDs to a masterscale (defined in terms of PD bounds) as a final step in the PD estimation process (using masterscale discrete PDs for the purpose of RWEA calculation), there is a risk that the mapping process could distort RWEAs. To mitigate this risk, institutions should verify that deviations between the masterscale PDs and the average of the

direct PDs assigned to obligors in each grade do not show a systematic or material bias towards underestimation of PD per grade over time. This analysis should be provided for both the portfolio and for each grade.

6 Loss given default

6.1 Realised LGD

6.1.1 Relevant regulatory references

Table 14

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	4	(1)(55)
		5	(2)
		144	(1)(e)
		161	(2), (3)
		164	(2)
		166	(1)
		174	(c)
		175	(1), (4)(a)
		176	(4), (5)
		179	(1)(a), (c), (d) and second sub-paragraph
		181	(1)(a), (h), (i), (j), (2)(b) and second sub-paragraph
		182	(3)
		183	(2)
		185	(a)
		191	
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	3	(1), (2)(c)
		11	(2)(a)
		17	(1)(a)
		30	(1)(a)
		31	
		37	(2)(a), (b)
		42	(1)(a), (c), (d), (2)(a), (b)
		47	
		48	(b), (c), (d), (g), (h)
		49	(b), (c)
EBA Guidelines on PD and LGD	20/11/2017		37(a)(viii), 100-103, 131-146
EBA Guidelines on DoD	18/01/2017		44, 51, 71, 72, 77

6.1.2 Reference dataset

143. Under paragraph 102 of the EBA Guidelines on PD and LGD, institutions should estimate LGDs on the basis of their own loss or recovery experience.[77] Institutions may supplement their own historical data on defaulted exposures with external data. The more own loss experience (i.e. the more internal defaults) an institution has, the less importance it needs to give to external data. Institutions should ensure that their own historical experience contains a minimum number of defaults in order to determine whether external data are sufficiently representative.

144. To ensure that LGD estimations are accurate and are not underestimated as a result of different external and internal recovery processes, institutions should place greater importance on comparisons of internal recovery processes with the recovery processes underlying the external data, in cases where a high weight is assigned to external data. Where limited representativeness of external data is found, a category A MoC should be considered, in order to reflect the uncertainty of the estimation under paragraph 37(a)(viii) of the EBA Guidelines on PD and LGD. Its magnitude should also be quantified in relation to the weight assigned to the external data.

145. When institutions use information derived from the market price of defaulted financial instruments to supplement their internal loss or recovery experience data, there is a risk of misspecification of their LGD estimates. To mitigate this risk, institutions should ensure the following:

    (a) institutions should verify whether the development sample is representative of the application portfolio at least in terms of regions and product type, even when those variables have not been identified as relevant risk drivers;

    (b) losses derived from market prices should be increased to reflect indirect costs, as specified in paragraph 146 of the EBA Guidelines on PD and LGD.

6.1.3 Calculation of realised LGD

146. Article 4(1)(55) of the CRR defines LGD as the ratio of the loss on an exposure due to the default of a counterparty to the amount outstanding at default. For the purposes of Article 181(1)(a) of the CRR, institutions are required to calculate realised LGD. To comply with this requirement, it is the ECB's understanding that institutions should calculate realised LGD under paragraphs 100 to 103 and 131 to 146 of the EBA Guidelines on PD and LGD.

[77] In accordance with paragraph 109 of the EBA Guidelines on PD and LGD, the RDS should contain all relevant information in relation to losses and recovery processes. This should also include climate-related and environmental information where relevant and material.

In addition, when performing this calculation institutions should follow the observations in the succeeding paragraphs.

147. In accordance with Article 181(1)(h) of the CRR, institutions must have estimates of LGD in-default and EL_{BE} on defaulted exposures. To comply with this requirement, it is the ECB's understanding that all principles regarding the calculation of realised LGD should be applied for the estimation of LGD on non-defaulted exposures and for the estimation of LGD in-default and EL_{BE} on defaulted exposures, unless mentioned otherwise (that is, if the reference date is considered instead of the date of default).

148. Where, in the case of retail exposures and purchased corporate receivables, institutions derive LGD estimates from realised losses and appropriate estimates of PDs in accordance with Articles 161(2) and 181(2)(a) of the CRR and under paragraph 103 of the EBA Guidelines on PD and LGD, all the principles regarding realised LGD should apply to realised losses.

149. Institutions must document the specific definitions of default and loss used internally and ensure that they are consistent with the definitions set out in the CRR.[78] To comply with these requirements, institutions should have in place sufficiently detailed policies and procedures to ensure that the realised LGD is calculated consistently and accurately, including the implementation of the definition of economic loss. These policies and procedures should include sufficiently detailed documentation to allow third parties to replicate the calculation of realised LGD. To ensure that the policies and procedures are implemented in an appropriate and adequate manner, the calculation process should be regularly reviewed by an independent unit.

150. In accordance with Article 181(1)(a) of the CRR and under paragraph 100 of the EBA Guidelines on PD and LGD, institutions should calculate the realised LGD at facility level for each default. In line with paragraph 112 of the EBA Guidelines on PD and LGD, where aggregated information is collected and stored, the realised LGD at facility level may be calculated using this more aggregated information, in which case institutions should define a proper methodology for the allocation of recoveries and costs to each individual facility. The ECB expects institutions to duly justify and document the underlying reasons for the collection and storage at a more aggregated level than facility level.

151. In exceptional cases, the ECB considers institutions to be compliant with the requirement to calculate realised LGD at facility level if they can prove that the recovery is not performed at individual facility level but at a more aggregated level (for example, several facilities of the same or different types secured by the same collateral). The realised LGD can therefore be calculated at a more aggregated level than individual facility level. For this exceptional deviation from

78 Article 175(3) of the CRR.

the calculation of realised LGD at facility level to be acceptable, institutions should:

(a) provide evidence that recovery at aggregated level is legally enforceable.

(b) on a regular basis (as often as review of estimates is performed or more often), provide evidence that recovery at a more aggregated level than single facility level is in practice enforced. This evidence should be based on the institution's historical practice and data and demonstrate that both the recovery process and its outcomes in terms of realised loss or recovery are the same for all the facilities considered at the aggregated level. Specifically, institutions should be able to prove that all collateral within an aggregation is called irrespective of the product triggering default (thus, for a current account as for a home loan) and that realised loss or observed recovery is the same for all types of facility within the aggregation.

(c) for retail exposures where institutions use the definition of default at facility level set out in the last sentence of Article 178(1) of the CRR, ensure that the default is triggered for all aggregated facilities.

(d) In addition, institutions following this approach should:

(e) ensure that the parameters are applied in a manner that is consistent with how they have been estimated, i.e. across aggregated facilities;

(f) ensure that the counting unit used for the purposes of risk quantification is at this aggregated level;

(g) ensure that no bias results from the aggregation of facilities, by validating the estimates (PD, LGD, CCF) at the more aggregated level also.

152. As mentioned in paragraph 146, for the purposes of Article 181(1)(a) of the CRR institutions are required to calculate realised LGD, which is defined by Article 4(1)(55) of the CRR as the ratio of the loss on an exposure due to the default of a counterparty to the amount outstanding at default. Furthermore, Article 5(2) of the CRR defines loss as an economic loss, including material discount effects, and material direct and indirect costs associated with collecting on the instrument. In accordance with these provisions, it is the ECB's understanding that institutions should calculate realised LGD as a ratio of the economic loss to the outstanding amount of the credit obligation at the moment of default, including any amount of principal, interest or fee (hereinafter outstanding amount at default). To calculate realised LGD, institutions should follow paragraphs 131 to 146 of the EBA Guidelines on PD and LGD. In addition, they should pay particular attention to the following points.

(a) Outstanding amount at default includes any part of the exposure that has been forgiven or written off before or at the date of default (paragraph 134 of the EBA Guidelines on PD and LGD). Institutions should ensure consistency with the accounting value gross of credit risk adjustment

(i.e. “provisions”) (Article 166(1) of the CRR) by explaining any differences. This amount also includes interest and fees capitalised in the institution’s income statement before the moment of default. However, interest and fees capitalised after the moment of default are not considered (paragraphs 137 to 138 of the EBA Guidelines on PD and LGD). Where institutions include additional drawings after the moment of default to estimate CCFs, these additional drawings discounted to the moment of default are added to the outstanding amount at default in the denominator (paragraphs 139 to 142 of the EBA Guidelines on PD and LGD). In other words, institutions should ensure that the exposure used for CCF estimation, where additional drawings after default are discounted with the same discount factor as applied for LGD, is consistent with the denominator of the LGD.

(b) Economic loss is calculated under paragraph 132 of the EBA Guidelines on PD and LGD. This also applies in the specific case of facilities that return to non-defaulted status, where losses arising from payment delays are expected to be accounted for as well as the “artificial cash flow” envisaged by paragraph 135 of the EBA Guidelines on PD and LGD.

(c) When recoveries are not directly observed but calculated on the basis of the difference between exposure values at two consecutive dates or derived, even partially, from some other treatment, all assumptions should be duly justified and clearly documented in order to adequately replicate the recovery flows that occur during the recovery process in accordance with letters a) and b) above. Institutions are expected to pay particular attention to the treatment of interest and fees capitalised after default, the treatment of additional drawings and the treatment of write-offs.

153. The economic loss as defined in Article 5(2) of the CRR also includes material discounts. The ECB’s understanding is as follows.

(a) Paragraph 134 of the EBA Guidelines on PD and LGD refers to all losses incurred through forgiveness or write-off.

(b) Where institutions open new facilities to replace previously defaulted facilities as part of restructuring or for technical reasons, the economic loss should include the decrease in the degree of financial obligation arising from changes in the contractual conditions (i.e. material forgiveness or postponement of payment of principal, interest or fees). The amount by which the financial obligation has diminished should be calculated under paragraph 51 of the EBA Guidelines on DoD. However, no double-counting of debt forgiveness is intended (for example, in the case of exposures that return to non-defaulted status, a possible double-counting through the diminished financial obligation and the artificial cash flow is not intended).

(c) Realised LGD for individual facilities may be zero or lower when it is the actual result of the recovery process (for example, where additional

recoveries offset the discounting effect and costs). Institutions should, however, pay particular attention to no-loss exposures, since they may reveal issues with the calculation of realised losses – for example, costs not being adequately allocated to recovery processes, or inadequate treatment of amounts forgiven or written off.

6.1.4 Treatment of multiple defaults

154. For the purpose of LGD estimation and in order to ensure an appropriate measurement of economic loss as defined in Article 5(2) of the CRR, institutions should consider an exposure that returns to normal status and subsequently defaults in a short period of time as being constantly defaulted from the moment the first default occurred. This treatment should be applied under paragraph 101 of the EBA Guidelines on PD and LGD. In addition, institutions should follow the observations in the following paragraphs.

    (a) Paragraph 101 of the EBA Guidelines on PD and LGD envisages the definition of a period longer than nine months when this is appropriate for the specific type of exposures and reflects the economic meaning of the default experience. It is the ECB's understanding that a longer period is adequate when the proportion of subsequent defaults occurring on individual facilities over a period of more than nine months is significant, unless institutions are able to provide evidence that the second (or subsequent) default is unconnected with the original default event. This evidence may include analysis of the curing process.

    (b) In the particular case of an institution opening new facilities to replace previously defaulted facilities as part of restructuring or for technical reasons, it should be able to make or trace a connection between the restructured facility and the facility (or facilities) previously advanced and which it is restructuring.

6.1.5 Treatment of massive disposals (Article 500 of the CRR)

155. Article 500 of the CRR allows institutions to adjust their LGD estimates "by partly or fully offsetting the effect of massive disposals of defaulted exposures on realised LGDs up to the difference between the average estimated LGDs for comparable exposures in default that have not been finally liquidated and the average realised LGDs including on the basis of the losses realised due to massive disposals", subject to certain conditions.

156. Article 500 of the CRR specifies that, irrespective of the date of disposal, the adjustment may only be carried out until 28 June 2022. Since this date has passed, it is no longer possible to request additional adjustments under this

Article[79]. However, the effect of existing adjustments may last for as long as the corresponding exposures are included in the institution's own LGD estimates. Furthermore, existing adjustments in accordance with Article 500 (and therefore carried out by 28 June 2022) may still be subject to change after 28 June 2022.

The dates of disposal mentioned in Article 500 (1)(b) of the CRR should be the dates of transfer of the legal ownership of assets. Article 500 of the CRR contains a time limit corresponding to the period from 23 November 2016 to 28 June 2022. Only the date of disposal is relevant for determining whether this time limit has been complied with.

157. An institution must qualify for the use of Article 500 of the CRR by meeting the conditions set out therein, or be a subsidiary or parent of an institution which thus qualifies. In the case of a parent, the ECB considers that the adjustment at the consolidated level should reflect the adjustment conducted by the qualifying subsidiary or subsidiaries only. In other words, if the parent does not by itself meet the conditions of Article 500, any additional defaults that are not defaults of the subsidiary that qualifies for the use of Article 500 CRR may not be part of the adjustment pursuant to Article 500 CRR at the consolidated level of the parent.

158. Article 500(1)(c) of CRR sets out a threshold condition that must be met in order to qualify for the use of this Article. The denominator of the 20% threshold must be understood as the outstanding amount of defaulted exposures as of the date of the first disposal according to the plan submitted to the competent authority.[80] It is the ECB's understanding that the threshold condition should be evaluated at the level of the institution submitting the plan referred to in Article 500(1)(a) of the CRR.

159. With respect to whether the inclusion of foreclosed assets (the repossession and sale of collateral as referred to in paragraph 115(b) of the EBA Guidelines on PD and LGD) in the Article 500 adjustment is permissible, the ECB considers it important to distinguish between the sale of an exposure and the sale of collateral. Only the former, but not the latter, is covered by Article 500 of the CRR. Consequently, since Article 500 of the CRR refers to the use of defaulted exposures for the calculation of the threshold and the adjustment itself, foreclosed assets cannot be included in either.

160. It is the ECB's understanding[81] that "the average estimated LGDs for comparable exposures in default that have not been finally liquidated" can be calculated based on the institution's incomplete workout treatment applied to the exposures as of the date before the date of their disposal. This calculation implies an adjustment back to the estimated LGD that would have occurred if the standard workout process had been followed instead of the massive

[79] This is based on the version of Regulation (EU) No 575/2013 in effect as of the date of publication of this guide.

[80] See also EBA Q&A with Question ID 2019_4824.

[81] See also EBA Q&A with Question ID 2019_4814.

disposals process. Where an institution follows this approach, it should ensure the following.

(a) The requirements related to the institution's incomplete workout treatment should be in line with paragraphs 153 to 159 of the EBA Guidelines on PD and LGD. In particular, the uncertainty referred to in 159(f) will persist indefinitely, and so the related MoC will also have to persist as long as the adjusted observations are used for the estimation of parameters.

(b) During the annual review of estimates of its LGD models, it should be assessed whether the use of newly available information would increase the accuracy of the Article 500 adjustment performed in the past. For this purpose the institution should have pre-defined, internally approved criteria to decide whether the accuracy of the Article 500 adjustment can be increased. If the accuracy can be increased, the institutions should perform a new Article 500 adjustment by incorporating this new relevant data and information in accordance with Article 179(1)(a) of the CRR, including appropriate documentation showing that the pre-defined criteria have been met. The ECB expects the update to the Article 500 adjustment to reflect the (economic) conditions and processes as of the date of disposal and not as of the date of the adjustment.

(c) It is expected that once a sufficiently long time has passed since the massive disposal, there will be no new information that can be considered relevant for the adjustment (in particular, a sufficiently long time may be considered to have passed once most of the cases that were incomplete as of the date of the disposals have been closed or if the maximum period of the recovery process has been reached as of the time of the estimation). If this is the case, it will not be necessary to modify the Article 500 adjustment performed in previous calibrations. The supervised entity should monitor whether most cases that were incomplete as of the date of the disposal have been closed. If this is the case, it should conclude that a sufficiently long period of time has passed and make a final assessment of whether the adjustment needs to be updated. The specific MoC related to the uncertainty of the cash flows should be reviewed in accordance with the MoC framework, taking newly available information into account for the same sufficiently long period of time.

161. The data used to develop the incomplete workout treatment should be representative of the portfolio of disposed assets. The institution should have criteria in place to assess representativeness by comparing key characteristics of the portfolios in line with paragraph 37(b)(ii) and Sections 4.2.2 to 4.2.4 of the EBA Guidelines on PD and LGD. Any issues of representativeness should be appropriately reflected in the MoC related to the Article 500 adjustment.

162. For the portfolio of disposed assets to which Article 500 CRR is applied, institutions should collect and store both the adjusted, realised LGDs and the actual sale price of disposed assets within their RDS.

163. Regarding the treatment of incomplete workouts, in order to avoid circular logic if the Article 500 adjustment is based on the incomplete workout treatment, then from the date of the massive disposal onwards, and in the case of disposed assets only, supervised entities are not expected to analyse costs and recoveries as described in paragraph 159(a) of the EBA Guidelines on PD and LGD.

164. According to the ECB's understanding, Article 500 authorises adjustments to the calculation of the following parameters: observed average LGD; LRA LGD; downturn LGD; EL_{BE}; and LGD in-default.

165. For the calculation of the observed average LGD, the adjusted realised LGD of the exposures subject to the Article 500 adjustment should be included.

166. It is the ECB's understanding that all the defaults subject to the massive disposal adjustment should be treated as closed observations. In particular, they should be treated as such for the purpose of determining the maximum period of the recovery process as referred to in paragraph 156 of the EBA Guidelines on PD and LGD with the date of the massive disposal as the closure date, unless institutions can provide firm evidence that this approach has a significant and unjustifiable biasing impact[82].

167. The relevant downturn period in accordance with paragraph 15 of the EBA/GL/2019/03 and the LGD appropriate for a downturn should be identified based on the realised LGDs of the observed defaults after the application of the Article 500 adjustment.

168. For LGD in-default and EL_{BE} estimates, it is expected that the massive disposal cash flow will be replaced by a cash flow or cash flows adjusted in line with the Article 500 adjustment.

169. Defaults subject to a massive disposal should be removed from the analysis underlying the setting of the reference dates as referred to in paragraph 171 of the EBA Guidelines on PD and LGD.

[82] If it is apparent that including these data points unduly inflates the maximum recovery period, which in reality should be much shorter, then steps should be taken to use a more appropriate and shorter period.

6.2 LGD structure

6.2.1 Relevant regulatory references

Table 15

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	143	(3) second sub-paragraph
		144	(1)(a), (f), (h)
		169	(3)
		170	(1)(e), (f), (3)(b), (c), (4)
		174	(d)
		175	(1), (4)(b)
		179	(1)(a)
		185	(a), (b), (c)
		190	(1)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	33, 34, 35, 36	
		38	(a)
		40	
		48	(i)
EBA Guidelines on PD and LGD	20/11/2017		121, 122, 123

170. A grade or pool is understood by the ECB to be the subset of facilities to which the same LGD is applied for the calculation of regulatory capital requirements, irrespective of how this LGD has been assigned.

171. In order to comply with the requirements regarding the structure of LGD models as set out in Article 170(1)(e) and (f) and 170(3)(b) and (c) of the CRR, institutions should follow the observations below.

172. LGD estimates must be based on the material drivers of risk.[83] To comply with this requirement, institutions should identify and analyse potential risk drivers under paragraphs 121 to 123 of the EBA Guidelines on PD and LGD.[84] When selecting the risk drivers, institutions should take into consideration any changes in product mix or characteristics between the reference and default dates. According to paragraph 122 of the EBA Guidelines on PD and LGD, “institutions should analyse the risk drivers not only at the moment of default but also at least within a year before default and should use reference dates for risk drivers that are representative of the realisations of the risk drivers within a year before default”. In the ECB’s understanding, this means that the choice of reference dates for risk drivers should ensure consistency with the expected distribution of defaults over the one-year horizon (and corresponding changes

83 Article 179(1)(a) of the CRR.

84 Institutions should consider all appropriate risk drivers in accordance with paragraph 121 of the EBA Guidelines on PD and LGD. These should include climate-related and environmental risk drivers where relevant and material.

in the value of the risk driver) that are expected for the exposures to which the estimates are applied. In this context, where risk drivers vary over time, an approach consisting of a fixed (for all defaults) time horizon before default, particularly where this time horizon is less than 12 months, should not be used unless the institution is able to show that such an approach does not result in a lack of representativeness (in the sense of the previous sentence) leading to the final LGD estimates (at grade or pool level) being underestimated.

173. Where an institution relies on one or more statistical models to define the process of assigning exposures to facility grades or pools (or parts of this process) in accordance with Article 175(4)(b) of the CRR, it is the ECB's understanding that for institutions to comply with the requirement set out in Article 144(1)(a) of the CRR that rating systems should provide for a meaningful differentiation of risk as further explained in letters (c) and (e) of Article 30(3) of Commission Delegated Regulation (EU) No 2022/439, the statistical process followed by the institution in selecting its model(s) should include assessing the performance of the model(s) on the basis of independent datasets (data points which were left out of the model fitting) in a way that limits the risk of overfitting. Independent datasets should correspond not only to random sampling (out-of-sample), but also to different time periods (out-of-time) unless there are no sufficient data available for the training sample. The expectations set out above in this paragraph are specifically related to the model development phase. Once the process for assigning exposures to facility grades or pools has been defined, the requirements related to the framework for the review of estimates under paragraphs 217 to 221 of the EBA Guidelines on PD and LGD apply, together with the expectations set out in Section 9 of this guide. In particular, in accordance with paragraph 218(b)(i) of the EBA Guidelines on PD and LGD, the institution must carry out an analysis to identify any potential deterioration in the model's performance, including the model's discriminatory power, by comparing its performance at the time of the development with its performance over each subsequent observation period.

174. Institutions' rating systems must provide for a meaningful assessment of obligor and transaction characteristics, a meaningful differentiation of risk and accurate and consistent quantitative estimates of risk.[85] It is the ECB's understanding that to comply with this requirement institutions should demonstrate that, in terms of the range of application of LGD models, the model performs adequately (in terms of discriminatory power and predictive power) on economically significant and material sub-ranges of application of the rating systems. The sub-ranges are identified by splitting the full range of application of the LGD model into different parts on the basis of potential drivers for risk differentiation, among which, where relevant, the drivers referred to in paragraph 121 of the EBA Guidelines on PD and LGD.

[85] Article 144(1)(a) of the CRR.

175. The number of grades and pools must be adequate for a meaningful risk differentiation and for the quantification of the LGD at the grade or pool level.[86] To comply with this requirement, institutions should ensure the following

(a) an adequate distribution of facilities across grades or pools in the datasets used for development and (initial and regular) validation. For this purpose:

(i) any unusually low number of facilities in a grade or pool is expected to be supported by empirical evidence of the adequacy of isolating those facilities in a specific grade or pool;

(ii) any unusually high concentration of facilities in a grade or pool is expected to be supported by empirical evidence of homogeneity within these grades or pools (for example by analysing whether some potential risk drivers (e.g. exposure size) that could further differentiate between riskier and less risky facilities have not been considered).

(b) sufficient homogeneity of the risk within each grade or pool by providing empirical evidence that the grade-level LGD is adequate for all facilities in that grade. For this purpose, in cases where it is found (through the use of additional drivers or a different discretisation of the existing ones) that a material subset of facilities within a grade or pool yields a significantly different average realised LGD to that of the rest of the grade or pool, this is considered to indicate a lack of homogeneity.

(c) sufficient heterogeneity of the risk across grades or pools by providing empirical evidence that the average realised LGD is different across consecutive grades or pools, for subsets for which there is a meaningful order.

176. Where an institution uses direct estimates of risk parameters, these may be seen as estimates assigned to grades on a continuous rating scale.[87] In this case, in the ECB's understanding the same requirements apply when an institution uses direct estimates of risk parameters as apply to grade-based models. To comply with these requirements, institutions are expected to ensure risk differentiation in accordance with the following principles:

(a) if the LGD estimates used to calculate the RWEAs are based on default weighted LRAs of realised LGDs for grades or pools, irrespective of whether at some point direct LGD estimates may have been used to define such grades or pools, this grade or pool level is the relevant one for the application of the principles set out in paragraph 175;

(b) when the situation described in point (a) above does not apply and, instead, several components are estimated separately and then combined in order to obtain the direct LGD estimates at facility level, institutions

[86] Article 170(1)(e) and (f) and 170(3)(b) and (c) of the CRR.

[87] Article 169(3) of the CRR.

should adequately analyse and reflect in the model possible dependencies between the components (e.g. through relevant risk drivers);

(c) in the case of other direct LGD estimates (i.e. where no components are defined) the principles above are expected to be applied where relevant.

177. In addition to paragraph 176 above and where several components are estimated separately and then combined in order to obtain the direct LGD estimates at facility level, there is a risk that a meaningful differentiation of risk will not be achieved at facility level. To mitigate this risk, institutions should ensure that no bias is introduced in the risk differentiation when combining the different components in order to obtain the final LGD estimate at facility level. Specifically:

(a) the allocation of recovery flows to these components should be adequately documented and implemented in a consistent way where applicable;

(b) risk differentiation (analogous to risk quantification) should be ensured with respect to facility level.

6.3 Risk quantification

6.3.1 Relevant regulatory references

Table 16

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	179	(1)(a), (1)(d)
		181	(1)(a), (b), (e), (f) and (2) second sub-paragraph
		185	(b)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	47	(c)
		48	(a) to (f), (i)
Commission Delegated Regulation (EU) No 2021/930	01/03/2021		
EBA Guidelines on PD and LGD	20/11/2017		100, 116-118, 147-164
EBA Guidelines for the estimation of LGD appropriate for an economic downturn ("Downturn LGD estimation")[88]	06/03/2019		

[88] EBA Guidelines for the estimation of LGD appropriate for an economic downturn ("Downturn LGD estimation") (EBA/GL/2019/03), referred to in this guide as the "EBA Guidelines for the estimation of LGD appropriate for an economic downturn ("Downturn LGD estimation")".

6.3.2 Observed average LGD

178. To comply with the requirement of obtaining an LRA LGD in accordance with Article 181(1)(a) of the CRR, institutions should calculate the observed average LGD under paragraphs 147, 148, 154-157 and 160 of the EBA Guidelines on PD and LGD. When performing this calculation, institutions should follow the principles set out below.

179. Under paragraph 147 of the EBA Guidelines on PD and LGD, default observations that are triggered close to the time of the LGD estimation process (i.e. observations with a recent default when the LGD is being estimated) are part of the historical observation period and should be included in the RDS. Since for these recent defaults only limited information is available regarding the full recovery process, the treatment of incomplete recovery processes envisaged in paragraph 158 of the EBA Guidelines on PD and LGD is more complex and could add uncertainty to the LGD estimates. It is the ECB's understanding that to mitigate this risk institutions may establish a minimum period of time during which the default should be observed in order for it to be considered in the calculation of the observed average LGD. This minimum period should be adequately justified and institutions should ensure that all relevant information regarding defaults observed for a shorter period (e.g. a change in the characteristics of defaults) is considered in the LGD estimates. In any case this period should not be longer than 12 months.

180. For the purposes of LGD estimation (and validation), long recovery processes are expected to be considered as closed under paragraph 156 of the EBA Guidelines on PD and LGD. The objective of defining the maximum period of the recovery process ("time-to-workout") is to avoid situations where institutions give consideration to overly optimistic recoveries from open exposures that are already at a very advanced stage of the recovery process. To achieve this, the specification of the "time-to-workout" should be supported by evidence of the observed pace of recoveries and be consistent with the nature of the products concerned, the type of exposures and the operational recovery process. In addition, the institution should substantiate and clearly document the studies that support the formulation of the time-to-workout and should pay particular attention to the following.

    (a) The specific moment after the date of default at which nearly nil evolution of the average cumulative recovery rates is observed. For example, when the cumulative recovery curves show a pronounced increase after which they flatten out, the time spent in default after the significant increase occurs could be used directly as the time-to-workout, especially in the case of unsecured exposures.

    (b) The period of time after the date of default where the cumulative percentage of closed/recovered exposures flattens.

(c) The number of exposures used to construct the curves referred to at letters (a) and (b) above, in order to identify situations where only a few cases contribute to the shape of the curves.

(d) The expected recovery rate conditioned to vintages higher than the time-to-workout.

(e) For secured exposures, the share of exposures for which recoveries from collateral have not yet been realised.

6.3.3 Treatment of incomplete recovery processes

181. In order to obtain an LRA LGD in accordance with Article 181(1)(a) of the CRR, institutions should ensure that the relevant information from incomplete recovery processes is taken into account in a conservative manner. For this purpose, institutions should analyse their incomplete recovery processes and extract the information relevant for LGD estimation under paragraphs 153 to 159 of the EBA Guidelines on PD and LGD. In addition, institutions should:

(a) justify and document their methodology for the treatment of incomplete recovery processes, and in particular how they take into account paragraph 159 of the EBA Guidelines on PD and LGD;

(b) for the purpose of paragraph 159(a) of the EBA Guidelines on PD and LGD in particular, base the extrapolation of future recoveries on defaults arising from vintages (i.e. group of exposures which defaulted in a given period of time) for which, during the period already observed, similar average past recoveries have been realised on similar exposures;

(c) in order to ensure transparency regarding the impact from the treatment of incomplete recovery processes, assess the sensitivity of the treatment with respect to the main assumptions.

6.3.4 Recovery processes where collateral has been repossessed and not yet sold

182. In specific cases where institutions have taken possession of but not yet sold the collateral, there is a risk that the value of repossession might not adequately reflect the value of the repossessed collateral. To mitigate this risk, institutions should estimate haircuts to the value of the collateral under paragraphs 116 to 118 of the EBA Guidelines on PD and LGD. In order to ensure transparency regarding the impact from the treatment of repossessed collateral, institutions should:

(a) compare the estimated haircuts with the available observations regarding the repossession and subsequent sale of similar types of collateral;

(b) assess the impact on the LRA LGD of the inclusion of the repossessed collateral by performing sensitivity analyses based on the application of different haircuts to the value of the collateral (at least, by applying a haircut of 100% to cases where collateral has been repossessed but not yet sold).

6.3.5 Long-run average

183. To comply with the requirement of obtaining an LRA LGD by facility grade or pool in accordance with Article 181(1)(a) of the CRR, institutions should estimate LGDs under paragraphs 100 and 149 to 164 of the EBA Guidelines on PD and LGD. When performing this estimation, institutions should follow the observations below.

184. Under paragraph 150 of the EBA Guidelines on PD and LGD, institutions should calculate the LRA LGD as an arithmetic average of realised LGDs over a historical observation period weighted by a number of defaults. When performing this calculation, institutions should observe the following points.

(a) In the event of definition of default applied at obligor level, where two facilities of the same obligor are assigned to the same facility grade or pool, institutions are expected to calculate the average realised LGD as follows: first take the exposure-weighted average realised LGD at the obligor level and then take the arithmetic average LGD weighted by the number of defaulted obligors within the LGD grade. If institutions use a different approach, they should demonstrate that there are no systematic deviations from the approach referred to above.

(b) Under paragraph 160 of the EBA Guidelines on PD and LGD, the realised LGD of each observation should be floored at zero for the purpose of LGD estimation. In cases where LGD estimates for specific facility grades or pools are low or even zero (in exceptional cases), in order to ensure that these estimates are accurate and not driven by (systematic) errors or distortions institutions should ensure that their estimation process is accurate. In particular, they should ensure that there is a sufficient number of observations supporting the estimate and that these outcomes are carefully monitored and scrutinised.

(c) Under paragraph 162 of the EBA Guidelines on PD and LGD, institutions should apply an appropriate treatment to extremely high values of realised LGDs much above 100%, at the level of data quality, risk drivers, assignment to grades or pools or assignment to calibration segments. To ensure that the estimates are accurate, institutions are not expected to cap realised LGD values (i.e. to replace the observed value by a pre-defined value when the observed value is above the pre-defined one).

185. Institutions can calibrate LGD estimates to the LRA LGD calculated at the level of the calibration segment under paragraph 161(b) of the EBA Guidelines on PD

and LGD. When calibration segments are used for the purpose of LGD estimations, institutions are expected to base their decision on a sound rationale, in particular on quantitative evidence. It is the ECB's understanding that, to comply with Article 181(1)(a) of the CRR, institutions should also calculate the LRA LGD at a more granular level than the calibration segment (i.e. individual LGD grades or pools if estimation is discrete or ranges of LGD values if the estimation is continuous). The level should be appropriate for the application of the model. In addition, institutions should ensure that there are no systematic deviations when comparing the estimated LGDs with the LRA of realised LGDs at this more granular level, i.e. the direction of divergences should be random.

186. Where the LGD is the result of a combination of different components (for example, secured and unsecured components), the calibration step according to paragraph 185 (ensuring that the average realised LGD and the average estimated LGD across facilities within the same calibration segment/range of LGD values are aligned) is expected to be performed after the aggregation of the components. In addition, there is a risk that systematic deviations could be introduced to the estimation when combining these different components. In this case, the direction of divergences would not be random. To mitigate this risk, institutions should do the following.

    (a) For defaults in the RDS which are closed or considered closed, compare the realised LGD at facility level with the estimates of LGD. Separate tests should be performed for the LGD applied to the performing portfolio and the LGD in-default. Analogous tests should be performed at component level.

    (b) In the case of models based on components with underlying data covering time windows with different lengths and/or periods for each of the components, ensure that no bias is introduced in the LGD estimates at facility level with respect to the LRA. The analysis referred to in point (a) should be performed, at least, for the available common time period.

187. Notwithstanding paragraph 184, for retail exposures institutions need not give equal importance to historical data if more recent data are a better predictor of loss rates.[89] It is the ECB's understanding that an institution may consider the more recent data to be a better predictor of loss rates and may give more importance to recent historical data if its methodology is in line with paragraphs 150 to 152 of the EBA Guidelines on PD and LGD and if the following apply.

    (a) There is a significant improvement in predictive power when using the more recent data with respect to the predictive power resulting from the use of an arithmetic average under paragraph 150 of the EBA Guidelines on PD and LGD. This improvement would be evidenced by comparing the

[89] Article 181(2), last paragraph, of the CRR.

estimated LGDs for each grade with the average realised LGD covering as long a period as possible in accordance with Article 185(b) of the CRR.

(b) The oldest data are considered as non-representative as a result of specific policy or business changes in the bank, but not in order to reflect current trends in loss rates directly related to macroeconomic conditions.

(c) The weighting approach is used in a consistent manner over time and any change in the applied weights of historical data is appropriately justified.

188. In accordance with Article 179(1)(a) of the CRR, an institution's own estimates must incorporate all relevant data and must be derived using both historical experience and empirical evidence. To comply with these requirements, when institutions use external or pooled data to complement their own loss or recovery experience, they should ensure that LRA LGDs derived from external or pooled data are also calculated separately from, and compared with, those based on internal data[90]. In addition, the direction and magnitude of the differences between these averages should be properly analysed and documented when calibrating the model, including the adequacy of the MoC considered, and duly followed up in the review of estimates.

189. Article 179(1)(d) of the CRR requires, among other things, that the population of exposures represented in the data used for estimation, the lending standards used when the data were generated and other relevant characteristics must be comparable with those of the institution's exposures and standards. Paragraph 164 of the EBA Guidelines on PD and LGD further specifies that institutions should take into account not only the current characteristics of the portfolio but also, where relevant, any changes to the structure of the portfolio that are expected to happen in the foreseeable future. When institutions perform adjustments to their LGD estimates in order to comply with these requirements, it is the ECB's understanding that the following principles should apply.

(a) The adjustment should be based on a comparison of the data used in risk quantification with the institution's application portfolio. In many circumstances (for example where a type of product has been discontinued by the institution), the addition of these characteristics as risk drivers for LGD estimation is the most simple and effective way of dealing with issues of non-representativeness.

(b) In the event of changes in lending or recovery policies, institutions should make only conservative adjustments until they are able to provide empirical evidence concerning the impact of the new policies. Such evidence should be based on the inclusion in the RDS of data from periods more recent than the change of policy.

(c) All economic and market conditions experienced in the past and reflected in historical observations should be considered by institutions as part of

[90] Considering the maximum common period possible between the internal and external or pooled data.

foreseeable economic and market conditions (paragraph 147 of the EBA Guidelines on PD and LGD). They are not, therefore, a reason to perform adjustments.

6.3.6 Downturn LGD

190. To obtain LGD estimates that are appropriate for an economic downturn in accordance with Article 181(1)(b) of the CRR, institutions are expected to:

(a) Characterise an economic downturn in accordance with the Commission Delegated Regulation (EU) No 2021/930;

(b) derive LGD estimates which are appropriate for the downturn conditions specified, in accordance with the EBA Guidelines for the estimation of LGD appropriate for an economic downturn ("Downturn LGD estimation").

6.4 Estimation of EL_{BE} and LGD in-default

6.4.1 Relevant regulatory references

Table 17

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	179	(1)(c)
		181	(1)(a), (h), (j) and (2) second sub-paragraph
		185	(a) to (c)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	47	
		48	(c)
		51	
EBA Guidelines on PD and LGD	20/11/2017		165 to 193

191. In accordance with Article 181(1)(h) of the CRR, for the specific case of exposures already in default institutions must use the sum of their EL_{BE} for each exposure, given current economic circumstances and exposure status and their estimate of the increased loss rate caused by possible additional unexpected losses during the recovery period. To comply with these requirements, institutions should estimate EL_{BE} and LGD in-default under paragraphs 165 to

193 of the EBA Guidelines on PD and LGD.[91] In this process, institutions should follow the observations below.

192. In accordance with Article 181(1)(h) of the CRR, the EL_{BE} must represent the best estimate of expected loss given current economic circumstances and exposure status. To comply with this requirement, it is the ECB's understanding that institutions should take into consideration the economic conditions expected over the period of the recovery process, and in particular reflect downturn conditions in the EL_{BE}, if and only if current economic conditions are in a downturn or a downturn is expected over the period of the recovery process. This can be done by adding the relevant macroeconomic and economic factors as drivers of the EL_{BE} model, as would be the case for models complying with any condition of paragraph 184 of the EBA Guidelines on PD and LGD, or by adjusting the LRA as referred to in paragraph 185 of the EBA Guidelines on PD and LGD. Furthermore, in accordance with paragraph 184 of the EBA Guidelines on PD and LGD, if any of the conditions referred to in that paragraph is met (i.e. the model includes directly at least one macroeconomic factor as a risk driver, or at least one material risk driver is sensitive to economic conditions, or the realised LGD for defaulted exposures is not sensitive to the relevant economic factors), then in the ECB's understanding, the EL_{BE} estimated on the basis of the LRA LGD reflects current economic circumstances as required by Article 181(1)(h) of the CRR and hence no further adjustments to the LRA LGD should be performed by institutions to reflect current economic circumstances. This means that, in the ECB's understanding, where paragraph 184 of the EBA Guidelines on PD and LGD applies, the EL_{BE} estimates should not deviate from the LRA LGD if the argument for the deviation is based on economic conditions. It is the ECB's understanding that institutions should appropriately account for paragraph 184 of the EBA Guidelines on PD and LGD when back-testing their EL_{BE} estimates in accordance with paragraph 170 of the EBA Guidelines on PD and LGD. To this end, where one of the conditions of paragraph 184 is met, the evolution of the EL_{BE} estimates over time should be in accordance with that of the average realised LGD for defaulted exposures, although the variability of the EL_{BE} time series may be lower than that of the average realised LGD for defaulted exposures.

193. Under paragraph 193 of the EBA Guidelines on PD and LGD, LGD in-default can be estimated directly or as the sum of EL_{BE} and an add-on capturing the unexpected loss related to the exposures in default that may occur during the recovery period. In particular, the following should be taken into consideration.

    (a) The use of a constant value for unexpected losses for all defaulted exposures is not risk sensitive. In the ECB's understanding, therefore, it

[91] In accordance with paragraph 177 of the EBA Guidelines on PD and LGD, for the purpose of EL_{BE} and LGD in-default estimation, institutions should analyse the potential risk drivers referred to in paragraph 121 of the EBA Guidelines on PD and LGD, not only until the moment of default but also after the date of default and until the date of termination of the recovery process. For the purposes of EL_{BE} and LGD-in default estimation, this should include climate-related and environmental risk drivers where those risk drivers are assessed as relevant and material.

does not allow an accurate assessment of risk. Where an institution does use a constant value, it should justify this. It should demonstrate that the constant value in question is an adequate estimate of all the components of unexpected loss envisaged in paragraph 193(b) of the EBA Guidelines on PD and LGD during the remaining recovery period, i.e. between the date for which estimates are being applied and the final closure of the recovery process. This analysis should be performed at least for every calibration segment.

(b) LGD in-default estimates are generally expected to be higher than EL_{BE} estimates and only equal for duly justified individual exposures, which are expected to be very limited.

7 Conversion factors

7.1 Commitments, unadvised limits and scope of application

7.1.1 Relevant regulatory references

Table 18

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	4	(1)(56)
		151	(7), (8)
		166	(1) to (8)(a), (b), (c), (d), (10)

194. In accordance with Article 151(7) and (8) of the CRR, institutions must use own estimates of CCFs for the retail exposure class. If they have received permission to use own estimates for the corporate, institutional, central government and central bank exposure classes, they must again use own estimates of CCFs, instead of the conversion factors set out in in Article 166(8)(a) to (d) of the CRR. In both cases (retail and non-retail exposure classes), the scope of CCF modelling is, in the ECB's understanding, limited to the off-balance sheet items referred to in Article 166(8) of the CRR.[92] The treatment of off-balance-sheet items other than those mentioned in Article 166(1) to (8) of the CRR is specified in Article 166(10). In accordance with Article 166(10) of the CRR, an exposure value must be a specific percentage of an off-balance-sheet item's value, based on the classification of off-balance-sheet items established in Annex I of the CRR.

[92] The understanding of the ECB is also supported by EBA Single Rulebook Q&A, Question ID: 2014_1263.

195. Conversion factor means the ratio of the currently undrawn amount of a commitment that could be drawn and that would therefore be outstanding at default to the currently undrawn amount of the commitment. The extent of the commitment is determined by the advised limit, unless the unadvised limit is higher.[93] The exposure value for the items listed in Article 166(8) of the CRR must be calculated as the committed but undrawn amount multiplied by a CCF.[94] To calculate the exposure value as required by Article 166(8) of the CRR, institutions should adopt the following approach.

    (a) Treat a facility as an exposure from the earliest date at which the facility is recorded in the institution's systems in a way that would allow the obligor to make a drawing. An unadvised limit is any credit limit defined by the institution (i) that is above the limit the obligor has been informed of by the institution; and (ii) according to which additional drawings are possible, at least temporarily. This higher (unadvised) credit limit may be disregarded if its availability is subject to a further credit assessment by the institution, as long as this additional assessment includes a re-rating or a confirmation of the rating of the obligor.

    (b) Consider as "commitment" any contractual arrangement that has been offered by the institution and accepted by the obligor to extend credit, purchase assets or issue credit substitutes.

    (c) Consider as "conditionally cancellable commitment" any such arrangement that can be and will be cancelled by the institution if the obligor fails to meet conditions set out in the facility documentation, including conditions that must be met by the obligor prior to any initial or subsequent drawdown under the arrangement.

    (d) Consider as "credit lines" all lines including products such as facilities granted for construction where the payments to the obligor are made according to the progress of the construction. Products such as guarantees are not, however, included in the concept of credit lines.

196. For institutions not using own estimates of CCFs for exposures to corporates, institutions, central governments and central banks, Article 166(8) of the CRR defines the CCFs to be used for the purpose of calculating RWEA. In accordance with Article 166(8)(a) and (c) of the CRR, institutions not using their own estimates of CCFs for non-retail exposures are permitted to apply a 0% CCF, under certain conditions.

