



Just in Time

**Targeted Review of
Internal Models**
*Focus on Market Risk and
Counterparty Credit Risk*

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At a Glance



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01

Overview



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- Under the standards issued by the **BCBS**¹, as implemented in European Union (EU) legislation, banks are allowed to employ **internally developed models** for the purpose of calculating **regulatory capital requirements**, provided these have received supervisory approval. Following the financial crisis of 2007-2009, concerns were raised regarding the **unwarranted (i.e. non-risk-based) variability** of outputs of some models across banks, alongside criticism from external stakeholders of the complexity of the models.
- The **ECB's** direct supervision of SIs² under the **SSM**³ has provided a unique opportunity to improve the **consistency of internal models across the euro area**. The **TRIM** project was a large-scale multi-year supervisory initiative launched by the **ECB** at the beginning of 2016 in close cooperation with **NCAs**⁴ that are part of European banking supervision in order to confirm the adequacy and appropriateness of approved **Pillar I internal models** used by SIs in euro area countries, ensuring their **compliance with regulatory requirements** and **harmonize supervisory practices** relating to internal models within the **SSM**.
- With activities stretching over more than four years, **TRIM** is the largest project conducted so far by **ECB Banking Supervision** in coordination with **NCAs**. It marks an important milestone in raising the quality standards and comparability of outcomes of internal models in use at SIs within the **SSM**. At the core of **TRIM** was the execution of **200 on-site IMIs**⁵ **across 65 institutions**. The project covered internal models for credit, market and counterparty risk. The decision to rely primarily on on-site investigations for **TRIM** stemmed from the consideration that on-site investigations are the most effective tool to confirm the adequacy of internal models, as they provide a thorough and intrusive procedure for model assessment. The **TRIM** project has created organisational structures and processes which **ensure harmonisation** by means of close cooperation among all the parties involved, gathering skilled internal model experts from across the European banking supervision.
- Overall, the outcomes of the **TRIM** investigations confirmed that the **internal models** of SIs **can continue to be used** for the calculation of own funds requirements. However, for a certain number of models, some **limitations** were needed to ensure a level of own funds that was appropriate to cover the underlying risk.

¹ Basel Committee on Banking Supervision.

² Significant Institutions are banks directly supervised by the ECB under the SSM and are the focus of TRIM.

³ Single Supervisory Mechanism is the system of banking supervision established by the SSM Regulation.

⁴ National Competent Authorities

⁵ Internal Model Investigation

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Institutions

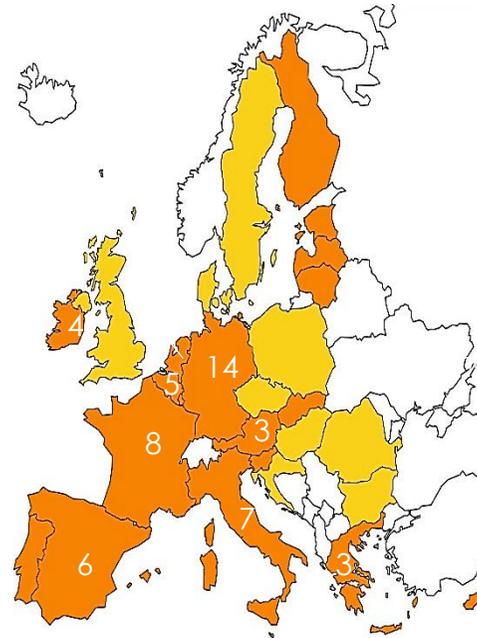
All SIs which at the start of the project had approved internal models for the in-scope risk types were within the scope of **TRIM**. Institutions undergoing a merger, or which would no longer be subject to direct supervision by the **ECB** were not included.

Institutions which received approval during the execution of the project, were included for assessment where possible.

Scope

All SIs with approved internal models fell within the scope of the **TRIM** project, with limited exceptions to reflect structural changes, such as mergers and acquisitions. **TRIM** focused on a **targeted approach to internal model assessment** following principal characteristics:

- Covering most relevant risk types
- Covering most relevant areas of unwarranted risk-weighted assets (RWA) variability
- Reviewing a sufficiently large number of the most material and critical Credit Risk¹ internal models



Code	Country	Sis in scope
AT	Austria	3
BE	Belgium	5
DE	Germany	14
ES	Spain	6
FR	France	8
GR	Greece	3
IE	Ireland	4
IT	Italy	7
NL	Netherlands	4
Other	Other	11
	Total	65

¹ Credit Risk will only be mentioned in the Overview of the TRIM project to explain the general features of the project, the focus will be on Market Risk and Counterparty Credit Risk

Source: [Targeted Review of Internal Models - Project report](#)

Risk Types

The scope of **TRIM** was based on internal models following the **Pillar I** risks:



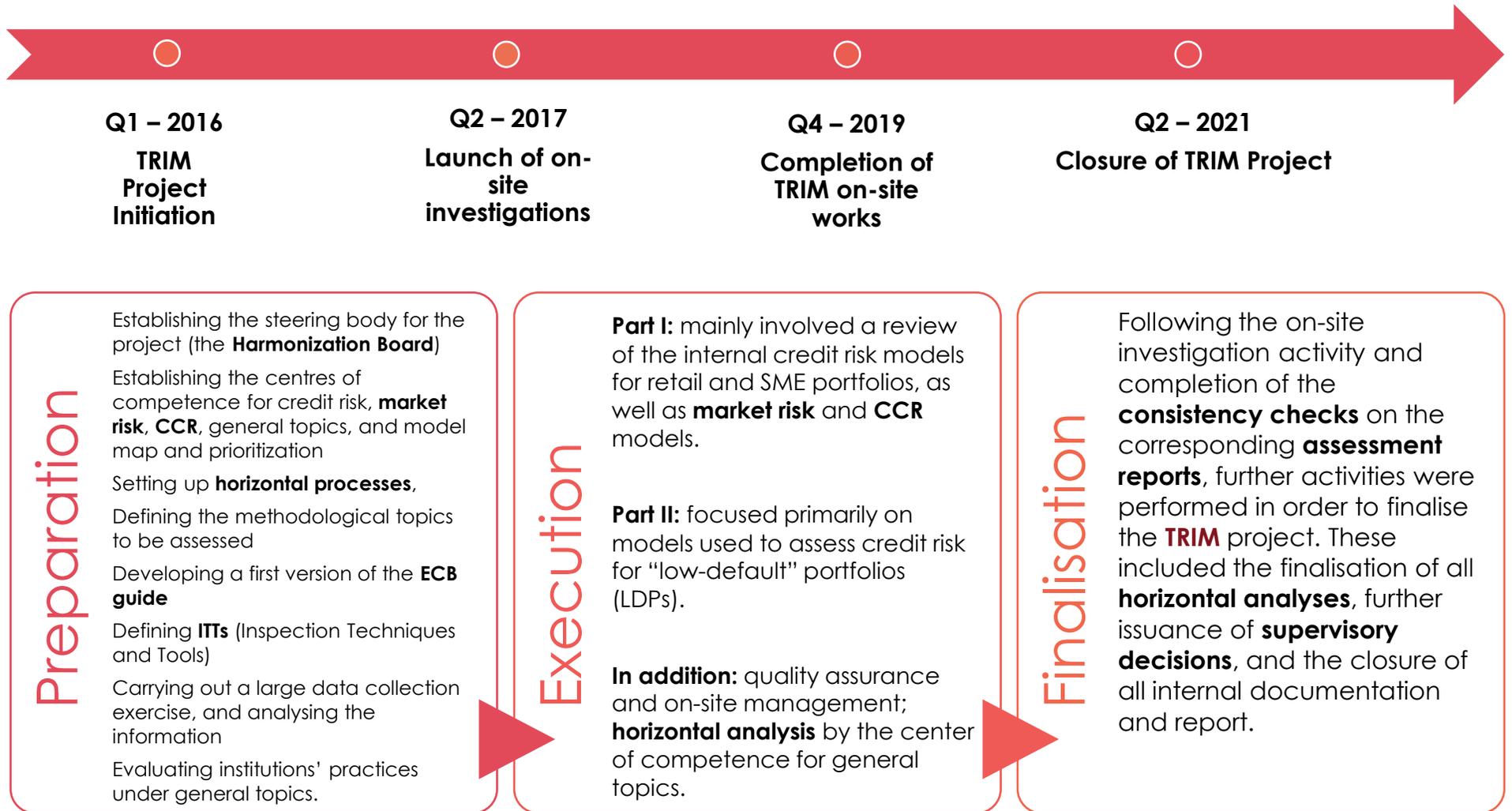
Models for on-site investigations

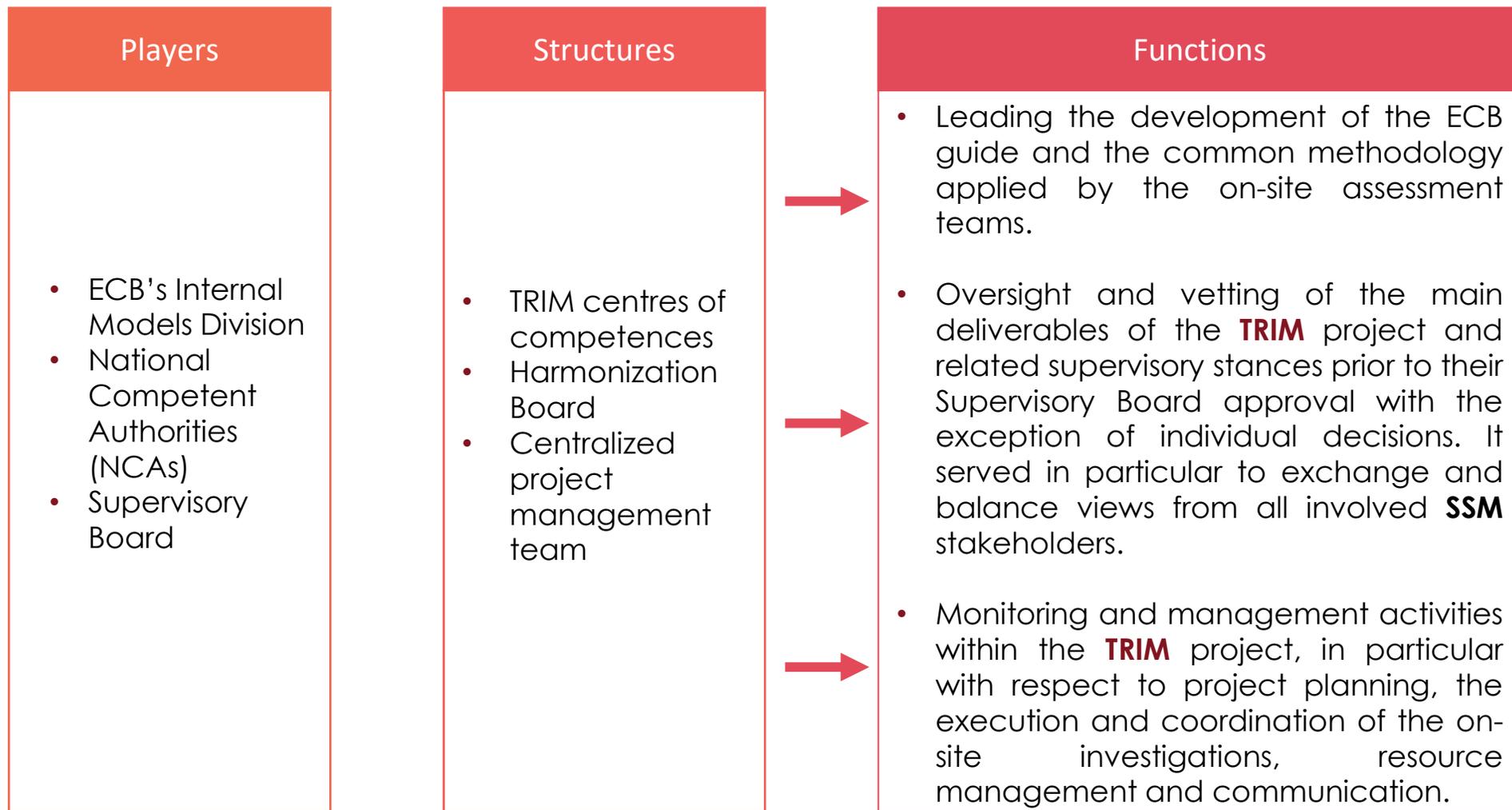
In the case of **market risk** and **CCR**, all approved internal models in place at the inception of **TRIM** (in 31 and 8 SIs, respectively) were able to be reviewed within the project.

While a dedicated center of competence on model map and prioritization was tasked with developing the approach to the prioritization and selection of credit risk models for on-site investigation based on: materiality, particularly looking at Exposure at Default (EAD) and criticality, looking at perceived performance of the model.

Risk/Exposure Type	Number of IMIs	% of Total
Credit Risk – retail and SME	85	42.5 %
Credit Risk – LDP ¹	76	38.0 %
Market Risk	31	15.5 %
CCR	8	4.0 %
Total	200	100 %

Source: [Targeted Review of Internal Models - Project report](#)





Overview 6/7

A multi-layered quality assurance framework was included in the **TRIM** project to ensure consistent and comparable outcomes across institutions.

Establish a common, standardized methodological framework to serve as the basis for the harmonized execution of **TRIM** on-site investigations through the ECB guide to internal models, common ITTs and close interaction between the assessment teams and the central risk-specific teams during the execution of each on-site investigation

I Layer

Implemented on an ongoing basis after each on-site investigation was completed. The assessment report produced for the investigation was checked for consistency by internal model experts to ensure that similar shortcomings gave rise to similar findings

II Layer

Applied ex post by the centers of competence, which performed cross checks and horizontal analyses across finalized assessment reports and raised additional findings when needed

III Layer

Several control mechanisms were also in place with regard to the preparation of supervisory decisions to ensure consistent treatment of comparable risks and deficiencies.

