



AUDIT MASTERS - 9TH ANNUAL INTERNAL AUDIT FORUM

Model Risk Management: a possible Audit approach in the Digitalization and AI era

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THE EXTERNAL CONTEXT

From Pillar I to Managerial Models, towards Artificial Intelligence

FROM PILLAR I ...

- The Basel framework has historically focused on **Pillar I models, which primarily deal with minimum capital requirements** based on credit, market, and operational risks
- This approach **ensured that financial institutions strengthened their capital position..**

... TO MANAGERIAL MODELS

- There has been a growing recognition that the Pillar I models alone **may not capture the full spectrum of risks faced by financial institutions**
- There has been an evolution towards greater emphasis on Accounting Practices (IFRS9), **Pillar II** (supervisory review) and Pillar III (market discipline), with **attention shifting from merely meeting regulatory capital requirements to adopting comprehensive risk management practices**
- This shift encouraged the development of **managerial models that provide a more nuanced understanding of risks**

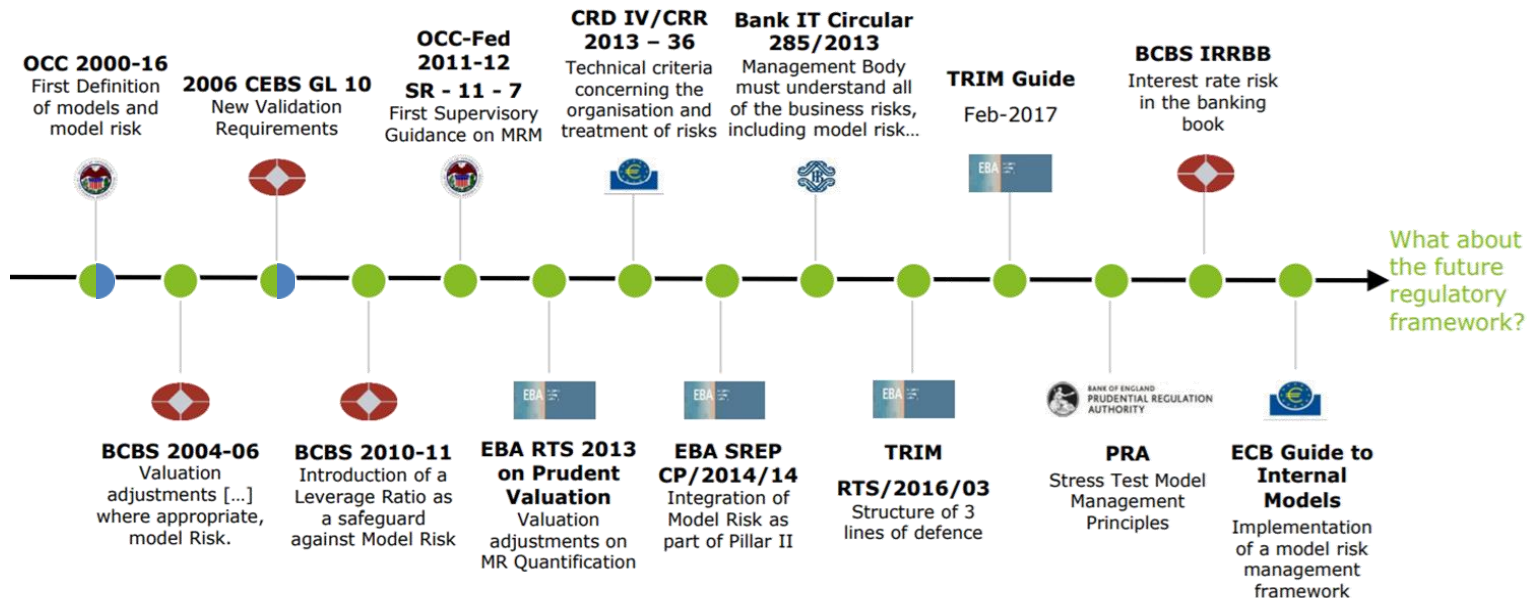
... TO THE NEW CHALLENGES AHEAD

- Managing the **exponential increase of artificial intelligence (AI)** models poses various challenges
- Effectively manage AI models, ensuring **governance, reliability, and ethical use** throughout the AI model lifecycle
- The 13th **March 2024** it has been adopted the **Artificial Intelligence Act** by the **European Commission** to establish a common regulatory and legal framework for AI.