    It is the ECB's understanding that, to comply with the conditions established under Article 166(8)(a) and (c) of the CRR and to apply a 0% CCF, institutions should have in place internal control systems that allow them to monitor the obligor's financial condition and to act in the event that a deterioration in the obligor's credit quality is detected. They should also be able to provide evidence that the internal control systems work effectively. For this purpose, institutions

93 Article 4(1)(56) of the CRR.

94 Article 166(8) of the CRR.

should demonstrate that there is only a very limited number of exposures of a particular type observed during the previous year for which the EAD is higher than the drawn amount at the reference date. This analysis should be performed on a regular basis. The ECB considers it best practice when institutions perform this analysis on an annual basis.

7.2 Realised CCFs

7.2.1 Relevant regulatory references

Table 19

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	175	(3)
		176	(4)
		178	(1)
		179	
		182	(1)(a)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	54	
Other references			
EBA Guidelines on DoD	18/01/2017		16

197. To ensure that a consistent and accurate approach is adopted to calculate the realised CCFs, institutions should have in place sufficiently detailed policies and procedures. For institutions to comply with the data-related requirements set out in Article 176(4) of the CRR, their RDS:

    (a) should not be capped at the principal amount outstanding or at facility limits;

    (b) should include all credit obligations (paragraph 16 of the EBA Guidelines on DoD), especially accrued interest, other due payments (e.g. fees) and limit excesses.

198. In accordance with Article 182(1)(a) of the CRR, institutions must calculate the realised CCF at facility level for each default. In cases where realised LGD is calculated at a more aggregated level than single facility level, as described in paragraph 150 above, CCF estimation can be performed at facility level or at the LGD aggregation level. One such example is where CCF is estimated by facility while several facilities are aggregated for LGD purposes, since they are all secured by the same collateral. In this case, institutions should:

    (a) for retail exposures where they use the definition of default at facility level in accordance with the last paragraph of Article 178(1) of the CRR, apply full contagion of default across aggregated facilities;

(b) ensure consistency between estimation and application of the parameters;

(c) ensure that no bias results from the aggregation of facilities by validation of the estimates (PD, LGD, CCF) also at the more aggregated level.

199. For the purposes of Article 182(1)(a) of the CRR, institutions must compute realised CCF. To comply with this requirement, in the understanding of the ECB institutions should adopt the following approach.

(a) Calculate realised CCF as the ratio of the difference between the EAD and the exposure at the reference date in the numerator, and the difference between the limit at reference date and the exposure at reference date (i.e. the amount available to be drawn at the reference date) in the denominator. This does not mean that, to address the issues with the "region of instability", institutions may not use direct EAD realisation (as referred to in paragraph 207(a) of this chapter). In any case, all the requirements regarding CCF risk quantification referred to in the applicable regulation apply, together with the ECB's understanding of those requirements as set out in paragraphs 203, 204, 205, 206 and 210(b) of this chapter.

(b) Ensure that the definition of exposure is identical to the one used for LGD estimation. In particular, treatment of post-default drawings should be identical for the exposures used in both the LGD and CCF estimations. Discounted additional drawings are expected to be included in CCF when they are included in the LGD denominator. See also paragraph 152(a) above.

(c) For each reference date and in cases where the same facility defaults more than once during the observation period, consider as the date of default relevant for CCF purposes the date of the first default.

7.3 CCF structure

7.3.1 Relevant regulatory references

Table 20

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	170	
		172	(1)(b), (2)
		174	
		175	(4)
		182	

200. A grade or pool is understood by the ECB to be the subset of facilities to which the same CCF is applied for the calculation of regulatory capital requirements, irrespective of how this CCF has been assigned.

201. To comply with the requirements for the structure of the CCF models established in Article 170 of the CRR, and particularly when considering the risk drivers envisaged by paragraph (4) of that Article, institutions should follow these principles:

    (a) Demonstrate a detailed understanding of the impact on the CCF model of changes in customer product mix or characteristics that take place between reference and default dates and the materiality of that impact. If the impact is material, institutions should address it within their own estimation process. This is because changes in exposure characteristics (e.g. a change in the value of the limit) or "product profile transformations" (e.g. a revolving loan that has been converted into a term loan or vice versa) which commonly occur between reference and default dates can impact the CCF model.

    (b) Although the reference date for the calculation of realised CCF should be up to 12 months prior to default, institutions should analyse risk drivers considering information not only at the reference date but also before that date whenever relevant. In assessing whether the use of information from before the reference date is relevant, institutions should take into account the volatility of the risk driver over time.

    (c) Ensure that the models reflect the institution's current policies and strategies regarding account monitoring, including limit monitoring, and payment processing.

202. Where an institution relies on one or more statistical models to define the process of assigning exposures to facility grades or pools (or parts of this process) in accordance with Article 175(4)(b) of the CRR, it is the ECB's understanding that for institutions to comply with the requirement, set out in Article 144(1)(a) of the CRR, that rating systems should provide for a meaningful differentiation of risk as further explained in letters (c) and (e) of Article 30(3) of Commission Delegated Regulation (EU) No 2022/439, the statistical process followed by the institution in selecting its model(s) should include assessing the performance of the model(s) on the basis of independent datasets (data points which were left out of the model fitting) in a way that limits the risk of overfitting. Independent datasets should correspond not only to random sampling (out-of-sample), but also to different time periods (out-of-time) unless there are no sufficient data available for the training sample. The expectations set out above in this paragraph are specifically related to the model development phase. Once the process for assigning exposures to facility grades or pools has been defined, the requirements related to the framework for the review of estimates under paragraphs 217 to 221 of the EBA Guidelines on PD and LGD (which are also relevant for the CCF estimation, according to paragraph 212 of this guide) apply, together with the expectations set out in

Section 9 of this guide. In particular, in accordance with paragraph 218(b)(i) of the EBA Guidelines on PD and LGD, the institution must carry out an analysis to identify any potential deterioration in the model's performance, including the model's discriminatory power, by comparing its performance at the time of the development with its performance over each subsequent observation period.

7.4 CCF risk quantification

7.4.1 Relevant regulatory references

Table 21

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	144	(1)(a)
		166	(8)
		169	(3)
		182	
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	53 to 56	
Commission Delegated Regulation (EU) No 2021/930	01/03/2021		

203. The exposure value for undrawn commitments is calculated as the committed but undrawn amount multiplied by a CCF.[95] CCFs can also be derived from direct estimates (for example by modelling total facility EAD) in accordance with Article 169(3) of the CRR. In this case, and in order to comply with Article 182(1)(a) of the CRR, it is the ECB's understanding that institutions should also calculate the LRA CCF at a level more granular than calibration segment that is appropriate for the application of the model, namely using individual CCF values if estimation is discrete or sub-ranges of CCF values if estimation is continuous. In addition, institutions should ensure that there are no systematic deviations when comparing the estimated CCFs with the LRA realised CCFs in sub-ranges. In other words, the direction of divergences should be random.

204. In accordance with Article 182(1)(a) of the CRR, institutions are required to calculate the default weighted LRA CCF separately for each facility grade or pool. To comply with this requirement, institutions should adopt the following approach.

    (a) Ensure that the historical observation period is as broad as possible and contains data from different periods characterised by different economic

[95] Article 166(8) of the CRR.

circumstances, including bad years as reflected in economic indicators that are relevant for the type of exposures considered.

(b) Calculate the observed average CCF for each facility grade or pool on all defaults observed in the historical observation period. Institutions should apply an appropriate treatment to extremely high values of realised CCF much above 100%, at the level of data quality, risk drivers, assignment to grades or pools or assignment to calibration segments. To ensure that the estimates are accurate, it is the ECB's understanding that institutions are not expected to cap realised CCF values. In other words, they are not expected to replace the observed value by a pre-defined value when the observed value is above the pre-defined one.

(c) When the historical observation period is considered to be representative of the LRA, the average realised CCFs should be computed as the arithmetic average of the yearly averages of realised CCFs in that period.

(d) When the historical observation period is not considered to be representative of the LRA:

(i) if bad years are under-represented in the historical observation period, the observed average CCF should be adjusted upwards in order to estimate an LRA CCF;

(ii) if bad years are over-represented in the historical observation period, the observed average CCF may be adjusted to estimate an LRA CCF where there is a significant correlation between the economic indicators referred to in paragraph 190(a) and the available observed CCF.

(e) It is the ECB's understanding that, where CCF estimates for specific facility grades or pools are low or even zero (in exceptional cases) before the MoC is applied, and in order to ensure that these estimates are accurate and not driven by (systematic) errors or distortions, institutions should ensure that their estimation process is pertinent and accurate. In particular, they should ensure that, in these specific facility grades or pools, there is only a very limited number of exposures for which the exposure at the moment of default is higher than the drawn amount at the reference date, and that these outcomes are carefully monitored and scrutinised.

205. Notwithstanding paragraph 204, for retail exposures an institution need not give equal importance to historical data if more recent data are a better predictor of drawdowns. In the ECB's understanding, an institution may consider that the more recent data are a better predictor of drawdowns and may give more importance to recent historical data if the following apply.

(a) There is a significant improvement in predictive power when using the more recent data compared with the predictive power resulting from the use of an arithmetic average. This improvement can be evidenced by comparing the estimated CCFs for each grade with the average realised

CCF covering as long a period as possible, as set out in Article 185(b) of the CRR.

(b) The oldest data are considered as non-representative as a result of specific policy or business changes in the bank, but not in order to reflect current trends in realised CCFs directly related to macroeconomic conditions.

(c) The weighting approach is used in a consistent manner over time and any change in the applied weights of historical data is appropriately justified.

206. To comply with the requirements of Article 182(1)(b) and to have CCF estimates that are appropriate for an economic downturn, institutions should characterise an economic downturn in accordance with Commission Delegated Regulation (EU) No 2021/930. To this end, an impact assessment should be performed to identify which identified downturn period is most strongly evidenced by elevated levels of realised CCFs. Any lag between the downturn period and the date of the impact on the realised CCFs should be taken into account. This means that where high levels of realised CCFs are not experienced simultaneously with the downturn periods, but nevertheless result from it, these high CCFs should be considered as the CCFs appropriate for the economic downturn.

207. In order to ensure a meaningful assessment of transaction characteristics, as required by Article 144(1)(a) of the CRR, particular attention should be given to the following observations.

(a) A common issue in estimating CCFs concerns facilities close to being fully drawn at the relevant reference date, as a result of the instability that may be observed in the estimates (also known as “region of instability”). To mitigate this risk, institutions should ensure that their CCF model is robust and provides estimates that are effectively protected against undesirable issues caused by the “region of instability” and/or that their estimates are adjusted adequately.

(b) Articles 179 and 182 of the CRR lay down the requirements for CCF quantification. In some cases, institutions define CCF values which are mostly based on judgemental considerations. The ECB understands this approach to be compliant with the requirements, provided all the following circumstances are met.

(i) The exposures to which such CCFs are applied are not material.

(ii) The data available are scarce to a degree that prevents the institution from obtaining sufficient relevant statistical evidence from them.

(iii) In accordance with Article 179(1)(a) and 179(1)(f) of the CRR, where data availability is considered to be unsatisfactory, the MoC must be larger, and the less data an institution has, the more conservative its estimation must be. The institution should provide evidence that, in accordance with (a) the internal data available, (b) the contractual

terms of the exposures to which the value is applied, and (c) the institution's policies and processes, the CCF value defined is an objectively conservative CCF estimate (in particular, appropriate for an economic downturn and including a sufficient MoC). As a consequence, especially in light of the regulatory requirement of MoC related to data scarcity, a minimum value of 100% must be applied as the final CCF estimate.

(iv) As part of the framework for the review of estimates of the CCF model, the institution should ensure that the three circumstances set out above continue to be met. With respect to point (iii) above, it should be ensured that the applied values remain conservative over time by comparing them with the realised CCFs of each defaulted facility within the subset of exposures to which such values are applied as a CCF estimate.

8 Model-related MoC

8.1 Relevant regulatory references

Table 22

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	179	(1)(f)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	44	
EBA Guidelines on PD and LGD	20/11/2017		36 to 52, 92(b)

208. Institutions must add to their estimates an MoC that is related to the expected range of estimation errors.[96] To comply with this requirement, institutions are expected to follow paragraphs 36 to 52 of the EBA Guidelines on PD and LGD. The ECB understands that the MoC must reflect the uncertainty at the level of the final risk estimates (namely, at the level of the grade or pool). It is also the ECB's understanding that institutions should be able to ensure monotonicity in their final estimates while still reflecting the uncertainty at grade or pool level. In accordance with paragraph 37(a) of the EBA Guidelines on PD and LGD, the MoC should consider any deficiencies stemming from missing or inaccurate information including, where relevant and material, any missing or inaccurate climate-related information considered in risk estimates.

209. Since the MoC requirements laid down by the CRR also apply in cases where institutions estimate CCFs, paragraph 208 is also relevant in such cases.

[96] Article 179(1)(f) of the CRR.

210. In the understanding of the ECB, to reflect the dispersion of the statistical estimators as set out in paragraph 43(b) of the EBA Guidelines on PD and LGD, institutions should adopt the following approach.

(a) For PD, estimate an MoC to account for statistical uncertainty/sampling error affecting the LRA estimate at grade/pool level. This MoC should be based on the distribution of the estimator, which is the average of one-year default rates of the grade/pool across time (i.e. the distribution of $(\Sigma DR_t)/T$), considering that the uncertainty is primarily driven by the statistical uncertainty of each one-year default rate and the length of the time series. As a result, it is expected that the lower the number of observations per grade and the shorter the time series are, the higher the MoC of the grade should be.

Institutions need to be aware of and deal adequately with the dependency between default rates over time on the quantification of the MoC, e.g. when using overlapping windows for the calculation of default rates.

The above principles also apply for institutions using direct PD estimates and for institutions calibrating the LRA default rate at the level of the calibration segment, as referred to in paragraph 92(b) of the EBA Guidelines on PD and LGD. When using direct PD estimates, the MoC is based on the distribution of this direct PD estimator (which includes the risk differentiation function), implicitly reflecting the uncertainty of the LRA. When calibration is performed at calibration segment level, the general estimation error may be computed at that level when the statistical uncertainty/sampling error is neither significantly different across grades or PD sub-ranges nor significantly different between the calibration segment level and the grades or PD sub-ranges level.

(b) Similarly, for LGD and CCF, estimate an MoC to account for statistical uncertainty/sampling error affecting the final estimates. This MoC should be defined on the basis of the distribution of the estimators, considering that their uncertainty is primarily driven by the statistical uncertainty of the observations used to compute the long-run and downturn estimates and the length of the time series.

9 Review of estimates

9.1 Relevant regulatory references

Table 23

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	172	(3)
		174	(e)
		179	(1)(a), (c)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	35	(2)
		43	
EBA Guidelines on PD and LGD	20/11/2017		217 to 221

211. Institutions must review their estimates whenever new information comes to light but at least on an annual basis.[97] To comply with this requirement, they are expected to have in place a framework under paragraphs 217 to 221 of the EBA Guidelines on PD and LGD.

212. Since the review of estimates requirements under the CRR also apply in cases where an institution estimates CCFs, paragraph 211 is also relevant to such cases.

213. In the ECB's understanding and for the purposes of paragraph 211, the following principles apply.

    (a) For PD models and regarding the analysis of the predictive power envisaged by paragraph 218(c) of the EBA Guidelines on PD and LGD:

        (i) the analysis should be performed at grade level; for institutions using direct PD estimates, it should be performed at a sufficient level of granularity;

        (ii) institutions should use a range of metrics to assess predictive ability, including statistical tests and graphical analysis of the evolution of default rates and PD.

    (b) The analysis referred to in paragraph 218(c)(i) of the EBA Guidelines on PD and LGD should also consider, for CCFs, whether including the most recent data leads to a significant change in the LRA CCF or downturn CCF.

    (c) For LGD models that result from a combination of different components (for example, secured and unsecured components), the back-testing

[97] Article 179(1)(c) of the CRR.

analysis referred to in paragraph 218(c)(ii) of the EBA Guidelines on PD and LGD should be run at both component and facility level.

(d) In addition, institutions should consider in their frameworks for the review of estimates the availability of data for different exposure types, taking into account the specificities of the model architecture, including the existing and potential risk drivers, under paragraph 220 of the EBA Guidelines on PD and LGD. When data are scarce, they should use complementary analyses for those exposure types where quantitative measures prove inconclusive as a result, for example, of the low number of exposures available.

(e) Where internal data are not considered sufficient to establish fixed targets and tolerances for defined metrics and tools to assess the performance of the PD model in terms of risk differentiation, institutions should define and put in place the appropriate actions to address this.[98] These actions could encompass, for example, the use of complementary analyses for those cases where the results for the application of metrics and tools are proven to be inconclusive.

(f) When external credit bureau scores or ratings are used as the main (or one of the main) driver(s) of the internal rating, in cases where significant changes are applied to the credit bureau scoring institutions should consider the possibility of adjusting their internal data following the changes applied to the score, and whenever the input variables are no longer considered appropriate in their credit rating process.

214. In the case of material models where the assignment of the grade is based on a statistical model and where there is a risk that slight changes in the ranking of the obligors, or in the boundaries between grades, could lead to significant changes in the RWEA in that portfolio, the framework referred to in paragraph 211 should also include an analysis of whether the inclusion of the most recent data in the RDS used for model development would lead to materially different model outcomes. This analysis should be conducted on a three-yearly basis, or more often, depending on the materiality of the model. The analysis should consider, in particular, whether the discriminatory power of the PD, LGD or CCF models would be materially increased when re-estimating the model parameters on the basis of the updated RDS. Portfolios should be considered as falling into this category when, for example: (i) a limited number of obligors represent an important share of the total exposure; or (ii) exposures are concentrated near the boundaries between two grades.

215. When the number of default observations is low, to analyse whether the main drivers of the observed defaults are appropriately reflected in the model in accordance with Article 179(1)(a) of the CRR[99] institutions should analyse individual defaults (or at least a sample of them where the number of defaults

[98] As set out in Article 35(2) of Commission Delegated Regulation (EU) No 2022/439.

[99] This article requires that estimates be based on the material drivers of the respective risk parameters.

makes analysing all of them unduly burdensome). However, the model should not be adapted simply to fit singular events from the institution's file review.

216. In accordance with Article 172(3) of the CRR, for grade and pool assignments institutions must document those situations in which human judgement may override the inputs or outputs of the assignment process. In addition, institutions must complement the statistical model by human judgement and human oversight to review model-based assignments and ensure that the models are used appropriately.[100] Furthermore, review procedures must be designed to find and limit errors associated with model weaknesses.[101] To comply with these requirements, institutions should assess the impact of the application of human judgement on risk differentiation capability (e.g. on discriminatory power), under paragraph 218(b) of the EBA Guidelines on PD and LGD.

10 Calculation of maturity for non-retail exposures

10.1 Relevant regulatory references

Table 24

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	162	(2)(f), (3)
Commission Delegated Regulation (EU) No 2022/439	20/10/2021	70	(d)(i), (ii)

217. For the cases described in Article 162(2)(f) of the CRR, the maturity parameter (M) must be the maximum remaining time (in years) that the obligor is permitted to take to fully discharge its contractual obligations. In the ECB's understanding, M should be calculated using the expiry date of a facility. The repayment date of a current drawn amount should not be used.

218. To ensure that the calculation of the maturity parameter is correct and to avoid any possible errors, for the purposes of Article 162(3) of the CRR institutions should adequately justify and document any exemptions from the one-year maturity floor.

[100] Article 174(e) of the CRR.

[101] Article 174(e) of the CRR.

Market risk

1 Scope of the market risk chapter

1. The purpose of this chapter is to provide transparency on how the ECB understands a number of topics related to internal models used in the calculation of own funds requirements for market risk. It is important to note that this chapter does not aim to cover exhaustively all topics that could be subject to review during internal model investigations (such as, for example, model governance). The topics covered in the market risk chapter have been selected taking into account the requirements of the Capital Requirements Regulation (CRR) and focus on certain modelling aspects relating, for example, to regulatory back-testing of value-at-risk (VaR) models, to VaR and stressed VaR (sVaR) methodologies, and to the incremental default and migration risk charge (IRC) methodology.

2 Scope of the internal model approach

2.1 Regulatory references

Table 25

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	4	(1)
		6	(1)
		7	
		11	(1)
		18	
		92	(3), (4)
		103	(1)
		104	
		106	(1)
		325b,349	
		350	(1), (2)
		352	(2), (3)
		353	(3)
		362, 363	
		364	(2)
		367	(2), (3)
		368, 370, 372	
		382	(4)
		386	(1), (3)
Commission Delegated Regulation on materiality of extensions and changes of the IMA[1]	04/03/2015		
SSM Regulation[2]	15/10/2013	10	
Other references			
EBA Guidelines on the IRC[3]	16/05/2012		4, 7
Final draft RTS on assessment methodology for IMA and significant share[4]	22/11/2016	Section 2, recital (20)	

1 Commission Delegated Regulation (EU) 2015/942 amending Delegated Regulation (EU) No 529/2014 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council as regards regulatory technical standards for assessing the materiality of extensions and changes of internal approaches when calculating own funds requirements for market risk (OJ L 154, 19.6.2015, p. 1) referred to in this guide as the "Commission Delegated Regulation on materiality of extensions and changes of the IMA".

2 Council Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions (OJ L 287, 29.10.2013, p. 63), referred to in this guide as the "SSM Regulation".

3 EBA Guidelines on the Incremental Default and Migration Risk Charge (IRC) (EBA/GL/2012/3), referred to in this guide as the "EBA Guidelines on the IRC".

4 EBA Final draft Regulatory Technical Standards on the specification of the assessment methodology for competent authorities regarding compliance of an institution with the requirements to use internal models for market risk and assessment of significant share under points (b) and (c) of Article 363(4) of Regulation (EU) No 575/2013 (EBA/RTS/2016/07), referred to in this guide as the "Final draft RTS on assessment methodology for IMA and significant share".

Once adopted by the European Commission, the Final draft RTS on assessment methodology for IMA and significant share will become an additional relevant regulatory reference. Currently that document only exists in a final draft version.

2.2 Delimitation of the regulatory trading book

2. According to Article 4(1)(86) of the CRR, “trading book” means all positions in financial instruments and commodities held by an institution either with trading intent, or in order to hedge positions held with trading intent in accordance with Article 104 of the CRR.

3. In accordance with Article 104 of the CRR, institutions must have clearly defined policies and procedures for determining which positions to include in the trading book for the purpose of calculating their capital requirements (referred to in this guide as the “regulatory trading book”). The ECB considers that, in this context and in accordance with Article 4(1)(86) of the CRR, “positions” refers to positions in financial instruments (as defined in Article 4(1)(50) of the CRR) and commodities, and not to risk positions as referred to in the glossary included in this guide. The ECB understands that positions that are classified as “held for trading” for accounting purposes are presumed to be included in the regulatory trading book. Therefore, institutions should be able to list all positions that are classified as “held for trading” for accounting purposes but not included in the regulatory trading book, and should be able to justify these exclusions.

4. As the instruments and transactions are included either in the regulatory trading book or in the non-regulatory trading book (referred to in this guide as the “banking book”), the ECB understands that the policies required by Article 104 of the CRR should also encompass rules for moving instruments between the regulatory trading book and the banking book.

5. In order for the ECB to assess the appropriateness and implementation of the policies and procedures for determining which positions to include in the regulatory trading book, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide a list of types of positions and instruments allocated to the regulatory trading or the banking book, identify all related transactions including their relevant characteristics, and justify such allocation.

6. In view of their nature in terms of trading intent, the ECB considers that the following types of instruments and transactions are expected to be included in the regulatory trading book:

   (a) instruments in the correlation trading portfolio;

   (b) instruments resulting from securities underwriting commitments;

(c) instruments held as accounting trading assets or liabilities ("held for trading" assets and liabilities);[5]

(d) instruments resulting from market-making activities;

(e) listed equities (other than equity investment funds);

(f) trading-related repo-style transactions (repo-style transactions that are (i) entered into for liquidity management purposes and are (ii) valued at accrual for accounting purposes, are not presumed to be trading-related);

(g) instruments that would give rise to net short risk positions[6] for equity risk or credit risk in the banking book;

(h) options including bifurcated embedded derivatives[7] from instruments issued out of the banking book that relate to credit or equity risk.

7. In view of their nature in terms of trading intent, the ECB considers that the following types of instruments and positions are expected be included in the banking book:

(a) unlisted equities;

(b) instruments designated for securitisation warehousing;

(c) real estate holdings;

(d) retail credit and credit to small and medium-sized enterprises (SMEs);

(e) other types of credit;

(f) equity investments in a fund for which the institution cannot obtain daily price quotes;[8]

(g) derivative instruments that have any of the types of instrument mentioned in points (a) to (f) as an underlying asset;

(h) instruments held for the purpose of hedging a particular risk of a position in any of the types of instrument mentioned in points (a) to (g).

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5 Under IFRS 9, these instruments would be held within a trading business model and would be accounted for at fair value though the profit and loss (P&L) account.

6 An institution will have a net short risk position for equity risk or credit risk if the present value of the position increases when an equity price decreases or when the credit spread of an issuer or group of issuers of debt increases.

7 Bifurcation means the separation of a derivative that is embedded in a hybrid security and that has to be separated according to accounting rules from the host security, and which has to be accounted for using the accounting rules for derivatives.

8 Where an institution is aware of the underlying investments of the fund on a daily basis, the underlying investments might be assigned to the trading or banking book depending on their characteristics, irrespective of the availability of daily price quotes for the fund itself.

8. In addition, for each category listed in paragraphs 6 and 7, institutions should be able to indicate to what extent the corresponding positions are included within the scope of the internal model approach (IMA).

9. In accordance with Article 106(1) of the CRR, internal hedges (as defined in Article 4(1)(96) of the CRR) must be properly documented and not be primarily intended to avoid or reduce own funds requirements. Therefore, institutions should be able to identify[9] all internal hedges and should document their treatment for the purpose of calculating own funds requirements for market risk. In accordance with Article 106(1)(d) of the CRR, the market risk that is generated by an internal hedge must be dynamically managed in the regulatory trading book within the authorised limits. For this reason, the ECB considers that proper documentation should distinguish between

   (a) hedges of a banking book credit risk exposure (or counterparty credit risk exposure) using an internal risk transfer with the regulatory trading book;

   (b) hedges of a banking book equity risk exposure using a hedging instrument purchased from the market through the regulatory trading book;

   (c) hedges of a banking book interest rate risk exposure using an internal risk transfer with the regulatory trading book;

   (d) hedges of a banking book foreign exchange risk exposure using an internal risk transfer with the regulatory trading book;

   (e) hedges of a banking book commodity risk exposure using an internal risk transfer with the regulatory trading book;

   (f) eligible hedges (as defined in Article 386(1) of the CRR) that are included in the credit valuation adjustment (CVA) capital charge.

   Additionally, institutions should be able to identify internal transactions which are in the regulatory trading book[10] and within the scope of the internal model, and show that these transactions do not contribute to the own funds requirements obtained using the internal model.

10. In accordance with Article 386(3) of the CRR, eligible CVA hedges that are included in the calculation of the own funds requirements for CVA risk must not be included in the calculation of the own funds requirements for specific risk of debt instruments. The ECB therefore considers that they should be included in the scope of calculation of own funds requirements for general risk (for example, included in the VaR and sVaR, or treated through the framework for risks-not-in-the-VaR or sVaR engine – see Section 7). Additionally, other (i.e. non-eligible) CVA hedges in the regulatory trading book should be included in the calculation of own funds requirements for market risk (i.e. general and

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9 To “identify” here means to be able to spot these trades among the institution’s transactions. The institution is not required to be able to segregate internal hedges in dedicated portfolios on which specific analysis is carried out.

10 For example, transactions within the scope of the IMA made between two trading units.

specific risk). The ECB considers that positions entered into with the purpose of hedging CVA risks for counterparties which are exempted from the own funds requirement for CVA risk, in accordance with Article 382(4) of the CRR, should also be included in the calculation of own funds requirements for market risk (i.e. general and specific risk).

11. In accordance with Article 362 of the CRR, position risk on a traded debt instrument may be divided into two components: specific risk and general risk. In accordance with the same article, general risk of traded debt instruments refers to the risk of a price change due to a change in the level of interest rates. The ECB considers that this is a reference to risk-free interest rates and does not include counterparty credit spread risk (i.e. the risk of a price change due to a change in the credit spread of the counterparty to a transaction). In accordance with the same article, specific risk of debt instruments refers to the risk of a price change due to factors related to its issuer or, in the case of a derivative, the issuer of the underlying instrument. The ECB considers that this definition of specific risk does not include counterparty credit spread risk. Consistent with this interpretation, the ECB considers that counterparty credit spread risk does not fall under the definition of either general or specific risk, cannot be included in the scope of the IMA and is not part of the actual or hypothetical profit and loss (P&L) for back-testing.

12. Back-to-back transactions in the regulatory trading book (i.e. transactions exactly matched with a third-party transaction) are generally included in the calculation of own funds requirements for market risk. The ECB considers that back-to-back transactions included in the scope of the internal model may be excluded from the calculation of own funds requirements, provided that institutions are able to document them and demonstrate that there are no residual market risks stemming from these transactions. However, potential P&L generated by these back-to-back transactions should be considered in the back-testing (for those P&L components that are not excluded from the actual or hypothetical P&L). This is because, although they do not carry residual market risks, such back-to-back transactions could generate P&L (for example, at the inception of the trade, or where the transaction is closed before maturity).

13. The ECB understands that instruments in the regulatory trading book which are lent out or repoed out should be included in the calculation of own funds requirements for market risk. Conversely, instruments borrowed/obtained via securities lending or reverse repo should not be included in the calculation of own funds requirements for market risk. This is because the securities lending or repo transaction does not transfer the market risk of the security. Furthermore, the market risk of the securities lending or repo transaction should be captured (if this transaction is recorded in the trading book).

2.3 Treatment of banking book positions

14. In accordance with Article 92(4)(a) of the CRR, for foreign exchange (FX) risk and commodities risk the own funds requirements must include those arising from all the business activities of an institution. Therefore, the ECB understands that for FX risk and commodities risk, the requirements for the calculation of own funds and, in particular, the IMA are not limited only to regulatory trading book positions but also include the positions in the banking book.

15. For institutions that have approval to use the IMA for FX risk, the ECB is aware that the modelling of banking book FX positions in the internal model may be challenging owing to different trade booking systems and different market data processes for the banking book and for the regulatory trading book. In accordance with Article 363(2) of the CRR, permission to use internal models for market risk will be granted only if the internal model covers a significant share of the positions of a certain risk category.[11] Therefore, institutions may exclude banking book FX positions from the scope of the internal model, provided that they can demonstrate to the satisfaction of the ECB that the scope of the approved internal model nevertheless covers a significant share of the positions of the FX risk category. If that is the case, the banking book FX exclusions should be treated in the same way as those positions excluded from the regulatory trading book (see Section 2.5).

16. In accordance with Article 92(3)(c) of the CRR, the own funds requirements for foreign exchange risk must be determined in accordance with the CRR provisions for market risk (using either the standardised approach or the IMA). Therefore, where excluded from the internal model, the banking book FX positions must be subject to own funds requirements calculated according to the standardised approach. The ECB considers a prudent approach to be that for the purpose of this own funds requirement calculation, banking book FX positions are not netted with regulatory trading book FX positions.

17. In accordance with Article 368(1)(e) of the CRR, institutions must have established procedures for monitoring and ensuring compliance with a documented set of internal policies and controls concerning the overall operation of their internal models. To satisfy the requirements of Article 368(1)(e) of the CRR, institutions should have documented processes and methodologies in place for determining FX positions. The ECB considers that in order to adequately cover the overall operation of the internal model, such documentation should include, in particular, the intermediate steps followed for calculating the FX positions, beginning with each individual subsidiary and proceeding to the group level (for example, before and after netting, the treatment of intragroup deals, the methodology applied to derive the FX position of banking book items including whether the institution applies the provisions of Article 352(3) of the CRR).

[11] See also Section 2 of the Final draft RTS on assessment methodology for IMA and significant share.

If an institution excludes any balance sheet items denominated in foreign currency from the FX positions in accordance with the provisions of Article 352(2) of the CRR, it should document in detail which positions are covered by the exclusion – including details on the materiality of each of them – and the justification for the exclusion, so that the institution can demonstrate that the provisions of the article have been complied with. In particular, this also applies at the consolidated and sub-consolidated levels to balance sheet items in foreign currencies that stem from consolidated subsidiaries and is without prejudice to the extent and manner of prudential consolidation prescribed in Article 18 of the CRR.

18. In order for the ECB to assess whether banking book FX positions have been excluded from the scope of application of the IMA for the sole purpose of reducing the own funds requirements for market risk, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution to estimate the difference between the own funds requirements calculated under the standardised approach and the own funds requirements calculated under the IMA[12] for those banking book FX positions.[13]

19. The ECB is aware that (in contrast to FX positions) it is not common practice to include commodities positions in the banking book. However, where an institution has permission to use the internal model for commodities risk, commodities positions in the banking book should not be systematically excluded from the scope of application of the internal model.

2.4 Partial use models

20. If an institution does not have permission to use an internal model to calculate the own funds requirements for market risk for all of the six risk categories listed in Article 363(1) of the CRR, but only for some of them (for the purposes of this guide, referred to as “partial use”), the institution must apply the standardised approach in accordance with Article 363(2) of the CRR to calculate the own funds requirements for the risk categories for which it has not been granted permission.

21. In the case of portfolios for which the bulk of the risks fall outside the scope of the approved risk categories of an internal model,[14] institutions may completely carve out such portfolios from the scope of application of the internal model, provided that the internal model still covers a significant share of the relevant risk categories. The ECB considers it best practice to carve out such portfolios only if the overall own funds requirements for market risk after the carve-out are higher than they would have been if the carve-out had not been performed.

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12 For estimating the own funds requirements under the IMA, the calculation can be based on only one date, rather than the average over the last 60 business days.

13 FX positions excluded from the scope of the calculation of the own funds requirements for market risk in accordance with Article 352(2) of the CRR would not need to be considered for this comparison.

14 A typical example would be a portfolio of equity options for an institution that has no permission to model equity risk, so that it only models the position risk of debt instruments.

Institutions should duly notify the ECB of such exclusions in accordance with the Commission Delegated Regulation on materiality of extensions and changes of the IMA. Institutions should, nevertheless, ensure that the risks of these portfolios are adequately managed. Institutions should determine the own funds requirements for the carved-out portfolios according to the standardised approach (for all risk categories, including those for which the institution has permission to use the internal model).

22. Portfolios for which the bulk of the risks fall within the scope of the model approval should be included in the calculation of own funds requirements using the internal model (for the risk categories within the scope of the internal model permission). The own funds requirements for the risks not included in the scope of the internal model permission should be determined according to the standardised approach.

23. In accordance with Article 362 of the CRR, general risk of debt instruments refers to the risk of a price change due to a change in the level of interest rates. The ECB considers that this is a reference to risk-free interest rates. In accordance with Article 362 of the CRR, general risk of equity instruments refers to the risk of a price change due to a change of a broad equity-market movement unrelated to any specific attributes of individual securities. The ECB considers that this is a reference to index movements. An institution without permission to use the IMA for the specific risk of debt or equity instruments, and which applies a different definition of general risk of debt or equity instruments (as applicable) should be able to demonstrate that the definition/s it applies lead to at least the same level of own funds requirements that would result from applying the principles of this paragraph.

2.5 Exclusion of positions in the regulatory trading book from the scope of application of the IMA

24. In accordance with Article 363(2) of the CRR, an internal model must cover a significant share of the positions of each risk category for which the permission is granted. The ECB understands that this requirement applies not only on the date on which the permission is granted, but on an ongoing basis. The ECB is aware that institutions have a certain margin of discretion not to include all positions exposed to the relevant approved risk categories, provided that the internal model still covers a significant share of those positions. In the ECB's view, exclusions would be justified where the inclusion of those positions in the internal model is operationally challenging (for example, in the case of products requiring a more sophisticated modelling approach). Exclusions should never be made for the sole purpose of reducing the overall own funds requirements for market risk.

    The ECB considers that to be able to demonstrate that the internal model covers a significant share of positions, institutions should monitor the exclusion of market risk positions, including the materiality of those positions. In the case

of FX and commodities risks, this monitoring should also extend to exclusions of banking book positions. This monitoring should consider all excluded positions in accordance with each relevant scope of approval of the internal model, which could be at individual ("solo"), sub-consolidated, or consolidated level. Institutions should be able to justify such exclusions and demonstrate that the risk of the excluded positions is adequately managed.

25. The own funds requirements for the positions deliberately excluded by the institution from the internal model (including any banking book positions) should be determined according to the standardised approach. For these positions, institutions should be able to demonstrate that the level of own funds requirements under the standardised approach is commensurate with their risks and that the exclusion was not made for the sole purpose of reducing the overall own funds requirements for market risk.[15]

26. The ECB considers that an appropriate approach to calculating the own funds requirements for derivatives on unusual underlyings (such as temperature, weather or mortality)[16] could be to include them in the scope of the IMA (the "exotic" risks might be treated under the risks-not-in-the-model-engines (RNIME)[17]" framework, where necessary). However, institutions may use the standardised approach for these positions, provided that they can demonstrate that the level of own funds requirements under the standardised approach is commensurate with the risks of such positions.

27. The ECB considers that a materiality criterion at transaction level (for example, a notional amount lower than a certain EUR amount) is not an appropriate criterion by itself for an exclusion from the scope, because the cumulative effect of these transactions may be a material position. Therefore, this type of exclusion should not be applied.

28. If back-to-back transactions are excluded from the calculation of own funds requirements using the internal model (in the circumstances set out in paragraph 12), it is not necessary – as it is with other excluded positions – to calculate the own funds requirements for these transactions under the standardised approach, as no residual market risks stem from them.

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15 This understanding is also supported by Article 13(b) of the Final draft RTS on assessment methodology for IMA and significant share.

16 The EBA considers that certain "unusual" underlyings, such as freight rate, weather derivatives or emission certificates can be considered as, or assimilated to, commodities (see the EBA Single Rulebook Q&A, Question ID: 2014_934).

17 See Section 7 for more details.

2.6 Treatment of specific positions

2.6.1 Own-debt exposures

29. For the purposes of this guide, the meaning of “own debt” requires clarification, given that the CRR does not provide a definition. As defined in Article 4(1)(47) of the CRR, “consolidated situation” means the situation that results from applying the requirements of the CRR to an institution as if that institution formed, together with one or more other entities, a single institution. As defined in Article 4(1)(49) of the CRR, “sub-consolidated basis” means “… on the basis of the consolidated situation of a parent entity … that is not the ultimate parent entity”. Therefore, the ECB considers an acceptable approach to be that when determining their own-debt positions, institutions using an IRC model also take into account the debt positions in their subsidiaries within the scope of prudential consolidation, depending on the level within the group of the institution using the IRC model.

30. By way of illustration, the positions described in the following situations can be considered as own-debt exposures. Figures 1, 2 and 3 below each illustrate an example, as indicated.

    Figure 1: Where the institution is the group EU parent institution – all positions in debt exposures to institutions within the prudential consolidation scope should be considered as own-debt exposures.

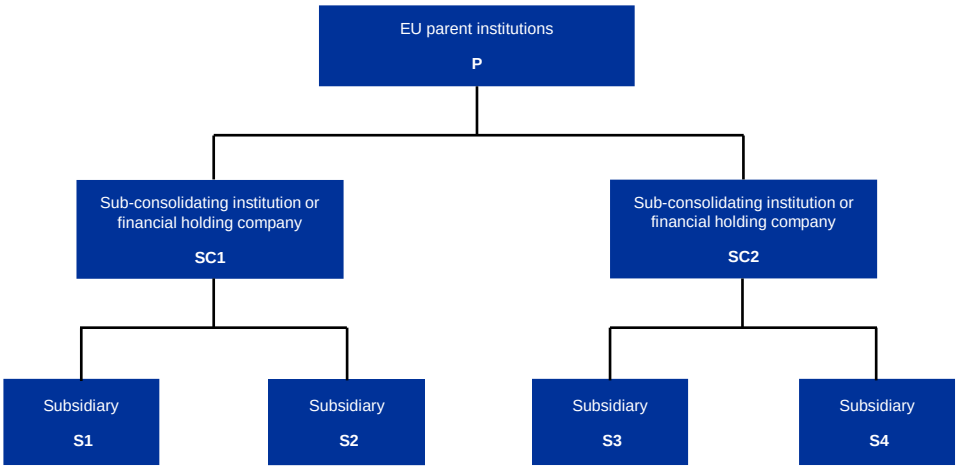
    Figure 2: Where the institution is the sub-consolidating institution or financial holding company that is not the ultimate EU parent institution – all positions in debt exposures to institutions within the relevant prudential sub-consolidation scope should be considered as own-debt exposures.

    Figure 3: Where the institution is a subsidiary without dependent subsidiaries (solo) – all debt exposures of an institution to itself at the solo level should be considered as own-debt exposures.

    This is without prejudice to other definitions of own debt that institutions may apply and that the ECB will assess on a case-by-case basis to take into account specific circumstances.

Figure 1

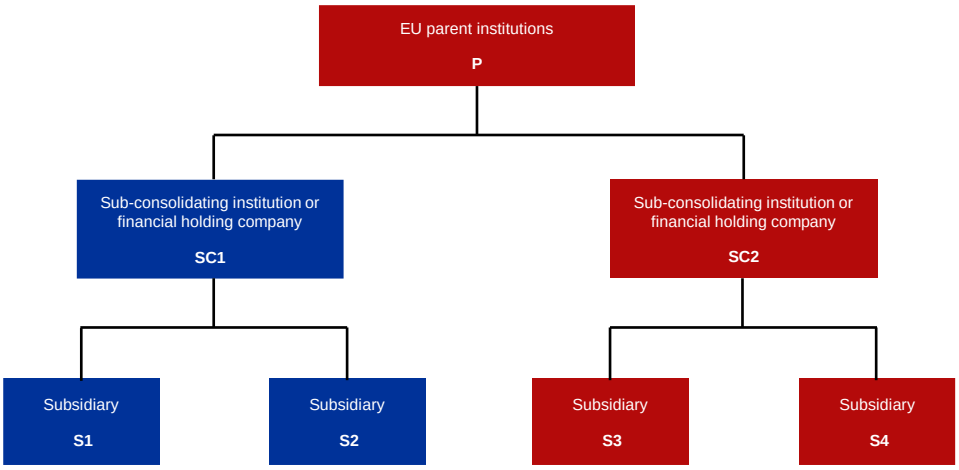
Own-debt positions at the consolidated level



Own-debt positions at the consolidated level are shown with a blue background.

Figure 2

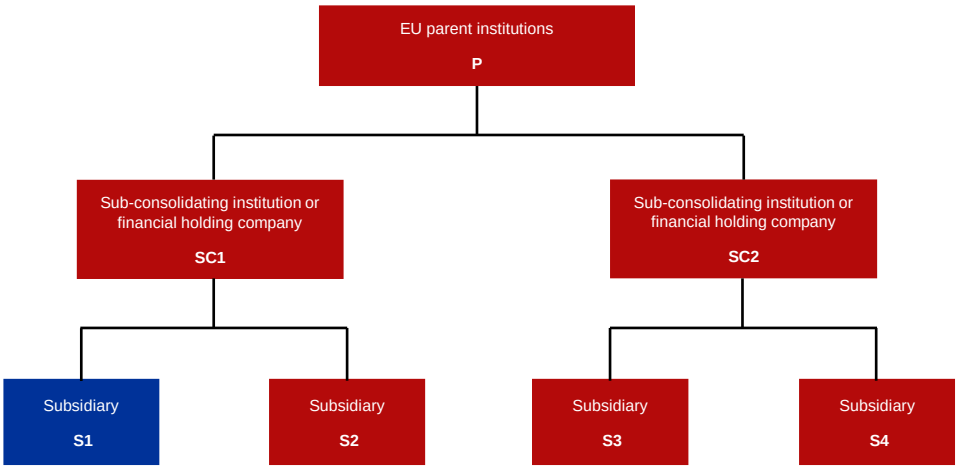
Own-debt positions at the sub-consolidated level of the sub-consolidating institution or financial holding company SC1



Own-debt positions at the sub-consolidated level of the sub-consolidating institution or financial holding company SC1 are shown with a blue background, while non-own-debt positions at the sub-consolidated level of SC1 are shown with a red background.