Deliverables

Description

-  **ECB guide to internal models**

The **ECB guide** to internal models documents how the ECB understands the regulatory requirements for internal models and provides transparency on how it applies them when assessing whether institutions meet these requirements.
-  **Inspection Techniques and Tool (ITTs)**

To facilitate a consistent and comparable execution of on-site investigations, standardised data requests and ITTs were drawn up during the preparatory phase. The ITTs provided assessment teams with a set of inspection methodologies and checks for use in conducting the model investigation.
-  **On-site model investigations and assessment reports**

On-site IMIs applied a common methodological approach to assess the regulatory compliance of internal models used by SIs. For each investigation, an assessment report was produced by the assessment team describing the activities and results of the investigation. Each draft assessment report underwent consistency checks by ECB staff and an NCA other than the NCA involved in the on-site work.
-  **Horizontal analysis**

Each center of competence performed a **horizontal analysis** based on the assessment reports with the aim of forming a comprehensive view of the main model design features as well as typical shortcomings of existing models. This analysis also contributed to ex post checks to ensure consistency in the identification and treatment of findings.
-  **Supervisory decisions**

After each on-site investigation, a process was initiated to provide the institution with supervisory decisions listing the **findings** and the required remedial action. A first supervisory decision with obligations and corresponding deadlines was addressed, requiring the **remediation** of findings. Where severe findings and/or a material underestimation of **RWA** were identified, limitations were imposed. A second supervisory decision was only issued in cases where the relevant supervisory measures could not be included in the first and would target only selected topics.

02

Market Risk

Detected Deficiencies



Market Risk 1/4

- **Article 363(1)** of the **CRR¹** states that competent authorities can grant permission to institutions to calculate their own funds requirements for market risk using the internal models approach instead of, or in combination with, the standardized approaches.
- Within **TRIM**, the ECB considered all 31 SIs with internal market risk models authorized by the competent authorities for regulatory capital calculation. All of these institutions had been granted IMA approval for general risk of debt instruments, and almost all of them also had approval for other risk categories (See table below for further details).
- Most of the findings regarding market risk concern the general features of the **VaR and sVaR modelling approach** and this is also where the most severe findings were raised.
- As specified in **Article 372** of the **CRR**, the granting of approval for specific risk of debt instruments implies that institutions must implement an incremental default and migration risk charge (IRC) model.

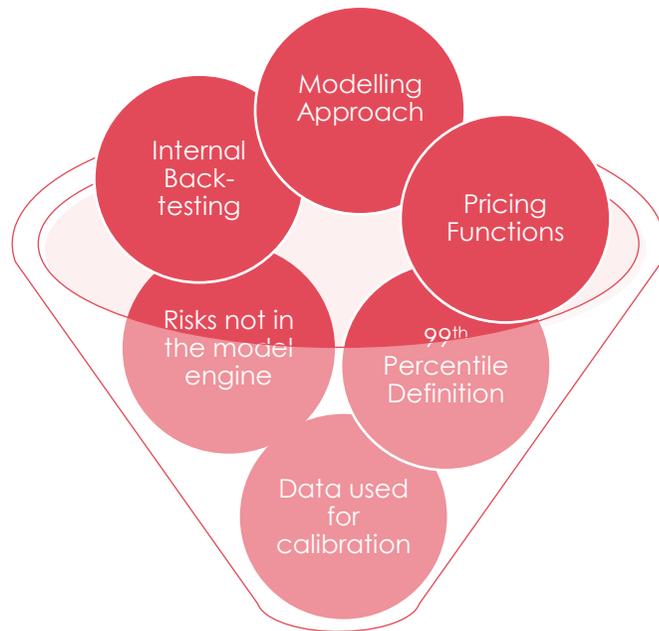
Approved risk categories for market risk models						
General risk of debt instruments	Specific risk of debt instruments	General risk of equity instruments	Specific risk of equity instruments	Foreign exchange risk	Commodities risk	Number of institutions
✓	✓	✓	✓	✓	✓	14
✓				✓		4
✓	✓	✓	✓	✓		2
✓		✓	✓	✓		2
✓		✓		✓	✓	2
✓		✓				2
Other Combinations						5

Source: [Targeted Review of Internal Models - Project report](#)

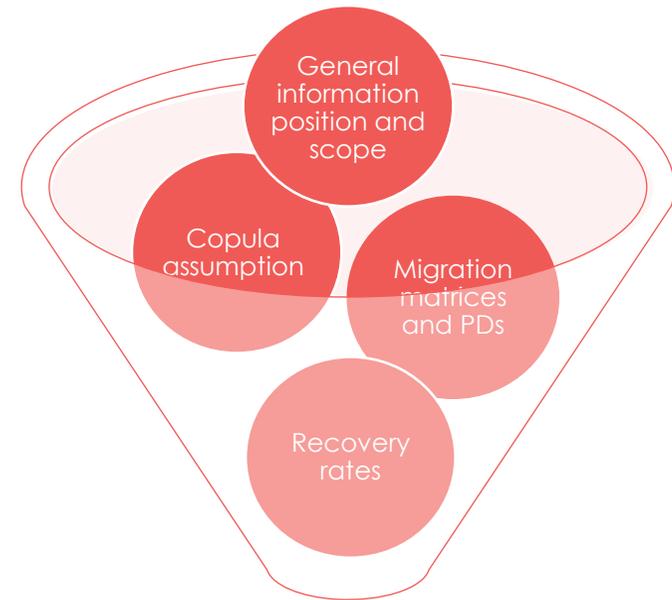
¹ Capital Requirements Regulation

Market Risk 2/4

The factors taken into consideration when analyzing **VaR/sVaR** and **IRC Modelling** (the areas with the greater number of findings):