In the context described above, the need for a well-structured Model Risk Management Framework, is significantly increased

The regulatory landscape

- **Model Risk Management does not have a dedicated regulation yet**
- Even though managerial models are assuming a more strategic role in the business practices and controls of the Banking sector, **most of the regulation is still focused on the regulatory perspective**
- The timeline below highlights the strong attention on the **Regulatory models** (green dots) compared to a broader approach including also **Managerial ones** (blue dots).



The importance of Model Risk Management

THE IMPORTANCE OF MODEL RISK MANAGEMENT...



More decisions and higher inherent risks

Models will be more used to make critical decisions without human interface.

That trend will further increase with the upcoming automation and robotization of the operational processes



Increased attention from stakeholders

Senior management is increasing its attention aimed at ensuring a strong Model Risk Management function



More models to enable a digital bank

Digitalization triggers increase in the number of models.

The usage of models in a wide way is a foundation for increasing and improving the proposition for innate digital customers

...THE IT CAN BRING...

- ❑ **Lower model and operational risk** with more accurate risk assessment
- ❑ Lead to a **more standardized and high-quality model life cycle**
- ❑ Be an enabler to **make models a source of competitive advantage in a context more and more driven by digital bank**

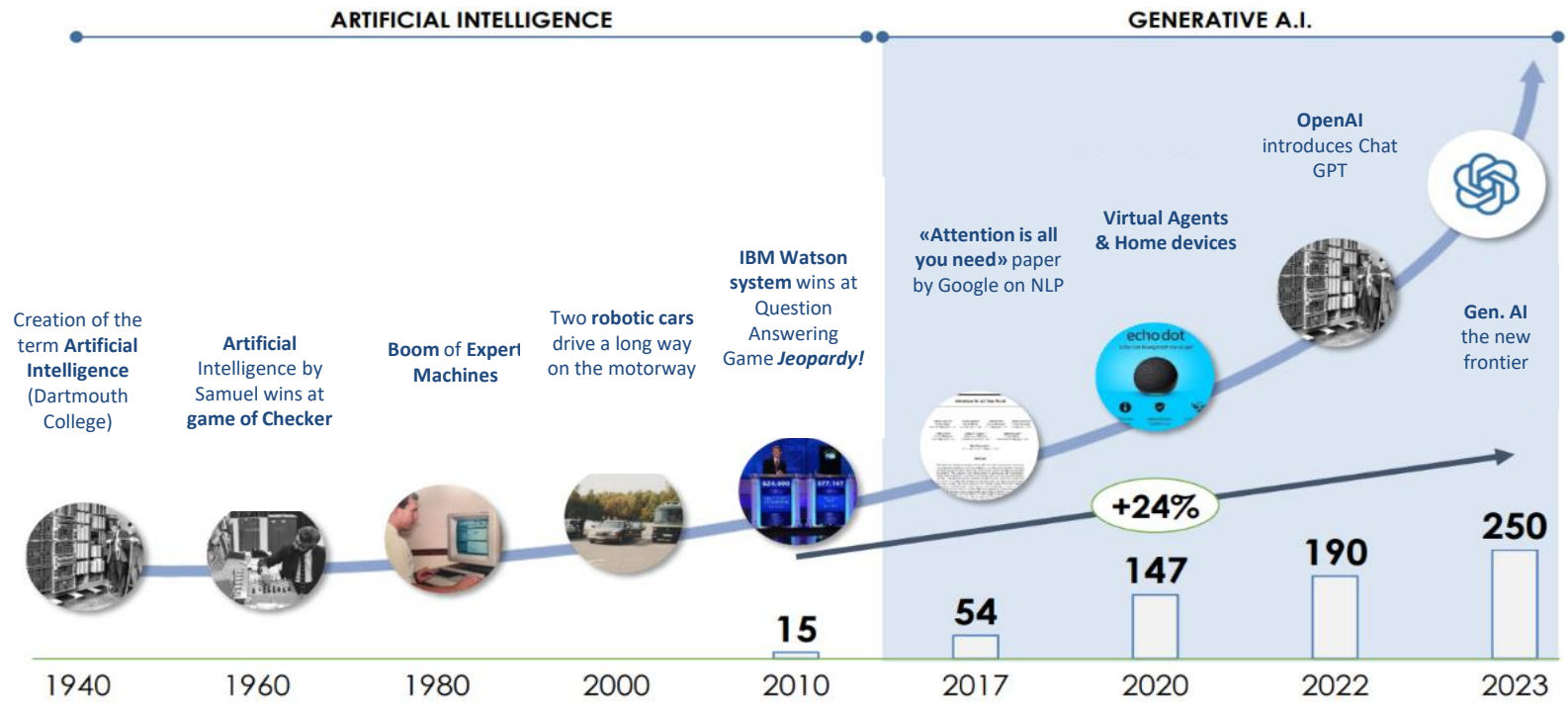
...KEY TRENDS

- ❑ **Exponential growth of AI/ML models**
Extension of Model Risk Management Framework to AI/ML models with focus on specific subjects
- ❑ **Integration of ESG related subjects**
Integration in the Model Risk Management Framework of ESG related subjects for the model risk assessment
- ❑ **Talent growth**
Development of internal skills in line with new market trends
- ❑ **External models usage**