Figure 3

Own-debt positions at the solo level of subsidiary S1



Own-debt positions at the solo level of subsidiary S1 are shown with a blue background, while non-own-debt positions at the solo level of S1 are shown with a red background.

31. Under paragraphs 7.1 and 7.2 of the EBA Guidelines on the IRC, for long or short positions in an institution's own debt which may arise from trading or market-making activity in its own-debt issuances, or from trading protection in the institution's own name (for example, via an index), the institution should only model the migration risk. The default risk of these positions should not be modelled in the IRC approach.

    To ensure consistency with the IRC model when modelling the specific risk of debt instruments in the VaR and sVaR models, institutions should include their own creditworthiness.[18] The ECB considers it best practice to model such own creditworthiness as (a) separate risk factor(s) in the VaR and sVaR models.[19] In addition, in accordance with Article 367(1)(a) of the CRR, the model must accurately capture all material price risks. Therefore, the ECB understands that the funding risk embedded in own liabilities held in the trading book should be modelled in the IMA.

32. As regards the general risk of debt instruments for own debt, and in the absence of any specific provision in the CRR or the EBA Guidelines on the IRC, the ECB understands that the general risk of own-debt instruments should be accommodated in the internal model if the institution has the relevant approval.

2.6.2 Positions in defaulted debt

33. Under paragraph 4.5 of the EBA Guidelines on the IRC, institutions should include in the calculation of the IRC the positions in defaulted debt that are held in the regulatory trading book, where material. In order for the ECB to assess

[18] This refers exclusively to position risk taken against debt issued by the institution or derivatives referencing that debt and does not refer to debit valuation adjustments (DVA).

[19] This understanding is also supported by Recital (20) of the Final draft RTS on assessment methodology for IMA and significant share.

the appropriateness of the treatment of such positions, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide a list of all positions in defaulted debt that are held in the regulatory trading book, along with the following information:

(a) the market value of the exposure;

(b) notional value of the exposure;

(c) a Boolean variable indicating whether the positions are included in the VaR/sVaR;

(d) a Boolean variable indicating whether the positions are included in the IRC.

34. The ECB considers that to reflect paragraph 4.5 of the EBA Guidelines on the IRC, material positions in defaulted debt should be included in the scope of the IMA. It also considers it best practice that non-material positions are included in the IMA; either in the VaR, sVaR (and IRC) engines or under the RNIME framework for the VaR, sVaR (and IRC).

35. Under paragraph 4.5 of the EBA Guidelines on the IRC, positions in defaulted debt held in the regulatory trading book should, where material, be included in the calculation of the IRC. In accordance with the requirement in Article 372(d) of the CRR as it relates to Article 370(e), the IRC model must be sensitive to material idiosyncratic differences between similar but not identical positions. Therefore, the ECB considers that when modelling the risk of price changes of positions in defaulted debt in the IRC, and to account for those idiosyncratic differences, institutions should apply a specific calibration of the recovery rates which is appropriate for the positions in defaulted debt. If an institution does not have the capacity to model price changes of positions in defaulted debt in the IRC model (for example, owing to IT constraints), the ECB considers that an appropriate way to account for those differences is to apply a stressed price of the positions in defaulted debt that is proven to be adequately conservative given the quantile and holding period of the IRC.

36. The ECB considers that default should be an absorbing state (i.e. once a position has defaulted it does not migrate to a different state). Therefore, the ECB considers it best practice that no migration from default to non-default states is considered in the IRC model.

2.6.3 Collective investment undertakings

37. This paragraph, and the following paragraphs 38 to 43 inclusive, apply to all exposures that institutions may have in collective investment undertakings (CIUs), as referred to in Article 4(1)(7) of the CRR (including exchange-traded funds (ETFs), equity investments in hedge funds, etc.) – which for the purposes

of these paragraphs are referred to as “positions in CIUs” – and also apply to derivative instruments that have these instruments as underlying assets.

38. In accordance with Articles 368(1)(e) and 103(1) of the CRR, institutions must have established procedures for ensuring compliance with a documented set of internal policies and controls concerning the overall operation of their internal models and the regulatory trading book. Therefore, the ECB considers that in order to ensure that an appropriate treatment is applied to positions in CIUs in their internal models for market risk, institutions should have a documented set of policies and controls in place to identify, for each CIU, the following:

    (a) the risk categories, as listed in Article 363 of the CRR, to which the CIU is subject;

    (b) whether the criteria as defined in Article 349 of the CRR are fulfilled;

    (c) whether daily look-through is possible, as referred to in Article 350(1) of the CRR;

    (d) where daily look-through is not possible, whether the requirements as laid down in Article 350(2) of the CRR are satisfied – in particular, institutions should define and document the methodology used to assess the correlation between the CIU and the index/basket that it tracks;

    (e) the extent to which the CIU can be marked-to-market daily by reference to an active, liquid two-way market as referred to in Article 103(1) of the CRR (for example, whether a daily liquid price is available).

39. The above information in relation to each CIU should be documented. In the ECB’s view it is necessary to update the information regularly, in order to ensure that the documented information is based on the current characteristics of the positions in CIUs and fully reflects the market risk to which the positions are exposed. The ECB considers that an appropriate update frequency for existing positions in CIUs is at least annual, as one year is a reasonable time in which significant changes in the market or in the positions in CIUs could occur. In addition, this time frame would allow institutions to use the outcomes of the updates in the review of their overall risk management process, as referred to in Article 368(2) of the CRR. For new positions in CIUs, the ECB considers that the procedure should take place before the investment in a new CIU is approved internally, in order to ensure that institutions compute own funds requirements for the positions in CIUs in compliance with the CRR requirements.

40. For the foreign exchange market risk related to CIUs, the CRR contemplates a specific treatment. In accordance with Article 367(2)(b) of the CRR, the actual foreign exchange positions of a CIU must be taken into account in the internal model. Institutions may rely on third-party reporting of the foreign exchange positions of a CIU where the correctness of that reporting is adequately ensured. If an institution is not aware of the foreign exchange positions of a

CIU, this position must be carved out and treated in accordance with Article 353(3) of the CRR.

41. As regards general and specific risk of equity instruments, general and specific risk of debt instruments, and commodities risk: for those positions in CIUs for which the conditions for either the look-through approach (as referred to in Article 350(1) of the CRR) or the representation approach (as referred to in Article 350(2) of the CRR) are met, the ECB considers that in order to ensure an accurate risk measurement, the own funds requirements for the general and specific risk of equity instruments, the general and specific risk of debt instruments and the commodities risk should be calculated by incorporating the underlying investments of the relevant CIU – or the index/basket that it tracks – into the internal model for the risk categories for which the institution has permission to use internal models.

    Where an institution with internal model approval for specific risk of debt instruments includes listed equity positions in the IRC, it should be consistent in including in the IRC either the underlying listed equity positions of the CIU, or those of the index/basket that the CIU tracks.

42. For positions in CIUs where neither the conditions for the look-through approach as referred to in Article 350(1) of the CRR nor the conditions for the representation approach as referred to in Article 350(2) of the CRR are met, the following apply.

    (a) In accordance with Article 364(2)(a) of the CRR, institutions using an internal model to calculate their own funds requirements for specific risk of debt instruments must fulfil an additional own funds requirement for specific risk of debt instruments in accordance with the standardised approach for positions in CIUs under Articles 348 to 350 of the CRR.

    (b) The ECB considers that the positions in CIUs can be incorporated into the VaR and sVaR models as a single risk factor to account for the general and specific risk of equity, the general risk of debt instruments, and the commodities risk of the positions in CIUs. As is the case for any other position, sufficient objective information on market risk should be available. The ECB considers that a suitable approach is to use the daily liquid price of the CIU.

43. For those risk categories in respect of which the institution does not use an internal model to compute own funds requirements for market risk, or for positions in CIUs to which none of the above-mentioned provisions apply, the institution should compute the own funds requirements for the respective positions in CIUs according to the standardised approach for CIUs.

2.7 Aggregation requirements

44. In accordance with Article 363 of the CRR, competent authorities may grant permission to institutions to calculate their own funds requirements for market risk by using their internal models instead of, or in combination with, the standardised approach – provided that the internal model covers a significant share of the positions of a certain risk category. For example, in accordance with Articles 6(1) and 11(1) of the CRR, institutions must meet their own funds requirements on an individual basis (unless, for example, a derogation in the circumstances set out in Article 7 of the CRR has been granted), and the parent institution in a Member State must comply with the own funds requirements on a consolidated basis.

    Therefore, the institution at the highest level of consolidation operating within the framework of the Single Supervisory Mechanism should be able to specify:

    (a) which legal entities within the group have been granted permission to use an internal model for calculating own funds requirements for market risk;

    (b) the scope of application of each model permission (i.e. individual, sub-consolidated or consolidated);

    (c) the risk categories listed in Article 363(1) of the CRR for which each permission has been granted.

    The ECB also understands that, for institutions to calculate own funds requirements at the consolidated level by using their internal models, a permission to use their internal models at consolidated level is required under Article 363(2) of the CRR.

45. In those cases in which the scope of the permission applies at the consolidated or sub-consolidated level, institutions should be able to provide a list of legal entities included in the scope of consolidation or sub-consolidation, specifying which of those entities effectively contribute to the market risk own funds requirements determined by using the internal model. In order for the ECB to assess how the own funds requirements are determined, institutions should also be able to provide information on how each legal entity is integrated into the information system infrastructure of the risk management system and whether impediments exist to such integration.

    If impediments exist to the integration of the risk numbers from individual legal entities, the ECB considers it best practice to integrate the risk numbers from these entities into the model-based own funds requirements by applying a simple sum aggregation.

46. In accordance with Article 368(1)(a) of the CRR, the internal model must be closely integrated into the daily risk management process of the institution and serve as the basis for reporting risk exposures to senior management. Therefore, the ECB understands that institutions should ensure an integrated

and harmonised risk management across all legal entities included in the scope of the model permission.

47. In accordance with Article 325b of the CRR, institutions may use positions in one institution or undertaking to offset positions in another institution or undertaking only for the purpose of calculating net positions and own funds requirements for market risk on a consolidated basis, and only subject to the permission of the competent authorities. The ECB understands that this requirement applies to all positions, in particular to intragroup transactions.[20] The offsetting of positions can be performed irrespective of the calculation approach that is applied for market risk own funds requirements (i.e. IMA or standardised approach). In order for the ECB to assess how these requirements are fulfilled, institutions should document how the offsetting of positions is performed.

48. In accordance with Article 367(3) of the CRR, an institution may use empirical correlations within risk categories and across risk categories only if the institution's approach to measuring correlations is sound and implemented with integrity. The ECB understands that for empirical correlations to be sound they should be based on reliable and objective data. If this cannot be ensured, an institution should use the simple sum aggregation of stand-alone risk numbers within risk categories or across risk categories.

    In order for the ECB to assess the soundness and integrity of the implementation of the use of empirical correlations, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide the stand-alone VaR and sVaR corresponding to each of the following risk classes:[21] interest rate risk; equity risk; commodity risk; foreign exchange risk; and credit spread risk.

[20] This interpretation is also supported by the explanation in footnote 7 of the Final draft RTS on assessment methodology for IMA and significant share.

[21] If this is not possible, the calculation should be based on the approved risk categories in accordance with Article 363(1) of the CRR.

3 Regulatory back-testing of VaR models

3.1 Regulatory references

Table 26

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	34	
		105	(10)
		352	(2)
		366	
		368	(1)
		386	(3)
SSM Regulation	15/10/2013	10	
Other references			
Final draft RTS on assessment methodology for IMA and significant share	22/11/2016	40	(4), (5), (10)
		43	(4)

Once adopted by the European Commission, the Final draft RTS on assessment methodology for IMA and significant share will become an additional relevant regulatory reference. Currently that document only exists in a final draft version.

3.2 Scope of application of regulatory back-testing

49. The scope of application of regulatory back-testing, as referred to in Article 366 of the CRR, should be clearly documented.

50. In accordance with Article 366(3) of the CRR, regulatory back-testing compares the hypothetical and actual changes in the portfolio's value ("hypothetical P&L" and "actual P&L") with the *related* one-day VaR number generated by the institution's model. Therefore, the changes in value of all of (and only) the instruments and transactions entailing positions included in the scope of calculation of the VaR model should be considered in the calculation of the hypothetical P&L and the actual P&L.

51. In particular, if the institution is authorised to apply the IMA for foreign exchange and/or commodities risk positions, and the banking book positions in these risk categories are included in the scope of the internal model, the institution should include these banking book positions in the back-testing and should clearly document how the actual and the hypothetical P&L of these positions are calculated.

52. Regarding positions in the banking book that are included in the IMA, only the changes in value of market data pertaining to FX risk and commodity risk

should be taken into account in the calculation of the actual and the hypothetical P&L. Only for those instruments or transactions where the separation of the positions stemming from risk categories other than FX risk or commodities risk (for example, risk of debt instruments) is operationally challenging or its effect on the total P&L is immaterial, an institution may include changes in value of market parameters pertaining to all risk categories in the actual and the hypothetical P&L. Institutions should be able to justify the immateriality or the operational challenge, if applicable. In particular, considering only the effect of FX risk in the actual and the hypothetical P&L is not deemed to be operationally challenging.

53. Positions excluded from the calculation of the own funds requirements for market risk on the basis of a permission granted by the competent authorities under Article 352(2) of the CRR (i.e. (i) positions taken in order to hedge against the adverse effect of the exchange rate on the institution's capital ratios, or (ii) positions which an institution has which relate to items that are already deducted in the calculation of own funds) should also be excluded from the scope of application of the back-testing.

54. In accordance with Article 386(3) of the CRR, eligible hedges that are included in the calculation of own funds requirements for CVA risk must not be included in the calculation of the own funds requirements for specific risk. Therefore, the change in value of those positions that are attributable to specific risk of those eligible hedges should also be excluded from the actual and the hypothetical P&L. However, if the own funds requirements for general risk of these eligible hedges are calculated using the VaR model (see paragraph 10), the change in value of those positions that are attributable to general risk should be included in the actual and in the hypothetical P&L.

55. Hedges which under Article 386(3) of the CRR are not eligible hedges for regulatory CVA should be included in the VaR calculation and in the scope of calculation of the hypothetical P&L and the actual P&L for back-testing.

3.3 Historical period used to perform back-testing, definition of business days, and documentation

56. In accordance with Article 366(2) of the CRR, the addend to the multiplication factors must depend on the number of overshootings for the most recent 250 business days.

57. For the purpose of paragraph 56, institutions should define and document local and global business days according to the guidance set out in paragraphs 58 to 60.

58. The ECB considers that when the business trading unit of an institution is conducting planned business operations on the risk positions (even with a reduced number of staff) on a given day in a given location, this constitutes a local business day for the institution in that location. Therefore, as it is a

business day, it requires actual and hypothetical P&L calculation, VaR calculation and market risk monitoring and reporting. Institutions should consistently define their business days, and therefore should be able to justify any non-business days. Unchanged risk positions are a necessary but not sufficient condition to demonstrate adequately that a particular day constitutes a non-business day.

59. The ECB considers that global business days should be defined at the consolidated level (or for a national sub-group, at the sub-consolidated level), and that for the purpose of defining global business days the institution's most important trading location (the "reference location") should be used, to ensure that the most important trading activity is adequately captured in back-testing. Global business days should include at least the local business days of the reference location. If there are two or more important trading locations (of approximately the same size), the institution should choose one reference location and is allowed to add additional global business days based on the local business days of the other important trading locations. In such a case, the rationale underlying this choice should be documented.

60. For every global business day, actual and hypothetical P&L calculation, VaR calculation and market risk monitoring and reporting are required.[22] However, if such calculations are carried out on non-global business days, these should not be used for the purpose of regulatory back-testing. The actual and hypothetical P&L used for back-testing should always be the P&L between two consecutive global business days, and should be compared with the related one-day VaR forecast for a one-day holding period between those two global business days, and be based on the composition of the portfolio on the first of those global business days.

61. Based on Article 368(1)(e) of the CRR, the ECB understands that institutions should have a documented policy and procedure describing how they calculate the actual and hypothetical P&L. The ECB considers that to be fit for purpose, the policy and procedure should include, at least, the following key information:

    (a) how the actual P&L is calculated and, in particular, the differences between the economic[23] and actual P&L;

    (b) the fees, commissions and net interest income excluded from the actual P&L;

    (c) how the hypothetical P&L is calculated and, in particular, the differences between the actual and hypothetical P&L;

    (d) the valuation adjustments not updated every day and whether or not they are included in the P&L time series.

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22 All positions of trading units in a location with local non-business days should be included in the calculation of the consolidated figures.

23 As defined in the glossary.

In order for the ECB to assess the appropriateness and implementation of the policy and procedure for the calculation of the actual and hypothetical P&L, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide, for a sample of transactions or portfolios, detailed decompositions of economic, actual and hypothetical P&L into their elements.

3.4 Calculation of actual P&L

3.4.1 General rules

62. In accordance with Article 366(3) of the CRR, actual P&L must be based on actual changes in the portfolio's end-of-day value. Therefore, the ECB understands that the actual P&L should correspond closely to the daily economic P&L as reflected in the books and records of the institution, with the exception of certain elements as specified in the following paragraphs.

63. Actual P&L should include the profit and loss stemming from intraday activities, as they change the portfolio's value. In accordance with Article 366(3) of the CRR, fees, commissions and net interest income must be excluded from the actual P&L. The definitions and methods used to apply this exclusion should be clearly documented.

64. In accordance with Article 366(3) of the CRR, fees, commissions and net interest income must be excluded from the portfolio's actual value when computing the actual P&L. The ECB understands that these exclusions from the portfolio's actual end-of-day value are required by the CRR so that fees, commissions, and interest gains or losses are removed from the daily actual P&L in order to ensure that the back-testing assesses whether P&L fluctuations driven by market risk are accurately captured by the VaR model. Furthermore, the ECB acknowledges that the net interest income definition applied to banking book items accounted for at amortised cost cannot easily be transferred to the fair value items in the regulatory trading book.

    The ECB considers that it is acceptable for an institution to define the net interest income in the regulatory trading book as equal to zero; this leads to no P&L component being excluded as net interest income.

    The ECB considers that where an institution uses another definition for net interest income it should be able to duly justify this approach, taking into account its trading strategy. In any case, theta effects (for example, options theta) and P&L contributions of unearned credit spreads should not contribute to the net interest income, because they are susceptible to market risk.

65. The actual P&L is calculated for instruments and transactions entailing positions[24] in the regulatory trading book and banking book which are within the scope of the IMA. In accordance with Article 366(3) of the CRR, the actual P&L must be based on the actual value at the end of the subsequent day. Therefore, the ECB considers that the change in value of all market risk parameters (even those that are not modelled in the VaR) should be taken into account in the actual P&L.

66. In order to ensure that the actual P&L corresponds closely to the daily economic P&L as reflected in the books and records of the institution, the ECB considers that the pricing methods, model parametrisations and market data should be the same as those used to compute the daily economic P&L.

3.4.2 Valuation adjustments

67. Because the actual P&L should correspond closely to the daily economic P&L as reflected in the books and records of the institution, all valuation adjustments or reserves made in the economic P&L are also relevant for the calculation of the actual P&L. Therefore, institutions should clearly document all such valuation adjustments and reserves (methodology, frequencies, calculation process, etc.).

68. Except for the elements referred to in paragraphs 69 to 71 below, fair value adjustments[25] and all other valuation adjustments or reserves (hereinafter referred to as “adjustments”) made in the economic P&L should be included in the actual P&L even if they are not computed on a daily basis – provided that they are in the scope of market risk.

69. The ECB considers that credit valuation adjustments (CVA) should be excluded from the actual P&L,[26] because they receive a specific regulatory treatment. The same applies to debit valuation adjustments (DVA), due to their nature as the reverse side of CVA.

70. Additional valuation adjustments (AVA)[27] that are calculated to obtain the prudent value of the positions in the regulatory trading book should also be excluded from the actual P&L, as they receive a specific regulatory treatment under Article 34 of the CRR as an additional layer of prudence.

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[24] For the purposes of this guide, a “position” is defined as a risk position (as stated in the glossary). For example, for a bond denominated in FX and where the scope of the IMA approval does not include FX risk, the FX risk position is not in the scope of the VaR model, while the FX risk is reflected in the actual P&L.

[25] This refers at least, but is not limited to, the examples of potential valuation adjustments listed in Article 105(10) of the CRR.

[26] This understanding is also supported by Article 40(5)(d) of the Final draft RTS on assessment methodology for IMA and significant share.

[27] As set out in Commission Delegated Regulation (EU) 2016/101 of 26 October 2015 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for prudent valuation under Article 105(14) (OJ L 21, 28.1.2016). Those categories may overlap with fair value adjustments (e.g. market price uncertainty, close-out costs, etc.).

71. Changes in portfolio value generated by the default of a counterparty should be excluded from the actual P&L, provided that the institution demonstrates that they are related solely to counterparty credit risk; this is because the corresponding profits or losses are taken into account in the institution's counterparty credit risk framework. Conversely, profits or losses due to the default of a bond or other fixed income security are not in the scope of counterparty credit risk and should therefore be included in the actual P&L.

72. In accordance with Article 366(3) of the CRR, back-testing must be performed daily on the portfolio's end-of-day value. It could therefore be understood that changes in valuation adjustment figures should be computed daily to obtain an accurate portfolio end-of-day value. However, the ECB is aware that some valuation adjustments are not calculated daily by some institutions. In such cases, the ECB considers that changes in valuation adjustment figures should be taken into account in the actual P&L on the business day which is taken as the reference date for the calculation of the valuation adjustment. As a consequence, institutions should not apply any kind of smoothing or distribution over several dates in relation to changes in valuation adjustment figures.

3.5 Calculation of hypothetical P&L

73. In accordance with Article 366(3) of the CRR, the hypothetical P&L is based on changes in the portfolio's value assuming unchanged positions at the end of the subsequent day. The ECB understands that the term "unchanged positions" refers to an unchanged composition of the portfolio in terms of instruments and transactions. Therefore, the P&L generated by intraday trading and by new transactions entered (or maturing transactions) during the day is not taken into account. The ECB understands that the term "subsequent day" could imply a passage of time of one business day and that this could lead to a change in the risk positions due solely to this passage of time. Therefore, institutions may choose to include the passage of time of one business day in the hypothetical P&L.

    The ECB understands from Article 366(3) of the CRR that back-testing on the hypothetical P&L is intended to focus on detecting deficiencies in the internal model. Therefore, back-testing on hypothetical P&L should be used as a statistical test of the integrity of the VaR measure, allowing for a more "pure" testing of the model.[28]

74. In accordance with Article 366(3) of the CRR, the hypothetical P&L is to be based on the portfolio's value, assuming unchanged positions, while the actual P&L is to be based on the portfolio's *actual* value. Therefore, the ECB considers that any adjustments taken into account in order to obtain the actual value of the portfolio should not be considered in the hypothetical P&L, unless they are

[28] This understanding is also supported by Section 2.3.2 of the report of the Final draft RTS on assessment methodology for IMA and significant share.

part of the VaR model.[29] Consequently, any other profit and loss element – such as credit valuation adjustments (CVA), debit valuation adjustments (DVA), additional valuation adjustments (AVA) and any other valuation adjustments – as well as fees, commissions and net interest income, should not be included in the hypothetical P&L.[30]

75. As both the actual and the hypothetical P&L are based on the portfolio's value, they should be calculated using the same pricing framework. Therefore, the hypothetical P&L should be computed using the same pricing methods, model parametrisations and market data as those used to compute the daily economic P&L. Where an institution computes the hypothetical P&L in a system that is different from the one that is used to produce the daily economic P&L, the risk is that differences in the computations could occur. To minimise this risk, the institution should ensure that differences in market value computations at instrument or transaction level and at the total hypothetical P&L level are negligible, and should monitor the alignment frequently.

76. The back-testing on the hypothetical P&L should be used as a statistical test of the integrity of the VaR measure. Therefore, paragraph 75 applies to partial use models so that only the changes in market value due to changes in pricing risk factors within the risk categories in the scope of the model are considered, and the other pricing risk factors outside the scope of the model are held fixed.[31] For example, (i) if the institution is authorised to use an internal model for general interest rate risk only, the hypothetical P&L should include the changes in value of market parameters pertaining to general interest rate risk only; or (ii) if FX risk is not in the scope of the model, market value changes due to changes in the FX rate should not be reflected in the hypothetical P&L.[32]

    In the case of partial use models, only for those instruments or transactions where the exclusion of the P&L stemming from risk categories not included in the scope of the internal model is operationally challenging or its effect on the total P&L is immaterial, an institution may include in the hypothetical P&L those changes in value of market parameters pertaining to all risk categories.[33] Institutions should be able to justify the immateriality or the operational

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29 This understanding is also supported by Article 40(5)(d) of the Final draft RTS on assessment methodology for IMA and significant share.

30 This understanding is also supported by Article 40(4)(d) of the Final draft RTS on assessment methodology for IMA and significant share.

31 The requirement to use the market quote or pricing methods and model parametrisations used for the economic P&L takes precedence over the requirement to change only the risk factors within the risk categories in scope of the model in this case.

32 For example, let $\mathrm{pv}(t; p; g_t, s_t, e_t, f_t, x_t)$ be the present market value of a position at time t used in the economic P&L calculation, depending on some parameter set p (not explicitly time dependent), and risk factor sets g_t, s_t, e_t, f_t, x_t for all risk categories at time t. If the specific interest rate risk s and the FX risk x are not in the scope of the model, the risk factor values in those categories do not change from the previous time t_0, and the hypothetical P&L at time t should be calculated as: $\mathrm{HypoP\&L}(t) = \mathrm{pv}(t_x; p; g_t, s_{t_0}, e_t, f_t, x_{t_0}) - \mathrm{pv}(t_0; p; g_{t_0}, s_{t_0}, e_{t_0}, f_{t_0}, x_{t_0})$, where $t_x = t_0$ if VaR uses an instantaneous shock; or $t_x = t$ if VaR includes theta for consistency.

33 In cases where the exclusion of the P&L stemming from risk categories not included in the scope of the internal model is operationally challenging or its effect on the total P&L is immaterial, if a market price that incorporates all risks is used in the economic P&L it should also be used in the hypothetical P&L.

challenge, if applicable. In particular, excluding the effect of FX risk in the hypothetical P&L is not automatically deemed to be operationally challenging.

77. The passage of time effect (theta effect) should be considered (or not) in the VaR and in the hypothetical P&L in a consistent manner. However, if institutions include the passage of time in the P&L and not in the VaR, or vice versa, they should be able to demonstrate that the effect of this inconsistency is not material.[34]

3.6 Counting of overshootings

78. In accordance with Article 366(2) and (3) of the CRR, the back-testing addend is determined as the higher of the number of overshootings under hypothetical and actual changes in the value of the portfolio for the most recent 250 business days.

79. In accordance with Article 366(5) of the CRR, institutions must notify the competent authorities promptly, and in any case no later than within five working days, of overshootings that result from their back-testing programme. The ECB understands that the period of five working days should start on the first working day after the "subsequent day" as referred to in the second and third paragraphs of Article 366(3) of the CRR.

80. If either a P&L or the VaR is not available or cannot be computed within five working days, the ECB considers that there is a risk that an overshooting may have occurred, and that in order to ensure that the number of overshootings is not misrepresented, a prudent approach would be to consider such an instance as an overshooting under hypothetical or actual changes, respectively.

81. If an overshooting has occurred due to malfunctions in the calculation of a P&L or the VaR and is notified to the ECB, and the institution demonstrates to the satisfaction of the ECB that the overshooting was caused by an acceptable reason, the institution may withdraw the overshooting notification. The explanation of the malfunction should be supported by clear and complete documentation. If malfunctions leading to erroneous calculations and overshooting notifications are recurrent, this may indicate that the internal model is not implemented with integrity as required in Article 368(1) of the CRR, and the ECB may require the institution to present a remediation plan.

82. The ECB considers that examples of acceptable reasons for withdrawing an overshooting notification could include:

    (a) errors in the calculation of the actual P&L, hypothetical P&L or VaR due to IT issues or incorrect data;

[34] This understanding is also supported by Article 43(4) of the Final draft RTS on assessment methodology for IMA and significant share.

(b) errors in the scope of positions for the calculations of the P&L or the VaR;

(c) false or missing bookings, or incorrect positions included in the scope of the calculations;

(d) delayed reserve releases;

(e) temporary transmission problems between different business locations.

83. However, the ECB considers the following to be a non-exhaustive list of reasons for withdrawing an overshooting notification which would not be acceptable, because they are not considered as malfunctions in the calculation of the P&L or the VaR:

(a) differences in pricing functions between the VaR engine and the actual and hypothetical P&L calculations (typically using front-office pricing functions);

(b) losses due to the trading or transfer of large positions at a price that deviates from the market price as a result of trading volumes;

(c) the overshooting corresponds to a small difference between VaR and a P&L;

(d) unexpected market movements;

(e) a model deficiency that has caused an overshooting in the past has already been addressed (there is no backward adjustment of overshootings);

(f) a change in the P&L calculation method, pricing function or parameterisation of a pricing function or a change in the market data input used in the P&L calculation.

84. In accordance with Article 368(1)(a) of the CRR, the internal model must be closely integrated into the daily risk management process. In order for institutions to be able to meet this requirement, the ECB considers that the VaR numbers should be available within three business days. In addition, this would enable institutions to fulfil the requirement to notify back-testing overshootings within five business days.

If delays in the VaR computation are recurrent, this may indicate that the internal model is not implemented with integrity as required by Article 368(1) of the CRR, and the ECB may require the institution to justify such delays or to present a remediation plan.

3.7 Analysis of overshootings

85. In accordance with Article 368(1)(b) of the CRR, the risk control unit must produce and analyse daily reports on the output of any internal model, including overshootings. The ECB considers that such an analysis of overshootings

should include at least the following areas, as they are the most relevant drivers of the VaR number:

(a) identification of the set of positions responsible for the overshooting (portfolio analysis);

(b) identification, description and analysis of the market moves contributing to the overshooting (market analysis);

(c) identification of possible weaknesses in the internal model in the light of (a) and (b) above (analysis of the internal model).

Paragraphs 86 to 89 explain what the ECB considers are best practices in order to analyse each of the three areas referred to in (a), (b) and (c) above.

The ECB considers it best practice that for every regulatory back-testing overshooting a detailed analysis should be performed by the institution and provided to the competent authority within one month.[35]

In accordance with Article 368(1)(f) of the CRR, any internal model for market risk must have a proven track record of reasonable accuracy in measuring risks. In order to assess the track record of reasonably accuracy in measuring risk, the ECB can, on the basis of Article 10 of the SSM Regulation, request a detailed analysis (in accordance with its specific instructions) of overshootings and reporting of time series related to back-testing.

3.7.1 Portfolio analysis

86. The analysis of the back-testing overshooting should include a detailed description of the trading portfolio for which the one-day VaR forecast calculated was exceeded by the one-day change in the portfolio's value. If the overshooting was notified for the actual P&L, the intraday changes in the portfolio that affected the actual change should also be analysed.

87. The analysis of back-testing overshooting should be performed not only at the overall portfolio level, but also at lower portfolio levels, to identify the main positions that caused the overshooting. If specific sub-portfolios can be identified, they should be mentioned and analysed.

3.7.2 Market analysis

88. The analysis of the market should describe the market moves contributing to the cause of the overshooting and explain them on the basis of objective market data (for example, asset prices, indices, interest rates, FX rates, implied correlations and volatilities). To assess the significance of the market data

[35] This understanding is also supported by Article 40(10) of the Final draft RTS on assessment methodology for IMA and significant share.

movements, the market data, including those that are risk factors in the VaR, should be analysed in a historical context. The significance of the change in market data that are risk factors in the VaR, and which contributed to the P&L, should be tested against the historical 99% confidence interval of risk factor changes. Changes in the structure of correlations between the risk factors should also be analysed. In addition, the analysis should, as far as possible, include the economic reasons for the market movements.

3.7.3 Analysis of the internal model

89. The suitability of the internal model should be assessed on the basis of the two previous analyses. Where positions contributing to the back-testing overshooting can be identified, the appropriateness of the model for these particular positions should be assessed. To do this, the part of the P&L that can be explained by the model (i.e. risk factors and pricing functions) should be distinguished from the part which cannot. In addition, the reliability of the VaR calculation and of the actual and hypothetical changes in the portfolio should be evaluated. The analysis of the internal model should focus on:

    (a) the appropriateness of risk factors used;

    (b) the modelling of risk factors;

    (c) the suitability of the processes for calculating VaR, hypothetical P&L and actual P&L.

4 Aspects of internal validation of market risk models

4.1 Regulatory references

Table 27

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	368	(1), (2)
		369	
SSM Regulation	15/10/2013	10	
Other references			
Final draft RTS on assessment methodology for IMA and significant share	22/11/2016	23	(2)

Once adopted by the European Commission, the Final draft RTS on assessment methodology for IMA and significant share will become an additional relevant regulatory reference. Currently that document only exists in a final draft version.

4.2 Frequency of internal validation

90. Institutions are required under Article 369(1) of the CRR to conduct a validation of their internal models on a periodic basis. The ECB considers that an appropriate frequency is at least annually, as one year is a reasonable time in which significant changes in the market or in the composition of the portfolio could occur.[36] In addition, a validation conducted at least annually would allow the institution to use the results in the review of its overall risk management process, as referred to in Article 368(2) of the CRR.

4.3 Internal back-testing of VaR models

4.3.1 Granularity of internal back-testing

91. In accordance with Article 369(1)(b) of the CRR, institutions must, in addition to the regulatory back-testing programmes, carry out their own internal model validation tests – including back-testing – in relation to the risks and the structure of their portfolios. The ECB considers that to satisfy the requirement regarding internal back-testing in relation to the risks and the structure of the portfolios, institutions should perform separate back-testing at more granular levels than the top-of-the-house level[37] on at least the hypothetical P&L (i.e. counting and analysing of overshootings under the hypothetical P&L).

    (a) The ECB understands that, at a minimum, internal back-testing should be performed:

        (i) at one level below the top-of-the-house level;

        (ii) for each portfolio that is subject to a separate VaR limit established by the institution's management body.

    (b) Where an institution intends to apply the revisions to the IMA as set out in the fundamental review of the trading book (FRTB) in the future, the ECB considers that it would be beneficial if the institution identified the sub-portfolios within the current scope of the internal model that would most likely satisfy the requirements for becoming FRTB trading desks, and performed separate internal back-testing on them.

    This is without prejudice to the requirement for the internal model validation function to perform back-testing on both actual and hypothetical P&L under Article 369(2) of the CRR, which the ECB understands as relating to the top-of-the-house level.

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[36] This understanding is also supported by Article 23(3) of the Final draft RTS on assessment methodology for IMA and significant share.

[37] See the glossary.

The ECB considers it best practice that the internal back-testing defined above in this paragraph is performed on a daily basis in order align it with the regulatory back-testing programme.[38]

92. The ECB understands that Article 369(2) of the CRR requires that the back-testing performed in internal validation complies with the same requirements as the regulatory back-testing regarding the calculation of actual and hypothetical P&L. Therefore, the requirements described in Section 3 regarding the calculation of actual and hypothetical P&L should also be applied to internal back-testing, in order to ensure consistency. In verifying compliance with this provision of the CRR, the ECB will take into account the specific circumstances of the institution.

4.3.2 Tests to be performed in internal back-testing

93. In accordance with Article 369(1)(b) of the CRR, institutions must carry out their own internal model validation tests, including back-testing. The ECB considers it best practice that the periodic internal validation tests include the following (or their equivalent) for at least the top-of-the-house level:

    (a) statistical tests on the overshootings, such as the Kupiec[39] and Christoffersen[40] tests, including an analysis of the validity of the hypotheses underlying those statistical tests;

    (b) a test on the uniformity of the distribution of the p-values[41] of the daily actual P&L and the hypothetical P&L in the daily forecasts of P&Ls of the VaR[42] engine, at least for the daily data of the last year. For example, a P&L value equal to the VaR at confidence level of 99% corresponds to a p-value of 0.01.

94. In order to assess whether the periodic internal validation tests used by an institution are adequate and fit for their purpose, the ECB can, on the basis of

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38 This understanding is also supported by Article 23(2)(b) of the Final draft RTS on assessment methodology for IMA and significant share.

39 See Kupiec, P.H., "Techniques for verifying the accuracy of risk measurement models", *Journal of Derivatives*, Vol. 3, Issue 2, 1995, pp. 73-84.

40 See Christoffersen, P., "Evaluating interval forecasts", *International Economic Review*, Vol. 39, Issue 4, 1998, pp. 841-862.

41 The probability integral transformation states that for a continuous random distribution X, applying the cumulative distribution function (CDF) of X, F_X, on X yields a uniform distribution. By negation, if the resulting distribution is not uniform, F_X is not the CDF of X.
Given a vector of simulated P&L (used to estimate the VaR) sorted in ascending order, $x_1, \dots, x_n$, the p-value, $p(x)$, corresponding to a given P&L, x, should be obtained in the following way:

$$p(x) = \begin{cases} \frac{x_{k+1}-x}{x_{k+1}-x_k} \cdot p_k + \frac{x-x_k}{x_{k+1}-x_k} \cdot p_{k+1} & \text{if } x_k \le x \le x_{k+1} \text{ for } k = 1, \dots, n-1 \\ \frac{\left(\frac{p_1}{1-p_1}\right)^{\frac{x}{x_1}}}{1+\left(\frac{p_1}{1-p_1}\right)^{\frac{x}{x_1}}} & \text{if } x < x_1 \\ \frac{\left(\frac{p_n}{1-p_n}\right)^{\frac{x}{x_n}}}{1+\left(\frac{p_n}{1-p_n}\right)^{\frac{x}{x_n}}} & \text{if } x > x_n \end{cases} \quad \text{where } p_k = \frac{k}{n+1}$$

42 If an institution has a model based on a mixture of approaches in several VaR model components, the most material approach should be used.

Article 10 of the SSM Regulation, require the institution to provide the following information:

(a) for the top-of-the-house level, the complete economic P&L, hypothetical P&L, actual P&L, and VaR time series of at least one year, but preferably three years;

(b) for the top-of-the-house level, the number of overshootings and the corresponding dates when they occurred over at least the last year, but preferably over the last three years;

(c) for the top-of-the-house level, for the overshootings (i.e. $-\mathrm{P\&L}_{t+1} > \mathrm{VaR}_t$ where $\mathrm{VaR}_t > 0$ by convention), the time series of at least one year, but preferably three years, of the loss overshooting ratio (LOR) defined as:

$\mathrm{LOR} = \frac{-\mathrm{P\&L}_{t+1} - \mathrm{VaR}_t}{\mathrm{VaR}_t}$, where $-\mathrm{P\&L}_{t+1} > \mathrm{VaR}_t$;

(d) for the top-of-the-house level, the time series of p-values of the daily actual P&L and the hypothetical P&L in the daily forecasts of P&Ls of the VaR engine of at least one year, but preferably three years;

(e) for the more granular levels referred to in paragraph 91:

(i) complete economic P&L, hypothetical P&L and VaR time series of at least one year, but preferably three years;

(ii) an analysis of all overshootings, including an explanation of the cause of the overshooting over the hypothetical P&L and an assessment of the model adequacy on the relevant level.

4.4 Validation on hypothetical portfolios

95. In accordance with Article 369(1) of the CRR, institutions must have processes in place to ensure that all their internal models for market risk have been adequately validated. Therefore, the requirement of Article 369(1)(c) to use hypothetical portfolios in the internal model validation refers in particular to VaR, sVaR, and IRC models.

96. In accordance with Article 368(1)(e) of the CRR, institutions must have a documented set of internal policies and controls in place concerning the overall operation of their internal models, including the internal validation. Therefore, institutions should have a policy in place that governs the overall processes related to the validation of their internal models for market risk using hypothetical portfolios. The ECB considers that in order to cover the overall process, such a policy should comprise the following aspects:

(a) portfolio definition – the processes for defining hypothetical portfolios;

(b) analysis – the processes for analysing the performance of the model based on the results of the tests performed on hypothetical portfolios, including:

(i) an assessment of the ability of the models to capture the risk of the hypothetical portfolios;

(ii) verification that the insights gained by the analysis of hypothetical portfolios are reflected in the models;

(iii) in particular, for back-testing on hypothetical portfolios, an identification of the market movements and parameters causing overshootings;

(c) reporting – the processes to ensure that the results of validation on hypothetical portfolios are reported to a management body with sufficient authority in respect of internal models.

97. In accordance with Article 369(1)(c) of the CRR, institutions must conduct validation exercises using hypothetical portfolios in order to ensure that a model is able to account for particular structural features.[43] The ECB understands that these hypothetical portfolios should have targeted compositions so that the model can be tested at a level of granularity that enables the identification and isolation of specific model performance for those structural features (for example, related to specific business lines, instrument features, and/or trading strategies).

98. As they should ensure that the risk model is validated for the institution's risk management purposes, such hypothetical portfolios should be designed in line with the business model of the institution. For example, it is not necessary to include products that are not covered by trader mandates, nor to test specific features that are not relevant for potential positions according to the institution's approved trading strategy. Consequently, an institution should review the hypothetical portfolios in the event of a change in its business model or trading strategy.

99. For the same reason, the number of hypothetical portfolios should be commensurate with the nature, scale and complexity of the activities of the institution.

4.5 Validation based on hypothetical portfolios for VaR models by internal back-testing

100. The ECB considers that the validation requirements of Article 369(1)(c) of the CRR for VaR models can be fulfilled by internal back-testing where an

[43] These hypothetical portfolios should not be limited to portfolios defined in the benchmarking exercises for market risk conducted by the EBA or the Basel Committee on Banking Supervision, as those portfolios cannot account for all relevant particular structural features. Participation in such benchmarking exercises is thus not sufficient to meet the requirements of this section of the guide.

institution can demonstrate that it has set up internal back-testing for the VaR model using sub-portfolios at a level which is sufficiently granular to account for the particular structural features that may arise in its portfolios.

101. Where an institution performs internal back-testing on hypothetical portfolios for the VaR model, the P&L calculations for this back-testing of hypothetical portfolios should not differ from the P&L calculations for regulatory VaR back-testing as described in Section 3, in order to ensure consistency. This back-testing can be conducted based on the hypothetical P&L only, as hypothetical portfolios are not part of the daily trading activity and therefore the actual P&L is not relevant.

102. As the purpose of such internal back-testing is the internal validation of the VaR model, the ECB considers that in order to ensure consistency:

(a) the comparison should be carried out using the daily hypothetical P&L and the one-day VaR;

(b) back-testing periods for hypothetical portfolios should cover at least the period used to calibrate the VaR as of the validation date, to ensure that the results are relevant for the model at that date;

(c) institutions should ensure that the particular structural feature, as referred to in paragraph 97, for which each hypothetical portfolio was selected, continues to be in place over time and during the entire historical period for which the back-testing is performed.