VaR / sVaR Modelling
240 findings



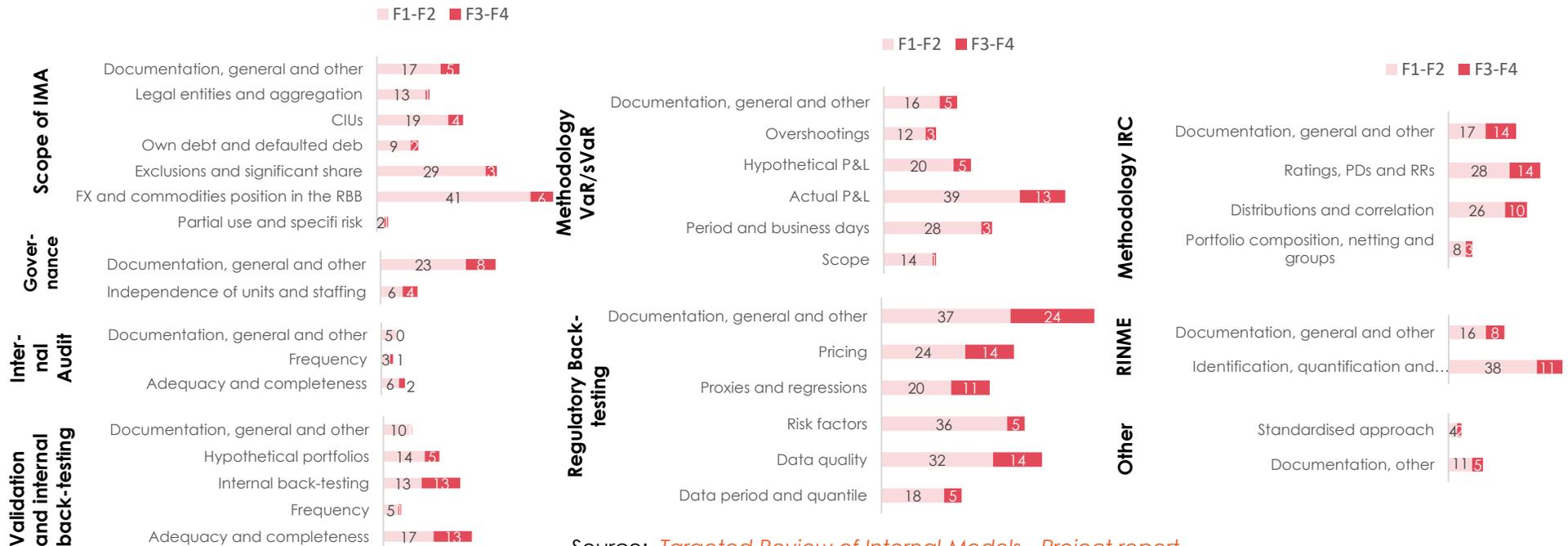
IRC Modelling
120 findings

Market Risk 3/4

There were 31 **TRIM** investigations related to **market risk models**, of which 17 included the assessment of the IRC models of institutions that used the **IMA** for specific risk of debt instruments. In total, these yielded **more than 900 findings**, including additional findings identified as a result of consistency checks and **horizontal analyses** (See tables below for a summary of the findings).

Overview of findings (Market Risk investigations)

Distribution of findings by severity (F1-F4)



Source: [Targeted Review of Internal Models - Project report](#)

N.B. The ECB classifies the severity of findings on a scale from F1 to F4; F1 being the lowest in terms of severity and F4 being the highest

Market Risk 4/4

Detected Deficiencies

Scope of IMA

- **FX and Commodities in Regulatory Banking Book:** Incorrect methodology applied to derive FX positions in Regulatory Banking Book (RBB) or sometimes FX positions not taken into account in the IMA and not capitalized.
- **Exclusions and significant share:** Unsubstantiated exclusions from the IMA of individual positions, books or portfolios.
- **Collective Investment Undertakings (CIUs):** Inadequate treatment of CIUs.

Internal Validation and Internal Back-testing

- **Adequacy and completeness:** Shortcomings in the tests and assessments performed as part of the internal validation.
- **Internal Back-testing:** Inadequate methodology or assessment did not cover all relevant portfolios.
- **Hypothetical portfolios:** Institutions did not carry out the required back-testing on hypothetical portfolios.

Regulatory Back-testing

- **Period and Business Days:** Lack of a specific definition of business days and non-business days.
- **Actual P&L:** Definition and treatment of fees, commissions and net interest income, which must be excluded from the actual P&L; deficiencies in the treatment of fair value or other adjustments, which were either not documented, not determined correctly, or were not correctly reflected in the actual P&L.
- **Hypothetical P&L:** Insufficient alignment of pricing functions, market data and parametrization between the economic P&L and the hypothetical P&L, as well as the inconsistent treatment of the theta effect in the hypothetical P&L and the VaR.