Usage of third parties' models that needs a stronger oversight of model risk

THE EXTERNAL CONTEXT

Investments in AI

Corporate Investment in A.I. (2010 - 2023 €/mld)



Source: Deloitte Monitor

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MODEL RISK MANAGEMENT: WHERE WE STAND

Insights from the banking industry (1/5)

Over the last years, **many leading consultancies analyzed practices and the maturity of the banking industry in Model Risk Governance^(*)**. This section presents some relevant outcomes came-up from public surveys carried out:

- **The collected responses are very heterogeneous**, highlighting the **uncertainty** of the banking industry in **addressing the challenges of model governance**, especially those regarding the usage of **ML/AI**
- Although the usage of managerial models is increasing, **model risk management frameworks remain mainly focused on regulatory models**
- Confirming the above, **both validation exercises and audit activities are still most structured in relation to the regulatory models**. The **difficulty in implementing robust control approaches** is even greater when it comes to **internal models contributed by third-parties**
- While traditional econometric/statistical models can be validated leveraging standard statistical tests, **the increasing usage of ML/AI models make validation and audit activities increasingly complex**



MODEL RISK INVENTORY



TYPE OF MODELS INVENTORIED



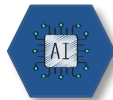
GOVERNANCE ON MODEL RISK MANAGEMENT



INTERNAL VALIDATION FUNCTION



INTERNAL AUDIT FUNCTION



ARTIFICIAL INTELLIGENCE / MACHINE LEARNING USAGE

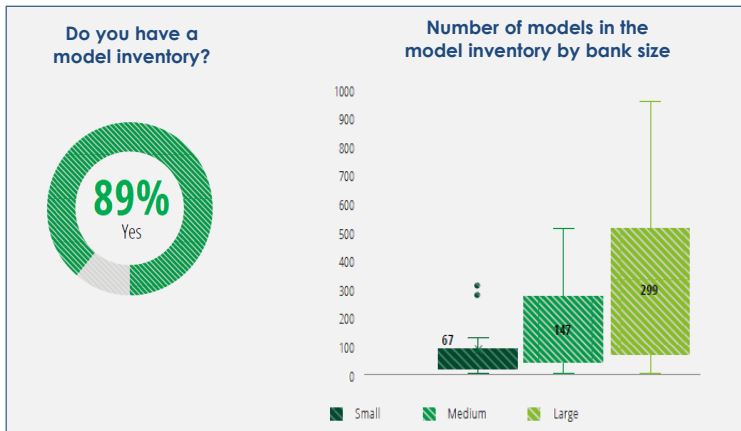
^(*) Sources:
- Deloitte - EMEA Model Risk Management Survey 2023
- McKinsey-RD MRM Survey 2023
- KPMG Models management in a complex and changing environment - A global benchmark analysis of significant banks (October 2023)
- KPMG IIF-EY Annual Survey Report on AI/ML Use in Financial Services (December 2023)

MODEL RISK MANAGEMENT: WHERE WE STAND

Insights from the banking industry (2/5)