5 Methodology for VaR and stressed VaR

5.1 Regulatory references

Table 28

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	365	
		366	(2)
		367, 368, 369, 370	
SSM Regulation	15/10/2013	10	
Other references			
EBA Guidelines on sVaR[44]	16/05/2012		6,10
Final draft RTS on assessment methodology for IMA and significant share	22/11/2016	38	(1), (2)
		49	(2)

44 EBA Guidelines on Stressed Value At Risk (Stressed VaR) (EBA/GL/2012/2), referred to in this guide as the “EBA Guidelines on sVaR”.

Once adopted by the European Commission, the Final draft RTS on assessment methodology for IMA and significant share will become an additional relevant regulatory reference. Currently that document only exists in a final draft version.

5.2 General requirements

103. In accordance with Article 369(1) of the CRR, the appropriateness of any assumptions made within the internal model must be demonstrated. Therefore, institutions should demonstrate the appropriateness of any assumptions about the distribution of risk factors included in the VaR and sVaR models on the basis of objective data.[45] In order to assess the appropriateness of the distribution assumptions, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to consider different plausible distribution assumptions and compare the VaR and sVaR amounts calculated according to those different assumptions to demonstrate that the selected assumption is appropriate.

104. In accordance with Article 368(1)(f) of the CRR, an internal model must be reasonably accurate in measuring risks. Therefore, when using Monte Carlo simulations, institutions should be able to demonstrate that the number of simulations used to compute the VaR and sVaR is sufficient to produce accurate and stable VaR and sVaR numbers.

105. An institution may apply different methodologies (i.e. the absolute, relative or mixed approach[46]) to calculate returns used to calibrate the VaR and sVaR models for different risk factors. The ECB has observed that the best practices used in the VaR and sVaR models are the following methodologies:

Table 29

Risk factor category	Methodology used to calculate returns
Interest rate curves	Absolute or mixed approach
Bond spread	Absolute or mixed approach
Credit default swap (CDS) spread	Absolute or mixed approach
Foreign exchange rate	Relative approach
Equities spot	Relative approach
Commodities	Relative approach

45 Where an institution applies historical returns in its model, the requirement refers to the choice of the specific methodology to determine the returns (for example, the use of relative or absolute returns).

46 Either of the two examples following could be considered as a “mixed approach”: (i) the case where some risk factors within a given risk factor category are calculated via absolute returns while others within the same risk factor category are calculated via relative returns (e.g. interest rate curves with low interest rate levels calculated via absolute returns and interest rate curves of other currencies with higher levels via relative returns); or (ii) the case where a single methodology takes into account different regimes (e.g. return close to absolute for low levels of interest rates and close to relative for higher levels).

As institutions are required under Article 368(3) of the CRR to apply best practices, they should be able to explain deviations from these methodologies and quantify the impact of those deviations.

Article 365(2) of the CRR requires that the calculation of the sVaR is made in accordance with the requirements for calculation of the VaR. Therefore, for a given risk factor, where a specific methodology is used in the VaR, the same methodology is expected to be used for the same risk factor in the sVaR.

As regime changes could occur between the VaR effective historical observation period and the sVaR historical period, the method should be suitable for both periods. In accordance with Article 369(1) of the CRR, the appropriateness of any assumptions made within the internal model must be demonstrated. The ECB considers that this choice of method is one of the assumptions whose appropriateness should be demonstrated.

106. In accordance with Article 368(1) of the CRR, the internal model must be conceptually sound and implemented with integrity. Therefore, it is expected that the returns are calculated on the basis of one single holding period (for example, one day or ten days) for all risk factors.[47]

107. Under paragraph 10.3(c) of the EBA Guidelines on sVaR, institutions should be able to prove that on the day of the week chosen for the sVaR calculation their portfolio is representative of the portfolio held during that week, and that the chosen portfolio does not lead to a systematic underestimation of the sVaR numbers when computed weekly; shown, for example, by using sensitivities or by proving that the VaR is not systematically lower on the day of the week chosen for sVaR.

108. In order to assess that the day of the week when the sVaR amounts are calculated does not lead to material bias, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution to recalculate the sVaR for 15 consecutive business days (including three reporting days). If it is not possible to perform this calculation in the production environment, it can be performed in a test environment that replicates the calculation of the regulatory sVaR.

109. In accordance with Article 368(1)(e) of the CRR, institutions must ensure compliance with a documented set of internal controls. In order for the ECB to assess compliance with this requirement, an institution should be able to provide an inventory of all open validation findings in relation to the VaR and sVaR models including, for each finding, a description thereof, the envisaged remedial action and the target date for closure of the finding. In addition, institutions should retain closed validation findings for at least one year after the closure date and should be able to provide a description of the remedial action implemented. Furthermore, to allow the ECB to assess compliance with Article 368(1)(e) of the CRR, an institution should be able to provide an inventory of

[47] Uniform use of a one-day holding period in VaR and a 10-day holding period in sVaR might be permissible if adequately justified by an institution.

analyses that have been conducted with the purpose of developing/justifying the VaR and sVaR models over the last five years.

5.3 Data inputs, length of the time series used to calibrate VaR and sVaR, and quantile estimation

110. In accordance with Article 365(1)(d) of the CRR, institutions must use an effective historical observation period of at least one year for the calculation of the VaR, except where a shorter observation period is justified by a significant upsurge in price volatility. The ECB considers that this requirement can be fulfilled by taking returns referring to 250 consecutive business days[48] in order to allow alignment with the time frame referred to in Article 366(2) of the CRR. The ECB understands that an effective historical observation period of at least one year means that the average time lag[49] of the scheme used by an institution is at least the average time lag for an equally weighted observation period of one year (i.e. 125.5 days for 250 business days).[50]

111. Where the institution uses a shorter effective historical observation period (for example, by applying a weighting scheme) due to a significant upsurge in price volatility, the ECB considers that this should not lead to a lower VaR risk number. Therefore, the institution should use the higher of the following:

    (a) the VaR amount calculated with an equally weighted historical observation period of at least one year;

    (b) the VaR amount calculated with the shorter effective historical observation period.[51]

    In accordance with Article 365(1)(e) of the CRR, this comparison should be performed at least monthly, and the institution should continue to apply the resulting calibration method until the next comparison.

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48 The observation period corresponds to the time frame between the first day of calculation of returns and the last day of calculation of returns. Where an institution uses 10-day returns, the minimum observation period is 250 business days but the time frame between the first day of calculation of the first 10-day return and the end date of the last 10-day return is 260 days.

49 A weighting scheme is considered to be the set of weights directly or implicitly applied to observations of a risk factor, $\{w_t\}_{t=1,2,\ldots}$, where typically for giving more weight to more recent observations $w_t \geq w_{t+1} \forall t$, and t is the lag in number of business days between the VaR or sVaR computation date and the historical observation date. The average time lag using the most recent n observations is defined as:

$$\text{Average time lag}(n, w) = \frac{\sum_{t=1}^{n} t \cdot w_t}{\sum_{t=1}^{n} w_t}$$

This definition can be extended to equally weighted schemes by setting $w_i = 1$ for all dates. For an equally weighted scheme on 250 continuous business days, the formula results in 125.5 days.

The ECB may, after analysing the particular circumstances of an institution, also consider other methods of processing market data or risk factors to be a weighting scheme, and assess whether such methods provide an effective historical observation period of at least one year in accordance with Article 365(1)(d) of the CRR.

50 This understanding is also supported by Article 38(1) of the Final draft RTS on assessment methodology for IMA and significant share.

51 This understanding is also supported by Article 38(1) and (2) of the Final draft RTS on assessment methodology for IMA and significant share.

112. For the purpose of the regulatory back-testing conducted under Article 366 of the CRR, the higher of the two metrics mentioned in paragraph 111 should be used for consistency with the own funds requirement calculation.

If the institution always uses a VaR calculated with the shorter effective observation period as mentioned in paragraph 111 for its risk management, the institution is allowed to perform internal back-testing of the VaR under Article 369(1)(b) of the CRR using this shorter effective observation period, in order to ensure that the model is closely integrated into the daily risk management process.

113. In accordance with Article 365(2) of the CRR, the institution must calculate the sVaR calibrated to historical data from a continuous 12-month period of significant financial stress relevant to the institution's portfolio. The ECB considers that this requirement can be fulfilled by taking returns referring to 250 consecutive business days in order to allow alignment with the time frame referred to in Article 366(2) of the CRR.

Under paragraph 6.8 of the EBA Guidelines on sVaR, no weighting of historical data should be applied when determining the relevant historical period or when calibrating the sVaR model.[52] The ECB considers that a calibration to historical data from a continuous 12-month period implies that no weighting scheme should be applied to the historical data used to calibrate the sVaR.[53]

114. In order to ensure that the approach for measuring empirical correlations is sound and implemented with integrity as required by Article 367(3) of the CRR, the institution should use one single observation period (i.e. with the same start date and end date, and consequently the same length of observation period) for all risk factors modelled in the VaR. This also applies to the sVaR.

115. Consequently, if a new instrument (e.g. a single stock or credit index series) is issued, the time series corresponding to this instrument should not be used on its own for the calibration of the VaR and sVaR models until the length of the available time series reaches the length of the observation period used by the institution. In this case, because, at the least, the missing portion needs to be completed, a risk factor calibrated to this time series is considered to be proxied and the requirements for proxies should be observed (see Section 5.5).

116. In accordance with Article 365 of the CRR, the VaR and sVaR are calculated as the 99th percentile, one-tailed confidence interval, and In accordance with Article 367(1)(a) of the CRR, the model must accurately capture all material price risks. In accordance with Article 368(1)(f) of the CRR, any internal model must have a proven track record of reasonable accuracy in measuring risks. Therefore, the ECB considers that for institutions using a simulation approach (either historical or Monte Carlo) in their VaR (or sVaR) model, the percentile

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52 Under paragraph 10.10 of the EBA Guidelines on sVaR, this does not contradict the requirement that the sVaR methodology should be based on the current VaR methodology.

53 This understanding is also supported by Article 49(2)(h) of the Final draft RTS on assessment methodology for IMA and significant share.

estimation method used to obtain the 99th percentile should be based on reasonable statistical properties that ensure its accuracy – that is, it should be asymptotically unbiased, distribution-free, and assume that the probability of experiencing a P&L lower (or higher) than the lowest (or highest) simulated value is strictly greater than zero. For these reasons the ECB considers that both the method proposed by Harrell and Davis[54] [55] and the simplified method proposed below[56] are appropriate methods to ensure that price risks are accurately captured when using the percentile estimation method.

Consider the vector of simulated P&L of length n for the VaR (or sVaR) percentile estimation ($\mathrm{P\&L}_1$ to $\mathrm{P\&L}_n$) in ascending order.[57] The result $Q(0.99)$ is obtained as the weighted average of the two subsequent P&L values $-\mathrm{P\&L}_{\mathrm{Int}(m)}$ and $-\mathrm{P\&L}_{\mathrm{Int}(m)+1}$, computed as

$$\mathrm{Q}(0.99) = \left(\mathrm{m} - \mathrm{Int}(\mathrm{m})\right) \cdot \left(-\mathrm{P\&L}_{\mathrm{Int}(\mathrm{m})+1}\right) + (\mathrm{Int}(\mathrm{m}) - \mathrm{m} + 1) \cdot \left(-\mathrm{P\&L}_{\mathrm{Int}(\mathrm{m})}\right) ,$$

with $m = \frac{n+1}{100}$.

For example:
for $n = 250$, the percentile result of this method is
$0.51 \times (-\mathrm{P\&L}_3) + 0.49 \times (-\mathrm{P\&L}_2)$;

for $n = 260$, the percentile result of this method is
$0.61 \times (-\mathrm{P\&L}_3) + 0.39 \times (-\mathrm{P\&L}_2)$.

5.4 Data quality

117. In accordance with Article 367(2)(e) of the CRR, an internal model must meet minimum data standards. This applies in particular to risk factor time series, which are fundamental inputs to a VaR model. For each risk factor time series used to calibrate the shocks of the VaR model, the institution should have a process in place to regularly check the quality of the time series. The ECB considers that an appropriate minimum frequency of such checks is quarterly, as this allows alignment with the regulatory reporting cycle. This is without prejudice to the discretion of institutions to perform certain checks on a more frequent basis if needed to meet minimum data standards. Where an institution uses different data sources for its VaR model and the daily economic P&L calculation reflected in the inventory referred to in paragraph 130, the ECB may request that the institution explain the differences between the two sets of data sources, in order to verify that they meet minimum data standards.

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54 See Harrell, F.E. and Davis, C.E., "A new distribution-free quantile estimator", *Biometrika*, Vol. 69, 1982, pp. 635-640.

55 Corresponding to estimator 9 in Dielman, T., Lowry C. and Pfaffenberger, R., "A comparison of quantile estimators", *Communications in Statistics. Simulation and Computation*, Vol. 23(2), 1994, pp. 355-371.

56 Corresponding to definition 6 in Hyndman, R.J. and Fan, Y., "Sample quantiles in statistical packages", *American Statistician*, Vol. 50, 1996, pp. 361-365.

57 $\mathrm{P\&L}_1$ is the lowest P&L (i.e. the highest loss).

118. The ECB understands that the minimum data standards should ensure that the true volatility of a position or portfolio is captured. Therefore, the quality checks on the risk factor time series should, at the minimum, identify for each time series:

    (a) the number of days for which data points were initially missing and then filled using a particular methodology (e.g. interpolation and extrapolation);[58]

    (b) the number of days for which data points were initially available and were replaced using a particular methodology (e.g. interpolation and extrapolation);

    (c) the number of days with no daily changes;

    (d) the maximum number of consecutive days with no daily change.

119. Material or large numbers of changes in the time series may affect the ability to capture the true volatility of a position or portfolio. In order to monitor and ensure that the operation of the internal model is not adversely affected, institutions should maintain up-to-date documentation[59] describing any changes in the risk factor time series, including in particular any methodology for the replacement of missing data, and the list of tasks that may be performed during manual adjustments. This documentation should contain the following:

    (a) a description of the methodology followed to introduce the adjustment – the description should be sufficiently detailed so that any staff member of the unit in charge is able to produce the same outcome;

    (b) a description of the processes in place to ensure the appropriate implementation of a manual process in accordance with the documentation.

120. In accordance with Article 367(2)(e) of the CRR, the institution's internal model must conservatively assess the risk arising from less liquid positions and positions with limited price transparency and must meet minimum data standards. Therefore, the ECB considers that institutions should have in place documentation which defines the minimum data quality standards that risk factor time series should meet, and be able to provide justification for the use of time series that include an elevated number of consecutive business days with missing data or no daily changes. Moreover, the ECB considers that when using time series with only a low number of available data points per year institutions should provide justification that the number of data points is sufficient to reflect the true volatility of a position or portfolio.

121. In order to ensure that changes in the risk factor time series do not affect the ability to capture the true volatility of a position or portfolio, institutions should

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[58] There should be no missing data points for the final time series of shocks used to calibrate the model.

[59] In accordance with Article 368(1)(e) of the CRR.

analyse how the replacement of missing data affects the volatilities and correlations of the IMA. This applies particularly where time series are used that have:

(a) the value of the same data of the previous day in the case of automatic and systematic replacement of missing data points;

(b) an elevated number of consecutive business days with missing data or no daily changes;

(c) only a low number of data points per year before any data cleaning or treatment.

Filtering of data or exclusions of outliers should not be performed unless the institution can demonstrate that the excluded data points correspond to erroneous or stale data and do not represent the real market volatility of the risk factors. As part of the requirement under Article 368(1)(e) of the CRR to have procedures for ensuring compliance with controls concerning the overall operation of internal models, the ECB considers that institutions should keep track of any exclusion made in the risk factor time series used to calculate VaR and sVaR.

122. Conversely, automatic and systematic filtering of data leading to exclusions of high or low returns should not be performed without further analysis and documentation.

5.5 Proxies, beta approximation and regressions

123. For the purposes of this guide, the ECB understands that market data are proxied in the calculation of the VaR or sVaR[60] when market data that are used as inputs in the pricing model to compute the economic P&L for an IMA position are replaced with other market data[61] (or a weighted average of market data) for the purpose of calibrating the VaR or sVaR (respectively) for that position.

Where for the economic P&L a certain market data input (for example, the directly observable price of an instrument) is used, while the VaR or sVaR model (respectively) uses other market data that would lead to an equivalent price, the ECB considers that these data should not be considered as proxies.[62]

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60 For the purpose of partial use models this proxy definition should be applied only to market data inputs that fall into the approved risk categories of the model. Market data inputs giving rise to risks that are out of the scope of the approved risk categories should not automatically be counted as proxied. For example, an equity price that is modelled by a regression to an index for a general equity risk model (no approval for specific equity risk) should not be counted as proxied.

61 If market data used for pricing and VaR calculation only differ in the source (for example, P&L pricing uses one source and VaR calculations are based on another source), the data used for risk calculation should not be considered as a proxy. In any case, the quality of the data should be checked and the sources justified by the institution.

62 Examples that could lead to equivalent prices are: (i) where the economic P&L is computed by market instrument (yield) rates, while the VaR/sVaR is computed based on zero coupon rates; and (ii) where a price-based economic P&L is used (for example, listed options, or the direct bond price), while the VaR uses a model-based P&L.

Conversely, if the data would not lead to an equivalent price, they should be considered as proxies.

In accordance with Article 367(1)(b) of the CRR, where a risk factor is incorporated into the institution's pricing model but not into the risk measurement model, the institution must be able to justify such an omission to the satisfaction of the competent authority. Therefore, the ECB considers that in the event of reduced granularity of market data inputs for curves or surfaces in the VaR or sVaR model, as compared with the economic P&L, an institution should duly justify why the data points interpolated owing to the reduced granularity should not be considered as proxies (e.g. by means of equivalent price as mentioned above).

124. In accordance with Article 370(e) of the CRR, an internal model used for specific risk must capture name-related basis risk, and in particular be sensitive to material idiosyncratic differences between similar, but not identical, positions. The ECB therefore considers that the use of each single stock price (where available) as a risk factor in the VaR or sVaR is the best practice for modelling specific risk for equity instruments. Similarly, the direct use of idiosyncratic market data (where available) (for example, the idiosyncratic bond spread or each single-name credit default swap) as a risk factor is considered to be the best practice for modelling specific risk for debt instruments.

    However, the use of beta approximations or regressions could be accepted if they are documented and regularly validated (i.e. they are shown to lead to good model performance) as required by Articles 368(1)(e) and 369 of the CRR. Institutions with internal model approval for specific risk should be able to demonstrate that the idiosyncratic volatility of equity or debt instruments with specific risk is correctly taken into account in the VaR and sVaR models.

125. The ECB considers that in order to demonstrate that the model captures accurately all material price risks as required by Article 367(1)(a) of the CRR, the institution should document and make available upon request an inventory of time series of risk factors that are proxied for the calibration of the VaR and sVaR models, together with the materiality of the corresponding risk factors.

126. The ECB considers that the requirement to have a documented set of internal policies and controls also applies to the use of proxies, as they are part of the overall operation of internal models. Therefore, institutions should have a policy in place that defines clear processes for deriving and validating each proxy for VaR and sVaR. The policy should further define a set of controls (for example, statistical analysis or comparison against alternative proxies) that should be performed to ensure the appropriateness of proxies.

127. As a control to ensure that the proxies are appropriately conservative and are reflective of the true volatility where sufficient market data are available, institutions should perform analyses to show that the proxy market data (i) are highly correlated with the market data used for economic P&L, and (ii) show a similar level of volatility for VaR and sVaR. Where analyses based on market

data used for economic P&L are not feasible, institutions should at least assess alternative plausible proxy choices.

In particular, institutions which have approved internal models for specific risk of debt instruments or specific risk of equity instruments should demonstrate that the use of a proxy enables the idiosyncratic risk to be appropriately captured as required by Article 370(e) of the CRR.

128. As proxies are part of the internal models, any proxy should also be validated for VaR and sVaR at least annually in accordance with Section 4.2 on the frequency of regular internal validation.

129. In order to assess that proxies are appropriately conservative and reflective of the true volatility, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution to provide, for a selection of sub-portfolios, business days, and material proxies:

    (a) the hypothetical P&L used for regulatory back-testing;

    (b) the hypothetical P&L calculated on the same unchanged positions but replacing, for the positions for which proxies are used in the VaR, the market data with the market data of their proxies;

    (c) the hypothetical P&L calculated on the same unchanged positions but replacing, for the positions for which proxies are used in the sVaR, the market data with the market data of their proxies.

    The specific information required will depend on the results of the institution's analysis of the appropriateness of the proxies.

5.6 Risk factors in the model

130. In accordance with Article 367(1)(b) of the CRR, the VaR and sVaR models must capture a sufficient number of risk factors, depending on the level of activity of the institution in the respective markets. Where a risk factor is incorporated into the institution's pricing model (referred to as "market data input" for the purposes of this guide) but not into the risk measurement model, the institution must be able to justify such an omission to the satisfaction of the competent authority.

    So that it can assess compliance with this requirement, the ECB considers that an institution should be able to provide an inventory of all the market data inputs to the economic P&L and of all the risk factors used in the VaR and sVaR models. This inventory should include a comprehensive mapping between the market data used to calculate the economic P&L and the corresponding risk factors included in the VaR and sVaR model. The inventory should contain at least the following information:

(a) a list of the market data inputs used in the calculation of the institution's economic P&L;[63]

(b) for each market data input, information confirming:

(i) whether the market data input is directly modelled in the VaR engine (i.e. whether it is a risk factor of the model and involves no use of a proxy);

(ii) whether the market data input is proxied in the VaR calculation;

(iii) whether the market data input is modelled (or not) in the VaR engine;

(iv) where relevant, how the market data input is proxied in the VaR calculation (for example, by one market data input or by a combination of several market data inputs in a regression approach).

A similar inventory should be provided for the sVaR model where relevant.

131. Identical underlyings should always be mapped to the same risk factor in order to ensure consistency within the model.

132. In order to assess whether VaR and sVaR models capture a sufficient number of risk factors and to assess the materiality of missing risk factors, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide, for a selection of sub-portfolios, business days, and missing risk factors:

(a) the hypothetical P&L used for regulatory back-testing as defined in Section 3.5;

(b) the P&L calculated assuming simultaneously:

(i) unchanged positions and omitting the changes in value of the missing risk factors of the VaR and sVaR;

(ii) use of the pricing method and model parametrisation used to compute the economic P&L.[64]

5.7 Pricing functions and methods in the model

133. In accordance with Article 367(1)(a) of the CRR, models must capture accurately all material price risks. In addition, in accordance with Article 368(1)(e) and (f) of the CRR, institutions must have a set of documented procedures and controls concerning the overall operations of their internal models, and those models must have a proven track record of reasonable accuracy in measuring risks. Therefore, institutions should be able to produce and update, on a regular basis, an inventory of all the VaR and sVaR pricing

[63] For example, inputs in institutions' pricing models for economic P&L.

[64] This should be identical to the pricing function used to calculate the hypothetical P&L under paragraph 75.

functions and methods, and the pricing functions and methods used in the economic P&L. This inventory should include a comprehensive mapping between the pricing functions and methods used in VaR and sVaR and the pricing functions and methods used for the daily economic P&L. It should include the following information at the relevant level of granularity:

(a) the pricing functions and methods, and pricing functions and methods parametrisation (for example, the number of Monte Carlo simulations) used to calculate the daily economic P&L;

(b) the scope of instrument types covered by each pricing function and method used to calculate the daily economic P&L;

(c) a meaningful indication of the materiality of positions priced with the corresponding pricing function and method, for example the number of individual positions, as well as the total amount of outstanding notional and market value covered by each pricing function and method used to calculate the daily economic P&L;

(d) corresponding pricing functions and methods as well as the pricing functions and methods parametrisation (for example, the number of Monte Carlo simulations) used in the VaR engine;

(e) a self-assessment by the institution, including a scorecard indicator (green, amber, red)[65] of the appropriateness of VaR pricing methods (VaR engine pricing versus daily economic P&L pricing).

The criteria for assessing this scorecard indicator should be described in an internal policy.

A similar inventory should be available for the sVaR model, where relevant.

The ECB considers that an appropriate frequency for updating this inventory is at least annually, so that it can be used in the annual review of the institution's overall risk management process as referred to in Article 368(2) of the CRR.

134. This inventory should be reviewed at least annually by a unit independent of the one that produces it (for example, the internal audit function or internal validation function). This review should check the quality, reliability and comprehensiveness of the information provided in the inventory.

135. As for any other assumption in an internal model, the differences in the pricing functions and methods used for the calculation of the VaR and sVaR, compared with those used for the calculation of the economic P&L, should be subject to validation[66] in accordance with Article 369(1) of the CRR. This validation should include any simplifications of pricing functions and methods introduced for use for VaR or sVaR-related purposes (for example, a reduced number of

[65] The scorecard indicators are: green – fully appropriate; amber – acceptable; red – weakness detected.

[66] The validation of pricing functions used for economic P&L purposes is expected to be regularly performed by an institution and thus is the basis for this additional requirement.

parameters or simulations). The validation should be performed at least initially when a pricing method is introduced into the VaR or sVaR calculation that is not identical to the one for economic P&L purposes, and should assess the impact of the use of different pricing methods. Additionally, a regular validation should be performed in order to check that this impact remains low. The scorecard indicator mentioned above should be based on the results from this (initial and regular) validation. The institution should develop a work plan to mitigate the risk or improve the quality of any pricing functions or methods that are deemed inadequate according to the institution's assessment in the scorecard (i.e. a red indicator).

136. In order to assess the accuracy and appropriateness of the pricing functions and methods in the VaR and sVaR models, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide, for a selection of sub-portfolios, business days, and pricing functions/methods:

    (a) the hypothetical P&L used for regulatory back-testing as defined in Section 3.5;

    (b) the P&L, calculated on the same unchanged positions, by using the pricing functions and methods used to compute the VaR and sVaR numbers with the market data input used for the hypothetical P&L.

    This information allows assessment of the isolated impact on the hypothetical P&L of using the pricing functions and methods in VaR and sVaR calculations, instead of those in the economic P&L.

6 Methodology for IRC models focusing on default risk

6.1 Regulatory references

Table 30

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/07/2013	4	(1)
		153,336	
		367	(1),(4)
		368	
		369	(1)
		370	
		372	(a), (d)
		373	
		374	(2), (4)
		375	(1)
		376	(2), (3), (6)
SSM Regulation	15/10/2013	10	
Other references			
EBA Guidelines on the IRC	16/05/2012		17, 25, 29
Final draft RTS on assessment methodology for IMA and significant share	22/11/2016	63	(4)(b)
		65	(3)
		70	(3)

Once adopted by the European Commission, the Final draft RTS on assessment methodology for IMA and significant share will become an additional relevant regulatory reference. Currently that document only exists in a final draft version.

6.2 General requirements

137. Under paragraph 29.2 of the EBA Guidelines on the IRC, institutions should be able to prove that, on the day of the week chosen for the IRC calculation, their portfolio is representative of the portfolio held during the week and that the chosen portfolio does not lead to a systematic underestimation of the IRC numbers when computed weekly (for example, by using sensitivities or jump-to-default).

138. In order to assess that the day of the week when the IRC numbers are calculated does not lead to material bias, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution to recalculate the IRC for 15 consecutive business days (including three reporting days). If it is not possible to perform this calculation in the production environment, it can be

performed in a test environment replicating the calculation of the regulatory IRC.

139. In accordance with Article 374(4) of the CRR, the IRC model must be based on the assumptions of a constant level of risk over the one-year time horizon or, alternatively, on the assumption of a one-year constant position. As with any other modelling assumption, an institution should be able to demonstrate that the chosen assumption appropriately captures the risk of its portfolio.

    In order to assess the appropriateness of that choice, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution that uses a constant level of risk assumption and liquidity horizons shorter than one year to calculate the impact of using a constant position assumption on the IRC and the default risk in the IRC[67] amounts.

140. In accordance with Article 375(1) of the CRR, hedging or diversification effects associated with long and short positions may only be recognised by explicitly modelling gross long and short positions in the different instruments, and institutions must reflect the potential for significant basis risks in hedging strategies, in particular by maturity. Therefore, the ECB considers that irrespective of whether a one-year constant position assumption or a constant level of risk assumption is used, institutions should not overestimate diversification or hedging effects, and in particular should ensure that maturity mismatches between long and short positions occurring within the liquidity horizon or within the one-year risk modelling horizon do not lead to an underestimation of risk.[68]

    In accordance with Article 376(3)(c) of the CRR, as part of the annual independent review and the initial and periodic validation of its IRC model, an institution must apply appropriate quantitative validation. Therefore, the ECB considers that institutions should, as part of the annual independent review and the initial and periodic validation of their IRC models, assess quantitatively how maturity mismatches – that may lead to imbalanced positions within the modelling horizon – impact the IRC and the default risk in the IRC amounts.[69]

141. In accordance with Article 372(d) in conjunction with Article 368(1)(f) of the CRR, an IRC model must be reasonably accurate in measuring risks. Therefore, an institution should be able to demonstrate that the number of simulations used in its model to compute the IRC and the default risk in the IRC is sufficient to ensure accurate and stable IRC amounts.

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67 For the purposes of this document, default risk in the IRC means the risk charge calculated with the institution's IRC methodology and on the institution's current IRC portfolio, but without taking the effect of rating migrations into account. Thus, default risk in the IRC is a stand-alone risk number and not the default risk contribution to the IRC amount.

68 This understanding is also supported by Article 63(4)(b) of the Final draft RTS on assessment methodology for IMA and significant share.

69 A simple way of testing the impact of maturity mismatches leading to imbalanced positions may be to scale down the PDs and migration of maturing positions, taking into account the reduced time horizon until maturity.

142. In order to assess the accuracy of the IRC calculations, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to calculate a confidence interval of IRC estimation with a confidence level of 95%.

143. Under paragraph 17.2 of the EBA Guidelines on the IRC, institutions should use one (or, where relevant data are available, more than one) migration matrix that is specific to sovereign issuers (where relevant). Therefore, institutions should use a separate migration matrix for other types of issuers. Where an institution uses only one matrix for all types of issuers, it should be able to demonstrate that this leads to conservative IRC amounts.[70]

144. In accordance with Article 372(d) in conjunction with Article 368(1)(e) of the CRR, institutions must ensure compliance with a documented set of internal controls related to their IRC model. So that the ECB can assess compliance with this requirement, an institution should be able to provide an inventory of all open validation findings in relation to its IRC model, including a description of the finding, the envisaged remedial action and the target date for closure of the finding. In addition, institutions should retain closed validation findings for at least one year after the closure date and should be able to provide a description of the remedial action implemented. Furthermore, to allow the ECB to assess compliance with Article 372(d) in conjunction with Article 368(1)(e) of the CRR, an institution should be able to provide an inventory of analyses that have been conducted with the purpose of developing/justifying the IRC model over the last five years.

6.3 Data inputs

145. In accordance with Article 376(6) of the CRR, an IRC model must meet minimum data standards. This applies in particular to time series used to calibrate the IRC model, for which the institution should have a process in place to check the quality of the time series regularly. The ECB considers that an appropriate minimum frequency for checking the quality of the time series is quarterly, as this allows alignment with the regulatory reporting cycle. Therefore, the data quality requirements for VaR and sVaR models indicated in paragraphs 118 to 119 and 121 to 122 also apply to the market data used for calibration of the IRC model.

6.4 Distribution and correlation assumptions

146. In accordance with Article 376(3)(a) of the CRR, an institution must, as part of the annual independent review and the initial and periodic validation of its IRC model, validate that its modelling approach for correlations and price changes is appropriate for its portfolio, including the choice and weights of its systematic risk factors. The ECB understands that this provision requires institutions in

[70] The impact on the default risk in the IRC should also be provided upon request.

particular to justify (i) the choice of systematic factor types (for example, region and industry) and, for each type of systematic factor, its granularity, and (ii) the full correlation structure and its calibration for the entire set of risk factors used.

147. An institution that does not calibrate the correlations of its IRC model to market data, but instead uses internal ratings based (IRB) correlations, should demonstrate their appropriateness in relation to its portfolio. The ECB considers that owing to the nature of the regulatory trading book, the correlations as defined in Article 153 of the CRR should be used for this purpose.

148. In accordance with Article 374(2) of the CRR, correlation assumptions must be supported by analysis of objective data in a conceptually sound framework. In accordance with Article 372(d) in conjunction with Article 369(1) of the CRR, institutions must perform tests to demonstrate that any assumptions made within the internal model are appropriate. In view of those two provisions, the ECB considers that any assumption for correlation modelling made by the institution should be supported by objective market data (for example, credit default swap data, equities data or rating migrations data) and justified by a quantitative analysis as part of its initial and periodic validation process. In particular, this quantitative analysis should compare the level of correlation between issuers that is derived from the institution's IRC correlation model and from objective market data. The ECB understands that this requirement also applies to those institutions using an IRB-based methodology and to those using a vendor model.

149. In order to assess the appropriateness of the modelling approach for correlations, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide correlations for all issuer pairs, and all relevant correlation values according to their factor model, in particular for the systematic factors.

150. In accordance with Article 374(2) of the CRR, concentrations under stressed conditions must be reflected in the correlation assumptions of the IRC model. The ECB understands that the use of a short period of data for calibrating the correlations implies the risk that stressed conditions are not appropriately reflected. Therefore, institutions should be able to justify that stressed conditions have been adequately captured and to quantify the impact of using sufficiently long time series capturing a relevant stressed period for calibrating correlations in the IRC and the default risk in the IRC. In accordance with Article 370(c) of the CRR in conjunction with Article 372(d) of the CRR, the IRC model must be robust to an adverse environment. Therefore, the ECB considers that, in order to also ensure a robust calibration of the IRC model, a time series of at least 10 years, capturing a relevant stressed period, is appropriate.[71]

151. In accordance with Article 376(3)(b) of the CRR, institutions must perform sensitivity analysis and scenario analysis to assess the qualitative and

[71] By using proxies if, and where, necessary.

quantitative reasonableness of the internal model, particularly with regard to the treatment of concentrations. Because the weights of the systematic risk factors are relevant for the modelling of concentrations, the ECB considers that institutions should – as part of the independent review, and in the initial and periodic validation process – perform sensitivity analyses for the IRC and the default risk in the IRC. In particular, the ECB considers it best practice that this sensitivity analysis includes, as a minimum, the following basic analysis, where systematic risk factor weights or correlations of risk factors[72] in the model are shifted up or down by a fixed value or set to generic values:

(a) all weights of the systematic factors per issuer, for each issuer,[73] are shifted by +10% in absolute value (not going beyond 100%);[74]

(b) all weights of the systematic factors per issuer, for each issuer, are shifted by −10% in absolute value (not going below 0%);

(c) all weights of the systematic factors per issuer, for each issuer, are set to 0;

(d) all weights of the systematic factors per issuer, for each issuer, are set to 1;

(e) all correlations between systematic factors are set to 100% (weights of issuers to their respective systematic factors remain unchanged);

(f) all correlations between systematic factors are set to 0% (weights of issuers to their respective systematic factors remain unchanged).

In order to assess the appropriateness of the sensitivity analysis and scenario analysis performed to validate the reasonableness of the internal model, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide the results of the sensitivity analysis as described in this paragraph, points (a) to (f).

152. In order to assess the appropriateness of the modelling approach for correlations, and in particular the choice and weights of the systematic risk factors, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to calculate the IRC and the default risk in the IRC amounts based on a one-factor Merton Model (using one single global systematic risk factor) and one flat correlation with different correlation assumptions: 0%, 5%,10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 60%, 70%, 80%. All other inputs into institutions' IRC models remain unchanged.

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72 The latent variables of the model that determine the correlation of migration and default events of the issuers.

73 If the asset value A_i of an obligor i is written as follows in a factor model: $A_i = \sqrt{\rho_i}\, X_i + \sqrt{1-\rho_i}\,\xi_i$ where X_i is driven by systemic contributions and ξ_i is the idiosyncratic noise term, the weights of the issuers to their respective systematic factors correspond to $\sqrt{\rho_i}$.

74 Which reduces the idiosyncratic weight accordingly.

153. In accordance with Article 374(2) of the CRR, correlation assumptions must be supported by analysis of objective data in a conceptually sound framework. In accordance with Article 376(3)(a) of the CRR, an institution must, as part of the annual independent review and the initial and periodic validation of its IRC model, validate that its modelling approach for correlations is appropriate for its portfolio. In accordance with Article 376(3)(c) of the CRR, institutions must apply appropriate quantitative validation. Under paragraph 25.2(iii) of the EBA Guidelines on the IRC, in the validation process the impact of different copula assumptions should be analysed, for example by testing the impact of different distributional assumptions. Because the copula choice is a key assumption of the modelling approach for correlations, the ECB understands that these provisions require, in particular, that institutions demonstrate the appropriateness of and validate the copula choice of the modelling approach for correlations. The copula choice refers to the copula of the joint multivariate distribution[75] of the risk factors for migration and default and of the joint systematic risk factors, where relevant.

154. In accordance with Article 376(3)(b) of the CRR, institutions must perform sensitivity analysis and scenario analysis to assess the qualitative and quantitative reasonableness of the internal model, particularly with regard to the treatment of concentrations. Because the copula choice is a key assumption of the modelling approach for correlations and is relevant for the modelling of concentrations, the ECB considers that institutions should – as part of the independent review, and in the initial and periodic validation process – perform sensitivity analyses for different copula assumptions. The ECB considers that the following are suitable choices for comparing the impact of different copulas on the IRC and the default risk in the IRC with respect to the approved model:

    (a) using a Student-t copula for all issuer risk factors with 8 degrees of freedom;

    (b) where relevant, using a Student-t copula for the systematic risk factors with 8 degrees of freedom;

    (c) using a Student-t copula for all issuer risk factors where the degrees of freedom have been calibrated to market data;

    (d) where relevant, using a Student-t copula for the systematic risk factors calibrated to market data.

    This list is without prejudice to the discretion of an institution to perform additional analyses on copula choices that it deems more fitting for its particular circumstances.

[75] Sklar's theorem (in Sklar, A., "Fonctions de répartition à n dimensions et leurs marges", *Publications de l'Institut de Statistique de L'Université de Paris*, Vol. 8, 1959, pp. 229-231) states that every multivariate cumulative distribution function of a random vector can be expressed in terms of its marginals and a copula.

6.5 Ratings, probabilities of default and recovery rate assumptions

6.5.1 Documentation requirements

155. In accordance with Article 372(d) in conjunction with 368(1)(e) of the CRR, an institution must have a documented set of internal policies and controls concerning the overall operation of its internal models. The ECB considers that for the IRC model institutions should have in place, in particular:

    (a) methodology and process documents for the determination of probabilities of default (PDs) and recovery rates (RRs), including a process and documentation concerning the fallback approaches applied;

    (b) validation documents demonstrating that the assumptions relating to PDs and RRs are appropriate;

    (c) a documented hierarchy of preferred sources for the determination of PDs and RRs, which are applied to all issuers and instruments within the scope of the IRC model.

156. In order to assess the appropriateness and implementation of the policies and procedures for determining PDs and RRs, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide on request a complete list of positions in the IRC model, together with the respective issuer or obligor ratings, the PDs of the issuer or obligor and the RRs for the positions. If the ratings, PDs or RRs have been adjusted or have not been assigned using the usual automated process (for example, by manual intervention or deviation from the usual automated process), the institution should maintain a complete list of such ratings, PDs and RRs, and provide the rationale for the adjustment, or (for example) manual intervention or deviation from the usual automated process (as applicable) in each case.

6.5.2 Validation requirements

157. In accordance with Article 376(3)(b) of the CRR, institutions must perform sensitivity analysis and scenario analysis to assess the qualitative and quantitative reasonableness of the internal model. Therefore, the ECB considers that institutions should – as part of the independent review and in the initial and periodic validation process – perform sensitivity analyses with respect to the PDs and RRs that are applied to assess the quantitative impact in terms of the IRC and the default risk in the IRC. In particular, the ECB considers it best practice that such sensitivity analysis include, as a minimum, the following basic analyses on the main drivers of the IRC model:

    (a) a simultaneous 10% (absolute) up and down shift (not going beyond 0% or above 100%) of the RRs used in the portfolio. For models using stochastic

RRs, institutions are expected to incorporate this impact by adjusting the mean of the RR distributions;

(b) for models using stochastic RRs, a simultaneous 30% (relative) up and down shift of the standard deviation of RRs;

(c) for all the PDs used in the IRC calculation:

(i) a minimum value of 0.01% for all PDs;

(ii) a minimum value of 0.03% for all PDs;

(iii) a simultaneous 10% relative upshift of all PDs;

(iv) a simultaneous 10% relative downshift of all PDs;

(v) a simultaneous 1bp absolute upshift of all PDs;

(vi) a simultaneous 1bp absolute downshift[76] of all PDs.

The change in PD should be compensated for by proportionally increasing (or decreasing) all the migration probabilities belonging to the same initial rating class to maintain the cumulative 100% migration and default probability.[77]

As the sensitivity analyses listed above are part of the model validation, institutions should take them into account in detail when assessing and justifying their PDs and RRs parameters. The assessment should encompass an analysis of how the most important issuers and groups of issuers are affected by the altered PD and RR values.

In order to assess the appropriateness of the sensitivity analysis and scenario analysis performed to validate the reasonableness of the internal model, the ECB can, on the basis of Article 10 of the SSM Regulation, require institutions to provide the results of the sensitivity analysis described in paragraph 157(a) to (c).

158. In accordance with Article 376(2) of the CRR, the IRC model must be based on data that are objective and up to date. In accordance with Article 368(1)(a), any internal model must be closely integrated into the daily risk management process of the institution and serve as the basis for reporting risk exposures to senior management. Therefore, the ECB considers that institutions should demonstrate, on the basis of objective data, that the PD estimates[78] are appropriate. Furthermore, where the estimates of PDs are not derived in combination with current market prices, institutions should analyse any observed differences between these estimates and estimates that are derived in combination with current market prices where the relevant corrections were

[76] Not going below zero.

[77] Given an initial set of migration probabilities, $p_1, \dots, p_n$, where p_n corresponds to the PD, the probabilities p_i for $i = 1, \dots, n-1$ should be adjusted by $p_i' = p_i \cdot \left(1 + \frac{p_n - p_n'}{1 - p_n}\right)$ where p_n' corresponds to the modified PD.

[78] The same requirements apply to the rating agency data.

performed to obtain real-world PDs. The expectation outlined in the last sentence does not apply to IRC PDs that are PDs from an IRB approach approved by the supervisor.

159. In accordance with Article 367(1)(a) of the CRR, any internal model used to calculate capital requirements for market risk must capture accurately all material price risks. In accordance with Article 368(1) of the CRR, an IRC model must be conceptually sound and implemented with integrity. In accordance with Article 372(a) of the CRR, the IRC model must give a meaningful differentiation of risk, and accurate and consistent estimates of incremental default and migration risk. Therefore, the ECB considers that institutions should be able to show that the statistical methodology used to derive PDs is conceptually sound and that PDs are accurate and consistent across all rating grades. The ECB considers that an analysis of the expected range of estimation errors should be performed, in order to assess the accuracy of the estimates. Furthermore, the PD for a rating grade should not be set to zero solely on the basis that no defaults have been observed in the past for that rating grade.