VaR and sVaR Methodology

- **Data Quality:** Shortcomings in data cleansing processes (e.g. outlier correction, data filtering, filling approaches and insufficient data quality assessment or validation in the VaR model).
- **Risk Factors:** Missing risk factors or inadequately modelled (e.g. modelled with overly reduced granularity).
- **Pricing:** Inadequate pricing methods for particular products in the VaR model (e.g. solely using sensitivity-based approximations).

IRC Methodology

- **Ratings, PDs and Recovery Rates:** Unjustified or inaccurate RR or PD values. (e.g. PDs close to or equal to zero without proper justification, typically for sovereign obligors in the highest quality rating classes).
- **Distributions and Correlations:** Shortcomings with respect to the specific modelling choice of the institution like insufficient or no justification of crucial modelling approaches such as the copula assumptions, of the choice of risk factors or of the correlation assumptions.

Risks not in the Model Engines (RINME)

- **Identification, Qualification and Management:** Missing or inadequate quantification of RINME (e.g. not all risks were quantified or the quantification did not consider cumulative impact).

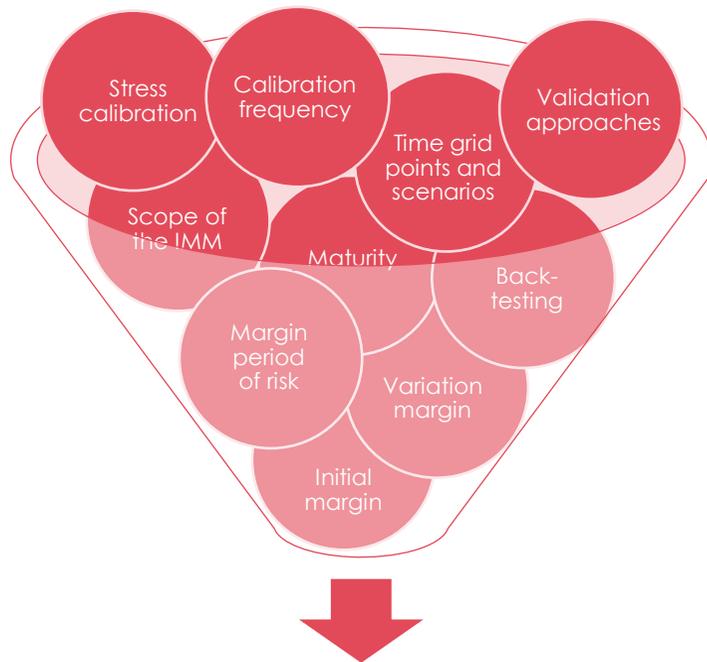
03

Counterparty Credit Risk



Counterparty Credit Risk 1/2

At the beginning of the **TRIM** project, eight SIs had approval to use the internal model method (IMM) to calculate **CCR** exposure. Hence eight on-site investigations were carried out under **TRIM**. The factors taken into consideration when analyzing various aspects of **CCR** were:



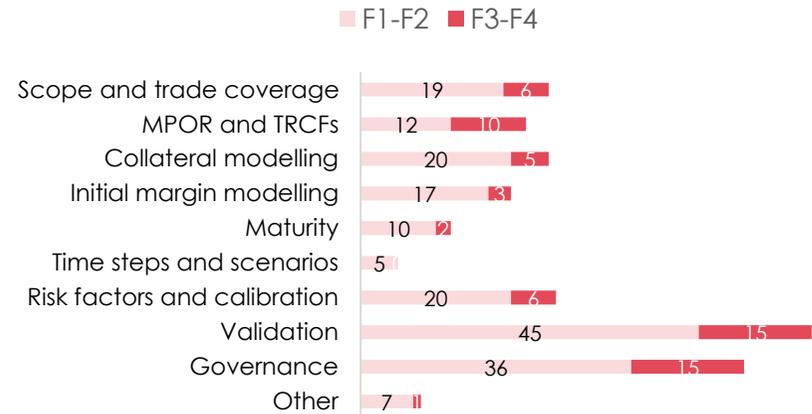
CCR Modelling
236 findings

N.B. The ECB classifies the severity of findings on a scale from F1 to F4; F1 being the lowest in terms of severity and F4 being the highest

Figure below shows the distribution of findings per modelling area and by severity.

Overview of findings (CCR investigations)

Distribution of findings by severity (F1-F4)



Source: [Targeted Review of Internal Models - Project report](#)

Counterparty Credit Risk 2/2

The most relevant in terms of severity and common shortcomings observed per topic are summarized below.

Scope and trade coverage: insufficient coverage of the IMM with respect to the proportion of transactions or of RWA covered by the IMM (For derivatives, the scope of approval covered, in most cases, all asset classes).

MPOR and trade-related cash flows: insufficient length (shorter than the regulatory floors) of the MPOR (Margin Period Of Risk) and inconsistent treatment of TRCFs (trade-related cash flows).