MODEL RISK INVENTORY

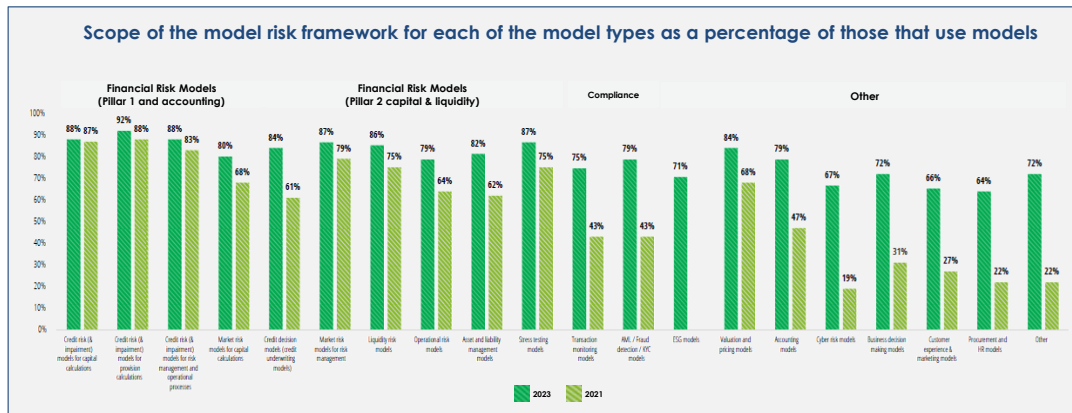


Practices diverge widely between small, medium and large banks. However, even between large banks the size of inventories is seen to vary considerably.



TYPE OF MODELS INVENTORIED

- ✓ Compared to the 2021, banks are now including more Managerial Models in scope of the MRM framework. This tendency is particularly clear for **compliance-related** and other model types such as **cyber risk, procurement, business decision and HR models and customer experience & marketing models**.
- ✓ The banks that include **pillar 2, compliance and other managerial models** in scope of their Model Risk Management framework are mostly **large and medium banks with a mature model risk management frameworks**.



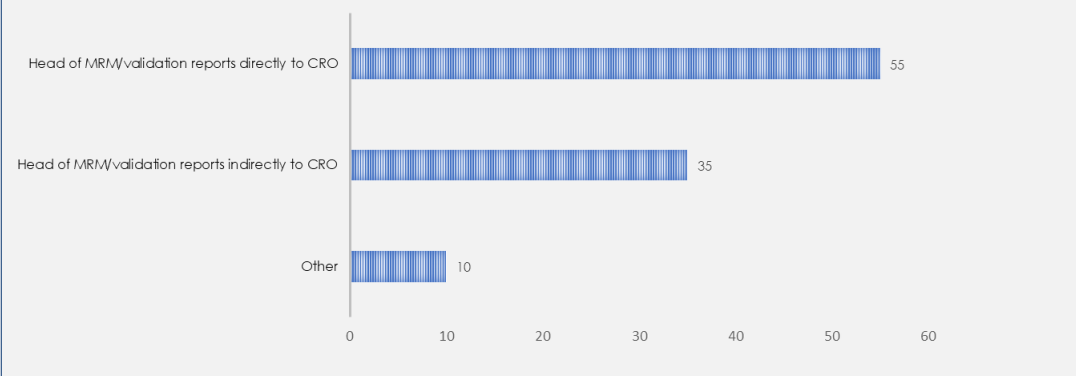
MODEL RISK MANAGEMENT: WHERE WE STAND

Insights from the banking industry (3/5)



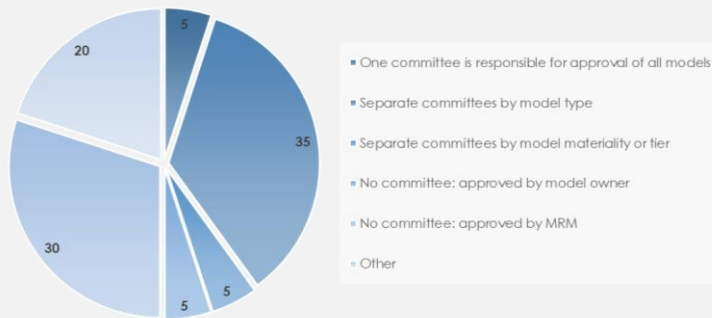
GOVERNANCE ON MODEL RISK MANAGEMENT

Where is your MRM/validation located within the corporate structure?