160. In accordance with Article 373 of the CRR, the IRC model must cover all positions that are subject to own funds requirements for specific interest rate risk, including those with a 0% specific risk capital charge under Article 336 of the CRR. In accordance with Article 372(a) of the CRR, the IRC model must give a meaningful differentiation of risk, and accurate and consistent estimates of incremental default and migration risk. In accordance with Article 375(1) of the CRR, institutions must reflect the potential for significant basis risks in hedging strategies by internal or external rating and other differences in the instruments.[79] Therefore, the ECB understands that all annual PDs should be risk sensitive and greater than zero[80] for all obligors. In this context, the term "greater than zero" is interpreted to mean greater than, or equal to, one basis point. Furthermore, in the ECB's understanding, "risk sensitive" implies that all annual PDs should increase strictly in line with the decreasing creditworthiness of the obligor. The ECB also considers that institutions should calculate the PD ratios between adjacent rating grades and analyse these ratios to understand potential differences from other ratios or the median of the ratios.

161. In accordance with Article 376(4) of the CRR, the internal model must be consistent with the institution's internal risk management methodologies for

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[79] These articles are read in conjunction with the CRR requirements regarding the IRB approach: Article 144(1)(a) of the CRR requires that the institution's rating systems provide for a meaningful assessment of obligor and transaction characteristics, a meaningful differentiation of risk, and accurate and consistent quantitative estimates of risk; Article 170(1)(c) of the CRR requires that an institution documents the relationship between obligor grades in terms of the level of default risk each grade implies and the criteria used to distinguish that level of default risk.

[80] This understanding is also supported by Article 65(3) of the Final draft RTS on assessment methodology for IMA and significant share.

identifying, measuring and managing trading risks.[81] The ECB considers that institutions should identify which terms, information or assumptions in the methodology used to estimate PDs for IRC are different from the terms, information or assumptions used to account for expected credit losses used under accounting rules (e.g. IFRS 9) as well as those used to account for expected losses as defined in Article 5 of the CRR. Where they differ, institutions should be able to show that the underlying rationale is documented and approved by the institution's management body or a designated committee thereof and senior management.

162. In accordance with Article 376(2) of the CRR, the IRC model must be based on data that are objective and up to date. Therefore, the ECB considers that institutions should demonstrate, based on objective data, that the RR estimates are appropriate.

    Based on its observations of the practices of the industry, the ECB considers it best practice that the RRs do not exceed the following values:

    (a) 25% for subordinated debt;

    (b) 55% for senior unsecured debt;

    (c) 88.75% for covered bonds;

    (d) 75% for any other product.

    This does not exclude the possibility that higher RRs may be used, where institutions can justify them by objective and up-to-date data in accordance with Article 376(2) of the CRR. This best practice also applies to positions under the fallback approach for the RRs (i.e. for which no direct data sources are available).

6.5.3 Consistency requirements

163. In accordance with Article 372(a) of the CRR, the IRC model must give accurate and consistent estimates of incremental default and migration risk. Therefore, and in order to ensure that institutions do not use different sources for PDs and RRs for the sole purpose of reducing their overall own funds requirements for market risk, the ECB considers that they should apply consistent sources for

[81] This requirement is also supported by the EBA Guidelines on credit institutions' credit risk management practices and accounting for expected credit losses (EBA/GL/2017/06). In accordance with paragraph 29 of the Guidelines, credit institutions should, to the maximum extent possible, leverage and integrate common processes, systems, tools and data that are used within a credit institution to determine if, when, and on what terms, credit should be granted; monitor credit risk; and measure allowances for both accounting and capital adequacy purposes. In accordance with paragraph 30, a credit institution's allowance methodologies should clearly document the definitions of key terms related to the assessment of credit risk and expected credit loss measurement (such as loss and migration rates, loss events and default). Where different terms, information or assumptions are used across functional areas (such as accounting, capital adequacy and credit risk management), the underlying rationale for these differences should be documented and approved by senior management. Information and assumptions used for expected credit loss estimates should be reviewed and updated as required by the applicable accounting framework.

PDs and RRs in the IRC model. Therefore, institutions using internal ratings should use the corresponding internal RRs, and those using external ratings should use historical, market implied or market convention RRs.[82]

6.5.4 Requirements for PD fallback values

164. In accordance with Article 376(6) of the CRR, proxies must be appropriately conservative and may be used only where the available data are insufficient. The ECB is aware that for positions where a reliable PD assignment is not possible due to a lack of adequate data (for example, where no internal or external ratings or liquid credit spread time series are available) institutions apply a fallback PD value. As fallback PD values are used when the available data are insufficient, the ECB considers them as proxies. In order to ensure that fallback PDs are appropriately conservative, the ECB considers it best practice that the fallback PD assigned to each of those issuers and positions is at least equal to the higher of the following.

    (a) The PD that is equivalent to the worst investment grade rating applicable, according to the institution's sources for the determination of PDs – those institutions using internal rating approaches for the assignment of PDs should use the PD that is equivalent to the worst investment grade rating in their internal rating scales.

    (b) The equally weighted[83] average PD[84] of those issuers included in the IRC model which are not subject to the fallback approach. Institutions may exclude defaulted issuers when calculating the equally weighted average PD, provided that they can ensure that the fallback PD is not applied to defaulted issuers.

165. In accordance with Article 372(a) of the CRR, the IRC model must provide a meaningful differentiation of risk, and accurate and consistent estimates of risk. In accordance with Article 376(2) of the CRR, the IRC model must be based on data that are objective and up to date. Therefore, the ECB considers that institutions should periodically assess the materiality of those issuers and positions that are assigned a fallback PD in the IRC model. The ECB considers that a suitable analysis for this purpose consists of the following:

    (a) a comparison of the jump-to-default risk (where applicable, by using the average of the RRs in the case of a stochastic RR) of those positions that are assigned fallback PDs with the jump-to-default risk of all positions in the IRC model;

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82 This understanding is also supported by Article 70(3) of the Final draft RTS on assessment methodology for IMA and significant share.

83 All issuers have the same weights.

84 The PD may be derived from the rating of the issuer by applying the migration matrix of the IRC model. In addition, defaulted positions are included in the calculation of the average with a PD equal to 100% as issuers subject to the fallback approach could be in default.

(b) a calculation of the ratio of the incremental[85] IRC contributions and the incremental default risk in the IRC contributions of the positions assigned fallback PDs, to the IRC number as calculated by the IRC model:

$$\frac{\text{IRC (full scope)} - \text{IRC (non-fallback for PD)}}{\text{IRC (full scope)}};$$

$$\frac{\text{Default risk in the IRC(full scope)} - \text{Default risk in the IRC (non-fallback for PD)}}{\text{Default risk in the IRC(full scope)}}$$

166. In accordance with Article 372(a) of the CRR, the IRC model must provide a meaningful differentiation of risk. The ECB considers that if a significant percentage of the IRC is calculated using fallback PDs, there is a risk that the IRC model may not provide the meaningful differentiation of risk required. The ECB considers that if the percentage of the IRC calculated using fallback PDs is larger than 10%,[86] the institution should investigate whether additional data sources are available to reduce the percentage of issuers subject to the fallback PD assignment.

    In accordance with Article 376(3)(b) of the CRR, institutions must perform sensitivity analysis and scenario analysis to assess the qualitative and quantitative reasonableness of the internal model. In the event that the resulting percentage of the IRC calculated using fallback PDs is larger than 10%, the ECB considers that institutions should perform, as part of the independent review and validation, a sensitivity analysis for the IRC and the default risk in the IRC. In particular, the ECB understands that this requirement implies assessing the sensitivity of the IRC and default risk in the IRC amounts by assigning one rating grade higher and one rating grade lower than the one used in the fallback PD assigned on the basis of paragraph 164.[87]

6.5.5 Requirements for the calculation of losses based on recovery rates

167. In accordance with Article 372(a) of the CRR, the IRC model must provide accurate and consistent estimates of incremental default risk. Therefore, the ECB considers that the market value change following the default of an issuer should be calculated as the difference between the current market value of the position and the expected market value subsequent to default.

168. In accordance with Article 372(a) of the CRR, the IRC model must provide a meaningful differentiation of risk. In accordance with Article 375(1) of the CRR, institutions must reflect the potential for significant basis risks in hedging

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85 Risk management literature is not uniform in the use of the terms “incremental” risk number (e.g. incremental value-at-risk) and “marginal” risk number. We adopt the convention that an incremental risk number refers to the exact finite change in a risk number when adding a finite position, whereas “marginal” risk number refers to the derivative of a risk number with respect to a position (infinitesimal change rate).

86 This threshold of 10% is set by analogy with the Commission Delegated Regulation on materiality of extensions and changes of the IMA, which establishes 10% as the threshold for assessing materiality.

87 When the average PD is used as a fallback approach, institutions should, by analogy, apply this requirement (i.e. identify the rating grade that is closest to the average PD and shift up and down starting from this rating grade).

strategies by product, seniority in the capital structure, internal or external rating, maturity, vintage and other differences in the instruments. The ECB considers that in order to provide a meaningful differentiation of risk and to reflect the potential for significant basis risks, recovery rates should at least reflect the type of product, including the collateralisation of the position, and its seniority in the capital structure.

169. In accordance with Article 372(a) of the CRR, the IRC model must provide accurate and consistent estimates of incremental default risk. In accordance with Article 372(d) in conjunction with Article 369(1) of the CRR, institutions must demonstrate that any assumptions made within the IRC model are appropriate. The ECB considers that this applies also to RRs. An RR measures the expected market value subsequent to default of a position as a percentage of the base value (for example, notional). For a long credit position (for example, the holding of a long bond position) a default of the issuer would lead to a loss. For RRs based on notional value, a negative RR indicates a negative expected market value subsequent to default, whereas an RR above 100% indicates that the expected market value subsequent to default is higher than the notional value. The ECB is aware that RRs generally range between 0% and 100%. RRs outside this range could indicate that the assumptions made within the IRC model are not appropriate – because they could imply an expected profit subsequent to default – and so institutions should be particularly prudent in applying such RRs or be able to demonstrate that they are conservative.

6.6 Treatment of groups of connected issuers

170. In accordance with Article 374(2) of the CRR, the IRC model must appropriately reflect issuer concentrations. As defined in Article 4(1)(39) of the CRR, two or more legal persons in the same group of connected clients constitute a single risk, unless it is shown otherwise. The ECB considers that groups of connected clients are relevant for modelling issuer concentrations. Therefore, such groups should be appropriately reflected in the IRC model and their treatment in the model is subject to the same requirements as any other component of the model, in particular documentation and validation.

171. In accordance with Article 374(2) of the CRR, the IRC model must appropriately reflect issuer concentrations. As defined in Article 4(1)(39) of the CRR, a group of connected clients constitute a single risk, unless it is shown otherwise. Therefore, the ECB considers that institutions should model issuers and obligors in the same group of connected clients as a single risk (this means, for example, that in an asset value model they should be modelled as a single asset value). However, the existence of different rating grades within a group of connected clients indicates the possibility that not all of those in the group default or migrate simultaneously. Therefore, the ECB considers that a suitable method of modelling is to distinguish within a group of connected clients by sub-groups of issuers that have the same internal or external rating grade and

where the default or migration of each sub-group would occur simultaneously in the IRC model – unless it is demonstrated that another treatment is more appropriate in view of the definition in Article 4(1)(39) of the CRR.

172. In accordance with Article 376(3)(a) of the CRR, an institution must, as part of the annual independent review and the initial and periodic validation of its IRC model, validate that its modelling approach for correlations is appropriate for its portfolio. Because modelling groups of connected clients is relevant for modelling issuer concentrations and the correlations among them, the ECB considers that validation of the modelling of groups of connected clients is part of the annual independent review and the initial and periodic validation of the institution's IRC model.

7 Risks-not-in-the-model engines

7.1 Regulatory references

Table 31

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013		
		103	(1)
		105	
		363	(1)
		366, 367, 368	
		369	(1)
		372	(a)
		377	
		430	(1)
SSM Regulation	15/10/2013	10	
Commission Delegated Regulation on materiality of extensions and changes of the IMA	04/03/2015	7a	(1)(c)
		7b	
		Annex III	Part II, Section 2(13)
Commission Implementing Regulation on supervisory reporting[88]	17/12/2020	5	(a)

88 Commission Implementing Regulation (EU) 2021/451 of 17 December 2020 laying down implementing technical standards for the application of Regulation (EU) No 575/2013 with regard to supervisory reporting of institutions and repealing Implementing Regulation EU No 680/2014 (OJ L 97, 19.3.2021, p. 1), referred to in this guide as "Commission Implementing Regulation on supervisory reporting".

7.2 The framework for risks-not-in-the-model engines

173. In accordance with Article 367(1)(a) of the CRR, any internal model used to calculate capital requirements for market risk must capture accurately all material price risks. For IRC models, the accuracy of the risk estimates is also required by Article 372(a) of the CRR. In accordance with Article 367(1)(b) of the CRR, where a risk factor is incorporated into the institution's pricing model but not into the risk measurement model, the institution must be able to justify such an omission to the satisfaction of the competent authority. In accordance with Article 368(2)(d) of the CRR, the annual review of an institution's overall risk management process must consider the scope of risks captured by the risk measurement model. In accordance with Article 369(1) of the CRR, institutions must have processes in place to ensure that all their internal models for market risk have been adequately validated to ensure that they are conceptually sound and adequately capture all material risks. In accordance with Article 368(1)(e) of the CRR, the institution must have in place established procedures for monitoring and ensuring compliance with a documented set of internal policies and controls concerning the overall operation of its internal models.

    Based on the provisions referred to above, the ECB considers that the processes set out in detail in this section for risks not captured in the model[89] engines (also referred to in this guide as "risks-not-in-the-model engines", or "RNIME"[90]) are an integral part of the overall processes of the IMA for market risks. Therefore, institutions should develop an RNIME framework, the elements of which are further elaborated on in the following paragraphs.

174. For the purposes of this guide and in relation to the RNIME framework, the following diagram shows schematically different components of the market risk own funds requirements and the RNIME framework.[91] The ECB considers that an internal model comprises all of the required methods, processes, policies, controls, and IT systems. Each internal model includes, inter alia, the following constituent elements.

    (a) An "engine" – that is, the calculation methodology for each risk number, referred to collectively as "risk engines". The ECB understands that Articles 367 and 368 of the CRR refer to an engine as a "risk measurement model". There is one risk engine for each risk number and the risk engine is used to compute the daily risk number. Typically, an engine models and computes all risks in an integrated manner. However, it may comprise several components, for example, a main component for the bulk of the risks, and some "satellite" components. A satellite component is part of a model engine, typically for a subset of products or

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89 In this section, the generic reference to "model" means a reference to the VaR, sVaR, IRC, and comprehensive risk measure (CRM) models for correlation trading portfolios as referred to in Article 377 of the CRR.

90 In this document, the abbreviation "RNIME" may be singular or plural depending on whether it refers to a single risk, several risks, or collectively all risks not captured in the model engines.

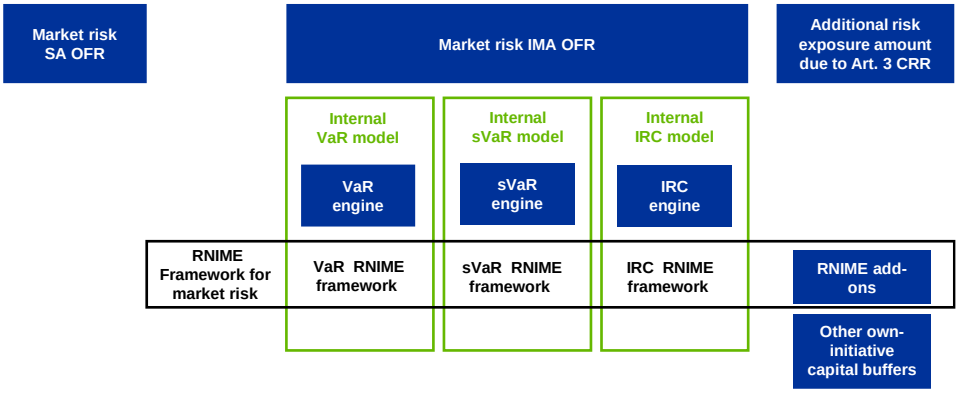
91 In order to simplify the diagram, CRM is not explicitly included. It should be treated in the same way as IRC.

risk positions, meeting all applicable CRR requirements for risk measurement models on an ongoing basis (for example, for particular risks not modelled in the main component). In accordance with Article 367(3) of the CRR, institutions may, in any internal model used for market risk, use empirical correlations; where they are not used, the model uses a simple sum aggregation of these components.

(b) An RNIME framework relating to all risk engines, in which RNIME are identified, quantified, managed and, if appropriate, capitalised by RNIME add-ons to the risk exposure amounts. The process for determining RNIME add-ons is part of the RNIME framework. An RNIME add-on is understood as a temporary risk exposure amount[92] that remains in place until the corresponding RNIME is incorporated into the model engine(s) in a manner compliant with the CRR. The ECB considers that the RNIME add-ons are not part of the model engines, and are therefore not included in the risk numbers. In particular, RNIME add-ons are not included in the VaR number used for regulatory back-testing.

Figure 4

Components of market risk own funds requirements and risk exposure amounts (blue filled boxes), internal models (green frames), and RNIME framework (black frame)



In accordance with Article 363(1) of the CRR, institutions may calculate their own funds requirements for market risk using their internal models instead of, or in combination with, the methods of the standardised approaches for market risk. Because the positions exposed to RNIME according to the process and requirements described in this Section 7 are within the scope of the IMA, they do not need to be accounted for under the standardised approaches for market risk.

92 To be reported in COREP as "Additional risk exposure amount due to Article 3 CRR" (COREP C02.00 Row 760, Column 010) together with any other own-initiative capital buffers.
Moreover, there could be supervisory imposed add-ons related to market risk which are not shown in the figure.

Exclusions of positions from the scope of the IMA in risk categories for which the IMA is approved are subject to the requirements described in Section 2.5 of this guide.

175. In accordance with Article 368(1)(e) of the CRR, institutions must have established procedures for monitoring and ensuring compliance with a documented set of internal policies and controls concerning the overall operation of internal models. Therefore, the ECB considers that an institution should have a policy and controls in place that govern the overall process for the identification, quantification and management of RNIME. In order to enable efficient monitoring of RNIME, the ECB considers that the documented policies should include a description of the different tasks and responsibilities, and the frequency of their execution. This policy and these controls constitute the RNIME framework. The ECB considers that the RNIME framework should cover the tasks described in the following paragraphs of this section.

176. In accordance with Article 368(1)(b) of the CRR, the risk control unit is responsible for the overall risk management system. Because the RNIME framework is an integral part of the overall IMA processes, the ECB considers that the risk control unit is also responsible for the overall RNIME framework.

    In accordance with Article 368(1)(b) of the CRR, the risk control unit must conduct the initial and ongoing validation of any internal model for market risk. Therefore, the ECB considers that the RNIME framework and methodologies should be initially and periodically validated internally, and updated if necessary.

7.3 Identification of RNIME

177. A single RNIME identified refers to a distinct risk not accurately captured or omitted, and related to positions or instruments within the approved risk categories in the IMA in the VaR, sVaR, IRC or CRM models. This can refer to a single risk factor, a set of risk factors (e.g. related to a yield curve), a particular effect (e.g. volatility skew) or specific instruments.

    The ECB considers that RNIME can emerge as a result of the following circumstances.

    (a) Differences in the positions, risk factors and pricing methods captured in VaR, sVaR, and IRC (and CRM if applicable) engines, in comparison with those of the end-of-day valuation process for the books and records of an institution.[93] In particular, these may include risk factors that are taken into account in the economic P&L, but not in the risk measurement model as referred to in Article 367(1)(b) of the CRR.

        Some examples could be: simplified pricing models or sensitivities based P&L in the risk engines; use of proxies for risk factors; calibration of pricing

[93] Those potential RNIME are different from valuation adjustments that an institution might have made in order to satisfy the fair value and prudent valuation requirements under Article 105 of the CRR.

models in the risk engines; and risks not adequately modelled, such as basis risk between two different classes of shares.

(b) Weaknesses and limitations in the stochastic modelling of risk factors in the risk engines that are not linked to the valuation produced by the end-of-day valuation process.

Some examples could be: distributional assumptions for risk factors of both the marginal distributions and joint distributions (i.e. correlation structure); jump risks; calibration of model parameters; regression approach calibration and deviations; IRC factor model assumptions and calibration; and insufficient or unreliable data for risk factors.

(c) Other factors leading to risks not being captured accurately or being omitted from the risk engines.

Some examples could be: instruments on exotic underlyings in the IMA scope that may be treated under the RNIME framework in the manner referred to in paragraph 26 of this chapter; positions in defaulted debt, as referred to in paragraph 34 of this chapter; some risks not accurately captured due to position data not being updated daily.

178. In accordance with Article 368(1)(e) of the CRR, an institution must have established procedures for monitoring and ensuring compliance with a documented set of internal policies and controls concerning the overall operation of its internal models. Therefore, the ECB considers that in order to ensure a comprehensive coverage of such risks, the institution should clearly describe and document each RNIME in an inventory, as part of its RNIME framework.

In order to properly monitor each RNIME, the ECB considers that institutions should explain how each RNIME is identified and defined, and should, in particular, be able to justify the cases where a single RNIME is defined across portfolios or product classes. In order to properly assess materiality, the ECB understands that the current portfolio composition and trading strategy of the institution should be taken into account when assessing each RNIME. The ECB understands that, generally, all RNIME need to be included in the RNIME framework described below. It understands that the only exception is where the institution can demonstrate that the effect of an identified RNIME is negligible in the current portfolio and will remain negligible taking into account the trading strategy, in which case the institution might exclude that RNIME from the RNIME quantification and management processes that are part of the RNIME framework. The institution should be able to provide justification as to why any particular RNIME is not included in its risk engines.

179. In accordance with Article 367(1)(a) of the CRR, any internal model must capture accurately all material price risks. The ECB considers that in order to ensure an accurate capture of risks, institutions should not rely solely on the monitoring of current RNIME, but strive to identify RNIME on an ongoing basis,

and as early as possible, as part of the overall risk management. The ECB considers it best practice to use existing processes efficiently to identify RNIME.

As part of such best practice, and in order to maximise efficiency, institutions should, at a minimum, use the following processes to identify RNIME:

(a) a review of the institution's trading strategy, as referred to in Article 103(2) of the CRR, considering, in particular, the expansion and reorientation of the trading business, given that expanding a particular business could lead to RNIME becoming significant, or to additional risks that are not currently covered in the RNIME process;

(b) the regulatory back-testing process, as referred to in Article 366 of the CRR, as part of which the institution should review the results and analyses of overshootings in order to identify RNIME;

(c) market data quality assurance processes for risk factors, as referred to in Article 367(2)(e) of the CRR, where market data display insufficient quality;

(d) initial and ongoing internal validation of internal models, as referred to in Articles 368(1)(b) and 369(1) of the CRR, at least where differences between the institution's pricing model and risk measurement model are identified (for example, risk factors that are used for the valuation of a product for the end-of-day valuation process, but not for risk measurement), and where internal back-testing shows a high number of overshootings;

(e) introduction of new products, where the institution should analyse whether the market risks inherent in the new products and their related trading strategies can be adequately captured by the risk engines in order to ensure that these new products – which may pose additional risk factors or require methodological changes – are fully compatible with the comprehensive risk control and validation by the risk control unit, as required by Article 368(1)(b) of the CRR.

In accordance with Article 368(2)(d) of the CRR, the annual review of an institution's overall risk management process must consider the scope of risks captured by the risk measurement model. Therefore, the ECB considers that a review of the inventory of RNIME should be carried out at least once a year.

7.4 Quantification of RNIME

180. In accordance with Article 367(1)(a) of the CRR, any internal model used to calculate capital requirements for market risk must capture accurately all material price risks. In order to ensure a meaningful quantification of RNIME in relation to the internal models, the ECB considers that the risk parameters for RNIME quantification should be aligned to the regulatory specifications. Therefore, the quantification of risks-not-in-the-VaR engine should aim to reflect

a loss at a 99% confidence level and a holding period of ten days. Similarly, the quantification of risks-not-in-the-sVaR engine should aim to reflect a loss at a 99% confidence level and a holding period of ten days, and be calibrated to historical data from the stressed period used to calibrate the sVaR model. The quantification of risks-not-in-the-IRC engine (or CRM engine, if applicable) should aim to reflect a loss at a 99.9% confidence interval over a time horizon of one year.

181. In accordance with Article 367(1)(a) of the CRR, any internal model used to calculate capital requirements for market risk must capture accurately all material price risks. Therefore, the ECB considers that in order to ensure that the internal models capture all material price risks, institutions should quantify RNIME in an appropriate way and document and duly justify the methodology applied. The ECB understands that the quantification of the impact of the identified i-th RNIME (denoted by RNIME_i) serves to assess the need to incorporate the i-th RNIME into the engine.

The ECB considers it best practice that for each RNIME_i identified, the impact quantification M_i should be estimated as the incremental risk number[94] where RNIME_i would be incorporated into the model engine; this is in comparison with the current engine using the same portfolio as reference,

$$M_i \stackrel{\text{def}}{=} \text{risk number}(\text{engine with } \text{RNIME}_i \text{ incorporated}) - \text{risk number}(\text{current engine}),$$
$$\text{risk number} \in \{\text{VaR}, \text{sVaR}, \text{IRC}, \text{CRM}\}$$

where no RNIME add-ons (or other add-ons) are included in the risk numbers.

The impact quantification M_i is a signed number and could be negative if incorporating RNIME_i were to be risk-reducing.

The estimation of M_i should be as accurate as possible using reasonable effort. Therefore, the ECB understands that the M_i estimation methodology can use appropriate approximations, assumptions, or a stress methodology when duly justified and documented.

Because the impact quantification should allow the different RNIME to be assessed individually, no diversification effect should be applied between different RNIME when quantifying the individual RNIME.

182. The ECB considers that a more conservative impact quantification than described in paragraph 181 could be used where this is duly justified. In particular, where an appropriate impact quantification using an incremental risk number cannot be performed, the ECB considers it a prudent approach to resort to a stand-alone impact estimation for RNIME_i,

$$\widetilde{M}_i \stackrel{\text{def}}{=} \text{risk number}(\text{RNIME}_i \text{ as only source of risk}),$$
$$\text{risk number} \in \{\text{VaR}, \text{sVaR}, \text{IRC}, \text{CRM}\},$$

[94] See footnote 85 above for details.

and M_i is set to $\widetilde{M}_i$ for the impact quantification.

The estimation of $\widetilde{M}_i$ should be as accurate as possible using reasonable effort. Therefore, the ECB understands that the $\widetilde{M}_i$ estimation methodology can use appropriate approximations, assumptions, or a stress methodology when duly justified and documented.

As an illustration, in the case of the VaR, and where RNIME_i can be well described as a sensitivity p_i to an additional risk factor (i.e. a risk position), the impact quantification M_i corresponds to its incremental VaR, i.e. the incremental effect on VaR of adding the risk position p_i to the existing set of risk positions. Let p denote the set of current risk positions, and let $\text{VaR}(p)$ denote the current VaR, then the impact quantification M_i of RNIME_i interpreted as an additional risk position p_i is

$$M_i = \text{VaR}(p + p_i) - \text{VaR}(p)$$

The impact quantification as incremental risk, M_i, is different from the assessment of the risk on a stand-alone basis as a sole source of risk, $\widetilde{M}_i$. In the setting above, the stand-alone risk would be $\widetilde{M}_i = \text{VaR}(p_i)$, which in general is different from $\text{VaR}(p + p_i) - \text{VaR}(p)$. If the sub-additivity property $\text{VaR}(p) + \text{VaR}(p_i) \geq \text{VaR}(p + p_i)$ holds, the stand-alone risk $\text{VaR}(p_i)$ is a conservative estimate of the incremental risk,

$$\widetilde{M}_i = \text{VaR}(p_i) \equiv \text{VaR}(p) + \text{VaR}(p_i) - \text{VaR}(p) \geq \text{VaR}(p + p_i) - \text{VaR}(p) = M_i.$$

Because VaR, sVaR, IRC and CRM are all value-at-risk-based risk measures, the same applies for those, by analogy.

183. In accordance with Article 367(1)(a) of the CRR, any internal model used to calculate capital requirements for market risk must capture accurately all material price risks. The ECB considers that in order to ensure that the quantification of RNIME is appropriately accurate, the quantification should, where possible, make use of objective market data, even if the data quality is not sufficient to model these risks in the model engine.

    In order to ensure alignment with the internal models when quantifying an RNIME – for example, by using sensitivities – the shocks applied in order to quantify it should be based on the same holding period and, in principle, on the same observation period as those for the shocks for the other risk factors used in the relevant internal model. Differences in the observation period should be duly justified. If scarce data are used to calibrate these shocks, the shocks should be estimated conservatively. This may involve relying to some extent on expert judgement.

7.5 Management of RNIME and implementation in an institution's risk engines

184. In accordance with Article 367(1)(a) of the CRR, any internal model must capture accurately all material price risks. The ECB considers that in order to ensure ongoing accurate risk capture, the risk control unit should carry out regular impact quantification and monitoring of all RNIME.

    If an institution can provide justification that an impact quantification of a VaR RNIME also applies for sVaR, the sVaR impact quantification and monitoring may be based on the VaR impact quantification. If it cannot provide such justification, or where certain RNIME have been identified specifically for the sVaR engine, a specific impact quantification and monitoring for those sVaR RNIME should be performed. Monitoring of RNIME should include, in particular, checking whether RNIME are above certain thresholds, as further detailed below in this Section 7.5.

185. In accordance with Article 430(1) of the CRR in conjunction with Article 5(a) of the Commission Implementing Regulation on supervisory reporting, institutions must submit the information relating to own funds requirements with a quarterly frequency. Therefore, the ECB considers that in order to assess the adequacy of own funds, institutions should quantify and monitor the RNIME at least quarterly.

    The risk control unit should report the outcome of the quantification and monitoring to the committee or persons responsible for deciding on the management of RNIME in terms of identification, quantification, treatment, limitation, reporting frequency, etc.

186. In accordance with Article 367(1)(a) of the CRR, any internal model must capture accurately all material price risks. Therefore, the ECB considers that in order to ensure that the models accurately capture all material price risks including RNIME and thereby result in a sufficient level of own funds, institutions should take into account all of the following points.

    (a) An RNIME$_i$, where $M_i < 0$ does not allow the reduction of own funds requirements until the related risk has been incorporated into the relevant engine.

    (b) Institutions should determine thresholds for assessing, at their own discretion, the impact of individual RNIME above which an individual RNIME is considered a "substantial" RNIME.

        The ECB considers that if a single RNIME already has a 5% impact, there is a risk that the risk engine might not capture accurately all material risks. Therefore, the ECB considers it best practice that the i-th individual RNIME is considered substantial if the impact quantification M_i

corresponds to more than 5% of the amount computed by the risk engine[95] [96] (without taking into account any add-ons, as they are not included in the relevant risk number).

That is, RNIME_i is considered substantial if

$$\frac{M_i}{\text{risk number}} > 5\%\,,\ \text{risk number} \in \{\text{VaR, sVaR, IRC, CRM}\}$$

This is without prejudice to the discretion of an institution to set a lower threshold than 5%.

The ECB considers it best practice and prudent that institutions should include any substantial RNIME_i in their total risk exposure amount by way of an RNIME_i add-on of size M_i multiplied by 12.5, in order to calculate the corresponding risk exposure amount. In so doing they should take into account the multiplication factors (m_c) and (m_s) for VaR and sVaR as referred to in Article 366 of the CRR without the back-testing addend, until they have incorporated it into the engine affected. Consistent with the impact quantification, the ECB considers that there should not be any diversification effect between different RNIME add-ons.

(c) Institutions should determine, at their own discretion, thresholds above which RNIME are incorporated into the model engines.

In accordance with Article 7a(1)(c)(ii) of the Commission Delegated Regulation on materiality of extensions and changes of the IMA, a change of 10% or more of a relevant risk VaR, sVaR, IRC, or CRM number is to be considered a material change to the IMA. Therefore, the ECB considers, by analogy, that if the cumulative RNIME impact corresponds to more than 10% of the amount computed by the risk engine, this indicates that an engine might not capture accurately all material price risks,[97] as the change needed to incorporate them into the engine could amount to a material model change.

In order to assess whether that is the case, institutions should calculate the cumulative impact quantification $\text{CIQ}_{\text{risk number}}$ per risk number by adding the positive impacts of all RNIME related to that risk number, including those subject to an RNIME add-on, without taking any

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95 The calculation should be made at the end of the quarter by comparing the impact quantification of the RNIME, e.g. at the end of the quarter, with the previous 60-business day average of the VaR or sVaR, or the previous 12-week average of the IRC or CRM amount (without any add-ons).

96 Please note that it is generally expected that the RNIME quantification, as described in paragraphs 181 and 182, is performed only once a quarter (for one day in the quarter, e.g. at the end of the quarter), to avoid overly burdensome computations. In the unlikely case that an institution is able to quantify an RNIME daily, for VaR/sVaR, or weekly, for IRC/CRM, it would be possible to use an average-based impact calculation for that RNIME, as long as the same dates are used for this average as for the 60-business day average of the VaR/sVaR or the 12-week average of the IRC or CRM amount respectively. In this case, the Mi of paragraphs 181, 182 and 186 should be determined based on this average.

97 This is without prejudice to a determination by the ECB, based on an assessment taking into account the specific circumstances of the institution, that the model does not accurately capture all material price risks.

diversification among the different RNIME into account, and dividing by the risk number computed by the model engine without taking any add-ons into account.[98] If the resulting ratio is greater than 10%, the ECB considers that the model engine might not accurately capture all material price risks,

$$\text{CIQ}_{\text{risk number}} = \frac{\sum_{\text{all RNIME}_i \text{ related to risk number}} \max[M_i, 0]}{\text{risk number}} > 10\%,$$

$$\text{risk number} \in \{\text{VaR}, \text{sVaR}, \text{IRC}, \text{CRM}\}$$

This is without prejudice to the discretion of an institution to set a lower threshold than 10%.

If it is the case that the ratio as calculated above is greater than 10% (or a lower threshold set by the institution), the institution should provide the ECB with an implementation plan for the incorporation of some or all of these RNIME in the model engine(s), such that the cumulative impacts are reduced below the threshold.

(d) The ECB considers it a prudent approach that RNIME which are to be incorporated into the relevant engine(s) are capitalised with RNIME add-ons as part of the implementation plan, until they are incorporated into the relevant engine(s). If the institution deems it convenient, the remaining RNIME may also be capitalised with RNIME add-ons.

187. With reference to the previous paragraphs in this Section 7.5, the incorporation of RNIME into the model engine should be performed so that the engine complies with all relevant requirements of the CRR including, in particular, internal validation. The term “incorporation” here means the integration of RNIME into the relevant risk engine, and into its methodology and processes, typically allowing for risk diversification. This is without prejudice to the discretion of an institution not to use empirical correlations within risk categories or across risk categories, as referred to in Article 367(3) of the CRR, by applying instead a simple sum aggregation.

188. In accordance with Article 430(1) of the CRR in conjunction with Article 5(a) of the Commission Implementing Regulation on supervisory reporting, institutions must submit the information relating to own funds requirements with a quarterly frequency. Therefore, the ECB considers that in order to ensure an accurate quarterly reporting of own funds requirements and risk exposure amounts, the RNIME add-ons should be updated at least quarterly.

In order to enable monitoring of RNIME add-ons, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution to provide an overview of RNIME add-ons in a suitable format chosen by the institution.

[98] The calculation should be made at the end of the quarter by comparing the sum of impact quantification of the RNIME, e.g. at the end of the quarter, with the 60-business-day average of the VaR or sVaR, or the 12-week average of the IRC or CRM amount of the preceding quarter.

189. Because the RNIME framework is an integral part of the overall IMA processes, a change to the RNIME framework – in particular one that relates to the RNIME identification methodology, the consideration of new types of RNIME, the impact quantification methodology, or the RNIME add-on methodology – constitutes an IMA model change and should therefore be assessed in accordance with the Commission Delegated Regulation on materiality of extensions and changes of the IMA.

    In accordance with Article 7b and Annex III, Part II, Section 2(13) of the Commission Delegated Regulation on materiality of extensions and changes of the IMA, any structural, organisational or operational change to the core processes in risk management or risk controlling functions requires ex ante notification to the competent authorities. The ECB considers that because the RNIME framework is an integral part of the overall IMA processes, a change to the RNIME framework should accordingly be notified ex ante to the competent authorities.

    However, changes within the existing RNIME framework which do not need new methodologies or processes to be implemented should be notified to the competent authorities through ex post notifications only.

190. Ceasing to capitalise an RNIME, or capitalising an RNIME with an RNIME add-on according to the thresholds of the RNIME framework, does not constitute a model change and does not need to be separately notified as a model change, provided that it is based on the approved methodology of the RNIME framework.

191. The incorporation of RNIME_i into the model engine, irrespective of whether it was previously treated as an RNIME add-on or not, and irrespective of whether it is an RNIME identified previously or is newly identified, constitutes an IMA model change and should therefore be assessed in accordance with the Commission Delegated Regulation on materiality of extensions and changes of the IMA. The materiality assessment, in accordance with Article 7a(1)(c)(ii) of that Commission Delegated Regulation, should be based on the new risk number, i.e. on the following ratio,

$$\frac{\text{risk number}(\text{engine with } \text{RNIME}_i \text{ incorporated})}{\text{risk number}(\text{current engine})},$$
$$\text{risk number} \in \{\text{VaR}, \text{sVaR}, \text{IRC}, \text{CRM}\}$$

    For the sum of market risk requirements, the assessment of materiality in accordance with Article 7a(1)(c)(i) of that Commission Delegated Regulation should be made analogously.

192. Because the RNIME add-ons are not included in the VaR number, they should not be taken into account when performing regulatory back-testing. However, all VaR engine components that constitute the VaR engine (including, where applicable, satellite components) should be taken into account in the regulatory back-testing.

Counterparty credit risk

1 Scope of the counterparty credit risk chapter

1. The purpose of this chapter is to provide transparency on how the ECB understands a number of topics related to the principles defined for the Internal Model Method (IMM[1], as referred to in Part Three, Title II, Chapter 6, Section 6 of the CRR). This chapter does not contain an exhaustive list of topics relevant for compliance with IMM requirements that could be subject to review during future internal model investigations.[2]

2. In the understanding of the ECB and in order to comply with Article 6(1) of the CRR, all requirements of Part III Title 2 Chapter 6 Section 6 must also be met by all legal entities that have approval to use the IMM for solo capital requirement calculations. This is especially important when underlying portfolios differ and the portfolio at consolidated level is not representative of that at the solo level. In particular, these requirements are relevant for stress period determination in accordance with Article 292(3) of the CRR and for all validation requirements when selecting, for example, relevant risk factors and synthetic portfolios for back-testing.

3. The following sections are structured in the same manner and cover those issues relating to counterparty credit risk (CCR) for which the TRIM project was intended to ensure the consistent application of regulatory requirements. For each item the following apply.

   (a) References are only made to the relevant CRR provisions that require more guidance. Other relevant provisions of the CRR are therefore not mentioned in the guide, but are not to be disregarded; this refers specifically to paragraphs 7, 19, 32, 44, 49, 56, 61, 65, 70, 85, 86, 89 and 93.

   (b) Principles are expressed following CRR requirements as they are understood by the ECB.

2 Trade coverage

4. For the purposes of this section, “IMM transactions” are transactions for which the institution has approval to use the IMM to estimate the related exposure value.

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1 Note that the advanced method for the CVA capital requirement is not in scope here.

2 A prominent example is data quality.

5. This section refers to transactions for which the institution does not have approval to use the IMM, and IMM transactions, for which the related exposure is not fully simulated in the IMM.[3]

6. The section also addresses potential carve-outs of transactions from the IMM scope to a non-IMM method, for example due to price differences compared with benchmarking systems[4], and the consequences of the potential creation of synthetic netting sets.

2.1 Relevant regulatory references

Table 32

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	273	(6)
		283	(1), (3)
		284	(1)
		293	(4)
		294	(1)(d), (l), (o)
Other references			
ECB Guide on options and discretions available in Union law	11/2016	Section II, Chapter 3, paragraph 8	

7. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following.

   (a) Articles 283(1) (permission to use the IMM) and 283(3) (sequential implementation of the IMM) of the CRR, further specified for banking supervision in Section II, Chapter 3, paragraph 8 of the ECB Guide on options and discretions available in Union law, form the basis for IMM approval.

   (b) Article 273(6) of the CRR requires, for all methods in Part Three, Title II, Chapter 6, Sections 3 to 6 of the CRR (Articles 274 to 294), that the exposure value for a given counterparty is calculated as the sum of exposure values, calculated for each netting set with that counterparty. However, these provisions do not explicitly address the case of synthetic netting sets arising from the splitting of a contractual netting set.

[3] "Fully simulated" in this context means that, for each of the simulated market data paths with a joint dependency structure at the pre-defined grid points, a full revaluation of the transactions is performed. All material risk drivers of the valuation routine are simulated, and the pricing function is not approximated compared with the benchmarking system.

[4] See the definition in the Counterparty credit risk glossary.

(c) Article 294(1)(d) of the CRR requires that actions be taken to address the inaccuracy of the model if model validation indicates that the effective expected positive exposure (EEPE) is underestimated.

(d) Article 294(1)(l) of the CRR requires that pricing functions be tested against an appropriate independent benchmark.

(e) Article 294(1)(o) of the CRR requires, in a general way and without further explanation, that validation "shall assess whether or not the counterparty level and netting set exposure calculations … are appropriate".

(f) According to Article 293(4) of the CRR, any "institution shall define criteria with which to assess its CCR exposure models and the models that input into the calculation of exposure and maintain a written policy that describes the process by which unacceptable performance will be identified and remedied". However, this provision is drafted in a general way and needs to be detailed further.

(g) Article 284(1) of the CRR requires that the exposure value at netting set level be calculated for those transactions where the institution has the permission to use the IMM in accordance with Article 283(1) of the CRR.

(h) Article 284(1)(a) of the CRR provides that the model used by the institution must "specify the forecasting distribution for changes in the market value of the netting set attributable to joint changes in relevant market variables, such as interest rates, foreign exchange rates".

(i) Article 284(1)(b) of the CRR provides that the model used by the institution must "calculate the exposure value for the netting set at each of the future dates on the basis of the joint changes in the market variables". It is not specific about excluding any exposure simulation for some transactions outside the standard joint Monte Carlo simulations.

8. The CRR does not explicitly establish a requirement regarding how to handle netting sets in cases where transactions which the institution has general approval to treat with the IMM need to be carved out from the IMM to a non-IMM method for any reason.

2.2 Principles for ECB Banking Supervision

9. With regard to the coverage of the IMM, institutions should comply with Section II, Chapter 3, paragraph 8 of the ECB Guide on options and discretions available in Union law, where the IMM coverage mentioned covers transactions treated under the method described in Part Three, Title II, Chapter 6, Section 6 of the CRR. Transactions treated under any non-IMM method are, however, excluded. In particular, transactions which are carved out from the IMM are excluded from the IMM coverage.

10. For cases where, for a given legally enforceable netting agreement as defined in Part Three, Title II, Chapter 6, Section 7 of the CRR, one part of the transactions is treated under the method described in Section 6 (IMM) and another part is covered by one of the non-IMM methods[5], the ECB considers, as a best practice, the creation of different synthetic netting sets, one per method. Hence, one synthetic netting set covers all the transactions under the IMM, and the other synthetic netting sets cover all the transactions under each non-IMM method (one per non-IMM method).

11. It is the ECB's understanding that synthetic netting sets created for the purposes described in paragraph 10 should cover only transactions under the same contractual netting agreement; that is, Article 273(6) of the CRR (netting set-specific application of any CCR method) is understood to apply also to synthetic netting sets.

