



Refinement of the ECB guide to internal models

Risk type-specific chapters

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01 Executive summary

In the wake of the financial crisis the use of internal models to determine regulatory capital requirements came under heightened regulatory and supervisory scrutiny. The reasons for this were twofold.

Firstly, internal models are becoming more and more complex due to detailed regulatory requirements, making them hard to monitor and maintain.

Secondly, the outcome of numerous studies indicated potential irregularities and high variability in the calculation of capital requirements using internal models between banks with similar portfolios.

To counter these issues, the European Central Bank (ECB) launched the targeted review of internal models (TRIM) project that assesses the reliability and comparability of banks' Pillar 1 internal models with respect to the regulatory requirements. By improving comparability, the ECB aims to reduce non-risk based variability in risk-weighted assets (RWA) driven by inappropriate modelling practices.

Through the TRIM project, the ECB intends to review Pillar 1 approved models at all directly supervised banks in the Eurozone that uses them. Although not all approved models at all banks will be checked, this project foresees the execution of about 200 internal model investigations (IMIs) at 65 significant institutions across the SSM (Single Supervisory Mechanism) and is expected to conclude in early 2020.

In its efforts to ensure a consistent approach to internal models the ECB has been working on the definition of topics required for a harmonised approach to reduce unwarranted RWA variability, and hence developed a guide in close cooperation with the National Competent Authorities (NCAs) to define best-practice approaches to credit risk, market risk, counterparty credit risk and general issues related to model governance. The guide is closely aligned with changes in regulations on internal models, such as those referred to in the Fundamental Review of the Trading Book (FRTB) and the EBA Guidelines on probability of default (PD) and loss given default (LGD).

This report focuses on the main enhancements to the revised version of the risk type-specific chapters of the ECB guide published in July 2019 and the consolidated version in October 2019 to internal models. We highlight the key implications this will have for banks going forward.



The guide is closely aligned with changes in regulations on internal models such as those referred to in the FRTB and the EBA Guidelines on PD and LGD.

¹Source: ECB

02

ECB guide to internal models

The general topics chapter of the guide sets supervisory expectations for general aspects of the existing legal framework for internal models.



Introduction

The ECB guide to internal models is a revised version of the TRIM guide and includes four main chapters; general (i.e. non-model specific) topics, credit risk, market risk and counterparty credit risk (CCR).

The guide aims to ensure uniform understanding across the Euro area of the regulations on internal models for banks directly supervised by the ECB.

ECB guide to internal models					
Chapters	General topics chapter (non-model specific)		Risk type-specific chapters		
Revised version	15.11.2018		08.07.2019		
Consolidated version	01.10.2019				
Structure & scope	General topics	Overarching principles for internal models Roll-out and permanent partial use Internal governance Internal validation Internal audit Model use Management of changes to the IRB approach Third-party involvement	Pillar 1 internal models	Credit risk Market risk Counterparty credit risk	 Data maintenance for the IRB approach Use of data Probability of default Loss given default Conversion factor Model-related MoC Review of estimates Calculation of maturity for non-retail exposures Scope of the IMA Regulatory back-testing of VaR models Internal validation of market risk models Methodology for VaR and stressed VaR Methodology for IRC models focusing on default risk RNIME Trade coverage Margin period of risk and cash flows Collateral modelling Modelling of initial margin Maturity Granularity, number of time steps and scenarios Calibration frequency & stress calibration Validation Effective expected positive exposure Alpha parameter
Out of scope	Operational risk models Pillar 2 Managerial models	Counterparty credit risk: Advanced method for the credit valuation adjustment (CVA) capital requirement			

The general topics chapter of the guide sets supervisory expectations for general aspects of the existing legal framework for internal models. It contains principles for non-model-specific topics, particularly as they relate to the internal ratings-based (IRB) approach, covering areas such as internal models governance, internal validation, internal audit, roll-out/PPU and model use.

The risk type-specific chapters of the guide are intended to inform banks of how specific provisions related to internal modelling practices for credit risk, market risk and counterparty credit risk are understood by the ECB. Although the guide is not legally binding, supervisory teams will need to leverage on it while performing inspections and therefore important to understand.