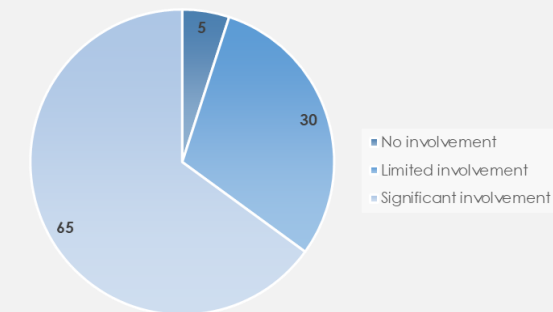


- ✓ For ~90% of banks, the head of MRM & Validation report directly/indirectly to the CRO, and for ~40% model approval is separated in different committees
- ✓ Responsibility for approving the models shows wide divergence among the banks
- ✓ ~90% of the banks involve the 1st LoD in the MRM function to ensure MRM awareness

Who is responsible for approving models?



To what extent does the MRM function involve the 1st LoD in MRM activities?

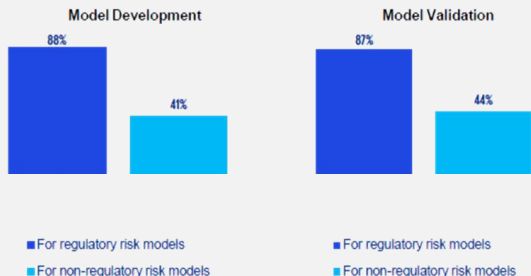


Insights from the banking industry (4/5)



INTERNAL VALIDATION FUNCTION

What type of models have approved corporate model development and validation standards?

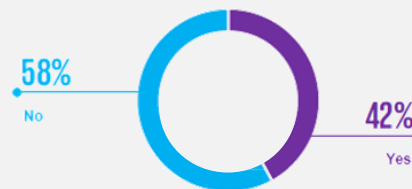


Most of models approved for Model Development or validated by Model Validation are focused on Regulatory Risk Models



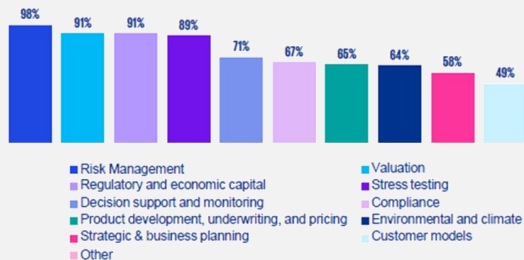
INTERNAL AUDIT FUNCTION

Is there a specific Internal Audit team for model risk review?



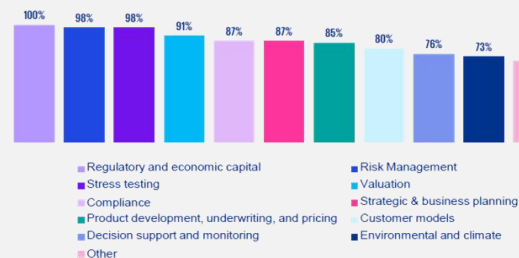
Excluding GSIBs, banks do not commonly have a specific Internal Audit team specialized in model Risk

What type of models are validated ?



Most of validated models by Internal Validation concerns Risk Management, Valuation and Regulatory and economic capital

What typology of models are audited?

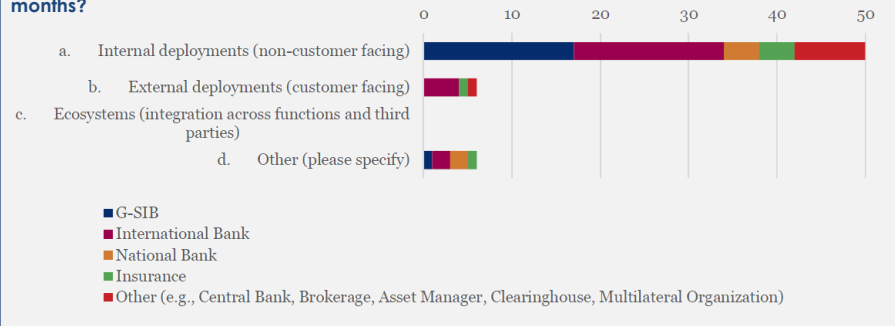


Due to regulatory requirements, Internal audit reviews are largely focused on regulatory and economic capital assessment, risk management and stress testing models.