Collateral modelling: overestimation of actual collateral value, inappropriate accounting for the collateral composition and divergences between actual and modelled collateral.

Initial margin modelling: divergences between actual and modelled initial margin and insufficient accounting for the contractual terms.

Maturity: using the wrong M (maturity) formula for IMM exposures or inadequate M parameter calculation, mainly for SFTs (securities financing transactions).

Time steps and scenarios: impact of the granularity of the time grid and of the number of scenarios on the accuracy of the exposure calculation.

Risk factor modelling and calibration: weaknesses in the assumptions of the stochastic processes used and the calibration of their parameters (especially the volatilities) and to the length of the stress period and the corresponding stress calibration.

Validation and Back-testing: weaknesses in the scope and depth of the validation tasks, related to back-testing owing to inappropriate coverage, missing levels or risk measures or a lack of follow-up action.

Governance: inadequate or missing documentation and processes and insufficient staffing of various units and unclear responsibilities.

04

Final Remarks

Achievements and Project Outcomes
Main Achievements of the TRIM Project
Conclusions



Final Remarks 1/4

Achievements and Project Outcomes 1/2

The table below summarizes how these deliverables fulfilled the initial objectives of TRIM.

Objective \ Deliverable	ECB guide to internal models	ITTs, on-site investigations, supervisory decisions
<p>Ensure compliance with regulatory requirements, thereby reducing inconsistencies and unwarranted (i.e. non-risk-based) RWA variability</p>	<p>The ECB guide provides institutions with transparency on the ECB's understanding of regulatory requirements, in order to develop a common understanding across SSM countries of the existing regulatory requirements for internal models. Thus, institutions have guidance for developing internal models that comply with the applicable regulation, which should reduce instances of inconsistency.</p>	<p>ECB supervisory decisions were issued as a result of the on-site investigations in order to oblige institutions to address instances of non-compliance with regulatory requirements. These instances have, in many cases, contributed to unwarranted (i.e. non-risk-based) RWA variability. Their removal will therefore contribute to its further reduction.</p>
<p>Harmonise supervisory practices in relation to the supervision of internal models</p>	<p>The ECB guide summarises the common understanding of the ECB and NCAs within the SSM regarding the implementation of regulatory requirements related to internal models in use at SIs. As such, it forms the basis for and a first key step towards harmonising supervisory practices and will continue to be used by the ECB and NCAs going forward as common guidance in the review and approval of internal model use in institutions.</p>	<p>ITTs have been developed for the TRIM on-site investigations to ensure consistent reviews across assessment teams. The TRIM ITTs can also be used by on-site teams in future IMIs. Consistent use and training/education on the use of the ITTs directly supported the ECB's objective of more harmonised supervisory practices within the SSM.</p> <p>In addition, several layers of quality assurance (including horizontal analyses) were implemented in relation to the outcomes of the on-site investigations to ensure that findings were raised in a consistent way.</p>

Source: [Targeted Review of Internal Models - Project report](#)

Final Remarks 2/4

Achievements and Project Outcomes 2/2

The project was initiated by the ECB with the following primary objectives:

- **More detailed understanding of the SSM model landscape**
 - **Horizontal analyses** carried out across each of the risk types have facilitated a comprehensive detailing of the modelling landscape.
 - New areas have been highlighted for **future investigation** or **monitoring** as an outcome of the **horizontal analyses**.
- **Strengthening of the supervisory practices for internal models**
 - The methodology developed and applied during the **TRIM** project by the center of competence on model map and prioritization can directly inform **future work** related to the planning and **prioritization of IMIs**, together with institutions, a road map for their internal model strategy.
 - The consistency ensured in the context of **TRIM**, both in terms of supervisory practices across assessment teams and in terms of modelling practices, should “spill over” to **regular IMIs** and to **internal models** that have **not been reviewed** within **TRIM**.

The objectives of **TRIM** included contributing to the improvement of ongoing and future supervisory work on internal models in the **SSM**; the work conducted was organized in four different work streams:

1. **Strategy and resources for IMIs after TRIM:** before the launch of **TRIM**, the existing **SSM** resources for on-site internal models supervision did not suffice to deal with the number of requests for supervisory approval; during **TRIM** this issue was partly mitigated.
2. **Methodological developments and related governance:** one of the main objectives of **TRIM** was to harmonize supervisory practices for internal model supervision within the **SSM**. To pursue this goal, the ECB guide to internal models and a common assessment methodology were developed.
3. **Processes and quality assurance:** as **no dedicated PMO function is available after TRIM**, to support **ongoing IMIs** alongside the existing planning and coordination functions of the ECB and the NCAs, it was acknowledged that the opportunity to transfer TRIM-specific processes to **future model supervision** was rather limited. **Standardized data requests** were recognized as a key tool for a successful and efficient on-site investigation, thus their use in future IMIs is therefore broadly supported.
4. **TRIM reduction of unwarranted (i.e. non-risk-based) RWA variability:** this stream covers how to best assess the desired reduction of **non-risk-based RWA variability** (e.g. by restoring compliance of banks' internal models with regulatory requirements).