03 Risk type-specific chapters

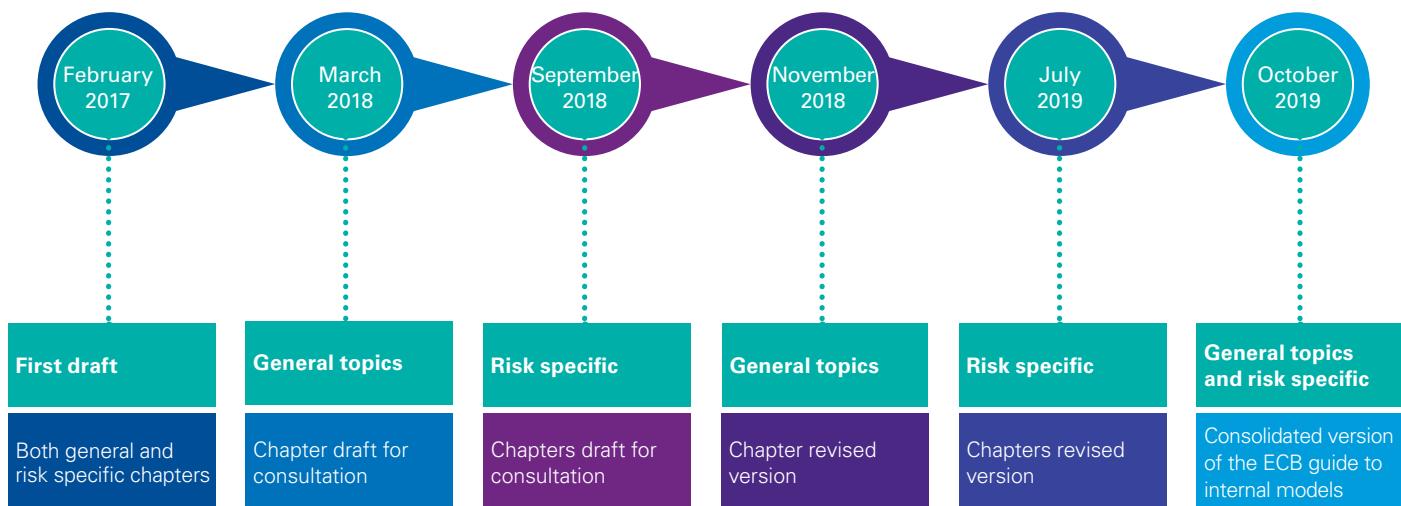
The Internal Ratings-Based (IRB) approach for credit risk, Internal Model Approach (IMA) for market risk and the Internal Model Method (IMM) for counterparty credit risk.

On 8 July 2019, the ECB published the final chapters of the guide to internal models, following a public consultation which ended in November 2018.

The guide sets the supervisory expectations for modelling approaches including the Internal Rating Based (IRB) approach for credit risk, the Internal Model Approach (IMA) for market risk

and the Internal Model Method (IMM) for counterparty credit risk. It also builds on various Capital Requirements Regulation (CRR) requirements and aligns with numerous regulatory guidelines such as the EBA Guidelines on PD estimation, LGD estimation (including economic downturn) and the treatment of defaulted exposures for credit risk, and the Basel Committee's FRTB for market risk.

ECB Guide to internal models - timeline



In February 2017, the ECB issued the first draft of the TRIM Guide covering both general and risk-specific chapters and set out its expectations on how the ECB intends to interpret the relevant EU law on internal models and general issues related to model governance. Subsequently, the general topics chapter was published by the ECB in March 2018 and the risk-specific chapters were published for public consultation in September 2018. These chapters were enhanced based on the feedback received from the industry, while also taking into account the outcomes of the reviews and horizontal analyses performed as part of the TRIM project. Post public consultation, the revised version of the general topics chapter was published in November 2018 and the revised version of risk-specific chapters were published in July 2019.

The final version of risk type-specific chapters of the guide does not differ significantly from the version published in September 2018. Some of the key alterations relate to data management, use of data (human judgement and overrides), elaboration of risks not in the model engines (RNIME) framework, criteria for supervision related to trade coverage, collateral modelling and validation. Banks should meticulously review any divergences from the supervisory expectations as well as underlying legal requirements.