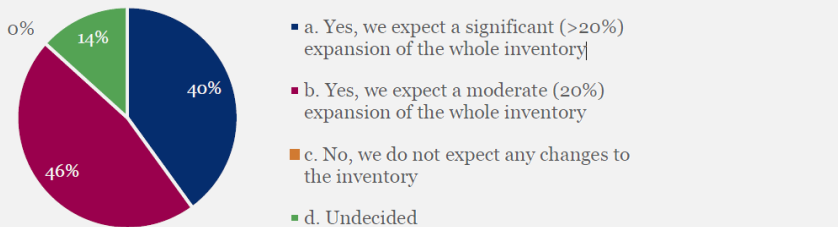
ARTIFICIAL INTELLIGENCE / MACHINE LEARNING USAGE

Where do you see generative AI most likely to be used in your institution in the following 12 months?



Most of institutions foresees the use of **Generative AI mainly** for **Internal deployments** rather than for external ones

Do you expect your model inventory to grow due to an increase in generative AI models in the next three years?



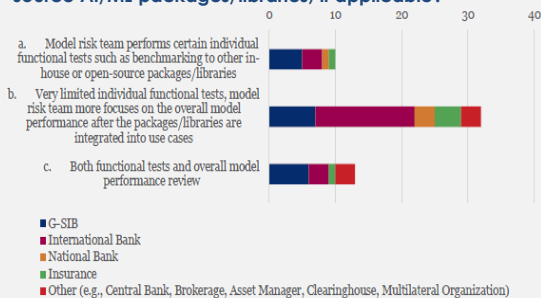
Uncertainty about the impacts related to the growth of the model inventory connected to the increasing of the Generative AI (moderate (20%) and significant impact (> 20%)

Does your organization have policies/procedures to control the following risks/concerns due to the use of generative AI?



Policies/procedures to control model risk have been observed in less than 50% of the sample

Does your organization's model risk management team (or equivalent) perform review/validation of the open-source AI/ML packages/libraries, if applicable?



✓ The **Model Risk Management Team** in general performs **very limited** tests on open-source AI/ML packages

✓ That **tests** are **mainly focussed** on the **overall model performance**

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A POSSIBLE AUDIT APPROACH FOR MODEL RISK MANAGEMENT FRAMEWORK

ISP's INTERNAL AUDIT FUNCTION ORGANISATIONAL CHART



KEY

-  = Audit Head Office Departments focussed on Business Divisions' activities
-  = Audit Head Office Departments entrusted of overseeing horizontal risks
-  = Audit Head Office Department entrusted of coordinating Internal Audit's structures for methodological and reporting purposes

Audit Dept. entrusted to carry out audit activities on **Internal Models** and **Artificial Intelligence solutions**

Organisational view

- The organisation of **ISP's Internal Audit Function** guarantees a **one-to-one relationship approach** with the **Business Units** and **Governance Areas**
- **Centralized oversight for horizontal risks through specialized audit Departments** (e.g. ICT/Cyber risks, credit risk)
- In response to the previous considerations, audit functions should become **more resilient, proactive, and value-driven** in supporting organizational objectives while effectively **managing emerging risks**.