12. In relation to the requirement provided for by Article 294(1)(l) of the CRR[6] and in accordance with Article 294(1)(d) of the CRR, it is the ECB's understanding that institutions should implement a framework that enables them to identify significant pricing model deficiencies at transaction level. It is considered as best practice to apply at least the following filter criteria to ensure the consistent identification of such deficiencies (in accordance with Article 294(1)(o) of the CRR) when comparing the IMM transaction's t_0 value and the respective benchmark value:

    (a) a threshold based on the absolute price difference;

    (b) a threshold for differences expressed as a percentage of the notional amount;

    (c) a threshold for differences expressed as a percentage of the absolute value of the respective benchmark.

    The institution should be able to justify the setting of the above filter criteria, which should be regularly validated and defined so that unacceptable model performance as set out in Article 293(4) of the CRR can be assessed, especially for pricing.

13. The ECB considers that appropriate measures to address identified model weaknesses as referred to in the above assessment are as follows.

    (a) A carve-out of transactions to one of the non-IMM methods, together with the creation of synthetic netting sets to remedy unacceptable performance of the CCR exposure model in accordance with Article 293(4) in conjunction with Article 294(1)(d) of the CRR. This is proposed provided that one of the identified price differences referred to in paragraph 12 is observed for longer than the number of business days that is pre-defined

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5 This implies that not all transactions covered by the contractual netting agreement are treated under the IMM.

6 See paragraph 81 with regard to how to detect value differences of transactions between the IMM and the benchmarking system.

by the institution for this case. The ECB considers it best practice that this number is limited to ten business days during the reference quarter.

(b) Measures other than carve-outs and the creation of synthetic netting sets that could be applied to address model deficiencies, provided that these other measures (i) can be justified, (ii) are regularly validated, and (iii) meet the purpose set out in Article 294(1)(d) of the CRR of not systematically underestimating exposure, in conjunction with the purpose of Article 293(4) of the CRR of identifying and remedying unacceptable exposure model performance.

This includes, in the ECB's understanding as further explained in paragraph 81, that institutions should take all necessary remediation actions to solve the root causes creating the most significant differences between the values of pricing functions used for revaluation under the IMM and the respective benchmarking value in a timely manner.

14. For all transactions that have been identified according to the assessment described in paragraph 12 and that remain in the IMM because they have not been carved out to address identified model weaknesses in accordance with paragraph 13(a), it is the ECB's understanding that the differences between the t_0 transaction values and the benchmarks as referred to in Article 294(1)(l) of the CRR should be taken into account. For such transactions, the ECB regards the following corrections as appropriate measures to remedy weaknesses in the exposure calculation as a result of pricing model deficiencies in accordance with Article 293(4) of the CRR.

(a) At t_0, IMM transaction values are adjusted to match the respective benchmark value.

(b) At future grid points, an adjustment to the modelling of the transaction's future values is applied in such a way that the EEPE of the netting set after correction is not lower than that without any correction. Rather than using the observed difference at t_0, the correction could be estimated using more sophisticated methods, taking future market scenarios and amortising transactions into account.

The corrections should be regularly validated (see paragraph 81(b)).

15. The ECB may see it as a violation of Article 292(1) CRR if the price differences as identified in accordance with paragraph 12 (i) are persistent, (ii) do not lead to remediation of model deficiencies and (iii) lead to a systematic underestimation of exposure, In such cases, the ECB may consider supervisory measures regarding affected transaction types.

16. In the ECB's understanding, transactions carved out as a result, for example, of price differences with a benchmarking system should not be considered as contributing to the required IMM coverage explained in Section II, Chapter 3, paragraph 8 of the ECB Guide on options and discretions available in Union law.

17. The ECB considers it best practice to perform a full simulation in accordance with paragraph 5 for all IMM transactions to directly comply with the requirements of Article 284(1) of the CRR. In cases where this practice is not feasible, the ECB considers that the following approach would still be compliant with the CRR:

    (a) if other (approximate) pricing methods are used, they should be subject to the validation requirements described in paragraphs 81 and 83(a) to 83(c);

    (b) if any alternative way to calculate exposures[7] is used, then the following points should be taken into account along with the validation requirements described in paragraphs 81 and 83(d).

        (i) The institution should be able to demonstrate that the sole reason for using this exposure calculation method is pricing performance, or a performance issue related to calibrating certain transaction-specific risk factors. For example, including these transactions in a full simulation in accordance with paragraph 5 would delay regulatory reporting by more than one business day.

        (ii) Correlations with the other risk factors simulated in the CCR exposure model should be taken into account when calculating or calibrating such exposures. This would also hold in the case of new or aggregated risk factors only used for this exposure calculation method.

        (iii) The underlying risk factor simulation should account for the exposure time dependency, in particular for margined trading regarding the time grid point to which the margin period of risk (MPOR) is attached.

        (iv) This exposure calculation method should account for potential trade-related cash flows (CFs) during the MPOR, either directly or in such a way as to avoid systematic underestimation of the exposure.

        (v) Pricing functions used for the purpose of calculating or calibrating the current exposure of affected transactions should be an explicit part of the IMM framework and governance.

        (vi) The sum of the absolute t_0 values of these transactions is below 20%[8] of the total sum of absolute t_0 values from all transactions covered by the IMM.

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7 Examples could be scenario-independent, pre-defined time profiles per transaction starting at the t_0 value, or scenario-independent, pre-defined value increases per transaction during MPOR, or new risk factors aggregated from those used in Article 284(1)(a) of the CRR with an own stochastic process.

8 This percentage may decrease in the future.

3 Margin period of risk and cash flows

18. This section refers to the modelling of the MPOR,[9] including the following aspects.

    (a) Treatment of margin call and trade-related CFs in all currencies. The trade-related CFs include here both intermediary flows and the settlements at maturity related to trades, as well as flows in the form of a commodity or precious metal or any other asset that may be paid/received during the MPOR. Trade-related CFs *paid* by the institution to the counterparty result in upward jumps of the exposure time profile (hereinafter called "spikes").

    (b) Taking the default management process (DMP) into account when modelling CFs paid/received during the MPOR. The DMP refers to all legal and operational actions performed by the institution upon counterparty default before the institution stops paying margin call and trade-related CFs to the defaulted counterparty.

    (c) Interpolation techniques that may be applied to estimate the netting set market value at MPOR time points that do not belong to the simulation time grid used.

    (d) Mapping between each time grid point t, for which EE(t) is calculated, and the associated MPOR.[10]

    (e) Clarifying the term "most recent exchange of collateral" regarding the definition of the MPOR and thus specifying the point in time in the modelling when the MPOR starts.

    (f) The concepts of "illiquid collateral", of over-the-counter (OTC) derivatives that "cannot be easily replaced" in the context of "stressed market conditions", and of "concentration" of transactions or securities in a particular counterparty.

[9] Note that the modelling of collateral is addressed in Section 4.

[10] Due to the small distance between the adjacent grid points (t), MPORs related to the two adjacent grid points may overlap.

3.1 Relevant regulatory references

Table 33

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	272	(9)
		284	(1), (4)
		285	(2), (3), (4), (5)
		289	(5)
		292	(1)(a), (b)
		294	(1)(g), (i)

19. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following.

    (a) Article 292(1)(a) of the CRR, which requires the model to reflect transaction terms and specifications in a timely, complete and conservative fashion, but does not make explicit mention of trade-related CFs.

    (b) Article 292(1)(b) of the CRR, which requires that netting agreements (including actions upon counterparty default or outstanding payments of the counterparty as part of netting arrangements) be reflected.

    (c) Article 289(5) of the CRR, which notably provides that an "institution shall estimate EE along a time profile of forecasting horizons that adequately reflects the time structure of future CFs and maturity of the contracts and in a manner that is consistent with the materiality and composition of the exposures". However, modelling within the MPOR is not explicitly mentioned.

    (d) Article 272(9) of the CRR, which provides a definition of the MPOR: "'margin period of risk' means the time period from the most recent exchange of collateral covering a netting set of transactions with a defaulting counterparty until the transactions are closed out and the resulting market risk is re-hedged". However, this definition does not mention the trade-related CFs. Furthermore, it is not explicitly stated whether the most recent exchange of collateral refers to the time when the margin amount is called or the time of the final settlement after the collateral is received.

    (e) Article 284(4) of the CRR, which specifies how to use the alpha parameter, mentioning that competent authorities may require a higher one than 1.4.

    (f) Article 294(1)(g) of the CRR, which notably requires the validation of transaction-specific information to capture the effects of margining in the model, and Article 294(1)(i) of the CRR, which requires the testing of key assumptions of the CCR exposure model, without mentioning explicitly advanced features in MPOR and CF modelling, such as the use of

"Brownian Bridge"-based interpolation for additional time grid points in the MPOR.

(g) According to Article 284(1) of the CRR, the exposure value needs to be calculated "on the basis of joint changes in relevant market variables". It does not give explicit details regarding the starting point in time of these changes.

(h) Article 285(2) to (5) of the CRR sets the length of the MPOR. There is no special provision for its length if the MPOR is attached to (i) time grid points t after t_0 but before t_0 plus the MPOR length or (ii) time grid points at the end of the exposure time axis with t plus MPOR being later than the one-year horizon or later than the final maturity of the netting set.

(i) According to Article 284(4) of the CRR, the "model shall estimate EE at a series of future dates t1, t2, t3, etc." The article does not specify for margined trading in which way an MPOR needs to be attached to these future dates, in particular concerning attachments close to t_0 and close to the one-year future date or the final maturity of the netting set.

(j) Article 285(3) of the CRR provides for two exceptions for the calculation of the MPOR for transactions subject to daily re-margining and mark-to-market valuation, namely (i) if the number of trades exceeds 5,000 at any point during a quarter, or (ii) if a netting set contains one or more trades involving either illiquid collateral or an OTC derivative that cannot be easily replaced. In these two cases, the MPOR must not be less than 20 business days. The provision provides for the following two obligations in this context.

(i) Institutions must determine whether collateral is illiquid or whether OTC derivatives cannot be easily replaced in the context of stressed market conditions, characterised by the absence of continuously active markets where a counterparty would, within two days or fewer, obtain multiple price quotations that would, however, not move the market or represent a price reflecting a market discount for collateral or a premium for OTC derivatives.

(ii) Institutions must also consider whether trades or securities it holds as collateral are concentrated in a particular counterparty and, if that counterparty exited the market precipitously, whether the institution would be able to replace those trades or securities.

3.2 Principles for ECB Banking Supervision

20. The requirements of Articles 292(1)(a) and 289(5) of the CRR are also seen as being applicable to the modelling of exposure changes of margined trading within the MPOR. The term "margin arrangement", as mentioned in Article 292(1)(b) of the CRR, is understood as comprising all contractual

features, the margining mechanism with margin call triggers, grace periods and close-out provisions, which, according to Article 292(1)(a) of the CRR, must be reflected in the model.

(a) In the view of the ECB, with regard to the modelling of margin call and trade-related CFs within the MPOR, Article 272(9) of the CRR should be understood as requiring that none of these CFs be received from the counterparty after the beginning of the MPOR. An institution may receive trade-related CFs after the beginning of the MPOR only if it can justify that its assumptions are consistent with its modelling of default time within the MPOR, its DMP and its assumptions regarding non-payment of CFs.[11]

(b) Furthermore, the counterparty is supposed to default at some time point during the MPOR, and non-payment of trade-related CFs to the defaulting counterparty may be assumed to the extent that this assumption is consistent with:

  (i) the DMP and the features of enforceable settlement mechanisms (e.g. agreements to net CFs with related margin calls or analogues to the Continuous Linked Settlement system);

  (ii) the grace period and close-out requirements specified in the netting agreement, and in particular how the close-out is affected by paid or non-paid CFs.

  It is considered best practice and cautious modelling (for example, given that watchlists of critical counterparties include only a subset of all potentially critical counterparties) that trade-related CFs from the institution to the counterparty that are due according to the underlying contract are assumed to be paid at least for a time period after the beginning of the MPOR corresponding to the re-margining period.

(c) If the institution has no defined DMP or the DMP is not taken into account in the modelling, all trade-related CFs due by the institution should be assumed to be paid to the counterparty during the whole MPOR.

(d) Assuming that there are documented and enforceable settlement netting rules, the aggregation of netting set CFs with opposite signs falling due on the same date from different legs of the same transactions and/or from other transactions in the netting set could be integrated into the modelling of CFs within the MPOR. The resulting net CF should be treated in accordance with points 20(a) and 20(b).

(e) A modelling different from the expected modelling described above showing discrepancies with the DMP could be accepted if it is shown that the quantitative impact of this approach on the EEPE is not material.

[11] At the very least, while CFs are still modelled to be received from the counterparty, it should be assumed that CFs are also paid to the counterparty.

21. If (i) an institution does not comply with the requirements of Articles 292(1)(a) and 289(5) of the CRR as explained in paragraphs 20(a)-20(d) above, and (ii) there is a material impact as referred to in paragraph 20(e), the ECB has the power to impose an appropriate and proportionate supervisory remediation measure, which can consist – as provided for by Article 284(4) of the CRR – in an increase of the alpha parameter.

22. MPOR modelling may require the estimation of netting set market values at time points that do not belong to the simulation time grid. It is the ECB's understanding of Article 294(1)(g) of the CRR that interpolation/extrapolation techniques[12] used by institutions to perform such estimations should be validated by studies showing that impacts on the EEPE, compared with full revaluation, are not material.

23. In the view of the ECB, backward[13] and forward[14] modelling of the MPOR setting, as well as a mix of both[15], can be considered CRR-compliant. In particular the following holds.

    (a) Backward modelling approach:
    For time grid points t falling within the interval $[t_0, t_0 + MPOR]$, institutions should calculate expected exposure $EE(t)$) as required in Article 284(4) of the CRR by modelling joint changes in relevant market variables mentioned in Article 284(1)(b) of the CRR starting from t_0, since Article 284(5) of the CRR defines this date as the earliest date for the calculation of exposure.

    (b) Forward modelling approach:
    When using the forward modelling approach, institutions should calculate expected exposure $EE(t)$) as required by Article 284(4) of the CRR by taking into account close-out amounts that are determined after t within the MPOR period as given by Article 285(2) to (5) of the CRR. This also applies when $t \in [1y - MPOR, 1y]$, i.e. for such a t, $t + MPOR \geq 1y$ holds.
    Furthermore, if t equals the maturity (T), of the longest-lasting transaction in the netting set, and if no collateral is modelled as held by the institution at T for a given scenario, the effective length of the MPOR may shorten, as no close-out or re-hedging is due after maturity of the last transaction in the netting set.

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12 For example, a Brownian Bridge-based interpolation.

13 In backward modelling, $EE(t)$ is calculated on the basis of the evolution of exposure (as a result of the evolution of transaction and collateral values) in the time interval $[t - MPOR, t]$, where MPOR denotes the time length of the MPOR.

14 In forward modelling, $EE(t)$ is calculated on the basis of the evolution of exposure in the time interval $[t, t + MPOR]$. In this approach, the MPOR starts at t and ends at $t + MPOR$.

15 This includes variants of attaching the MPOR to the t of $EE(t)$, where the t is not at the border of the time interval set by the MPOR.

The ECB understands that the effective length of the MPOR for these grid points may be shortened and considers that this will not affect the formal length of the MPOR as provided for by Article 285(2) to (5) of the CRR.

24. In the view of the ECB, the term “exchange of collateral” in Article 272(9) of the CRR means that the margin call has been issued and has a high probability of being completed, or is expected to be completed, even if the collateral called actually arrives only after the start of the MPOR. This understanding implies that the default time is not necessarily immediately at the start of the MPOR but could occur at a later point in time. For modelling purposes, it may still be assumed that collateral will be delivered for margin calls issued at the time the MPOR starts or earlier. Furthermore, this understanding implies that changes in value that arise after a margin call is issued and that affect both collateral and underlying transactions in the collateral agreement can happen within the full MPOR.

25. Where a netting set contains one or more trades involving either illiquid collateral or an OTC derivative that cannot be easily replaced, the ECB considers that the correct application of Article 285(3)(b) of the CRR should imply that the following items are defined and determined by each institution based on its portfolio and market data history:

    (a) illiquid collateral, which includes the collateral legs of securities financing transactions (SFTs);

    (b) OTC derivatives that cannot be easily replaced (hereinafter referred to as “hard-to-replace transactions”);

    (c) trades or securities that are held as collateral, concentrated in a particular counterparty;

    (d) stressed market conditions.

    This means that institutions should implement processes to reliably identify the securities or transactions concerned and the related netting sets, and to monitor them.

26. In establishing the definitions of the items mentioned in paragraph 25(a) to (c) above, along with the related processes, the ECB considers it best practice if an institution considers, for each counterparty, the following features and attributes of transactions and collateral, beside others, as possible determinants of illiquidity or concentration:

    (a) For illiquid collateral and hard-to-replace transactions:

(i) product type, underlying asset(s) and complexity (e.g. path-dependent features, payoffs in different currencies or multiple underlyings, etc.)[16];

(ii) accounting classification[17];

(iii) clearing[18];

(iv) currency;

(v) size/notional amount;

(vi) time-to-maturity;

(vii) issuer concentration[19];

(viii) frequency and depth of marking/market price observations;

(ix) type(s)[20] of underlying[21];

(x) liquidation cost.[22]

(b) For illiquid collateral in addition to point (a) above:

(i) security type and categorisation as a "liquid asset" under Article 416 of the CRR;

(ii) time period (number of business days) since the most recent market price[23] was observed;

(iii) issuer's financial health (based, for instance, on its external rating and recent public information).

(c) For the concentration of transactions or of collateral in one counterparty:

(i) for derivative transactions, the sensitivity to main risk factors (as defined by the institution), or the notional amount or mark-to-market value, whichever is more appropriate for the type of transaction;

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16 The ECB suggests that, when assessing complexity, institutions take into consideration the Final draft RTS on assessment methodology for IMA and significant share, in particular Article 7.

17 The concept of "fair value hierarchy" in IFRS 13 may be one useful input for institutions' definitions.

18 For example, a transaction that is offered for central clearing and is therefore more standardised could be more liquid or easier to replace under stressed market conditions, even if the particular OTC derivative itself is not cleared but could be cleared because the institution has access to a CCP that offers the clearing possibility.

19 Concentration relative to the market in which the institution trades, taking into account, for example, single equity stocks and bonds that have a significant share relative to the overall market capitalisation or issued volumes.

20 For example, a basket of (different) securities in the collateral leg of an SFT or components of an index.

21 Liquidity may be different for an option on a highly traded equity share (that is part of an index) than for a thinly traded equity share.

22 For example, a quantitative indicator to measure market impacts of liquidating positions could be used.

23 The term "market price" refers to the price of an executed security transaction or a binding quote.

(ii) for a security that is part of an SFT or received variation margin, the notional amount or mark-to-market value of the security posted to the institution should be compared with the same security's trading volume in the market;

(iii) items (i) and (ii) should also take into account cases where the concentrated transaction or collateral might be hard to replace or illiquid under stressed market conditions.

27. For the purpose of potential MPOR extensions, the illiquid collateral and hard-to-replace transactions need to be identified under normal market conditions and under stressed market conditions. In order to derive conditions that characterise stressed market conditions as defined in Article 285(3) second sub-paragraph of the CRR, the ECB sees benefit in establishing processes and methodologies that:

(a) analyse the available market data history on a regular basis in order to identify historical events leading to conditions where the market for a certain derivative or collateral cannot be considered as continuously active;

(b) where relevant[24], alternatively or additionally consider potential future situations that could affect the replaceability of transactions and/or the liquidity of collateral, in order to anticipate potentially reduced market depth and/or liquidity under future extreme but plausible economic scenarios based on justified expert opinions.

28. For the purpose of paragraph 27, the ECB sees benefit in defining and determining conditions under which:

(a) no prices for collateral or the relevant transactions can be obtained;

(b) prices are unchanged (stale) for a number of consecutive days in markets where prices normally change more frequently;

(c) smaller (local) but usually active markets – where the institution has no chance to "sidestep" to another market – could be subject to market-specific stress events that affect the replaceability of transactions and/or the liquidity of collateral traded on these markets.

29. The ECB sees benefit in developing documented methodologies, including filter criteria, detailed identification of algorithms, etc., on the following:

(a) how to use the features and attributes mentioned in paragraph 26, in particular for assessing market liquidity and potential concentrations regarding transactions and collateral with a given counterparty;

[24] This may refer in particular to situations where the historic evidence is scarce, missing or not sufficient to account for potential future situations or new markets.

(b) how historical events of market stress or reduced liquidity as mentioned in paragraph 27(a) are identified to the extent historical analysis is used;

(c) how stressed market conditions can be anticipated from future extreme but plausible economic scenarios as mentioned in paragraph 27(b), using expert opinions;

(d) how available data (e.g. bid-offer spread, volatilities, sensitivities, traded market volumes, etc., including from external data sources) are taken into account, potentially complemented by expert judgement[25], if necessary.

In order to derive sound qualitative and quantitative criteria to determine hard-to-replace transactions and illiquid collateral under stressed and non-stressed market conditions, these methodologies, as well as the list of features and attributes to be monitored to identify these transactions and collateral (which may go beyond those set out in paragraph 26 above) should be subject to internal validation.

30. Finally, and independently from the issue of a potential MPOR extension, the ECB sees benefit in monitoring on an ongoing basis, from the overall institution's portfolio perspective:

(a) the size of hard-to-replace transactions and illiquid collateral;

(b) the size of concentration in a single counterparty as set out in paragraph 26(c) above.

4 Collateral modelling

31. This section deals with the modelling of cash and non-cash margin collateral, that is, its potential value changes from the time when the last margin call at the beginning of the MPOR is settled up to the end of the MPOR. Initial margin (IM) modelling is addressed in Section 5.

4.1 Relevant regulatory references

Table 34

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	223, 224, 225, 226, 227	
		285	(1), (6), (7)
		292	(1)

[25] For example, based on past experience or where no opinion from the trading desks is available.

32. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following.

(a) Article 292(1) of the CRR requires an institution to ensure the integrity of its modelling process by reflecting, among other things, transaction terms and specifications, which also include margining arrangements. However, it does not further specify how the future collateral composition or a reflection of the actual collateral balance in the IMM's estimated exposure for a netting set should be reflected in the IMM's assumptions.

(b) Article 285(1), (6) and (7) of the CRR clarifies the modelling options under which the effects of margining can be directly recognised in the exposure value calculation.

(i) However, these provisions do not determine whether institutions should model margin collateral in a manner consistent with the modelling of securities underlying OTC derivatives and SFTs[26], or whether they are allowed to adopt a different modelling approach for margin collateral, on the one hand, and securities underlying the different transactions, on the other.

(ii) The provisions of Article 285(6) of the CRR leave room for interpretation regarding the term "jointly modelled".

(iii) The wording of Article 285(7)[27] of the CRR leads to the conclusion that this article provides an exemption to Article 285(6) of the CRR in cases where an institution is not able to model collateral jointly with the exposure. In this case, and in accordance with Article 285(7) of the CRR, the institution is allowed to use volatility adjustments to recognise the effects of margining in the exposure calculation directly such that the institution does not have to apply one of the EEPE calculation measures presented in Article 285(1)(a) or (b) of the CRR.

(iv) In addition, Article 285(1), (6) and (7) of the CRR is not specific about whether a combination of the two options (use of volatility adjustments and joint modelling) to account for margining effects is possible. Thus, it is not clear if it is possible to use volatility adjustments in line with Article 285(7) of the CRR, together with the jointly modelled risk factors in accordance with Article 285(6) of the CRR, for the collateral modelling in cases where, for some risk factors, the institution is able to model some collateral components jointly.

(c) Article 285(7) of the CRR refers to the standards of the Financial Collateral Comprehensive Method (as set out in Article 223 of the CRR, which refers

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[26] See the definition in the Counterparty credit risk glossary.

[27] "If an institution is not able to model collateral jointly with the exposure [in accordance with Article 285(6) of the CRR] it shall not recognise […] the effect of collateral […], unless it uses […] volatility adjustments […]."

to Articles 224 to 227 of the CRR) in cases where an institution wants to make use of volatility adjustments to recognise the effect of margining directly in its exposure calculation. Article 223(1) third sub-paragraph of the CRR requires institutions to apply a volatility adjustment to reflect mismatches between the collateral currency and the settlement currency for OTC derivative transactions covered by recognised netting agreements. However, Article 223(1) third sub-paragraph of the CRR neither defines exactly what the settlement currency is, nor its relationship with the currency in which the exposure is denominated in the context of netting sets with attached margin agreements. In addition, the case of these currencies being different from the reporting currency is not treated explicitly.

4.2 Principles for ECB Banking Supervision

33. The ECB sees as a best practice that non-cash margin collateral is treated in a manner that is consistent with the modelling of securities underlying OTC or SFT transactions, provided that these transactions are within the scope of the IMM. For example, if a certain type of security is fully simulated (or if a volatility adjustment is applied) in the security leg of an SFT, then it should also be fully simulated (or a volatility adjustment should also be applied) if it occurs as margin collateral within the IMM. In the case of inconsistent treatment, the ECB sees it as beneficial that the institution is able to justify this choice and to demonstrate that (i) its approach does not systematically underestimate exposures and (ii) the quantitative impact on the final EEPE is not material.

34. In order to comply with the requirements laid down by Article 292(1)(a) and (b) of the CRR with respect to the terms of margining and netting arrangements, the ECB is of the view that the future composition of the collateral pool over the lifetime of the netting set should reflect one or more of the following:

    (a) the contractual arrangements in terms of eligible margin collateral;

    (b) the institution's policy as regards posted collateral types[28] being eligible;

    (c) the composition observed historically;[29]

    (d) at least the current composition of the margin collateral pool.

    This holds for the same or similar characteristics of these collateral types.

35. When a contractual margin agreement contains transactions treated under both the IMM and a non-IMM method and therefore the contractual netting set is split into different synthetic netting sets, and if collateral modelling uses the actual

[28] This requires the institution to have a clear and well-documented policy further limiting the contractually eligible collateral to certain types of posted collateral.

[29] This includes the use of a historically observed composition of collateral for counterparties with a comparable behaviour in the case of new agreements, i.e. agreements with new counterparties without their own history in the institution.

collateral balance at t_0, the ECB considers that the actual margin collateral should be assigned to the synthetic netting sets. This should be done in a way that also reflects their respective current exposures, as defined in Article 272(17) of the CRR, and does not lead to double-counting of collateral. If the institution chooses a different approach (e.g. a full assignment of collateral to only one synthetic netting set), it should be able to justify this choice and demonstrate that its methodology does not systematically underestimate the resulting exposure values.

36. The ECB considers the use of the "model-estimated collateral balance at t_0"[30] to be compliant with Article 292(1)(b) of the CRR, if the resulting modelled collateral balance is regularly benchmarked against the actual collateral balance at t_0 in accordance with Article 292(1)(g) of the CRR. In this case, validated but still relevant differences between model-estimated and actual t_0 collateral balances should be taken into account in the modelling of t_0 so that the exposure value is not systematically underestimated. Transactions that are potentially carved out from the IMM as well as collateral potentially not yet settled at t_0 should also be taken into account.

37. It can be inferred from Article 285(6) in conjunction with Article 285(7) of the CRR that, in order to directly capture the effects of margining in the calculation of exposure values, an institution can use either of the following:

    (a) the option of joint modelling (Article 285(6) of the CRR) for the modelling of all collateral;

    (b) the volatility adjustment option (Article 285(7) of the CRR) for the modelling of all collateral.

38. The ECB is of the view that using both options at the same time would only be compliant with the above CRR articles if volatility adjustments for non-cash collateral were used and the joint modelling for the treatment of FX risk were applied in the collateral modelling only. In this context, the ECB considers it best practice that the above combination can only be made by using jointly modelled FX rates for all currencies that are simulated for the exposure calculation under the IMM. In other words, the ECB would not consider a partial application of FX volatility adjustments alongside jointly modelled FX rates for the purpose of collateral modelling as being consistent.

39. In the context of Article 285(6) of the CRR, the ECB understands the provision "an institution shall model collateral … jointly with the exposure in its exposure value calculation" as requiring model integrity in accordance with Article 292(1)(a) and (b) of the CRR. This means in particular that:

[30] That is, when the t_0 collateral balance is estimated as a function of the calculated netting set value as of t_0 – using IMM pricing functions and modelled features of the margin agreement – and is not set as being equal to the actual collateral balance.

(a) the collateral value changes over time and during the MPOR are determined by using the same model as for the calculation of the transactions' value changes;

(b) the use of the same model refers to the IMM's general modelling features (including simulated and non-simulated risk factors, the dependency structure, pricing functions, etc.), which should be used for both the calculation of the transactions' value changes and the calculation of collateral value changes applying the same generated scenarios;

(c) if some risk factors are not required for the calculation of the transactions' value changes and are only used for the collateral modelling, these risk factors should be modelled consistently with those for derivatives and SFTs within the scope of the IMM, also regarding the dependency structure.

40. Article 285(7) of the CRR provides that, if an institution is not able to model collateral jointly with the exposure, it may use volatility adjustments to recognise the effects of margining on the exposure itself, provided the institution complies with the requirements of the Financial Collateral Comprehensive Method as per Article 223 of the CRR. If an institution needs to apply volatility adjustments to recognise the effects of margining on the exposure itself, these adjustments must be applied to reflect currency mismatches in accordance with Article 223(1) third sub-paragraph of the CRR. In the light of Article 220(2)(d) of the CRR, the ECB sees the identification of the currency that is potentially different from the collateral currency as described below as best practice:

(a) when Article 223(1) second sub-paragraph of the CRR uses the term "the currency in which the underlying exposure of the netting set is denominated", and when Article 223(1) third sub-paragraph of the CRR (for OTC derivative transactions only) uses the term "settlement currency", it is the currency as determined in (b);

(b) it is the currency:

(i) agreed in the individual derivative contract if no netting has been agreed upon; or

(ii) of the relevant governing master netting agreement if agreed without a credit support annex; or

(iii) of the relevant credit support annex, if agreed; or

(iv) of the close-out amount if more than one credit support annex has been defined for one master netting agreement.

41. The ECB recommends that, in order to comply with Article 292(1)(a) and (b) of the CRR for unmargined cases, and with Article 292(1)(a) and (b) in conjunction with Article 285(6) and (7) for margined cases, institutions take into account the potential FX risk arising from currency mismatches. The potential mismatches

are between (i) any of the various currencies of the exposure components (e.g. various transactions with different currencies, collateral types with different currencies) and (ii) the currency in which the netting set's total exposure is determined in the simulation (e.g. the currency of the governing master agreement as explained in paragraph 40). The ECB considers that potential FX risk is treated in compliance with Article 292(1)(a) and (b) of the CRR if either of the following is applied:

(a) simulation of FX rates for all exposure components at all relevant points in time;

(b) FX volatility adjustments in accordance with Article 223(1) of the CRR when making use of Article 285(7) of the CRR.

42. It is the understanding of the ECB that any potentially remaining FX risk that arises from currency mismatches between (i) the currency in which the netting set's exposure is determined in the simulation and (ii) the reporting currency should be taken into account in the institutions' modelling process. The ECB considers the treatment of this potentially remaining FX risk to be compliant with Article 292(1)(a) and (b) of the CRR if institutions apply the simulated FX rates at the end of the MPOR.[31]

5 Modelling of initial margin

43. IM is already applied in central clearing and currently carries over to bilateral OTC agreements. The modelling issue with respect to CCR is that the IM depends on the risk profile of the future netting set in terms of the levels and volatility of simulated market risk factors and on transactions still alive, i.e. it is a variable agreement parameter.

To be clear, it should be specified that "IM modelling" refers here to the modelling of IM under the IMM and not, for example, to the implementation of European Market Infrastructure Regulation (EMIR)[32] requirements in the institutions' collateral management in terms of calculating an appropriate level of IM.

[31] The additional use of simulated FX rates applies in particular to those cases where the currency as per Article 223(1) of the CRR differs from the reporting currency, but also to cases of joint modelling where, for example, the netting set's currency and the collateral currency are different from each other and from the reporting currency.

[32] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories.

5.1 Relevant regulatory references

Table 35

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	292	(1)(b) and (g)
		293	(1)(b)

44. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following:

    (a) Article 292(1)(b) of the CRR, which requires institutions to include, among other transaction terms, margining and netting arrangements in the model; Article 292(1)(g) of the CRR, which requires processes for formal reconciliation between the model and source data systems;

    (b) Article 293(1)(b) of the CRR, which notably requires the comparison of risk measures generated by the model with realised risk measures.

5.2 Principles for ECB Banking Supervision

45. In relation to the requirements set out in Article 292(1)(b) of the CRR, and for agreements subject to IM where both the transaction exposures and IM are within the scope of the IMM, the ECB considers it best practice that institutions have an IM modelling that adequately reflects contractual arrangements for the respective netting set.[33] In particular, if contractual arrangements provide that the IM should reflect forward variability and maturing transactions[34] inside netting set value changes relevant for the contractual IM method, the IMM modelling of the IM should take this feature into account unless the institution demonstrates that its choice for IM modelling inside the IMM does not systematically underestimate exposures.

46. The ECB considers that, in order to avoid the risk of non-compliance with Articles 292(1)(b) and 293(1)(b) of the CRR, the level of the modelled IM at t_0 should be benchmarked on a regular basis against the respective real margin at t_0 in accordance with Article 292(1)(g) of the CRR. Validated but still relevant differences should be taken into account in the modelling (e.g. by using some corrective exposure level add-on if the modelling is not risk sensitive and/or may lead to non-conservative exposures).

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33 In cases where IM agreements include discretionary or undisclosed elements, institutions are still expected to consider all contractual arrangements to the extent possible when modelling the IM within the IMM, potentially also taking the history of observed IMs into account. This includes potential information and assumptions for past IM amounts.

34 A contractual IM specification includes IM changes resulting from newly contracted transactions, whereas the IMM modelling starts with the portfolio at t_0 and then has a “melting down” portfolio, since the effect of new trades is modelled only through the EEPE.

6 Maturity

47. This section refers to the estimation of the parameter M used in the calculation of the risk weight for counterparties, towards which the institution has an IMM exposure and for which the institution uses the IRB approach.

48. The section also refers to the treatment of contingent transaction maturities, especially where there are early termination clauses (ETCs, also called break clauses) for derivatives and SFTs, and to different CRR interpretations.

    Note that transaction maturities (and their changes) affect (i) the M parameter of Article 162 of the CRR, (ii) the shape of the EE(t) time profile, and (iii) the maximum transaction maturity relevant for Article 284(6) of the CRR, where (i) affects the calculation of risk-weighted assets (RWAs) for IRB institutions and (ii) and (iii) affect the calculation of the EEPE and then (via the exposure value) also RWAs.

6.1 Relevant regulatory references

Table 36

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	162	
		284	(4), (6)

49. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following:

    Article 162 (defining the maturity parameter M) and Article 284(4)[35] and (6) (defining the remaining transaction maturity) of the CRR. Contingent transaction maturities and contractual arrangements for early termination are not mentioned in these articles.

6.2 Principles for ECB Banking Supervision

50. Article 162 of the CRR will be understood as outlined below for the exclusive purpose of applying the IMM as specified by Part Three, Title II, Chapter 6, Section 6 of the CRR. In the ECB's understanding, the article should apply in the following way:

[35] Article 284(4) of the CRR stipulates: "The model shall estimate EE at a series of future dates t1, t2, t3, etc."

(a) paragraph (2)(b) should apply to unmargined derivatives subject to a master netting agreement if the longest-dated contract in the netting set has a maturity of less than or equal to one year;

(b) paragraph (2)(c) should apply to fully or nearly fully collateralised derivatives or fully or nearly fully collateralised margin lending transactions subject to a master netting agreement if the longest-dated contract in the netting set has a maturity of less than or equal to one year;

(c) paragraph (2)(d) should apply to unmargined and margined SFTs (excluding margin lending transactions) subject to a master netting agreement if the longest-dated contract in the netting set has a maturity of less than or equal to one year;

(d) paragraph (2)(g) should apply to all transactions not subject to a master netting agreement, on the one hand, and to multiple transaction netting sets where the maturity of the transaction or the longest-dated contract within the netting set is greater than one year, on the other hand, unless the conditions for applying paragraph (2)(i) are satisfied;

(e) if the conditions of paragraph (2)(i) are fulfilled, setting M to one year should apply only for those transactions or netting sets where the application of paragraphs (2)(a), (b), (c), (d), (f) or (g) would result in M being greater than one year;

(f) the provisions of paragraph (3) regarding the floor value for M should be used in the following way: when applying paragraph (2)(c) or (2)(d) for the purpose of estimating M for a given netting set, an institution should be allowed to use the floor value provided by paragraph (3) (one business day), if all paragraph (3) requirements are fulfilled.

51. The CRR is silent on the transaction maturity that should be considered for both the calculation of the EEPE and the calculation of the M parameter in the case of open term repos or, in general, SFTs without an explicitly fixed maturity.

(a) If the institution has the right to terminate the transaction, in the ECB's view the transaction maturity should be set at the higher of:

(i) the contractually agreed first date on which the transaction can be terminated;

(ii) the applicable MPOR.

(b) If the institution does not have the right to terminate the transaction, the ECB considers that the transaction maturity should be given by the longest past lifetime of transactions with the same or comparable counterparties, subject to a five-year cap.

52. For derivatives with ETCs:

(a) it is seen by the ECB as best practice that non-mandatory ETCs are not used for the calculation of EE as used in Article 284(4) and (6) of the CRR, and of M, as provided for in Article 162(2) of the CRR (this article aims to deal only with a non-contingent maturity), unless the institution can demonstrate that non-mandatory ETCs are regularly exercised based on an assessment of past exercise events. This can be the case:

(i) generally, i.e. it is possible to calibrate an expected exercise likelihood for non-mandatory ETCs jointly across all paths; or

(ii) subject to specific, pre-defined market conditions, which allow expected exercise events to be identified along a particular scenario path.

(b) the ECB also considers it as compliant with Article 162(2) and (3) of the CRR to use mandatory ETCs for the calculation of EE and M instead of the contractual maturity, because there cannot be any positive exposure after that date due to the provisions of Article 284(4) of the CRR. However, the ECB would expect institutions to provide a legal opinion confirming the enforceability of the respective legal clauses. In particular, mandatory ETCs are part of the transaction terms that must be reflected in the model as required by Article 292(1)(a) and (b) of the CRR.

53. Internal analyses by the institutions should be able to justify, as the case may be, choices of M values shorter than:

- five business days for netting sets consisting only of SFTs;
- ten business days for all other netting sets, including the derivative instruments listed in Annex II of the CRR.

In accordance with Article 162(3) of the CRR, provisions for prompt liquidation need to be in place in order to use short M values. If these provisions are different for the M parameter referred to in Article 162 of the CRR than in the IMM exposure modelling of margined trading, the appropriateness of shorter close-out periods would also have to be demonstrated.

54. The ECB sees it as best practice when the estimation of the maturity of physically settled options on derivatives (e.g. swaptions, used for the purpose of calculating the parameter M and for the calculation of the EEPE) is made on the basis of the maturity date of the underlying derivatives (e.g. the swap underlying the swaption), unless the institution is able to justify the use of a different maturity for specific products.[36]

[36] One example is when an underlying swap becomes subject to central clearing and thus the counterparty changes.

7 Granularity, number of time steps and scenarios

55. This section refers to the chosen time grid for the future exposure calculation and the number of scenarios generated. More specifically:

    (a) the number and density of time grid points have an impact on the accuracy of EE profiles and thus also on the accuracy of the EEPE;

    (b) the number of scenarios and the type of random number generator determine the numerical accuracy of the calculations and thus the statistical error of expected exposures.

7.1 Relevant regulatory references

Table 37

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	284	(4), (5), (6)
		292	(1)(a), (b)
		293	(1)(a), (c)
		294	(1)
		368	(1)(f)

56. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following.

    (a) In accordance with Article 292(1)(a) of the CRR, an institution must ensure that the model reflects transaction terms and specifications in a timely, complete and conservative fashion. Article 292(1)(b) of the CRR specifies that these terms must include at least the contract notional amounts, maturity, reference assets, margining arrangements and netting arrangements. However, it stays silent on the number of grid points necessary to take CFs resulting from these terms into account.

    (b) In accordance with Article 284(4) of the CRR, EE must be calculated for time grid points $t_i = 1, 2, 3, \ldots$ The output, $EE(t_i)$, is used in the EEPE calculations (Article 284(5) and (6) of the CRR). However, there is no specific requirement as to how to set these $t_i$values.

    (c) Article 293(1)(c) of the CRR requires an institution to carry out initial and ongoing validation of its CCR exposure model, while Article 294(1) states the requirements that need to be met by the institution's validation programme. While there is no explicit requirement regarding the number of scenarios in Article 294 of the CRR, Article 368(1)(f) of the CRR (which is included in the reference to Part Three, Title IV, Chapter 5 of the CRR made by Article 293(1)(a) of the CRR) requires the internal model to have a proven track record of "reasonable accuracy" in measuring risks.

7.2 Principles for ECB Banking Supervision

57. Since the modelling process has to reflect transaction terms, as required by Article 292(1)(a) and (b) of the CRR, in the understanding of the ECB the density and location of grid points as defined in Article 284(4) of the CRR should capture intermediate and final trade-related CFs depending on notional amounts, maturities, etc. that influence the shape of the exposure profile. The ECB also considers that, if the EEPE calculated with a very dense time grid[37] is more than 5% above[38] the EEPE as calculated by the institution using its standard set of grid points under the standard configuration of the IMM for the whole portfolio, then the ECB can increase the alpha parameter following the process described in Section 12.[39] Institutions can conduct this impact assessment on representative sub-portfolios as defined in the Counterparty credit risk glossary.

58. The ECB considers that the inclusion of the estimation and monitoring of the numerical error of the EEPE due to the number of scenarios in the regular validation programme mentioned in Articles 293(1)(c) and 294(1)(d) of the CRR complies with Article 368(1)(f) of the CRR requirements. If the numerical error[40] is more than 5% of the EEPE for the whole portfolio, the ECB can increase the alpha parameter following the process described in Section 12.[41] Institutions can conduct this impact assessment on representative sub-portfolios as defined in the Counterparty credit risk glossary.

8 Calibration frequency and stress calibration

59. The calibration frequency is relevant both for regulatory reporting and for internal risk management (line consumption, etc.) as part of the use test requirements set by Article 289 of the CRR:

    (a) for Pillar 1 purposes, Article 292(2) of the CRR requires that the minimum quarterly frequency is increased to reflect (important) changes in market conditions;

    (b) for internal risk management purposes, the calibration frequency also affects the quality of exposure numbers used for the institution's day-to-day risk management process.

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37 The expression "very dense time grid" means here a daily grid, unless the institution can show that all CFs are captured with a coarser time grid.

38 However, the impact of any numerical error (see paragraph 58) could also be considered in order to avoid potential double counting if the institution can demonstrate a corresponding overlap.

39 For example, if the difference is more than 5%, the alpha parameter could be increased by at least 0.05, etc.

40 See the Annex for a description of how to derive the statistical error at a 95% confidence level.

41 For example, if the error is more than 5%, the alpha parameter could be increased by at least 0.05, etc.

60. To compute own funds requirements for CCR, Article 284(3) of the CRR requires that institutions use two different calibrations: one based on current market data, and one based on a stress period.

8.1 Relevant regulatory references

Table 38

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013		
		284	(3)(b)
		289	(1), (4), (5)
		292	(2), (3), (4)

61. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following.

(a) Article 289(1) of the CRR requires among other things “that the distribution of exposures generated by the model used to calculate EEPE is closely integrated into the day-to-day CCR management process of the institution”, without further specifying the meaning of “closely integrated”. Article 289(4) of the CRR requires that institutions measure and manage current exposures; Article 289(5) requires them to have system capabilities to estimate EE daily if necessary, unless they can demonstrate to the satisfaction of their competent authorities that their exposures to CCR warrant less frequent calculation.