Recently, the ECB has also published the consolidated version of the ECB guide to internal models, which includes both general topics as well as risk specific chapters. There are no material changes to the consolidated version of the ECB guide to the internal models, when compared with previous version of the general topics and risk specific chapters.

The following section of this report will highlight the main enhancements to the risk-specific chapters as well as how banks can prepare and prioritise for these.

Source: ECB Guide to internal models – Risk type-specific chapters



Credit risk

The purpose of the credit risk chapter is to provide transparency on how the ECB understands topics related to internal models used for the IRB approach for calculating own funds requirements.

Main enhancements to the credit risk chapter:

Several paragraphs of the credit risk section have been revised when compared with the previous version. The areas that have seen the most changes include use of data, PD, LGD approaches, credit conversion factors (CCF) and model related margin of conservatism (MoC).

Data maintenance for the IRB application

- Banks should maintain the register of all current and past versions of rating systems and keep this up to date for a minimum of three years and extend beyond this period whenever necessary.

Use of data (previously referred as 'Data requirements')

- Banks should develop adequate measures to avoid double counting effects when using external data sources, i.e. dedicated processes should be established to identify and remove common obligors within banks' databases.
- Banks should consider that the frequency of monitoring the appropriateness of the external scores or ratings (structure, nature and key drivers) is proportionate to the importance of these external scores or ratings.
- New expectations are set on the replicability of the rating assignment process, when human judgements are applied. It encompasses the following guidance:
 - The basic structure of the model (e.g. data sources, risk drivers, process steps) should be applied consistently and not modified by human judgement; and
 - The consistency of the rating assignment process should be assessed proportionally to the degree of human judgment applied (e.g. independent re-rating of obligors by different analysts).

Probability of default (PD)

Further guidance is provided regarding the external rating dynamics. In particular banks should:

- For the purpose of risk differentiation within a specific model, take appropriate measures when there is a risk that the bank's own rating dynamics is not preserved; and
- Include the necessary adjustment as part of the risk quantification activity when there are differences between the internal and external rating assignment dynamics.

Loss given default (LGD)

- The ECB clarified that the use of a high proportion of external data should not lead to a higher category A MoC. The latter should be connected to representativeness issues.
- It is clarified that the application of a 100% haircut, within recovery processes where the collateral has been repossessed and not yet sold, is only one of the expected approaches to perform sensitivity analyses.

- As a best practice approach to estimate the average realised LGD at obligor level, the ECB suggests to consider the exposure-weighted average realised LGD at obligor level and the arithmetic average LGD weighted by the number of defaulted obligors within the facility grade or pool.
- For LGD models based on components, it is clearly expressed that a calibration at grade or segments level (i.e. after aggregation of the components) should be performed.
- The expectations on the downturn LGD are refined to consider the final draft RTS on the specification of the nature, severity and duration of an economic downturn and the EBA guidelines for downturn LGD estimation.



Recommendations

Banks should review their current documentation related to internal models and ensure that a model register is already in place. It should also be kept up to date and made available to the relevant stakeholders.

In addition, banks should have robust data infrastructure to support data storage requirements. Further, banks will have to perform an assessment of external data as well as internal data. This assessment would allow banks to develop a sound understanding of the external data, contributing to strengthening the risk estimations (e.g. in the event that the external data are the main risk drivers in the rating model). At the same time, the analysis of external data requires that the information is made available at the same level of granularity as for internal data.

For the analysis and interpretation of observed default rates from the external part of the pooled data, banks will need to find the criteria used by the external organisations and perform a mapping between the observed default rates for the internal and the external rating grades.

Also, banks have to ensure that sufficient resources are allocated for the assessment and IT infrastructure budget. Moreover, the potential review of banks' internal credit processes, governance in terms of roles and responsibilities, and internal reporting are foreseen in order to implement the above recommendations.



The purpose of the credit risk chapter is to provide transparency on how the ECB understands topics related to internal models used for the IRB approach for calculating own funds requirements.



Market risk

The purpose of the market risk chapter is to provide transparency on how the ECB understands topics related to internal models used in the calculation of own funds requirement for market risk.

