

Internal audit of IRB models

Setkání interních auditorů z finančního
sektoru

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The EY logo consists of the letters 'EY' in a bold, white, sans-serif font. A yellow diagonal line is positioned above the 'Y'.

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Agenda

1. Regulatory requirements
2. IRB in credit risk
3. Model lifecycle and role of internal audit
4. Common findings
5. Q&A

Regulatory requirements

Capital Requirements Regulation 575/2013 (CRR)

Article 191

Internal audit

Internal audit or another comparable independent auditing unit **shall review at least annually** the institution's rating systems and its operations, including the operations of the credit function and the estimation of PDs, LGDs, ELs and conversion factors.

Areas of review shall include adherence to all applicable requirements.

Relevant regulatory requirements / guidelines for internal audit

- Directive 2013/36/EU, as amended by Directive 2019/878/EU
 - *“... reinforces the governance requirements for institutions and in particular, stresses the responsibility of the management body for sound governance arrangements ...”*
- EBA Guidelines on internal governance (mandated by Article 74(3) of Directive 2013/36/EU)
 - *“... harmonise institutions’ internal governance arrangements, processes and mechanisms ...”*
 - *“... ensuring the sound management of risks across all three lines of defence”*
 - **Section 22 Internal audit function (“IAF”) - Articles 214 - 224**
 - *“the institution should ensure that the **qualification of the IAF’s staff members and the IAF’s resources, in particular its auditing tools and risk analysis methods, are adequate for the institution’s size and locations**”*
 - *“the **IAF should, following a risk-based approach, independently review and provide objective assurance of the compliance of all activities and units of an institution, including outsourced activities, with the institution’s policies and procedures and with regulatory requirements**”*
 - *The **IAF should verify, in particular, the integrity of the processes ensuring the reliability of the institution’s methods and techniques, and the assumptions and sources of information used in its internal models (e.g. risk modelling and accounting measurements). It should also evaluate the quality and use of qualitative risk identification and assessment tools and the risk mitigation measures taken.***

Relevant regulatory requirements / guidelines for IRB models

- RTS on Assessment Methodology for IRB
 - *“... set out **standards for competent authorities** in assessing an institution’s compliance with minimum IRB requirements ...”*
- ECB Guide to internal models (IA: articles 9, 21-24, 133, Section 5, see Annex)
 - *... provides **transparency on how the ECB understands those rules** and how it intends to apply them when assessing whether institutions meet these requirements ...”*
- ECB Instructions for reporting the validation results of internal models
 - *“(i) describe the background for the requested reporting of the significant credit institutions' validation results”*
 - *“(ii) explain the **supplementary validation reporting using common metrics** to assess Pillar I models for credit risk introduced by the Decisions”*
- EBA Guidelines on PD estimation, LGD estimation and the treatment of defaulted exposures
 - *“... to **reduce unjustified variability** of risk parameters and own funds requirements ...”*
 - *“... to **reduce the unwarranted variability** in capital requirements stemming from differences in model practices ...”*

Regulatory capital requirements

Capital requirement

$$8 \% * \text{risk weighted assets} = 8 \% * \text{risk weight} * \text{exposure}$$

Standardized approach

Internal rating based (IRB) approach

- Risk weights given by regulator
- Bank can use own models for setting of off-balance exposure

- Risk weight depends on Probability of Default (PD) and Loss Given Default (LGD) parameters

Foundation IRB approach

- Bank estimates PD
- Other parameters given by regulator
- Allowed only for non-retail

Advanced IRB approach

- Bank estimates PD
- Bank estimates LGD
- Bank estimates CCF
- Mandatory for retail



IRB approach better reflects risks of the Bank, but it is more complex

Capital requirement formula

Sovereign, bank and corporate exposures

- For illustration / completeness, below is the capital requirement formula

$$\text{Capital requirement (percentage)}^* \quad K = \left[LGD * N \left[\frac{N^{-1}(PD) + \sqrt{R} * N^{-1}(0.999)}{\sqrt{1-R}} \right] - PD * LGD \right] * \frac{1 + (M - 2.5) * b}{1 - 1.5 * b} * 1.06^\#$$

$$\text{Correlation} \quad R = 0.12 * \frac{1 - \exp(-50 * PD)}{1 - \exp(-50)} + 0.24 * \left(1 - \frac{1 - \exp(-50 * PD)}{1 - \exp(-50)} \right)$$

$$\text{Maturity adjustment} \quad b = (0.11852 - 0.05478 * \ln(PD))^2$$

$$\text{Risk-weighted assets} \quad RWA = K * 12.5 * EAD$$

N denotes the cumulative distribution function of the standard normal distribution,

N^{-1} denotes the inverse of the cumulative distribution function of the standard normal distribution.