Final Remarks 3/4

Main Achievements of the TRIM Project

Within its mandate, the **TRIM** project has fully achieved its main objectives:

Reduce non-risk-based RWA variability within the SSM

- The **ECB guide** seeks to ensure that supervisory requirements are implemented in a **harmonized** and **consistent manner**.
- Numerous **deviations** from the regulatory requirements were observed, resulting in **more than 5,800 findings across** all risk types, of which around **30% were of high severity (F3 and F4)**. To ensure that the observed deficiencies were remediated swiftly and that own funds requirements were not underestimated during the remediation phase, for all **TRIM** investigations supervisory follow-up measures and actions were imposed through supervisory decisions containing obligations, recommendations and limitations¹.
- Supervisory decisions issued as a follow-up to **TRIM** investigations are not intended to reduce or discourage the use of internal models, but rather to bring all those models fully into line with regulatory requirements and to compensate for any identified underestimation of risk. These measures ultimately improve the comparability of model outcomes and thus contribute to restoring the **credibility of RWA calculations based on internal models**².
- Efforts to address the **TRIM** supervisory follow-up are expected to be made in conjunction with preparations for upcoming regulatory developments.

Support future supervision of internal models within the SSM

- The project has enabled supervisors to gain a much deeper, system-wide knowledge of existing modelling practices and related shortcomings, which **will help them to define areas for future investigation or monitoring**.
- The **ECB guide** to internal models, developed and published during the project, will be further **complemented in the future** to reflect regulatory developments and any additional interpretative issues that may arise on an ongoing basis.
- Within its mandate **TRIM** has:
 - enabled a deeper, system-wide **knowledge of existing modelling practices** and the typical shortcomings relating to the use of internal models;
 - addressed the **deviations from regulatory requirements** or **underestimations of risk parameters** through follow-up measures which ensure that internal models used by SIs are fully in line with regulatory requirements and own funds requirements are not underestimated during the remediation phase;
 - raised the bar for SIs using internal models and paved the way for **satisfactory models to be developed in the future** and for the optimization of the model landscape at European banking supervision level;
 - contributed to **reducing unwarranted variability of RWA**³ and to maintaining a level playing field across banks under the ECB's direct supervision as regards the use of internal models;
 - contributed to **restoring overall confidence in internal models**.

¹ **Obligation** are needed to ensure the sustainable use and sound implementation of internal models in line with regulatory requirements and have, in principle, to be fulfilled within a certain deadline. **Limitations** restrict or modify the use of a model.

² It is estimated that the aggregated impact of **TRIM** limitations and model changes approved will lead to a 12% increase in the aggregated RWA.

³ Using for example a harmonized methodology for market risk multipliers .

Final Remarks 3/4

Conclusions

The results of the **TRIM** project have led to the following conclusions, which confirm that consistent implementation of internal models within a supervisory area is possible:

1. Thanks to the detailed supervisory follow-up of **TRIM**, existing internal models can be considered **suitable** for the **calculation** of **Pillar 1** own funds requirements.
2. Numerous **deviations from regulatory requirements** have been addressed through legally binding supervisory measures (limitations, obligations).
 - a) Institutions need to make additional efforts to **remediate all deficiencies** in a timely manner and to the required standard (they are expected to find synergies with ongoing work to implement new regulatory requirements).
 - b) In addition to the supervisory follow-up, **institutions' independent validation** and **audit functions need to strictly follow up on remedial actions**.
3. Institutions need to continue to invest in the maintenance and development of internal models to **maintain the high quality of models** achieved through **TRIM**. In particular, in accordance with the supervisory standards applied in **TRIM**, the ECB expects the **independent internal validation function** to be able to **ensure an ongoing internal challenge** of the performance of internal models, and in some cases its oversight role should be further strengthened.
4. These efforts and investments are expected to **support institutions in deciding on their model strategies**; in particular, they may lead to simplification in current model landscapes – partially driven by the implementation of upcoming regulatory developments – or to corresponding improvements in some less material or less critical models.
5. Institutions' efforts need to be **complemented by continued intrusive supervisory scrutiny**, including:
 - a) An adequate and proportionate multifaceted approach to ongoing model monitoring;
 - b) Strict assessment of model changes or initial model approvals in line with the supervisory methodology developed in **TRIM**.

Sources and Literature

[01] **European Central Bank.** [*Targeted Review of Internal Models - Project report*](#). European Central Bank, April 2021.

[02] **European Central Bank.** [*ECB guide to internal Models*](#). European Central Bank, October 2019.



Company Profile

Iason is an international firm that consults Financial Institutions on Risk Management. Iason integrates deep industry knowledge with specialised expertise in Market, Liquidity, Funding, Credit and Counterparty Risk, in Organisational Set-Up and in Strategic Planning.

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