Main enhancements to the market risk chapter:

The key changes when compared with the previous version are mainly related to the scope of the internal model approach (IMA), regulatory back-testing of VaR models, methodology for VaR and stressed VaR (sVaR), and methodology for IRC models focusing on default risk and RNIME.

Scope of the internal model approach (IMA)

- Under the delimitation of the regulatory trading book, it is clarified that equity investments in a fund, for which the bank cannot obtain daily price quotes or a look-through, are expected to be included in the banking book.
- For positions that are deliberately excluded from the internal model scope, banks are requested to demonstrate that:
 - The level of own funds requirements under the standardised approach is commensurate with their risks; and
 - These positions are not excluded for the sole purpose of reducing the own funds requirements.

Regulatory back-testing of VaR models

- With regards to the calculation of actual P&L additional guidance is provided on valuation adjustments or reserves (methodology, frequencies, calculation process, etc.) that should be documented by the banks.
- Counting of overshootings references to the Article 366(3) of the CRR are included to clarify the starting day for the notification period where banks must inform the competent authorities in case of overshootings. Further, the ECB elaborates the list of reasons for withdrawing an overshooting notification which would not be acceptable, i.e. changes in the P&L calculation method, pricing functions or changes in the data used in the P&L calculation.

Methodology for VaR and stressed VaR

- Clarification provided on the use of 'objective' instead of 'observable' data, when justifying the appropriateness of the bank's risk factor distribution assumptions, e.g. use of relative or absolute returns when a bank applies historical return in its model.
- Under the pricing functions and methods, the use of outstanding notional is clarified for the purpose of providing a meaningful indication of the materiality of positions priced with the corresponding pricing function.

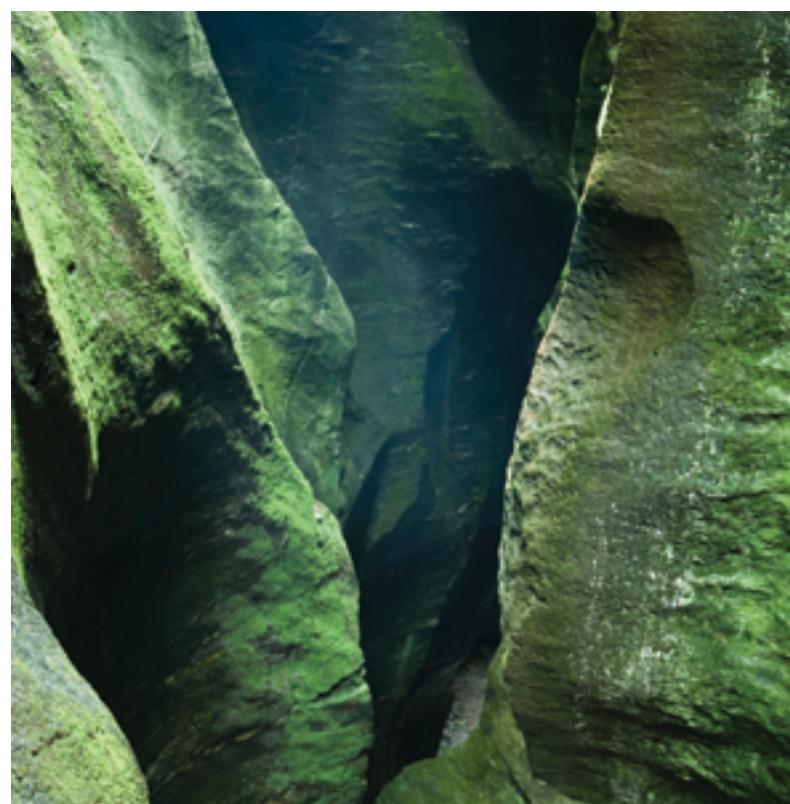
Methodology for IRC models focusing on default risk

- Additional guidance by including a specific reference to the Article 372(a) of the CRR related to the consistency requirements which are adopted by banks (i.e. consistent use of sources for probabilities of defaults and recovery rates in the IRC model).

- The expectations for PD fallback values are enriched: defaulted issuers can be excluded from the calculation of the equally weighted average PD values if it is ensured that the fallback PD is not applied to defaulted issuers.