(b) In accordance with Article 284(3)(b) of the CRR, institutions must compute the EEPE using a stress calibration. This provision should be read in the light of Article 292(2) of the CRR, which sets out the requirements of the stress calibration, and Article 292(3) of the CRR, which sets out the requirements for the stress period determination.

(c) In accordance with Article 292(4) of the CRR, the EPE model must use data – implied or historical – that include the data from the stressed credit period and must use such data in a manner consistent with the method used for the calibration of the EPE model to current data. It does not further specify the meaning of “consistent”.

8.2 Principles for ECB Banking Supervision

62. The ECB considers that Article 289(1) of the CRR should be understood as implying that the exposure distribution used for internal risk measurement in the day-to-day CCR management process is sufficiently up to date for daily line

consumption calculations. Accordingly, the revaluation of current exposure[42] for internal risk management purposes should also be performed on a daily basis in compliance with Article 289(4) and (5) of the CRR. The ECB regards a monthly or higher frequency for the recalibration of the parameters of the underlying stochastic processes (such as drift, volatility and correlation) for internal risk management as best practice to minimise the risk of non-compliance with Article 292(2) and Article 289(5) of the CRR, since an outdated calibration may no longer reflect market conditions or adequately reflect the exposure profile.

63. The ECB considers the following to be compliant with Article 292(2) and (4) of the CRR:

    (a) The ECB considers it best practice that parameters underlying the stochastic processes of the EPE model are calibrated with the data from the identified stress period (i.e. with the exact three years of data defining the stress period in the case of historical data) using the same estimation method that is applied for the current calibration. This comprises, in particular, the parameters needed for the simulation of market risk factors, the pricing of transactions and collateral valuation. It is expected that the adequacy of expert-set parameters for the identified stress period is assessed and, if applicable, their values are adjusted accordingly.

    (b) The ECB would accept an alternative stress calibration method for parameters other than volatilities and correlations if the institution is able to demonstrate that its approach is consistent with its current calibration (for example, regarding the length of the calibration window or boundary conditions that need to be satisfied) and does not systematically underestimate exposures.

9 Use test

64. This section refers to implementations of the IMM as used by internal risk management and calculation of the internal line consumption.

9.1 Relevant regulatory references

Table 39

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	289	(2) and (3)
		286	(4) to (6)

[42] Current exposure is the starting point at t_0 for every EE time profile.

65. The regulatory provisions relating to the topic addressed in this section that require further guidance are as follows.

(a) Article 289 of the CRR includes the following provisions.

(i) Paragraph (2) of this article requires that institutions demonstrate to the satisfaction of the competent authorities that they have been using a model to calculate the distribution of exposures upon which the EPE calculation is based that broadly meets the requirements set out in Section 6 of the CRR for at least one year prior to permission to use the IMM being granted by the competent authorities in accordance with Article 283 of the CRR.

(ii) Paragraph (3) of this article requires, among other things, that the model used to generate a distribution of exposures to CCR is part of the CCR management framework required by Article 286 of the CRR.

(b) Article 286 of the CRR includes the following provisions.

(i) Paragraph (4) of this article requires, among other things, that an institution's management body and senior management are actively involved in, and ensure that adequate resources are allocated to, the management of CCR. It also requires that senior management is aware of the limitations and assumptions of the model used and the impact those limitations and assumptions can have on the reliability of the output through a formal process.

(ii) Paragraph (5) of this article requires that the daily reports prepared on an institution's exposures to CCR in accordance with Article 287(2)(b) are reviewed by a level of management with sufficient seniority and authority to enforce both reductions in positions taken by individual credit managers or traders and reductions in the institution's overall CCR exposure.

(iii) Paragraph (6) of this article requires, among other things, that an institution's CCR management framework is used in conjunction with internal credit and trading limits, which need to be related to the institution's risk measurement model in a manner that is consistent over time and that is well understood by credit managers, traders and senior management.

66. Articles 289(2) and 283(2) of the CRR are not explicit as to whether the same use test requirements that need to be applied for model approval should also be applied to model changes and extensions. It is the ECB's understanding that the early implementation of these requirements would provide benefits in terms of model use and supervision, and that their implementation would be consistent with the rationale behind these articles.

9.2 Principles for ECB Banking Supervision

67. In accordance with the aim of Article 289(2) of the CRR regarding the upfront use of a new model, the ECB considers it best practice for an institution to start by applying the envisaged model changes or extensions for internal risk management purposes to acquire sufficient experience with the change or extension before it is fully implemented. This would apply in cases where the change or extension needs to be investigated as set out in the ECB Guide on materiality assessment (EGMA).[43] The institution should determine the most appropriate upfront use of the model changes or extensions in order to acquire sufficient experience, taking into consideration its situation and the nature of the extension or change. The ECB has identified the following possible ways for an institution to make appropriate upfront use of the model changes and extensions and also to test Pillar 1 own funds requirements:

    (a) implement the extension in the live production environment[44] used to calculate limit utilisation for internal risk management on a daily basis; or

    (b) implement the change or extension in a non-live production environment[45], where weekly[46] test runs are recommended in the cases (a)-(d) identified in paragraph 68 and during the period between implementation and the sending of the application letter, as well as for the time between the notification of the internal model investigation starting date and the end of the onsite phase of the investigation. Within both periods, the test runs should in general be performed without interruption. It is further recommended that the institution:

        (i) uses the test results to calibrate and document limits that might need an update;

        (ii) identifies and plans the necessary steps for the updated limits to become effective as soon as the supervisory approval envisaged in the EGMA for the planned change or extension is obtained;

        (iii) plans all other processes and controls outlined in Article 289 of the CRR that are to be applied after the permission, in particular ensuring IT performance regarding the calculation frequency.

    The implementation should be done in such a way that the institution gains sufficient understanding of the intended changes or extensions to its model and its outputs, for instance by providing relevant figures for information purposes in addition to the relevant figures from the model in production for Pillar 1 own fund requirements.

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43 ECB Guide on materiality assessment (EGMA) – Materiality assessment for IMM and ACVA model extensions and changes.

44 See paragraph 7 of the credit risk chapter.

45 As defined in paragraph 7 of the credit risk chapter.

46 A higher run frequency than weekly is not excluded.

68. The practices set out in paragraph 67 above are recommended for all model extensions. In the event of model changes, they are only recommended in the following cases:

(a) changes in exposure levels (e.g. due to changes in risk factor forecasting, capturing of margining effects or collateral modelling);

(b) changes of data management/supply (e.g. due to changes of input data or data sources including the use of additional data/data sources or changes of the data quality control processes);

(c) significant IT system changes (including software changes);

(d) changes in regular quantitative validation that have a quantitative impact on how the institution assesses the integrity of the IMM.

If an extension or a change affecting any of the above items (a) to (d) is classified as “to be investigated” by the EGMA, this upfront implementation should be completed within a sufficient time (recommended to be at least three months or two months if more than one test run is carried out per week) before the date of the application letter.

Where the institution notifies ex ante an extension or a change affecting any of the above items (a) to (d), the ECB recommends that the institution completes the upfront implementation at least one month before the date of the notification letter if there is a considerable impact on limit utilisation for certain transactions, netting sets or counterparties that are particularly affected by the change or extension owing to its nature.

It is noted that institutions may choose different time periods for an upfront implementation, provided that the institution is able to reliably demonstrate that such periods (if shorter) being still significantly ahead of sending the application or notification letter will not limit the validity of the results of the upfront implementation, especially in terms of calibrating limits; if institutions wish to do this, it is recommended that they discuss the matter with the JST.

Article 286(4) to (6) of the CRR (to which Article 289(3) refers) requires in general that the institution’s management and senior management are actively involved in the management of the CCR model. The ECB considers that as well as being involved in the upfront use of a changed or extended model, the management and senior management should also be involved in approving any limit change resulting from the prior implementation of an IMM model change or extension in the live production environment as envisaged in paragraph 67(a) above, or any limit change or extension expected to result from the tests in the non-live production environment as envisaged in paragraph 67(b) above.

10 Validation

69. This section refers to the validation framework set up by institutions to assess the performance of the CCR exposure model, in particular back-testing methodologies, the validation of pricing functions and further checks on key modelling assumptions.

10.1 Relevant regulatory references

Table 40

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	287	(2)
		292	(1)(a), (b), (g), (6)(a)
		293	(1)(b), (c), (4)
		294	(1)(c), (d), (e), (g), (h), (i), (j), (l), (o)

70. The regulatory provisions relating to the topic addressed in this section that require further guidance are as follows.

(a) Article 287(2) of the CRR states that the risk control unit is expected to be responsible for the initial and ongoing validation of the model. Furthermore, Article 293(1)(c) of the CRR provides that the validation and review must be conducted independently of model development, which needs to be reconciled with Article 287(2) of the CRR given that model development is usually also done within the risk control unit.

(b) Article 293(4) of the CRR requires, among other things, that institutions "maintain a written policy that describes the process by which unacceptable performance will be identified and remedied", without further describing what constitutes unacceptable performance and what the remedies might be.

(c) According to Article 292(6)(a) of the CRR, "an institution shall subject the model to a validation process that specifies the kind of testing needed to ensure model integrity and identify conditions under which the assumptions underlying the model are inappropriate and therefore result in an understatement of EPE". However, the CRR does not further specify which assumptions should form part of the validation process.

(d) Article 293(1)(b) of the CRR requires institutions to conduct "a regular programme of back-testing" but does not further specify the frequency of the back-testing.

(e) Regarding the requirements laid out with respect to back-testing levels[47] and methodologies, Article 294(1)(c) of the CRR provides that "an institution shall back-test the performance of its CCR exposure model and the model's relevant risk measures as well as market risk factor predictions", without mentioning any restrictions. Article 294(1)(h) of the CRR requires the model validation process to "include static, historical back-testing on representative counterparty portfolios that are actual or hypothetical", not specifying whether the "or" in this sentence is an inclusive or exclusive "or". According to Article 294(1)(i) and (j) of the CRR, "back-testing shall be designed to test the relevant risk measures" and furthermore "be appropriate and capable of identifying poor performance in an EPE model's risk measure".

(f) Article 294(1)(g) of the CRR states that "as part of the initial and ongoing validation of its CCR exposure model and its risk measures, an institution shall ensure that the CCR exposure model includes transaction-specific information to capture the effects of margining", without specifying any further details of the expected validation tasks.

(g) Article 292(1)(a) of the CRR requires that the model reflect transaction terms and specifications in a timely, complete and conservative fashion (also regarding pricing and the market data to be used). Article 292(1)(b) of the CRR specifies that those terms include, at least, notional amounts, maturity, reference assets, margining arrangements and netting arrangements. Article 292(1)(g) of the CRR requires ongoing processes for reconciliation between the model and source data, which verify that transaction terms and specifications are reflected correctly or at least conservatively.

(h) Article 294(1)(e) of the CRR provides that, as part of the initial and ongoing validation process, an institution "shall test the pricing models used to calculate CCR exposure for a given scenario of future shocks to market risk factors", as well as regularly testing these pricing models against appropriate independent benchmarks in accordance with Article 294(1)(l) of the CRR.

(i) As outlined in Article 294(1)(o) of the CRR, "the initial and ongoing validation of CCR exposure models shall assess whether or not the counterparty level and netting set exposure calculations of exposure are appropriate". Article 294(1)(d) of the CRR provides that "if the model validation indicates that EEPE is underestimated, the institution shall take the action necessary to address the inaccuracy of the model". Both requirements are set out in a general way and therefore need further guidance.

[47] Back-testing levels refer to the risk factor level, the transaction level, and the actual and/or hypothetical portfolio level.

(j) Article 292(1)(a) of the CRR requires the model to reflect transaction terms which must be ensured by formal reconciliation processes between the model and source data in accordance with point (g) of the same article.

10.2 Principles for ECB Banking Supervision

71. In accordance with Article 293(1)(c) of the CRR, model validation/review and model development must be conducted independently, that is, the validation function as defined in the glossary must be effectively separated from model development. Hence, the ECB considers that for cases where certain parts of the validation framework, e.g. back-testing or the benchmarking of IMM pricing functions, are conducted by staff also responsible for model design and development, the above-mentioned requirement could still be observed with the implementation of the following practices:

    (a) a regular, independent and effective challenging of the underlying methodological aspects of the respective validation task comprising at least scope, data samples, tools/statistical tests (including, if applicable, test statistics and thresholds[48] in use) is performed by the validation function;

    (b) the assessment of the outcomes of the analysis (e.g. the evaluation of back-testing traffic lights or pricing deficiencies detected in the benchmarking) and the judgement regarding the respective remediation measures are reviewed by the validation function, which may require further analyses and/or changes to the actions concerned.

    Moreover, the ECB considers that the organisational requirements of the risk control unit (see Article 287(2) of the CRR) should be regarded as fulfilled when (part of) the initial or ongoing validation of the model is conducted by staff not belonging directly to the risk control unit, but for instance to a separate validation unit.[49]

    As part of the process by which unacceptable performance will be identified and remedied in accordance with Article 293(4) of the CRR, the ECB considers it best practice that a comprehensive view of all the findings, problems, weaknesses and limits of the exposure model, identified by all staff contributing to the validation and review of the exposure model, is ensured.

72. The validation framework is expected to cover the kind of testing needed to ensure model integrity and the appropriateness of assumptions underlying the model in accordance with Article 292(6)(a) of the CRR. The ECB considers it best practice to include various types of analyses on the key modelling

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48 This refers, for example, to thresholds used for back-testing traffic lights or for the benchmarking of pricing functions.

49 Please refer to Section 1.7 of the general topics chapter of this guide regarding the principle that the internal audit function should not be responsible for validation.

assumptions in a regular validation schedule. In particular, it is the ECB's understanding that the key modelling assumptions contain:

(a) the grid point setting;

(b) the chosen stochastic processes[50];

(c) the Monte Carlo error of the EEPE (see paragraph 58);

(d) expert-set parameters and boundaries in use (such as caps and floors for risk factor paths);

(e) all pricing functions used in the IMM;

(f) modelling features regarding margining, i.e. the MPOR setting, agreement-dependent variation margin and IM mechanisms and the modelling of collateral value changes during the MPOR.

73. In order to comply with Article 293(1)(b) of the CRR, the ECB sees it as best practice if back-testing is performed and reported on at least once a year.

74. In accordance with Article 294(1)(c) of the CRR, back-testing at risk factor level is mandatory. In the ECB's view, not all key assumptions of the CCR exposure model (mentioned in Article 294(1)(i) of the CRR) can be captured when back-testing is only conducted on hypothetical portfolios, in particular when considering non-plain vanilla transactions or margined netting sets. Hence, in the light of Article 294(1)(h) of the CRR, the ECB regards back-testing at both actual and hypothetical portfolio level as best practice.

75. In order to support the analysis of portfolio back-testing and mitigate the risk of breaching Article 294(1)(e) and (i) of the CRR, it is recommended and seen as best practice to include back-testing at single transaction level in the regular framework.

76. According to Article 294(1)(h) of the CRR, back-testing samples[51] must be representative and chosen on the basis of their sensitivity to material risk factors as well as their combinations. As stated in point (j) of the same paragraph in Article 294, the institution's back-testing programme must be capable of identifying poor performance of an EPE model's risk measures. As a result, the ECB considers that back-testing samples should allow for a meaningful assessment of the CCR exposure model and that institutions should ensure a comprehensive coverage of their back-testing framework by calculating back-testing coverage ratios (i.e. shares of back-tested risk factors or portfolios), at least at risk factor and, if applicable, at actual portfolio level. In particular:

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50 At least in the event of poor back-testing results, the chosen stochastic processes should be thoroughly challenged.

51 This refers to samples comprising the subset of risk factors, transactions or portfolios, including margin agreements used for the purpose of back-testing.

(a) next to a simple number-based[52] approach, institutions should take into account different weighting schemes like sensitivities and exposure metrics;

(b) at risk factor level, in addition to the full risk factor set[53], coverage ratios should also be calculated by asset class;[54]

(c) institutions should be able to provide an explanation justifying the level of the respective coverage ratio.

Such coverage ratios should form part of the back-testing reports to ensure that the scope of the back-testing is transparent.

Furthermore, it is the ECB's understanding that, if SFTs are within the IMM scope, their inclusion in the back-testing samples is compliant with the representativeness requirements stated in Article 294(1)(h) of the CRR.

77. The ECB considers that statistical tests used for back-testing should be adapted when back-testing samples contain forecasts over fully or partially overlapping time periods[55] (compared with standard versions of statistical tools applicable for the case of non-overlapping forecasts) to account for dependencies in the sample and therefore serve as a proper indicator of the model performance. In the view of the ECB, this practice would avoid the risk of being in breach of Article 294(1)(j) of the CRR.

78. Where back-testing relies only on IMM pricing functions for both predictions and realisations (i.e. realised prices derived from benchmarking systems are not taken into account), the attention given to the assessment of the adequacy of IMM pricing functions (as provided for by Article 294(1)(e) and (l) of the CRR) is seen to be even more important. Consequently, in the view of the ECB, institutions should strengthen their validation/review of IMM pricing functions accordingly.

79. In order to ensure appropriate back-testing practices as required by Article 294(1)(j) of the CRR, the ECB sees it as best practice to pay special attention to the consistency of predictions and realisations in the case of actual portfolio back-testing; in other words, changes of the portfolio composition during the observation period (e.g. due to new or closed-out transactions) should be handled accordingly.

80. In accordance with Article 294(1)(c), (e) and (g) of the CRR as understood by the ECB in paragraphs 74 and 75 of this chapter, the ECB sees benefit in back-

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52 This means, for example, the number of risk factors, the number of portfolios that are covered, etc.

53 Note that the set of risk factors should include all underlying risk factors/drivers that are integrated into the IMM exposure model (not differentiating between whether risk factors are directly or implicitly diffused).

54 It should be noted that for a sensitivity-based approach, coverage ratios by asset class only (such as interest rate, foreign exchange, equity, etc.) are sufficient.

55 For instance, distinct variables over the same forecasting period are tested simultaneously or tests are built on a single variable and different successive but overlapping observation periods.

testing different relevant risk measures, including the market value[56] at transaction level, the market value of netting sets[57] as well as the exposure[58] at netting set level.

(a) Market value corrections resulting from the application of paragraph 14 of this chapter are considered to be part of the IMM and should hence be reflected in the back-testing framework. Therefore, such corrections should be taken into account when performing back-testing both on the level of predictions and on the level of realisations, if the latter are calculated using the IMM pricing functions. Regarding predictions, the ECB considers it best practice for an institution to complement this approach with an additional back-testing run that does not take into account the market value corrections in the predictions. Regarding realisations, either the market value with correction or the market value coming directly from a benchmarking system can be used. In cases where the comparison of these back-testing runs shows significantly different results, the institution should investigate the root cause of these differences to support the validation of the market value corrections.

(b) If direct back-testing of the exposure of margined netting sets is not feasible, institutions should have a separate validation of the margining process, of collateral value changes and of netting set market value changes over the relevant time horizons.

81. In order to reduce the risk of breaching Article 292(1)(a) and (g) of the CRR and based on the requirements of Article 294(1)(l) of the CRR, institutions should compare the values of pricing functions used for revaluation under the IMM with values from a benchmarking system on a regular basis.

(a) The ECB understands Article 294(1)(o) of the CRR as requiring a validation of the identification process for significant price differences (see paragraph 12) as well as a corresponding full analysis of these differences and their root causes.

(b) The action taken to address the inaccuracy of the model in accordance with Article 294(1)(d) of the CRR, including price corrections also for future grid points in accordance with paragraph 14, should be validated.[59]

82. The ECB considers it compliant with Article 292(1)(b) and (g) of the CRR when the following benchmark comparisons are conducted:

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56 Market values can be either positive or negative.

57 This means the sum of all transaction market values within that netting set. This sum can be positive or negative.

58 Exposure should always take into account the collateral balance and the margin mechanism. In the case of unmargined netting sets, the collateral is zero. Combining the provisions of Article 272(14) and (17) of the CRR, exposure is understood as an inherently non-negative value.

59 The validation for future grid points may consider market data scenarios deviating significantly from t_0 and potential changes in sign and absolute value of the detected price difference.

(a) The model-estimated collateral balance at t_0 is benchmarked against the actual collateral balance at t_0, if applicable (see paragraph 36).

(b) Institutions benchmark the IM (see paragraph 46).

A full analysis of the differences detected, their root causes and the action taken to address the inaccuracy of the model should be conducted regularly in order to reduce the risk of breaching Article 294(1)(d) and (o) of the CRR.

83. For the purposes of Article 294(1)(e), (l) and (o) of the CRR, in accordance with the understanding of the ECB described in paragraph 17 and in addition to paragraph 81, the ECB considers it best practice that institutions assess the following within their validation framework.

(a) Whether deviations from a full simulation[60] are documented and justified.

(b) Whether the effect of using approximated pricing functions instead of those from any reliable benchmarking system is not significant.

(c) Whether, for all approximated pricing functions, the value changes due to risk factor changes occurring in IMM simulated paths are reliable compared with value changes from non-approximated pricing functions (from any reliable benchmarking system) for the same transaction type.

(d) If any alternative way to calculate exposures is used, the ECB considers that the items mentioned in paragraph 17(b) of this chapter should also be met. Furthermore, validation should ensure that the respective methods are applied in a way that does not lead to a systematic underestimation of exposures compared with the full simulation (as described in paragraph 5) for the transactions affected.

In the ECB's understanding, transactions treated with alternative exposure calculation methods should also be included in the back-testing framework. In order to fulfil the requirements of Article 294(1)(o) of the CRR, the ECB sees it as beneficial to also analyse affected transactions separately rather than mixing effects when back-testing is only conducted at actual portfolio level.

In addition, the netting benefits (numerical impact) when using any type of alternative method to calculate exposures in the IMM should be assessed by comparing the resulting exposure with those obtained after:

(i) splitting the transactions into synthetic netting sets differentiating between transactions treated using the "standard" IMM calculation and those where exposures are calculated in an alternative way;

(ii) carving-out the affected transactions into a standardised method.

[60] As described in paragraph 5.

11 Effective expected positive exposure

84. This section refers to the normalisation of the weights Δt_k that are used in the calculation formula for the EEPE.

11.1 Relevant regulatory references

Table 41

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013[61]	284	(6)

85. The regulatory provision relating to the topic addressed in this section that requires further guidance is the calculation formula for the EEPE, which appears in Article 284(6) of the CRR.

86. The corrigendum of 25 January 2017 amends the formula in Article 284(6) of the CRR by dividing the weighted sum of the Effective EEs by the applicable time horizon (1 year or the maturity of the longest-dated transaction belonging to a netting set if this is below 1 year):

$$Effective\ EPE = \frac{1}{min\{1\ year, maturity\}} \cdot \sum_{k=1}^{min\{1\ year, maturity\}} Effective\ EE_{t_k} \Delta t_k$$

However, the units of the weights Δt_k and $maturity$ still need to be defined.

11.2 Principles for ECB Banking Supervision

87. In the understanding of the ECB, Article 284(6) of the CRR should be understood as requiring that the weights Δt_k and the parameter $maturity$ are expressed in units of one year.

12 Alpha parameter

88. The alpha multiplier affects all netting sets and thus all counterparties and should be considered as intending to capture extra risk arising, for example, from the fact that exposures are correlated with credit drivers (e.g. PD, LGD) and to address general deficiencies in the IMM framework. Alpha is the only parameter besides capital buffers that can be increased explicitly to account for such deficiencies.

[61] See corrigendum to the CRR of 25 January 2017.

12.1 Relevant regulatory references

Table 42

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	284	(4)
		293	(1), (2)

89. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following:

    (a) Article 284(4) of the CRR defines the exposure value as the product of alpha and the EEPE with "α = 1.4, unless competent authorities require a higher α or permit institutions to use their own estimates in accordance with paragraph 9 [of Article 284 of the CRR]";

    (b) Article 293(2) of the CRR, based on Article 284(4) of the CRR, links the level[62] of the supervisory alpha setting to the degree with which the institution meets the requirements for the risk management system as set out in Article 293(1) of the CRR;

    (c) Article 293(1) of the CRR refers in particular to overall validation, adequate processes, integration into the day-to-day risk management process and limit utilisation (use test), documentation and independent reviews.

12.2 Supervisory actions

90. In accordance with Article 284(4) of the CRR, the ECB can increase the alpha parameter in a proportionate and appropriate way for either an interim or an undefined period to address model, risk management or governance deficiencies identified by the ECB. In particular, targeted deficiencies may include (i) model deficiencies, which lead or may lead to an underestimation of the EEPE as defined in Article 284(5) and (6) of the CRR and Article 285 of the CRR for margined trading, or (ii) deficiencies in the validation framework.

    It should be noted that:

    (a) both supervisory alpha increases related to an interim period and those related to an undefined period require explicit supervisory decisions;

    (b) if alpha is increased for an interim period, the decision will specify the length of the interim period or the condition when it ends.

[62] This refers to levels higher than the floor value of 1.4 for the non-modelled and 1.2 for the modelled alpha parameter in accordance with Article 284(4) and (9) of the CRR.

91. The ECB can base the amount of a potential alpha increase above the floor values to the extent possible on an available impact analysis.

(a) The analysis assesses[63] the impact on the EEPE as calculated without the identified model deficiency.

(b) As this deficiency is obviously related to the standard configuration of the IMM, which contains this deficiency, an impact calculation based only on a subset of the relevant portfolio could be accepted for this purpose. This calculation can be performed in a well-defined developer area for representative sub-portfolios (as defined in the Counterparty credit risk glossary).

(c) Some non-exhaustive examples of how identified model deficiencies can increase alpha are discussed in this document (see for example paragraphs 21, 57 and 58), where the general alpha increase (applied to all netting sets) reflects whether the identified deficiencies possibly affect only a part of the netting sets (e.g. only the margined ones).

(d) The ECB considers that increases should be in multiples of half a decimal point. For example, if alpha = 1.4, alpha becomes at least 1.45 if an increase is deemed necessary.

If no impact calculations are available, the ECB may estimate the amount of the alpha increase in a conservative way using all other available information.

13 Risks not in effective expected positive exposure

92. Depending on the set-up of the IMM and the nature of the transactions, some quantifiable risks may not be captured, or may not be adequately captured, by the IMM. This section refers to processes for identifying, monitoring and capitalising such risks.

[63] This assessment can also include less precise estimations, where needed.

13.1 Relevant regulatory references

Table 43

	Date of issue	Article	Paragraph/Point
Legal background			
CRR	26/06/2013	92	(3)(f)
		430(1)	
		284	(1)(a), (3), (4), (5), (6), (8)
		287	(2)
		288	
		290	
		292	(1)(a), (b), (g), (2)-(5), (6), (7)
		293	(1)(a), (b), (c)
		294	(1)(d), (g), (k), (m), (n), (o)
		368	(1)(e), (f), (h), (2)(d)

93. The regulatory provisions relating to the topic addressed in this section that require further guidance are the following.

(a) Article 92(3)(f) of the CRR specifies the types of transactions and agreements to be included in the calculation of the risk-weighted exposure amounts for the CCR.

(b) Article 430(1) of the CRR in conjunction with Article 5(1) of the Commission Implementing Regulation on supervisory reporting requires institutions to report the information relating to own funds requirements with a quarterly frequency.

(c) Article 284(1)(a) of the CRR requires that the model used by the institution specify the forecasting distribution for changes in the market value of the netting set attributable to joint changes in relevant market variables such as interest rates and foreign exchange rates.

(d) Article 284(3) of the CRR requires the own funds requirement for CCR exposures under the IMM to be the higher of (a) the own funds requirement for those exposures calculated on the basis of EEPE using current market data, and (b) the own funds requirement for those exposures calculated on the basis of EEPE using a single consistent stress calibration for all CCR exposures to which the IMM is applied.

(e) Article 284(4) to (6) of the CRR describes the way the exposure value is calculated based on EEPE.

(f) Article 284(8) of the CRR allows institutions to use a measure of the distribution calculated by the IMM that is more conservative than α multiplied by EEPE as calculated in accordance with the equation in Article 284(4) for every counterparty.

(g) In accordance with Article 287(2) of the CRR, the independent risk control unit is responsible for the design and implementation of its CCR management, including the initial and ongoing validation of the model. Specifically, under Article 287(2)(c) of the same regulation, the independent risk control must control input data integrity and produce and analyse reports on the output of the institution's risk measurement model, including an evaluation of the relationship between measures of risk exposure and credit and trading limits.

(h) In accordance with Article 288 of the CRR, an independent review of the CCR management system should be conducted regularly through an internal auditing process encompassing both the activities of the control and collateral management units as required by Article 287 of the CRR.

(i) Article 290 of the CRR describes the requirements for the stress testing programme. Specifically, Article 290(9) of the same regulation requires the results of the stress testing to be regularly reported to senior management, at least on a quarterly basis. The reports and analysis of the results must cover the largest counterparty-level impacts across the portfolio, material concentrations within segments of the portfolio (within the same industry or region), and relevant portfolio and counterparty specific trends.

(j) In accordance with Article 292(1)(a) and (b) of the CRR, institutions must ensure the integrity of the modelling process by adopting at least the following measures: (a) the model must reflect transaction terms and specifications in a timely, complete and conservative fashion; (b) those terms must include at least contract notional amounts, maturity, reference assets, margining arrangements and netting arrangements.

(k) In accordance with Article 292(1)(g) of the CRR, institutions must ensure the integrity of the modelling process by adopting a certain number of measures including processes for formal reconciliation between the model and source data systems to verify on an ongoing basis that transaction terms and specifications are being reflected in EPE correctly or at least conservatively.

(l) Article 292(2) to (5) of the CRR describes requirements for the calibration of the IMM using current and stressed market data.

(m) In accordance with Article 292(6) of the CRR, institutions must subject the model to a validation process that is clearly formulated in their policies and procedures.

(n) In accordance with Article 292(7) of the CRR, institutions must monitor relevant risks such as their exposures to specific wrong-way risk and general wrong-way risk, their exposures with a rising risk profile after one year and their exposures with a residual maturity below one year.

(o) In accordance with Article 293(1)(a) of the CRR, institutions must meet the qualitative requirements set out in Part Three, Title IV, Chapter 5 of the

CRR, including the qualitative requirements set in Article 368 of the CRR for the use of internal models for market risk.

(p) In accordance with Article 293(1)(b) and (c) of the CRR, institutions must conduct a regular programme of back-testing and carry out an initial validation and ongoing periodic reviews of their CCR exposure models and the risk measures generated by them.

(q) In accordance with Article 294(1)(d) of the CRR, if the model validation indicates that EEPE is underestimated, institutions must take the action necessary to address the inaccuracy of the model.

(r) Article 294(1)(g) of the CRR requires institutions to validate that the CCR exposure model includes transaction-specific information to capture the effects of margining and that it accounts for the nature of margin agreements.

(s) Article 294(1)(k) of the CRR requires institutions to validate their CCR exposure models and all risk measures out to time horizons commensurate with the maturity of trades.

(t) Article 294(1)(m) of the CRR requires that the validation of an institution's CCR exposure model and its relevant risk measures include an assessment of the adequacy of the recent performance.

(u) Article 294(1)(n) of the CRR requires institutions to assess the frequency with which the parameters of an CCR exposure model are updated as part of the initial and ongoing validation process.

(v) Article 294(1)(o) of the CRR requires that the initial and ongoing validation of CCR exposure models assess whether or not the counterparty level and netting set exposure calculations of exposure are appropriate.

(w) In accordance with Article 287(2)(d) and (f) of the CRR, institutions must have a risk control unit that is independent from units responsible for originating, renewing or trading exposures and that reports directly to senior management. The unit must conduct the initial and ongoing validation, being responsible for designing and implementing the CCR management system.

(x) In accordance with Article 293(1)(a) of the CRR referring to Part Three, Title IV, Chapter 5 and more particularly to Article 368(1)(b) of the CRR, institutions must have a risk control unit that is independent from business trading units and reports directly to senior management, being responsible for designing and implementing any internal model. The unit must conduct the initial and ongoing validation, being responsible for the overall risk management system.

(y) In accordance with Article 368(1)(e) of the CRR, institutions must have in place established procedures for monitoring and ensuring compliance with

a documented set of internal policies and controls concerning the overall operation of its internal models.

(z) In accordance with Article 368(1)(f) of the CRR, any internal must have a proven track record of reasonable accuracy in measuring risks.

(aa) In accordance with Article 368(1)(h) of the CRR, institutions must conduct an independent review of their internal models as part of their regular internal auditing process.

(bb) In accordance with Article 368(2)(d) of the CRR, the review mentioned in Article 368(1)(h) of the CRR must be conducted at least once a year and must consider various elements, including the scope of risks captured by the risk measurement model.

13.2 Principles for ECB Banking Supervision

13.2.1 Framework

94. "Risks not in effective expected positive exposure" (RNIEPE) are those risks inside the IMM which are not yet part of the EEPE or not adequately captured in EEPE and hence are not included in the IMM exposure value defined in Article 284(4) of the CRR.

The ECB has identified two possible ways of treating these risks:

(a) The RNIEPE framework is applied as described in this section, which may include using voluntary RNIEPE add-ons for substantial RNIEPE as further described in paragraphs 105 and 117.

(b) Alternatively, institutions intend including such risks directly in the exposure value as defined in Article 284(4) of the CRR.

(i) Such inclusion could always be done immediately, or

(ii) Such inclusion could be deferred as long as institutions ensure that the exposure value is sufficiently conservative in the sense of Article 292(1)(a) and (b) of the CRR and that relevant market variables are modelled in accordance with Article 284(1) of the CRR.

For the purpose of point (b), if institutions identify these risks as described in sub-section 13.2.2, the ECB would then consider the calculation of the exposure value to be complete and sufficiently conservative in the sense of Article 284(1) and Article 292(1)(a) and (b) of the CRR.

Based on the provisions referred to above and in view of sub-paragraphs (a) and (b) above, the ECB considers that the processes, methods and governance set out in this section for RNIEPE are an integral part of the overall processes

and general internal governance of the IMM for CCR. Therefore, the ECB considers it best practice for institutions to have policies and controls relating to RNIEPE (hereinafter referred to as the "RNIEPE framework"). The elements of the RNIEPE framework are set out in detail in following paragraphs.

95. The RNIEPE framework should comprise guidance for identification and quantification, which may also include capitalisation of certain RNIEPE, monitoring, management and reporting of RNIEPE, and all related governance arrangements.

96. An "RNIEPE add-on" is part of the RNIEPE framework and is understood as a temporary risk analogue to an exposure amount[64] until the corresponding RNIEPE is incorporated into the EEPE in a manner compliant with the regulatory requirements of the IMM as provided for in Article 284(6) of the CRR.[65] As such, the ECB considers that RNIEPE add-ons are not part of the EEPE itself and are therefore not included in the exposure value calculated in accordance with Article 284(4) of the CRR.[66] The ECB expects these RNIEPE add-ons to result in risk exposure amounts[67] in line with paragraph 105 of this chapter.[68]

    In the view of the ECB, the RNIEPE framework should not be understood as covering elements for which separate provisions are provided in the regulatory framework for CCR, such as – but not limited to – the aspects mentioned in Article 292(7)(b) of the CRR.

97. As the RNIEPE framework is considered to be a part of the processes and modelling related to the IMM, it covers the same scope in terms of transactions as that permitted under Article 283 of the CRR and the same risk factors as relevant for Article 284(1)(a) of the CRR.

98. In accordance with Article 287(2) of the CRR, the risk control unit is responsible for the design and implementation of the institution's CCR management. Because the RNIEPE framework is seen as an integral part of the IMM, the ECB considers that the risk control unit is also responsible for the overall RNIEPE framework.

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64 The precise meaning of "temporary" in this context needs to be agreed with the supervisor and depends on the specific RNIEPE. For the RNIEPE add-on calculated in accordance with paragraph 109(b), it refers to the time until EU legislation refines the IMM provisions explicitly including the treatment of exposure spikes in margined trading.

65 The quantification of the RNIEPE requires a flooring at zero. Institutions would need to include the underlying risk in the EEPE to benefit from potential exposure offsetting.

66 If the exposure value is calculated in accordance with Article 284(8) of the CRR, no RNIEPE add-on is expected by the ECB, i.e. all modelling components of the IMM, including additional or conservative elements, are expected to be part of the exposure metric under Article 284(8) of the CRR. Since the RNIEPE framework is seen as an integral part of the overall processes in the IMM, no additional or parallel capitalisation is proposed using any of the methods in Sections 3 to 5 of Part Three, Title II, Chapter 6 of the CRR.

67 Risk exposure amounts as defined in Article 92(3) and (4) of the CRR.

68 To be reported in COREP as "Additional risk exposure amount due to Article 3 CRR" (COREP C02.00 Row 760, Column 010) together with any other own-initiative capital buffers. See also paragraph 105 of this chapter on using a consistent metric/unit for insertion.

99. In accordance with Article 287(2) of the CRR, the RNIEPE framework and methodologies should be subject to validation and independent review, as set out in further detail in Article 294(1)(d), (g), (k), (m), (n) and (o) of the CRR and Article 288 of the CRR respectively. In this context and where applicable, back-testing of RNIEPE add-ons is seen as beneficial.

100. In order to enable efficient monitoring of RNIEPE for the purpose of internal modelling as referred to in Article 368(1)(e) of the CRR, the ECB considers that the policies of the RNIEPE framework should be documented and should include:

(a) descriptions of each RNIEPE with a justification as to why any identified RNIEPE is not directly included in the EEPE calculation;

(b) the different tasks and responsibilities, and the frequency of their execution.

13.2.2 Identification

101. A single identified RNIEPE refers to a distinct risk not accurately captured in or fully omitted from the calculation of EEPE. This can refer, for example, to one specific risk factor or a set of risk factors (e.g. related to a yield curve), or to an element missing from the margining mechanism or other model assumptions.

The ECB considers that RNIEPE can emerge as a result of specific circumstances, including the following.

(a) A single risk factor, a set of risk factors or the dependency structure (correlations) of a subset of risk factors that cannot be modelled precisely enough to allow for the modelling of the joint distribution under Article 284(1)(a) of the CRR, for instance because of:

(i) a different stochastic dynamic (e.g. due a partially effective pegging mechanism for a subset of FX rates);

(ii) in the case of historical calibration, the underlying time series containing too many proxies;

(iii) the occurrence of risk factor jumps that are not frequent enough to allow for an appropriate calibration;

(iv) insufficient observations of basis risks.

(b) Processes in place that do not allow the modelling of a margin arrangement to reflect correctly or conservatively enough all the relevant terms and specifications required by Article 292(1)(g) of the CRR.

(c) Cash flows that would be paid to a defaulting counterparty in margined trading and that are not, or not fully, reflected in exposures underlying the EEPE owing to the DMP or owing to the legal requirements of the contract.

102. The ECB considers that the following shortcomings should be treated in EEPE rather than in RNIEPE, unless duly justified:

(a) treatment of synthetic netting sets arising from the application of paragraph 10 of this chapter;

(b) deficiencies in pricing models at transaction level for which paragraphs 12 to 16 of this chapter apply;

(c) corrected transaction values arising from the application of paragraph 14 of this chapter;

(d) all cases where a full simulation is missing, as listed in paragraph 17 of this chapter.

The concept of RNIEPE should not affect potentially existing approaches to modelling specific parameters or modelling features that use a sufficient degree of conservatism[69] in dealing with uncertainty in the EEPE. Therefore, the ECB does not see a need to separate the effects of such parameters and modelling features from EEPE and include them in RNIEPE. However, the ECB expects such parameters or modelling features affecting EEPE to be clearly documented, monitored and reported as part of the processes of the IMM.

103. In order to properly monitor each RNIEPE, the ECB considers that institutions should explain in their documentation how each RNIEPE is identified and defined. In order to properly assess materiality, the ECB considers that the current portfolio composition and trading strategy of the institution should be taken into account when assessing each RNIEPE.

The ECB considers it best practice for an RNIEPE that is substantial in the current portfolio to be subject to an RNIEPE add-on, even if this RNIEPE might cease to be substantial at a later point in time.

104. The ECB considers that in order to ensure an accurate capture of risks, institutions should strive to identify and monitor[70] RNIEPE on a regular basis as part of the overall risk management framework. The ECB considers it best practice to use existing processes efficiently to identify RNIEPE.

As part of such best practice, and in order to maximise efficiency, institutions should, as a minimum[71], use the following processes to identify RNIEPE:

(a) initial and ongoing internal validation of the IMM, as referred to in Articles 287(2), 292(6), 293(1)(b) and (c), and 294 of the CRR;

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69 This refers for example to diffusion parameters leading to greater variation in simulated risk factors than would be observed from historical data, or simplifications of margin arrangements that do not lead to a systematic underestimation of exposures.

70 Monitoring should be applied in particular to frequently or permanently occurring RNIEPE in line with paragraphs 100 and 115 of this chapter.

71 Using all the processes (a) to(e) does not imply that all concrete RNIEPE are sensitive to all these processes or could be detected by all of them.

(b) back-testing as referred to in Article 294 of the CRR;

(c) controls of input data integrity as referred to in Article 287(2)(c) of the CRR;

(d) with regard to the approval of new products, analysing whether the characteristics inherent in the new products can be adequately captured by the IMM in order to ensure that these new products are fully compatible with the comprehensive risk control and validation by the risk control unit, as required by Article 368(1)(b) of the CRR;

(e) stress testing as referred to in Article 290 of the CRR.

In accordance with Article 368(2)(d) of the CRR, the annual review of an institution's overall risk management process must consider the scope of risks captured by the risk measurement model. Therefore, the ECB considers that a review and, if necessary, an update of the RNIEPE inventory should be carried out at least once a year.

13.2.3 Quantifications

105. As identified RNIEPE are considered to be part of the IMM, the quantification of each RNIEPE should (to the extent possible) be methodologically similar to the respective exposure quantification in the IMM, reflecting either an expected exposure averaged over one year or an increment to an EEPE, taking relevant stress calibrations (as set out in Articles 284(3)(b) and 292(2) to (5) of the CRR) into account where applicable. This would imply that two quantifications are not necessary in cases where the expected RNIEPE exposures (EREs) according to the current calibration and the stress calibration are very similar.

The quantification of EREs is set out in further detail in the paragraphs below. Each individual ERE should be floored at zero.

It is the ECB's understanding that for each RNIEPE add-on[72], the corresponding risk exposure amount should be calculated as

$$RWA_{RNIEPE} = RW \cdot \alpha \cdot ERE,$$

where RW denotes the risk weight as defined in Part III, Title 2, Chapter 2, Sections 2 and 3 of the CRR for SA and Part III, Title 2, Chapter 3, Sections 2 to 4 of the CRR for IRB and α corresponds to the alpha parameter under Article 284(4) of the CRR, including potential increases as outlined in paragraph 90 of this chapter. Note that the RNIEPE add-on equals $RW \cdot \alpha \cdot ERE$ in cases where the ERE is substantial (as defined in paragraph 117 below).

[72] As set out in paragraph 96 of this chapter, a substantial RNIEPE add-on constitutes an additional exposure that should be capitalised in accordance with Article 3 of the CRR.

106. The value of the risk weight referred to in paragraph 105 above may depend on how many counterparties are affected by a given RNIEPE.