Components of credit risk

PD

- Probability of Default: The likelihood the borrower will default on its obligation either over the life of the obligation or over some specified horizon.

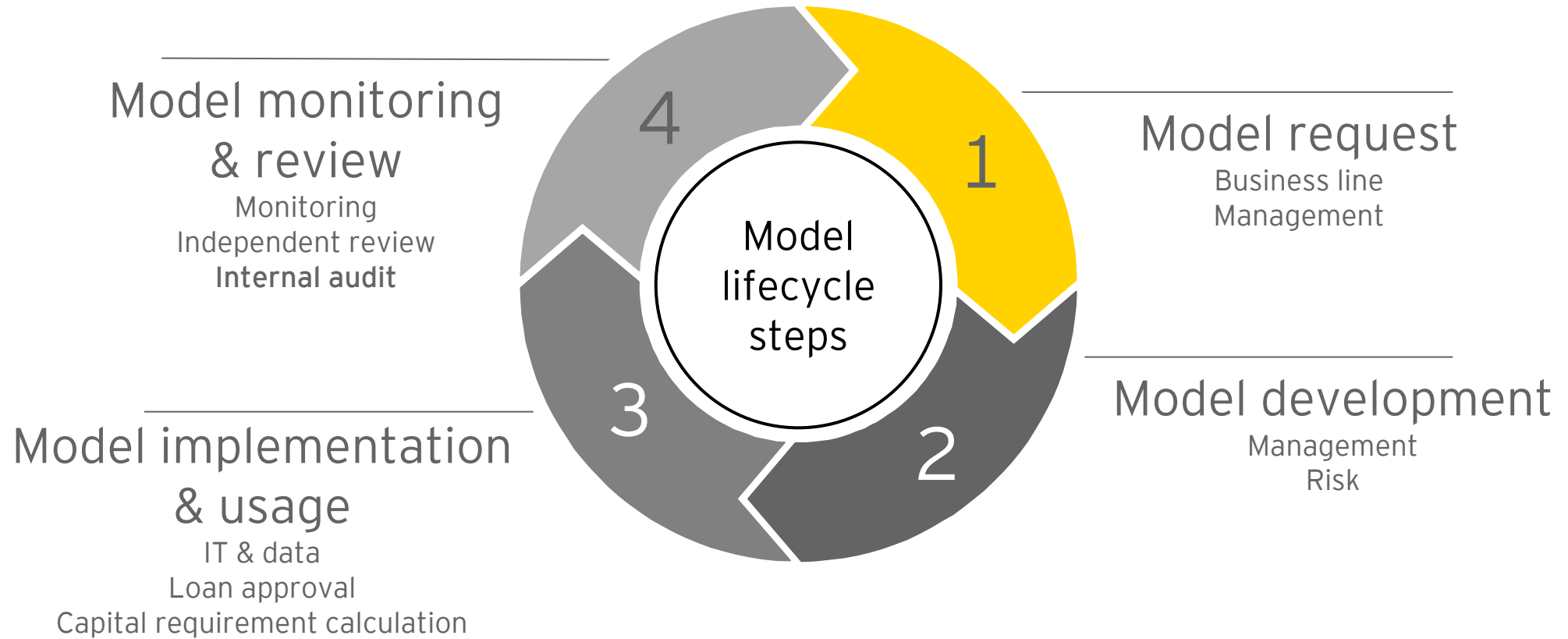
EAD

- Exposure at Default: The exposure that the borrower would have at default. Takes into account both on-balance sheet (capital) and off-balance sheet (unused lines, derivatives or repo transactions) exposures.