Risks not in the model engines (RNIME)

- Amendments are applied to better convey the concept that the RNIME framework should be intended as a compilation of processes, i.e. it does not constitute an additional engine namely the VaR, sVaR, IRC, or CRM models.
- Further explanation provided regarding the differences of satellite components and the RNIME add-on.
- It is highlighted that the RNIME estimation methodology can use appropriate approximations, assumptions or a stress methodology when these are duly justified and documented.
- Additional clarification provided with regards to the cumulative impact assessment: all RNIME should be considered in the assessment, notwithstanding whether they are already subject to an RNIME add-on.
- With regards to the management of RNIME further guidance is provided that an individual RNIME of an already known type (i.e. which does not require the implementation of new methodologies or processes) is not considered a change to the framework and it should be notified to the Competent Authorities through ex post notifications only.
- It is clarified that the RNIME capital shall be reported as 'additional risk exposure amount' in COREP.





Recommendations

Banks should review the types of investments and positions assigned to their trading book or banking book as per the expectations set by the ECB (enhancing the understanding of the different categories of instruments and transactions that should be included either in the trading book or in the banking book). There might be synergies to the trading book boundary reviews in banks' FRTB projects. In case banks deviate from the categories set by the ECB, they should be able to justify this deviation. Additionally, banks must be able to justify any exclusion of positions from the scope of the internal model in order to demonstrate that these positions were not excluded for the sole purpose of reducing the own funds requirements for market risk. From the additional guidance provided by the ECB, it is evident that supervisors expect banks to have a robust process of documentation such as various aspects related to any valuation adjustments and reserves.

Furthermore, banks should review their current RNIME framework and ensure compliance with the enhanced supervisory guidance. To this extent, banks should periodically monitor weaknesses and limitations in the stochastic modelling of risk factors, e.g. via internal review and validation process activities that could lead to a model improvement if the weakness or limitation is deemed material. In addition, periodical reporting processes related to RNIME should be implemented by banks. The ECB considers a quarterly monitoring of RNIME appropriate in order to assess whether all material risks are captured in the quarterly reporting of own funds requirements. Banks are also requested to have efficient processes in place to assess the materiality of changes to the RNIME framework. Banks should be able to discriminate changes which would trigger ex-ante and ex-post notifications.

Though the enhancements to this section do not lead to extensive revisions of the current practices adopted by banks, they should ensure that they do not overlook additional supervisory guidance. Banks should establish measures or deploy resources where needed, specifically taking into consideration various aspects of the RNIME framework and ensure adherence to the guidance.



Counterparty credit risk

The main purpose of the counterparty credit risk chapter is to provide transparency on how the ECB understands topics related to the principles defined for the Internal Model Method (IMM).

Main enhancements to the counterparty credit risk chapter:

Several paragraphs of this section have been enhanced as well as eased when compared with the previous version. The main enhancements are related to the scope of the chapter, trade coverage, margin period of risk and cash flows, collateral modelling, modelling of initial margin, maturity, granularity, number of time steps and scenarios, calibration frequency, stress calibration, and validation.

Scope of the chapter

In the event that the portfolio at a consolidated level is not representative of the ones at individual level, it is indicated that all requirements of Part III Title 2 Chapter 6 Section 6 of the CRR must be met by all legal entities with IMM approval for individual capital requirements calculation.

Trade coverage

Additional guidance is provided with regards to the following areas:

- Thresholds to identify transactions where pricing in the IMM differs significantly from benchmark systems;
- Measures apart from carve-outs that can be implemented to address significant pricing model deficiencies;
- Timing-criteria to identify the persistence of price differences; and
- Adjustments in the modelling of future transaction values.

Margin period of risk and cash flows

- Amendments are incorporated to clarify that banks can receive trade-related cash-flows after the beginning of the MPOR (Margin Period of Risk) only if they can justify the modelling assumptions.
- The guidelines on the cash-flow spikes methodology are removed in consideration of the Industry's comments received that favoured the general add-on methodology.

Collateral modelling

- Additional guidance on how to model or estimate the future collateral composition is provided: the use of comparable counterparty information as a proxy is explicitly mentioned.
- Further clarification on the different steps and approaches to account for the FX risk in the MPOR in cases where haircuts are used.