(a) If the ERE related to a given RNIEPE can be calculated per netting set, the risk weight(s)[73] applied should be the same as that taken for the exposure value for the respective netting set as referred to in Article 284(4) of the CRR, regardless of whether a standardised risk weight or an IRB approach is applied for the calculation of own funds requirements according to Article 92(3)(f) of the CRR. Thus, the risk exposure amount should be calculated as

$$RWA_{RNIEPE} = \sum_{n} RW_n \cdot \alpha \cdot ERE_n \,,$$

where RW_n denotes the risk weight corresponding to the n-th netting set affected by RNIEPE, and ERE_n the corresponding expected RNIEPE exposure.

(b) Alternatively, if the ERE is calculated simultaneously across several netting sets (i.e. no calculation of a single ERE_n is possible), it is recommended that institutions follow one of the following two approaches:

(i) apply one risk weight to all affected counterparties or nettings sets being as high as the highest risk weight of the set of affected counterparties or netting sets:

$$RWA_{RNIEPE} = RW \cdot \alpha \cdot ERE,$$

where $RW = \max_{n}\{RW_n \text{ for affected counterparties } n = 1, \dots, N\}$;

(ii) apply an average risk weight to all affected counterparties or netting sets, which takes the relative materiality of exposures into account and does not systematically underestimate risk weights, provided the methodology of averaging is justified and internally validated.

107. In accordance with Article 368(1)(e) and (f) of the CRR, the ECB considers it best practice that institutions quantify RNIEPE in an appropriate way and document and duly justify the methodology applied, in order to assess the need to incorporate the RNIEPE into EEPE.

Because the quantification of the impact should allow the different RNIEPE to be assessed individually, no diversification effect should be applied between different RNIEPE when quantifying an individual RNIEPE.

108. The ECB considers it best practice that for each RNIEPE identified, the quantification of the ERE is estimated based on the resulting (incremental[74]) exposure when the RNIEPE is incorporated into EEPE as follows.

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[73] The A-IRB risk weights depend in general on netting sets and may even depend on a single netting set for one counterparty owing to the maturity adjustment.

[74] See footnote 85 regarding incremental risk numbers in the market risk chapter.

(a) The baseline is the EEPE based on the same transactions and netting sets as used in production (without any RNIEPE add-ons).

(b) Where the RNIEPE does not depend on the stress calibration and is incorporated into one EEPE according to (a) above, either the difference between that EEPE and the current EEPE, or the difference between that EEPE and the stressed EEPE, whichever is higher, should be used. Alternatively, two incremental measures can be calculated, one stressed, one current, in line with paragraph 105 of this chapter, and the higher of the two should be taken into account.

(c) The incremental exposure can be any positive or negative number. The calculation of the incremental exposure may result in a negative number if the incorporation of the RNIEPE has a risk-reducing effect. In that case, and in line with paragraph 105, the incremental exposure is set to zero for the respective netting set.

(d) The quantification of the impact should be as accurate as possible using reasonable effort. Therefore, the ECB understands that the impact estimation methodology can use appropriate approximations, assumptions, expert judgement or a stress methodology. Any such approximations, assumptions or expert judgement should be duly justified and documented.

109. The ECB considers that a prudent impact quantification differing from that described in paragraph 108 above could be used where this is duly justified. Where using an RNIEPE is justified but an appropriate impact quantification using an incremental exposure cannot be performed for this RNIEPE, the ECB considers it a prudent approach to perform an estimation of the impact of a RNIEPE based on an exposure calculation outside the EEPE where the RNIEPE is the only source of risks.

(a) For this stand-alone impact estimation of ERE, the institution should demonstrate that it does not systematically underestimate the incremental exposure or that the calculation of the incremental exposure is misleading.

(b) Where trade-related cash flows may be missing from the EEPE calculation as discussed in the case of margined trading in paragraph 20 of this chapter, the ECB expects the following method to be applied to account for such cash flows when calculating ERE in the RNIEPE add-on:

(i) The ERE for one netting set is given by the formula:

$$ERE_{spike} = \frac{1}{min\{1\ year, maturity\}} \cdot \sum_{k=1}^{min\{1\ year, maturity\}} ESE_{t_k} \cdot \Delta t_k \,.$$

(ii) The term ESE_{t_k}, the expected spike exposure, is calculated as the expected exposure increase due to trade-related cash flow payments from the institution to the defaulting counterparty during the MPOR between time grid points t_k and t_{k-1} attached to the time grid point

t_k, which are not included in the EEPE, and which are possible due to:

(ii.a) contractual provisions (e.g. grace periods) as outlined in paragraph 20(b)(ii) of this chapter;

(ii.b) the default notification and management processes of the institution as outlined in paragraphs 20(b)(i) and (c) of this chapter;

(ii.c) applicable settlement netting rules for such cash flows as mentioned in paragraph 20(d) of this chapter, which can also include variation margin payments if contractually agreed.

(iii) The term $\Delta t_k = t_k - t_{k-1}$ is expressed in units of a year and has the same meaning as the Δt_k in Article 284(6) of the CRR, where for the purpose of calculating ESE_{t_k}, time grid points $t_k$may be used that do not belong to the standard time grid of the IMM as used for Article 284(6) of the CRR.

110. The ECB considers that in order to ensure that the quantification of RNIEPE is appropriately accurate in accordance with Article 368(1)(f) of the CRR, the quantification should, where possible, make use of objective market data. Where the quality of the data used is insufficient, the institution should be aware of the effect this might have on the quantification of the respective RNIEPE and, if necessary, take measures to mitigate the effect. This should also be part of the documentation of the respective RNIEPE.

111. In order to ensure alignment with the EEPE, when quantifying an RNIEPE the calibration methodology for the ERE should be based on the same methodology as used for the EEPE. For example, it should be based on the same observation period if the EEPE is based on historical calibration. Any differences should be duly justified. If scarce data are used for calibration, they should be used in a way that avoids a systematic underestimation of exposure. This may involve relying to some extent on expert judgement, which should be well documented and explained.

13.2.4 Management of RNIEPE

112. As mentioned previously, the identification, quantification and management of the RNIEPE should be integrated into the CCR management framework. The ECB therefore considers that in order to ensure that ongoing risk measurement is accurate according to Article 368(1)(f) of the CRR, the risk control unit should carry out regular impact quantification and monitoring of all RNIEPE. The outcome should be reported to the relevant stakeholders in line with the processes set out in the institution's RNIEPE framework.

113. In accordance with Article 430 of the CRR in conjunction with Article 5(1) of the Commission Implementing Regulation on supervisory reporting, institutions must submit the information relating to own funds requirements with a quarterly frequency. Therefore, the ECB considers that in order to assess the adequacy of own funds, institutions should quantify and monitor the RNIEPE add-ons and adjust their scope at least quarterly.

114. More particularly, regarding the requirement under Article 368(1)(f) of the CRR that internal models should have a proven track record of reasonable accuracy in measuring risk, the ECB considers it a good practice for institutions to determine thresholds for treating individual and combined RNIEPE as part of their RNIEPE management. Such thresholds are based on the ratio of the ERE as defined in paragraph 105 of this chapter over the EEPE, in which regard no RNIEPE are to be included in the denominators of the following ratios.

(a) For a single ERE_i of type i as described in paragraphs 108 and 109 of this chapter relating to one netting set, the ratio used for determining whether an RNIEPE is substantial is calculated as follows:

$$ratio_i = \frac{ERE_i}{EEPE}.$$

(b) If one ERE_i relates, for example, to a non-modelled risk factor in the IMM that affects a number of netting sets or counterparties (overall N netting sets), the ratio used for determining whether an RNIEPE is substantial is calculated as follows:

$$ratio_i^{mult} = \frac{\sum_{n=1}^{N} ERE_i^n}{\sum_{n=1}^{N} EEPE_n}.$$

(c) Regarding all ERE_i, except the ERE on exposure spikes, the ratio used to determine if RNIEPE should be included in EEPE for overall N netting sets affected by RNIEPE type i and M netting sets in the overall IMM scope should be:

$$ratio = \frac{\sum_{i=1}^{I}\sum_{n=1}^{N} ERE_i^n}{\sum_{m=1}^{M} EEPE_m},$$

where I denotes the overall number of RNIEPE types different from the RNIEPE related to spikes.

(d) For the ERE associated with exposures spikes in a netting set n as described in paragraph 109(b) above, the ratio used to determine whether this RNIEPE should be included in EEPE is given (using the notation of the above point (c)) by:

$$ratio^{spike} = \frac{\sum_{n=1}^{N} ERE_{spike}^n}{\sum_{m=1}^{M} EEPE_m}.$$

115. Regarding RNIEPE that are identified as not being substantial according to one of the processes described in paragraph 104 of this chapter, the ECB recommends that institutions either define quantitative thresholds using the

above or similar metrics or define qualitative methodological criteria to identify RNIEPE that are not substantial but require at least the monitoring described in paragraph 100 of this chapter.

116. The thresholds on the ratios (a) to (d) described in paragraph 114 above should include at least:

    (a) a threshold on the ratios (a) and (b) above which individual RNIEPE are considered as substantial and capitalised with RNIEPE add-ons as recommended in paragraph 105;

    (b) a (higher) threshold on ratios (a) and (b) above which individual RNIEPE are to be included in the EEPE calculation in accordance with Article 284(6) of the CRR, in which regard additional qualitative criteria possibly defined by the institution could also lead to an inclusion in EEPE, even if the quantitative threshold is not breached;

    (c) a threshold on ratio (c) above which one or more RNIEPE are to be included in the EEPE calculation in accordance with Article 284(6) of the CRR so that the sum of the remaining RNIEPE leads to a ratio (c) below this threshold[75];

    (d) a threshold on ratio (d) above which the RNIEPE related to the exposure spikes need to be included into the EEPE calculation in accordance with Article 284(6) of the CRR.

117. Institutions should determine at their own discretion thresholds for assessing the impact of individual RNIEPE above which an individual RNIEPE is considered a substantial RNIEPE in the sense of paragraph 116(a) or (b) of this chapter. However, the ECB considers that if a single RNIEPE already has a 5% impact, the EEPE might not capture accurately all relevant risks. Therefore, the ECB considers it best practice for a single RNIEPE to be considered substantial if the impact quantification according to paragraph 114(a) or (b) of this chapter corresponds to more than 5% of the amount given by the EEPE.

118. Institutions should determine, at their own discretion, a threshold on the ratio defined in paragraph 114(c) above which RNIEPE are incorporated into EEPE. However, the ECB considers that if the cumulative RNIEPE impact across all RNIEPE types corresponds to more than 10% without the impact due to exposure spikes calculated as defined in paragraph 109(b) of this chapter, of the amount given by EEPE of the IMM using the ratio set out in paragraph 114(c) of this chapter for two consecutive quarters, the EEPE might not capture accurately all material risks, because in accordance with Article 7a(1)(c)(ii) of the Commission Delegated Regulation on materiality of extensions and changes of the IMA, a change of 10% or more of a relevant

[75] This also takes the scheduling into account as discussed in footnote 64 on how long a RNIEPE might stay outside EEPE.

market risk number is to be considered a material change to the IMA. Therefore, and in the absence of RTS for CCR, the ECB considers, by analogy and also using this threshold for the IMM, that if the cumulative RNIEPE impact corresponds to more than 10% of the amount computed using EEPE, this indicates that the EEPE might not capture accurately all material risks.

This implies that some (or all) of the RNIEPE contributing to the numerator of the ratio in paragraph 114(c) of this chapter would need to be included in the EEPE in accordance with Article 284(6) of the CRR, such that this ratio falls below 10%.

119. Institutions should determine, at their own discretion, a threshold on the ratio defined in paragraph 114(d) above which the RNIEPE associated with the exposure spikes as defined in paragraph 109(b) of this chapter for two consecutive quarters is incorporated into the EEPE in accordance with Article 284(6) of the CRR.

    However, the ECB considers that if the impact of this RNIEPE relative to all netting sets in scope of the IMM corresponds to more than 10%, the risk related to exposure spikes should be incorporated into the EEPE.

120. The ECB considers it a prudent approach that RNIEPE that are to be incorporated into the EEPE in accordance with paragraphs 118 and 119 are capitalised with RNIEPE add-ons – if this is not already the case – as part of the implementation plan, until they are incorporated into EEPE. If the institution deems it convenient, the remaining RNIEPE, even if not substantial, may also be capitalised with RNIEPE add-ons.

121. In order to enable monitoring of RNIEPE add-ons, the ECB can, on the basis of Article 10 of the SSM Regulation, require an institution to provide an overview of RNIEPE add-ons in a suitable format chosen by the institution.

122. Because the RNIEPE framework is an integral part of the overall IMM processes, a change to the RNIEPE framework – and in particular a change relating to the RNIEPE identification methodology, the impact quantification methodology or the RNIEPE add-on methodology – should be considered as an IMM model change. The ECB considers that the EGMA could provide appropriate guidance on assessing these changes.[76]

    (a) The ECB considers that changes to the RNIEPE framework should in general be notified ex ante to the ECB.

    (b) However, changes within the existing RNIEPE framework which do not need new methodologies or processes to be implemented may be notified to the ECB through ex post notifications only.

123. In the view of the ECB, ceasing to capitalise an RNIEPE because ratios under paragraph 114(a) and (b) of this chapter are below the thresholds set out in

[76] It is possible that a future version of the EGMA might contain refinements regarding changes and extensions that are affected by the RNIEPE framework.

paragraph 117, or starting to capitalise an RNIEPE with an RNIEPE add-on according to the thresholds of the RNIEPE framework, would not constitute a model change and does not need to be separately notified as a model change, provided that it is based on the approved methodology of the RNIEPE framework.

124. The incorporation of an individual RNIEPE into EEPE, irrespective of whether it was previously treated as an RNIEPE add-on, and irrespective of whether it is a previously identified or newly identified RNIEPE, constitutes an IMM model change and should therefore be assessed using the EGMA.

    (a) If a change or extension of the RNIEPE framework or the incorporation of an individual RNIEPE into the EEPE receives the classification “ex ante” but is very close to the classification “to be investigated”, the individual RNIEPE or those RNIEPE that contribute to that materiality should be integrated into the EEPE.

    (b) When calculating the impacts of incorporating an RNIEPE into EEPE, the calculation should not take into account impacts with the opposite sign inside the RNIEPE framework.

125. Because the RNIEPE add-ons are not included in EEPE, they should not be taken into account when back-testing the EEPE in accordance with Article 294 of the CRR.

Annex

This annex outlines two examples of a technique for assessing the confidence interval of the estimated EEPE referred to in paragraph 58, assuming that the EEPE is calculated using a Monte Carlo method and a pseudo random number generator.

In the examples, the MC error on the EEPE is defined as an aggregation of the MC error on the different netting sets. At netting set level, the MC error on the EEPE is defined as half the length of the 95% two-sided confidence interval centred around the sample estimated EEPE.

Two methods are proposed for the calculation performed at the netting set level. These are described in the "Method 1" and "Method 2" sections. How the MC error should be inferred for a whole portfolio consisting of several netting sets is detailed below in the "Aggregation" section.

Note that the methods below apply to banks that use a pseudo Monte Carlo simulation method and not to banks that apply a quasi Monte Carlo simulation method. In this context, a pseudo Monte Carlo simulation method is defined as a method that utilises a random number generator based on an algorithm creating a sequence of desired length *N* of numbers that mimic independent samples drawn from a uniform distribution. A quasi Monte Carlo simulation method is defined as a method that utilises a low-discrepancy sequence of numbers, which is deterministically uniformly distributed (e.g. Sobol).

Irrespective of the numerical method implemented for its estimation of the EEPE (e.g. types of random number generators), the institution should provide an analysis as part of its validation framework demonstrating that its approach has a reasonable accuracy as required by Article 368(1)(f) of the CRR (as referenced by Article 293(1)(a) of the CRR). This analysis should include an assessment of convergence and an error estimation.

In the following, "MC run" refers to a pseudo Monte Carlo simulation with *N* scenarios calculated with one particular set of random numbers.

A.1 Method 1

Let $\widehat{EEPE_N}(\alpha)$ denote the estimator of the EEPE for one given netting set α obtained from one MC run with N simulations (e.g. $N = 2000$).

The institution can estimate an MC error on $\widehat{EEPE_N}(\alpha)$, on the basis of a 95% confidence level, by using a set of several MC runs. In what follows, notations are simplified: $\widehat{EEPE_N}(\alpha)$ is replaced by $\widehat{EEPE}$; α and N are dropped, since the calculations detailed below are performed on the same netting set α and with the same number of simulations per MC run, N.

Furthermore, let m denote the size of the set of MC runs (e.g. $m = 50$). The different MC runs are obtained by running the MC simulation with different random numbers (e.g. by using different seeds).

The MC error on $\widehat{EEPE}$ calculated with method 1 is defined as:

$$\widehat{error}_{M1}\left(\widehat{EEPE}\right) \coloneqq \Phi^{-1}(0.975) \cdot convAdj(m) \cdot \sqrt{\widehat{var}_{M1}\left(\widehat{EEPE}\right)}$$
$$\simeq 1.96 \cdot convAdj(m) \cdot \sqrt{\widehat{var}_{M1}\left(\widehat{EEPE}\right)},$$

with

$$\widehat{var}_{M1}\left(\widehat{EEPE}\right) \coloneqq \frac{1}{m-1}\sum_{k=1}^{m}\left(\widehat{EEPE}^{k} - \frac{1}{m}\sum_{l=1}^{m}\widehat{EEPE}^{l}\right)^2;$$

- $\widehat{EEPE}^{k}$ denoting the estimation of $EEPE$ using the *k*-th run of the MC run set;
- Φ^{-1} standing for the inverse cumulative function of a standard normal distribution.

By using $\Phi^{-1}(0.975) \approx 1.96$, we arrive at the following error formula:

$$\widehat{error}_{M1}\left(\widehat{EEPE}\right) \coloneqq 1.96 \cdot convAdj(m) \cdot \sqrt{\frac{1}{m-1}\sum_{k=1}^{m}\left(\widehat{EEPE}^{k} - \frac{1}{m}\sum_{l=1}^{m}\widehat{EEPE}^{l}\right)^2}$$

The rationale of this formula is as follows.

If we assume that $\widehat{EEPE}$ follows a normal distribution, $\widehat{error}_{M1}\left(\widehat{EEPE}\right)$ can be interpreted as half of the length of the 95% two-sided confidence interval centred around $\widehat{EEPE}$. More precisely, it is estimated through a three-step approach:

1. $\Phi^{-1}(0.975)\sqrt{var\left(\widehat{EEPE}\right)}$ is half of the length of the 95% two-sided confidence interval centred around $\widehat{EEPE}$, since we have:

   $$P\left(EEPE \in \left[\widehat{EEPE} - \Phi^{-1}(0.975)\sqrt{var\left(\widehat{EEPE}\right)},\right.\right.$$
   $$\left.\left.\widehat{EEPE} + \Phi^{-1}(0.975)\sqrt{var\left(\widehat{EEPE}\right)}\right]\right) = 95\%.$$

2. $\sqrt{var\left(\widehat{EEPE}\right)}$ being unknown, it is approximated by $\sqrt{\widehat{var}_{M1}\left(\widehat{EEPE}\right)}$. The length of the two-sided 95% confidence interval, $\Phi^{-1}(0.975)\sqrt{var\left(\widehat{EEPE}\right)}$, is then approximated by $\Phi^{-1}(0.975)\sqrt{\widehat{var}_{M1}\left(\widehat{EEPE}\right)}$.

3. However, one must take into account that whenever m is too small (e.g. $m < 50$), $\widehat{var}_{M1}\left(\widehat{EEPE}\right)$ may not have properly converged to $var\left(\widehat{EEPE}\right)$. Finally, $\Phi^{-1}(0.975)\sqrt{var\left(\widehat{EEPE}\right)}$ is estimated by
   $\Phi^{-1}(0.975) \cdot convAdj(m) \cdot \sqrt{\widehat{var}_{M1}\left(\widehat{EEPE}\right)}$,

where· $convAdj(m)$ takes into account the fact that $\widehat{var_{M1}}(\widehat{EEPE})$ may not have properly converged to $var(\widehat{EEPE})$.

Details of $convAdj(m)$:

The parameter $convAdj(m)$ is chosen such that

$$P\left(\sqrt{var(\widehat{EEPE})} < convAdj(m)\sqrt{\widehat{var_{M1}}(\widehat{EEPE})}\right) = 95\%$$

holds. More precisely, still under the assumption that $\widehat{EEPE}$ has a normal distribution, one can write:

$$\frac{m-1}{var(\widehat{EEPE})}\widehat{var_{M1}}(\widehat{EEPE}) \sim \chi^2_{m-1} \quad (1)$$

where χ^2_{m-1} denotes a standard chi-squared distribution with $m-1$ degrees of freedom.

From (1), we get $P\left(var(\widehat{EEPE}) < convAdj(m)^2\ \widehat{var_{M1}}(\widehat{EEPE})\right) = 95\%$ with

- $convAdj(m) = \sqrt{\frac{m-1}{q(m-1;97.5\%)}}$,
- $q(m-1;97.5\%)$ is such that $P(q(m-1;97.5\%) \leq Z) = 97.5\%$ with $Z \sim \chi^2_{m-1}$.

A.2 Method 2

As in the previous section, we denote $\widehat{EEPE_N}(\alpha)$ as the estimator of the EEPE for one given netting set α obtained from one MC run with N simulations (e.g. N = 2000) and, as in the previous section, we simplify the notation $\widehat{EEPE_N}(\alpha)$ as $\widehat{EEPE}$.

The second method to estimate the error on $\widehat{EEPE}$ is a method where only one MC run is needed (contrary to method 1 where a set of m MC runs was needed).

Before presenting the method for the estimation of the MC error, let us detail some definitions and notations. For any time point t_k of the time grid used for exposure calculations, we denote $E(t_k)$ as the netting set exposure at time t_k and $EE(t_k)$ as its expected value. Let $\widehat{EE}(t_k)$ be the estimator of $EE(t_k)$ based on the MC run, i.e.

$$\widehat{EE}(t_k) = \frac{1}{N}\sum_{j=1}^{N} E_j(t_k),$$

where $E_j(t_k)$ stands for the netting set exposure level at time t_k for scenario *j*.

The following equations holds if the EEPE is not dominated by the current exposure $E(t_0)$, meaning there is at least one t_k below one year with $E(t_0) < \widehat{EE}(t_k)$, otherwise the numerical error of the EEPE is in any case zero. For the sake of simplicity, it is also assumed that $EE(t_0) < \widehat{EE}(t_1)$.

The *effective reference dates* are the subset of dates t_k among the simulation dates $(t_h)_{h>0}$ such that

$$EE(t_k) > \max_{0 \le h < k} EE(t_h) .$$

Let us denote $(s_u)_u$ these effective reference dates with

$$s_1 < s_2 < \cdots < s_u < \cdots < s_p \le t_{1y} ,$$

i.e. p dates.

For the given MC run, the estimated effective reference dates are the subset of dates t_k among the simulation dates $(t_h)_{h>0}$ such that:

$$\widehat{EE}(t_k) > \max_{0 \le h < k} \widehat{EE}(t_h)$$

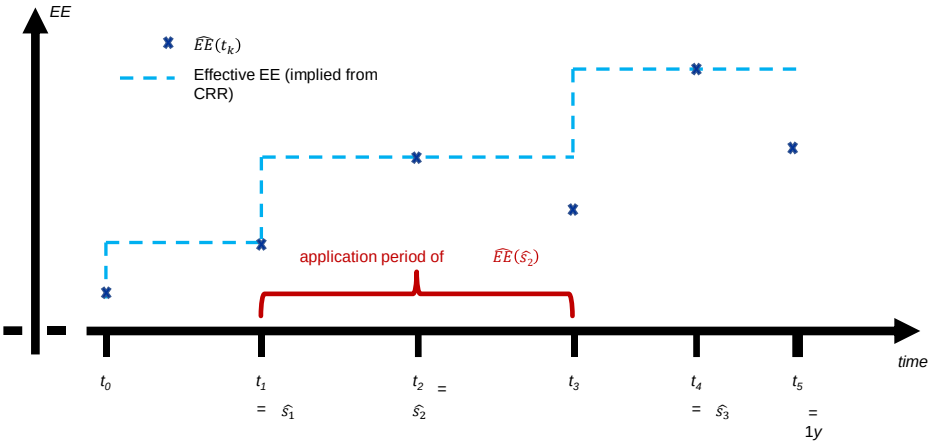
Let us denote $(\hat{s}_u)_u$ these estimated (i.e. as resulting from an MC simulation) effective reference dates with:

$$\hat{s}_1 < \hat{s}_2 < \cdots < \hat{s}_u < \cdots < \hat{s}_{\hat{p}} \le t_{1y}$$

i.e. $\hat{p}$ dates.

$\widehat{EEPE}$ depends only on the $\left(\widehat{EE}(\hat{s}_u)\right)_u$ and the time profile of effective EE values as defined in Article 284(5) of the CRR. More precisely, it is fully determined by $\widehat{EE}(\hat{s}_u)$, as can be seen by the following schematic graph:

Chart A1
Estimate of EEPE



The method below relies on the assumption, which should be checked by the institution when applying the method, that N is large enough such that all $\widehat{EE}(t_k)$ are "sufficiently close" to their true values $EE(t_k)$ and that, as a consequence, the effective reference dates are properly identified, i.e. $(\hat{s}_u)_u = (s_u)_u$.

Under the complementary assumptions that $s_p \neq t_{1y}$, and considering, as previously mentioned, that $(\widehat{s_u})_u = (s_u)_u$, $\widehat{EEPE}$ is given by:[401]

$$\widehat{EEPE} = \sum_{u=1}^{p-1}(v_u - v_{u-1})\widehat{EE}(s_u) + (t_{1y} - v_{p-1})\widehat{EE}(s_p)$$
$$= \frac{1}{N}\sum_{j=1}^{N}\left[\sum_{u=1}^{p-1}(v_u - v_{u-1})E_j(s_u) + (t_{1y} - v_{p-1})E_j(s_p)\right].$$

Where $(v_u)_u$ are the "application period dates": they are such that $[\, v_{u-1},\, v_u \,]$ is the period $\widehat{EE}(s_u)$ is applied to. For instance, for the case illustrated in the graph above, $\widehat{EE}(s_2)$ is applied on $[t_1\,,\, t_3]$, and thus $v_1 = t_1$ and $v_2 = t_3$.

Let us define, for each scenario j from 1 to N:

$$D_j := \sum_{u=1}^{p-1}(v_u - v_{u-1})E_j(s_u) + (t_{1y} - v_{p-1})E_j(s_p)$$

By definition of D_j, we have $\widehat{EEPE} = \frac{1}{N}\sum_{j=1}^{N} D_j$.

For $D := \sum_{u=1}^{p-1}(v_u - v_{u-1})E(s_u) + (t_{1y} - v_{p-1})E(s_p)$, the variance of D can be estimated by:

$$\widehat{var}(D) = \frac{1}{N-1}\sum_{j=1}^{N}\left(D_j - \frac{1}{N}\sum_{k=1}^{N} D_k\right)^2 = \frac{1}{N-1}\sum_{j=1}^{N}\left(D_j - \widehat{EEPE}\right)^2.$$

Note: cases where $E(t_0) \geq \widehat{EE}(t_1)$ and/or $s_p = t_{1y}$ are not derived in this annex. However similar equations can be obtained.

An estimator of the variance of $\widehat{EEPE}$ is then given by:

$$\widehat{var_{M2}}\left(\widehat{EEPE}\right) = \frac{1}{N}\widehat{var}(D) = \frac{1}{N(N-1)}\sum_{j=1}^{N}\left(D_j - \widehat{EEPE}\right)^2.$$

As mentioned in the first footnote of paragraph 58 requiring a statistical error at a 95% confidence level, the estimation of the MC error on $\widehat{EEPE}$ should be calculated according to the following formula:

$$\widehat{error}_{M2}\left(\widehat{EEPE}\right) := \Phi^{-1}(0.975)\sqrt{\widehat{var}_{M2}\left(\widehat{EEPE}\right)}$$
$$\simeq 1.96 \cdot \sqrt{\frac{1}{N(N-1)}\sum_{j=1}^{N}\left(D_j - \widehat{EEPE}\right)^2}.$$

The rationale of the formula is the same as that outlined in method 1, with a different estimator of the variance of $\widehat{EEPE}$ and without a convergence adjustment. If we assume that $\widehat{EEPE}$ follows a normal distribution, then $\widehat{error}_{M2}\left(\widehat{EEPE}\right)$ can be interpreted as half of the length of the 95% two-sided confidence interval centred

[401] This assumes the longest-lasting transaction in the netting set has a maturity equal to or higher than one year and all time differences in the above formulas are expressed in units of a year (not dividing by the minimum between 1y and the netting set maturity for simplicity) – otherwise the normalised weighting as described in paragraph 86 needs to be applied.

around $\widehat{EEPE}$. No adjustment (similar to $convAdj(.)$ in the first method) is needed, since for usual values of N, we have $convAdj(N)$ close to 1, e.g. $convAdj(500) \simeq 1.067$ and $convAdj(1000) \simeq 1.046$.

A.3 Aggregation across netting sets

a) When risk factors are simulated all together (no "silo"), the MC error of the estimator of the EEPE for the full scope should be calculated in a similar way to that described for a single netting set, except that $\widehat{EEPE}_N$ should be understood as the sum of the estimators of the EEPE related to all netting sets belonging to the institution's portfolio. Assume that a set of n netting sets $A = \{\alpha_1, \dots, \alpha_n\}$ is available for the MC error analysis.

This means for **method 1** that

$$\widehat{var}_{M1}\left(\widehat{EEPE}_N\right) = \frac{1}{m-1}\sum_{k=1}^{m}\left(\sum_{\alpha_i \in A}\widehat{EEPE}_N^k(\alpha_i) - \frac{1}{m}\sum_{l=1}^{m}\sum_{\alpha_i \in A}\widehat{EEPE}_N^l(\alpha_i)\right)^2$$

should be inserted into the equation for $\widehat{error}_{M1}\left(\widehat{EEPE}\right)$.

For **method 2**, the addition needs to happen at the netting set-specific D term.

$$D_j = \sum_{\alpha_i \in A} D_j(\alpha_i)$$

should be inserted into the equation for $\widehat{var}_{M2}\left(\widehat{EEPE}_N\right)$ to calculate the variance, then this should be inserted into the equation for $\widehat{error}_{M2}\left(\widehat{EEPE}_N\right)$.

b) When risk factors are not simulated all together (in cases where exposures are estimated through "silos", e.g. one per asset class), the MC error should be derived from the MC errors of $\widehat{EEPE}_N$ per silo. Using either method 1 or 2 for computing the MC error per silo as explained immediately above (item a), the error on the total portfolio is then given by:

$$\widehat{error}_{\substack{M1\\M2}}\left(\widehat{EEPE}_N \; of \; total \; portfolio\right) = \sqrt{\sum_{i=1}^{S}\left(\widehat{error}_{\substack{M1\\M2}}\left(\widehat{EEPE}_N \; of \; silo_i\right)\right)^2},$$

where

- S is the total number of silos,
- $silo_i$ is a sub-portfolio of the institution's total portfolio corresponding to all the netting sets simulated in silo i.

Acronyms

BCBS	Basel Committee on Banking Supervision
CCF	Conversion factor
CCR	Counterparty credit risk
CF	Cash flow
EAD	Exposure at default
EBA	European Banking Authority
ECB	European Central Bank
EL	Expected loss
ELBE	Expected loss best estimate
EU	European Union
IRB	Internal ratings-based
IT	Information technology
LGD	Loss given default
M	Maturity parameter
OTC derivative	Over-the-counter derivative
SME	Small and medium-sized enterprise
PD	Probability of default
RR	Recovery rate
RTS	Regulatory Technical Standards
RWA	Risk-weighted asset
RWEA	Risk-weighted exposure amount
SSM	Single Supervisory Mechanism
TRIM	Targeted review of internal models

Glossary

General topics

Basel Committee on Banking Supervision (BCBS) 328
Basel Committee on Banking Supervision "Guidelines: Corporate governance principles for banks"

Basel Committee on Banking Supervision (BCBS) - Newsletter No. 4
Basel Committee Newsletter No. 4 (January 2005), "Update on work of the Accord Implementation Group related to validation under the Basel II Framework"

Basel Committee on Banking Supervision (BCBS) - Newsletter No. 9
Basel Committee Newsletter No. 9 (September 2006), "The IRB Use Test: Background and Implementation"

Basel Committee on Banking Supervision (BCBS) - Regulatory consistency assessment programme (RCAP)
Basel Committee on Banking Supervision "Regulatory Consistency Assessment Programme (RCAP) – Analysis of risk-weighted assets for credit risk in the banking book"

Commission Delegated Regulation (EU) No 529/2014
Commission Delegated Regulation (EU) No 529/2014 of 12 March 2014 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for assessing the materiality of extensions and changes of the Internal Ratings Based Approach and the Advanced Measurement Approach (OJ L 148, 20.5.2014, p. 36)

Commission Delegated Regulation (EU) No 2022/439
Commission Delegated Regulation (EU) 2022/439 of October 2021 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for the specification of the assessment methodology competent authorities are to follow when assessing the compliance of credit institutions and investment firms with the requirements to use the Internal Ratings Based Approach (OJ L 90, 18.3.2022, p. 1).

CRCU
Credit risk control unit

CRD
Directive 2013/36/EU of the European Parliament and the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC (OJ L 176, 27.6.2013, p. 338)

CRR
Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 (OJ L 176, 27.6.2013, p. 1). For the purposes of this document, the reader's attention is also drawn to the corrigendum published on 30 November 2013 (OJ L 321, 30.11.2013, p. 6)

EBA Consultation Paper 2014/10
Consultation Paper "Draft regulatory technical standards on the sequential implementation of the IRB Approach and permanent partial use under the Standardised Approach under Articles 148(6), 150(3) and 152(5) of Regulation (EU) No 575/2013 (CRR)" (EBA/CP/2014/10)

EBA Guidelines on internal governance
Guidelines on internal governance (EBA/GL/2017/11)

EBA Guidelines on Outsourcing
EBA Guidelines on outsourcing (EBA/GL/2019/02)

EBA Guidelines on SREP
EBA Guidelines on common procedures and methodologies for the supervisory review and evaluation process (SREP) and supervisory stress testing under Directive 2013/36/EU (EBA/GL/2022/03)

Final draft RTS on assessment methodology for IMA and significant share
Final draft Regulatory Technical Standards on the specification of the assessment methodology for competent authorities regarding compliance of an institution with the requirements to use internal models for market risk and assessment of significant share under points (b) and (c) of Article 363(4) of Regulation (EU) No 575/2013 (EBA/RTS/2016/07)

G-SII
Global systemically important institution

KPI
Key performance indicator

IFRS
International Financial Reporting Standards

O-SII
Other systemically important institution

PPU
Permanent partial use

RDS
Reference dataset

RORAC
Return on risk-adjusted capital

SA
Standardised approach

SLA
Service level agreement

SSCA
Supervisory slotting criteria approach

SSM Regulation
Council Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions (OJ L 287, 29.10.2013, p. 63)

Credit risk

Basel Committee on Banking Supervision (BCBS) 239
Basel Committee on Banking Supervision "Principles for effective risk data aggregation and risk reporting"

Commission Delegated Regulation (EU) No 529/2014
Commission Delegated Regulation (EU) No 529/2014 of 12 March 2014 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for assessing the materiality of extensions and changes of the Internal Ratings Based Approach and the Advanced Measurement Approach (OJ L 148, 20.5.2014, p. 36)

Commission Delegated Regulation (EU) No 2021/930
Commission Delegated Regulation (EU) 2021/930 of 1 March 2021 supplementing the CRR with regard to regulatory technical standards specifying the nature, severity and duration of an economic downturn referred to in Article 181(1), point (b), and Article 182(1), point (b), of that Regulation (OJ L 204, 10.6.2021, p. 1)

Commission Delegated Regulation (EU) No 2022/439
Commission Delegated Regulation (EU) 2022/439 of October 2021 supplementing Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to regulatory technical standards for the specification of the assessment methodology competent authorities are to follow when assessing the compliance of credit institutions and investment firms with the requirements to use the Internal Ratings Based Approach (OJ L 90, 18.3.2022, p. 1)

CRM
Credit risk mitigation

CRR
Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 (OJ L 176, 27.6.2013, p. 1). For the purposes of this document, the reader's attention is also drawn to the corrigendum published on 30 November 2013 (OJ L 321, 30.11.2013, p. 6)

EBA Guidelines for the estimation of LGD appropriate for an economic downturn ("Downturn LGD estimation")
EBA Guidelines for the estimation of LGD appropriate for an economic downturn ("Downturn LGD estimation") (EBA/GL/2019/03)

EBA Guidelines on DoD
EBA Guidelines on the application of the definition of default under Article 178 of Regulation (EU) No 575/2013 (EBA/GL/2016/07)

EBA Guidelines on PD and LGD
EBA Guidelines on PD estimation, LGD estimation and the treatment of defaulted exposures (EBA/GL/2017/16)

EBA Guidelines on SRT
EBA Guidelines on Significant Credit Risk Transfer relating to Articles 243 and Article 244 of Regulation 575/2013 (EBA/GL/2014/05)

ECB Regulation on options and discretions
Regulation (EU) 2016/445 of the European Central Bank of 14 March 2016 on the exercise of options and discretions available in Union law (ECB/2016/4) (OJ L 78, 24.3.2016, p. 60)

Corrigendum to the ECB Regulation on discretion on materiality threshold
Corrigendum to Regulation (EU) 2018/1845 of the European Central Bank of 21 November 2018 on the exercise of the discretion under Article 178(2)(d) of Regulation (EU) No 575/2013 in relation to the threshold for assessing the materiality of credit obligations past due (ECB/2018/26) (Official Journal of the European Union L 299 of 26 November 2018) (OJ L 217 08.07.2020, p. 8)

ECB Regulation on discretion on materiality threshold
Regulation (EU) 2018/1845 of the European Central Bank of 21 November 2018 on the exercise of the discretion under Article 178(2)(d) of Regulation (EU) No 575/2013 in relation to the threshold for assessing the materiality of credit obligations past due (ECB/2018/26) (OJ L 299, 26.11.2018, pp. 55-57)

F-IRB
Foundation IRB

GDP
Gross domestic product

LRA
Long-run average

MoC
Margin of conservatism

NACE
Nomenclature statistique des activités économiques dans la Communauté Européenne

NUTS
Nomenclature of territorial units for statistics

SRM
Shadow rating model

Market risk

Actual P&L
The daily actual changes in the portfolio's value, as defined in Article 366(3) of the CRR.

AVA
Additional valuation adjustment

CIU
Collective investment undertaking

CVA
Credit valuation adjustment

CRM
Comprehensive risk measure

DVA
Debit valuation adjustment

Economic P&L
The daily changes in the portfolio's value (or profit and loss, P&L) calculated on the basis of end-of-day mark-to-market or mark-to-model (depending on the instruments) values of the books and records of the institution, taking into account the independent price verification (IPV) process. It is generally calculated using front-office systems (position data, pricing models, valuation methods, pricing parameters, end-of-day market data, etc.).

ETF
Exchange-traded fund

FX
Foreign exchange

Fundamental review of the trading book (FRTB)
The document entitled "Minimum capital requirements for market risk" issued by the Basel Committee on Banking Supervision (BCBS) in January 2019

Hypothetical P&L
The daily hypothetical changes in the portfolio's value, as defined in Article 366(3) of the CRR

IMA
The internal model approach for the calculation of own funds requirements for market risk

IRC
Incremental default and migration risk charge

P&L
The daily changes in the portfolio's value (or profit and loss)

Position
Understood to be a risk position. A risk position is a non-identically-zero sensitivity to a risk factor. Holding securities or entering into transaction contracts entails having a position. When defining a position, neither hedging nor netting should be considered.

Top-of-the-house level
Both (i) the legal entity for which an approval for the IMA approach has been granted, and (ii) (within the scope of the IMA) the highest level of the portfolio structure.

RNIME
Risk(s) not-in-the-model engines, as set out in detail in Section 7 of the market risk chapter. In this document, the abbreviation "RNIME" may be singular or plural depending on whether it refers to a single risk, several risks, or collectively all risks not captured in the model engines.

VaR
Value-at-risk

sVaR
Stressed VaR

Counterparty credit risk

Benchmarking system
In the context of pricing functions mentioned in the guide, this means the respective front-office pricing functions, pricing functions of accounting systems or other benchmarks with which front-office prices are frequently compared (at least quarterly, as for CCR purposes). Values taken from such benchmarking systems are values after independent price verification (see Article 4(70) of the CRR) without any valuation adjustments beyond the default-free value (such as the credit valuation adjustment).

DMP
Default management process

EEPE
Effective expected positive exposure

ETC
Early termination clause

IM
Initial margin

IMM
Internal Model Method for counterparty credit risk

MPOR
Margin period of risk

Pricing function
A dedicated implementation of a pricing model taking into account:

- the input data used in this particular implementation (e.g. the input market data needed, day-count conventions, etc.);
- the parametrisation of the implemented pricing model including the method for its calibration;
- the numerical method used (e.g. binomial tree, finite difference, Monte Carlo, etc.).

Pricing model
The quantitative, mathematical model (e.g. a Black 76 swaption) that is used to determine the market value of a transaction for a given (current or future) date and specified market conditions/scenarios.

Representative sub-portfolios
A subset of all counterparties or netting sets that is representative of the full set at least in terms of:

- transaction types and their "moneyness";
- underlying risk factors;
- the ratio of the value of short positions to the value of long positions;
- margin agreement types;
- the ratio of margined to unmargined netting sets;

and for which the institution is able to demonstrate to supervisors that the chosen sub-portfolios are sufficiently representative in terms of the above criteria and meaningful regarding the purpose for which the portfolio has been selected.

RNIEPE
Risk(s) not in effective expected positive exposure, as set out in detail in Section 13 of the counterparty credit risk chapter. In this document, the abbreviation "RNIEPE" may be singular or plural depending on whether it refers to a single risk, several risks, or collectively all risks inside the IMM which are not yet part of the EEPE or are not adequately captured in EEPE.

Securities financing transactions (SFTs)
This term covers repurchase agreements, margin lending and borrowing agreements, as well as securities and commodities lending and borrowing agreements. It thus encompasses all products covered by Article 272(25)(a) and (b) of the CRR.

t_0
The first date of the simulation time grid in the IMM and the reporting date for which the EEPE is calculated. It is thus equal to the "current date" referred to in Article 284(5) of the CRR.

Systematically underestimated exposures
This expression means a progressive, aggressive or non-conservative modelling of exposures in *almost all cases* compared with a precise treatment without approximations, which may refer to *almost all cases* of:

- simulated scenarios;
- portfolio configurations;
- market conditions at t_0;
- market conditions during the period used for calibration.

This holds to the extent that "*almost all cases*" can be anticipated from past experience or historic time series. Otherwise, this expression refers to an a priori estimation, for example resulting from a mathematical consideration. Example: A model implementation approximates the true value of a bought vanilla call option inside a netting set by its intrinsic value (the value if exercised). Since the true value is always more than the intrinsic value before exercising the option, this modelling would lead to too low a transaction value and thus to too low a netting set value; hence, in this specific example, "*almost all cases*" changes even to "always".

If the expression is used in the context of the netting set value, it means that modelling/pricing leads in almost all cases to too low an overall netting set value, i.e. after applying the netting rules. If it is used in the context of single transaction values, it means that transactions with a positive value have in almost all cases too low a value and that transactions with a negative value (if they are also inside a netting set) have, in almost all cases, too high an absolute value compared with a precise treatment.

Validation function
This expression denotes the staff responsible for performing tasks and setting up processes relevant for the independent initial and ongoing model validation, including ongoing reviews of the CCR exposure model and its risk measures. In particular, the term refers to both qualitative and quantitative validation, with the latter also including back-testing of the CCR exposure model.

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For specific terminology please refer to the SSM glossary (available in English only).

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