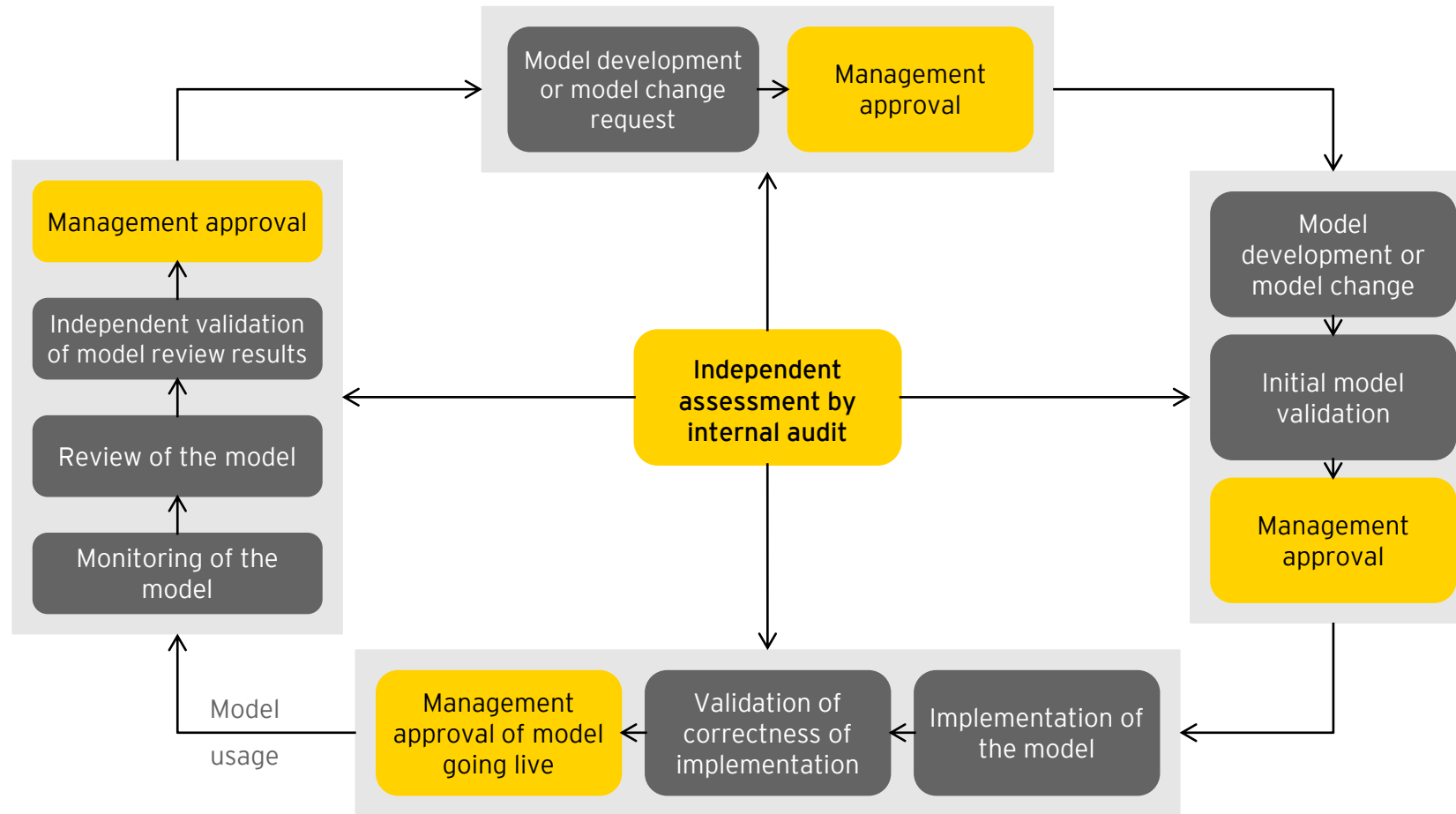
LGD

- Loss Given Default: Loss that lender would incur in the event of borrower default. It is the exposure that cannot be recovered through bankruptcy proceedings or some other form of settlement. Usually expressed as a percentage of exposure at default.

Model lifecycle



Model lifecycle - Internal audit role



Common findings by internal audit

- Documentation
 - Not sufficiently detailed to allow replication
 - Missing mandatory sections
- Model governance is not adhered to
 - Latest version of data/codes/documentation is not available
 - Sign-offs are missing
- Data related deficiencies
 - Insufficient data quality checks
 - Data extraction by validation team is not independent
- Development / Validation methodology not adhered to
 - Development / validation step is missing / deviated from
 - Model results not sufficient (passing the required thresholds)
- *Replication of the model is not possible*

Questions & answers

Any questions?