Modelling of initial margin

- More clarity is provided to explain that changes in the netting set composition should be considered as key elements of forward variability, to be reflected in the Initial Margin (IM) modelling approach.



Banks should closely review their systems and infrastructure capabilities and allocate resources where required, specifically taking into consideration various aspects of the RNIME framework.



Recommendations

Banks should review their internal processes and procedures and ensure compliance with the enhanced supervisory requirements, such as following the criteria to identify significant pricing model deficiencies at transaction level as per the best practices laid out by the supervisors. In this regard, banks should strengthen their processes to monitor periods of pricing differences and identify criteria to assess the related persistence.

Banks should closely review their systems, forecasting capabilities as well as other infrastructure capabilities to ensure adherence to the additional guidance. Specifically, banks' models to forecast the effects from margining, for instance, estimate the future collateral composition as per the supervisory expectations should be reviewed.

As highlighted by the ECB, banks should put in place adequate controls in order to ensure independence of model validation activities from model development ones.

Maturity

- The list of instruments mentioned as part of the Securities Financing Transactions (SFTs) is refined and now more closely aligned to Article 162(2) of the CRR.
- Additional clarity is provided regarding the transaction maturity that should be intended as the higher of MPOR and the contractual first date at which the transaction can be terminated.

Granularity, number of time steps & scenarios

The grid density impact assessment is further explained to reflect the possibility:

- Of analysing the impact of any numerical error, stemming from the number of scenarios considered, to avoid potential double counting effect in the assessment; and
- Of performing the impact assessment on representative sub-portfolios.

Calibration frequency and stress calibration

The ECB highlights that a monthly (or higher) calibration frequency is advisable to minimise the risk of non-compliance with Article 292(2) and Article 289(5) of the CRR.

Validation

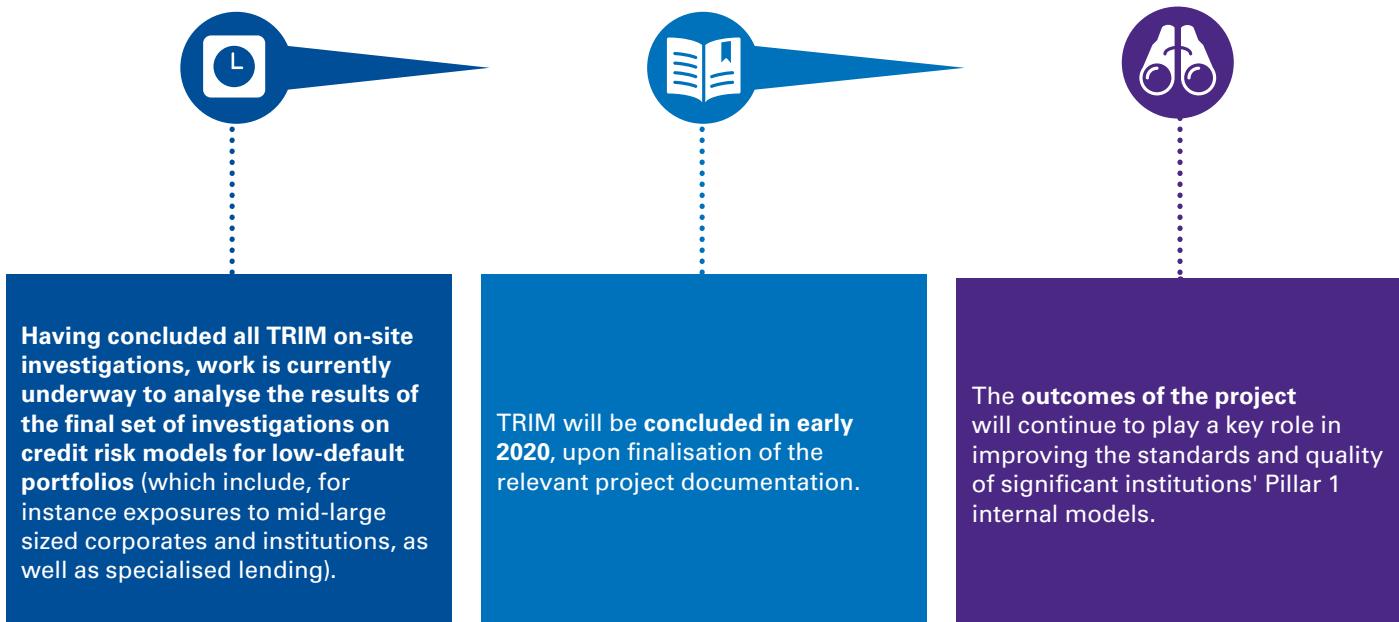
- Where the validation function performs specific tasks of the validation framework, the expectations on the independence of model validation activities from model development ones are further elaborated.
- The execution of back-testing activities at both hypothetical and actual portfolio level is confirmed as good practice, in line with the regulatory requirements.
- The predefined 50% threshold of the back-testing coverage ratios is removed: validation functions can set their own internal thresholds but they should be able to provide adequate justifications on the reported coverage ratios.



04 What's next?

The first part of the execution phase (Q2 of 2017 to Q2 of 2018) of the TRIM project was focused on the review of the internal credit risk models for retail and small and medium-sized enterprise (SME) portfolios, as well as all market risk and counterparty credit risk models. As highlighted in the recent outcome update, the last set of on-site investigations for the

TRIM project have now successfully concluded. Therefore the second part of execution phase (Q3 of 2018 to 2019) is now over. This focused on the models used to assess the credit risk for low-default portfolios (exposures to mid-large sized corporates and institutions, as well as, specialised lending).



The outcomes of the ECB's TRIM exercise have already begun to induce tangible changes in internal models across the SSM to reduce unwarranted (i.e. non-risk-based) RWA variability, by ensuring that the shortcomings identified by supervisors are duly

remediated by the banks. Further, the recent public disclosure of financial results from numerous banks suggests that the average risk weights on certain asset classes (such as mortgage portfolios) have been raised considerably due to TRIM.

 **The recent public disclosure of financial results from numerous banks suggests that the average risk weights on certain asset classes (such as mortgage portfolios) have been raised considerably owing to TRIM.**

Source: ECB Letters to banks: Interim update on the Targeted review of Internal Models (TRIM)

05 Conclusion

As highlighted in the SSM Supervisory Priorities 2020, work will continue on ensuring the adequacy of internal models used by banks in calculating their regulatory capital requirements. In addition, for credit risk models, banks will also need to address the requirements of the European Banking Authority's IRB repair programme.

We advise banks to align their internal models as per supervisory expectations in order to minimise unwarranted RWA variability.

In summary, banks should focus on the most critical shortcomings detected by TRIM horizontal analyses (if applicable) as supervisors will place particular attention in this area. We believe that banks should adopt the following measures if they have not done so already:



Banks should review their existing internal models and compare them to the enhanced requirements set by the ECB and ensure adherence to these revised requirements.



Banks should put efforts into reviewing their existing system capabilities and other infrastructure capabilities in order to comply with the ECB's expectations for internal models such as requirements related to data maintenance and use of data. Specifically, banks should attribute a huge importance to their data quality control, their IT systems (relating to risk) management, reporting and monitoring.



Banks should closely track any further enhancements to this guide which could be driven by ongoing regulatory reforms as well as the outcome of the analysis of the final set of TRIM investigations.



Whilst considering the requirements mentioned in the ECB guide, banks should also consider the specific modelling aspects, such as, modelling traits driven by the EBA Guidelines on PD estimation, LGD estimation and the treatment of defaulted exposures.



Banks should be fully aware that the guidelines covered in this guide do not contain an exhaustive list of topics relevant to internal models. Instead, banks should proactively adopt measures or controls considering the numerous guidelines laid out by the regulatory or supervisory authorities where these impact internal models.



Due to recent heightened regulatory as well supervisory requirements, the model validation task predominantly has become burdensome for banks using internal models. Therefore, the need for an effective internal validation tool for IRB models is crucial for banks in order to meet expectations set by regulators, as well as supervisors.



Banks are required to consider a robust project management framework that includes IRB repair programme in order to integrate more strategic and governance aspects. The management of the program should be very flexible/adaptable in order to quickly integrate the new evolutions to come.



Finally, as highlighted in the SSM Supervisory Priorities 2020, banks should meticulously review and align their internal models to comply with the Basel IV framework as it remains a key focus.

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