Annex - EBA Guidelines on internal governance - Section 22 - Internal audit

- Article 214
- Institutions should set up an independent and effective internal audit function (IAF), taking into account the proportionality criteria set out in Title I, and should appoint a person to be responsible for this function across the entire institution. The IAF should be independent and have sufficient authority, stature and resources. In particular, the institution should ensure that the qualification of the IAF's staff members and the IAF's resources, in particular its auditing tools and risk analysis methods, are adequate for the institution's size and locations, and the nature, scale and complexity of the risks associated with the institution's business model, activities, risk culture and risk appetite.
- Article 215
- The IAF should be independent of the audited activities. Therefore, the IAF should not be combined with other functions.

Annex - EBA Guidelines on internal governance - Section 22 - Internal audit

- Article 216
- The IAF should, following a risk-based approach, independently review and provide objective assurance of the compliance of all activities and units of an institution, including outsourced activities, with the institution's policies and procedures and with regulatory requirements. Each entity within the group should fall within the scope of the IAF.
- Article 217
- The IAF should not be involved in designing, selecting, establishing and implementing specific internal control policies, mechanisms and procedures, and risk limits. However, this should not prevent the management body in its management function from requesting input from internal audit on matters related to risk, internal controls and compliance with applicable rules.

Annex - EBA Guidelines on internal governance - Section 22 - Internal audit

- Article 218
- The IAF should assess whether the institution's internal control framework as set out in Section 15 is both effective and efficient. In particular, the IAF should assess:
 - a. the appropriateness of the institution's governance framework;
 - b. whether existing policies and procedures remain adequate and comply with legal and regulatory requirements and with the risk strategy and risk appetite of the institution;
 - c. the compliance of the procedures with the applicable laws and regulations and with decisions of the management body;
 - d. whether the procedures are correctly and effectively implemented (e.g. compliance of transactions, the level of risk effectively incurred, etc.); and
 - e. the adequacy, quality and effectiveness of the controls performed and the reporting done by the defence business units and the risk management and compliance functions.

Annex - EBA Guidelines on internal governance - Section 22 - Internal audit

- Article 219
- The IAF should verify, in particular, the integrity of the processes ensuring the reliability of the institution's methods and techniques, and the assumptions and sources of information used in its internal models (e.g. risk modelling and accounting measurements). It should also evaluate the quality and use of qualitative risk identification and assessment tools and the risk mitigation measures taken.
- Article 220
- The IAF should have unfettered institution-wide access to all the records, documents, information and buildings of the institution. This should include access to management information systems and minutes of all committees and decision-making bodies.

Annex - EBA Guidelines on internal governance - Section 22 - Internal audit

- Article 221
- The IAF should adhere to national and international professional standards. An example of the professional standards referred to here is the standards established by the Institute of Internal Auditors.
- Article 222
- Internal audit work should be performed in accordance with an audit plan and a detailed audit programme following a risk-based approach.

Annex - EBA Guidelines on internal governance - Section 22 - Internal audit

- Article 223
- An internal audit plan should be drawn up at least once a year on the basis of the annual internal audit control objectives. The internal audit plan should be approved by the management body.
- Article 224
- All audit recommendations should be subject to a formal follow-up procedure by the appropriate levels of management to ensure and report on their effective and timely resolution.

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 74
- 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.
- Article 75
- 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 76 to 78, and executes this plan.

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 76
- Depending on the outcome of the general risk assessment, the intensity and frequency of the audit assignments may differ between specific areas.
 - (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.

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 77
- 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 and performance 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, 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.

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 77
- 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
 - (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

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 78
- The procedures and results of the general risk assessment and prioritisation, the annual work plan, the guidelines, and the subsequent production of the 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

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 79
- 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 standardised approach, 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.

Annex - ECB Guide to internal models - Section 5 - Internal audit

- Article 80
- For extensions and changes to the IRB approach, institutions must submit, among other things, reports of their independent review or validation. In the case of material changes in the validation methodology and/or validation processes or process-related aspects of material changes, including changes in the definition of default, the review of those aspects should be subject to an independent assessment by the internal audit function before they are submitted to the competent authority for approval

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