KEY FIGURES

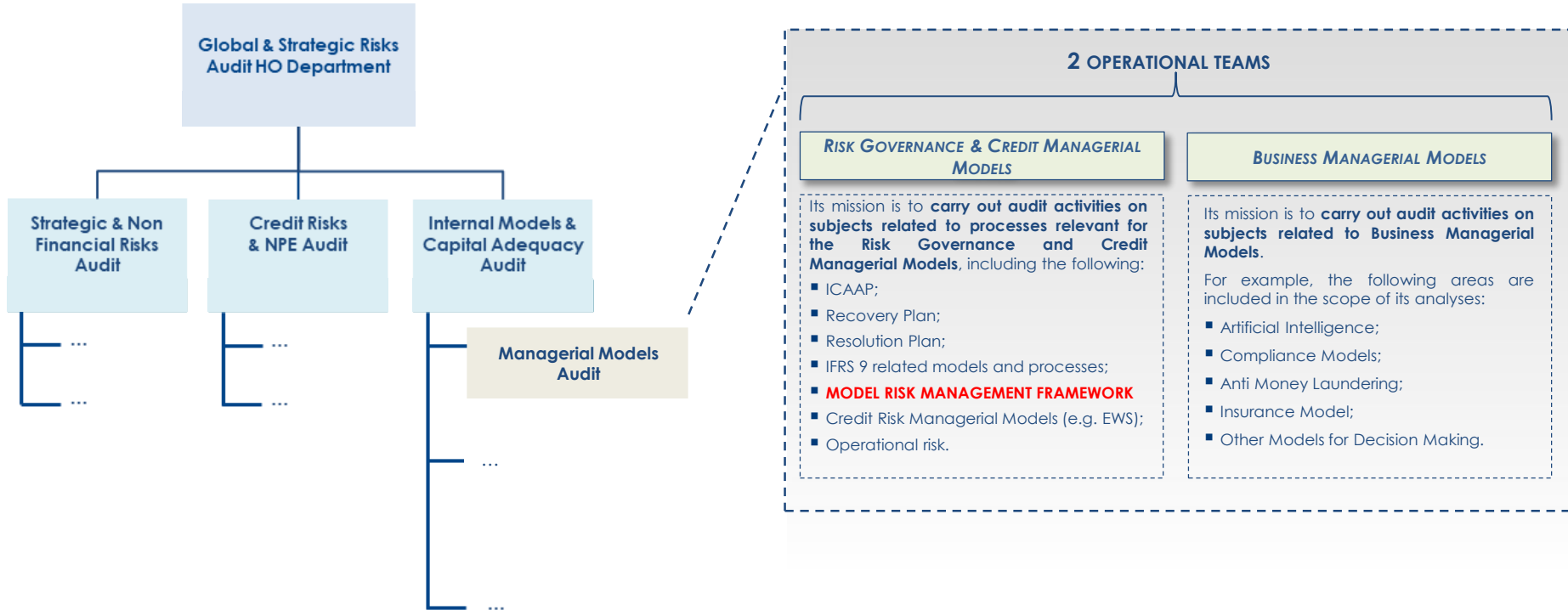


The ISP's Internal Audit function is a certified structure under the International Standards for Professional Internal Auditing

TOWARDS A NEW APPROACH TO INTERNAL AUDIT

Set-up of Managerial Models Audit structure

In 2021 a new audit structure was established with the aim of **aligning the Internal Audit's organizational structure to the Bank's strategic objectives** (including the exponential use of AI models), **strengthening audit activities on these subjects as well.**



A POSSIBLE APPROACH TO AUDIT MRM FRAMEWORK

Internal Audit activities should be focussed at least on targeting the following goals:

- **assess the MRM governance framework, including role, responsibilities and effectiveness of the Development Functions and Internal Validation Function**
- **identify and assess risks connected to the internal models** adopted by the company, including the evaluation of the potential impacts related to model errors/inaccuracies
- **identify vulnerabilities** and weaknesses in the modelling process

1. MODEL RISK GOVERNANCE

- Assessment of organizational safeguards and model governance:
 - *Roles and responsibilities*
 - *Process analysis*

2. MODEL RISK APPETITE

- Analysis of the model risk appetite defined in the RAF:
 - *Rules*
 - *RAF limits*

3. MODEL IDENTIFICATION

- Analysis of models and their relationships throughout the life cycle:
 - *Rules*
 - *Model life cycle*

4. MODEL TIERING

- Inherent risk assessment of models based on their business, regulatory, and reputational relevance
 - *Rules*
 - *Tiering scorecard*

5. MODEL RISK MITIGATION

- Verification of model risk mitigation techniques:
 - *Finding*
 - *Remedial actions*

6. MODEL RISK ASSESMENT

- Models residual risk assessment:
 - *Rules*
 - *Risk scorecards*
 - *Economic capital*

7. MODEL RISK REPORTING

- Assessment of the monitoring and reporting system:
 - *Model Risk Reporting Deck*
 - *Reporting AI*

THE CHALLENGES OF MODEL RISK MANAGEMENT FOR INTERNAL AUDIT

The role of Internal Audit within the Model Risk Management Framework (2/3)

For assessing the MRMF with an objective and quantitative approach some tools can enhance the fieldwork activities, such as:

- ✓ a **detailed control objective map** to be covered;
- ✓ a semi-automatic **evaluation framework** to assess the governance of model risk, with a risk-based approach.

ID	Title	Summary	Type	Conditions	Asses 1	Asses 2	Asses 3	Asses 4	Asses 5
001	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
002	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
003	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
004	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
005	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework

CONTROL OBJECTIVE MAP

ID	Title	Summary	Type	Conditions	Asses 1	Asses 2	Asses 3	Asses 4	Asses 5
001	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
002	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
003	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
004	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework
005	Model Risk Management Framework	Model Risk Management Framework	Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework	Model Risk Management Framework

EVALUATION FRAMEWORK

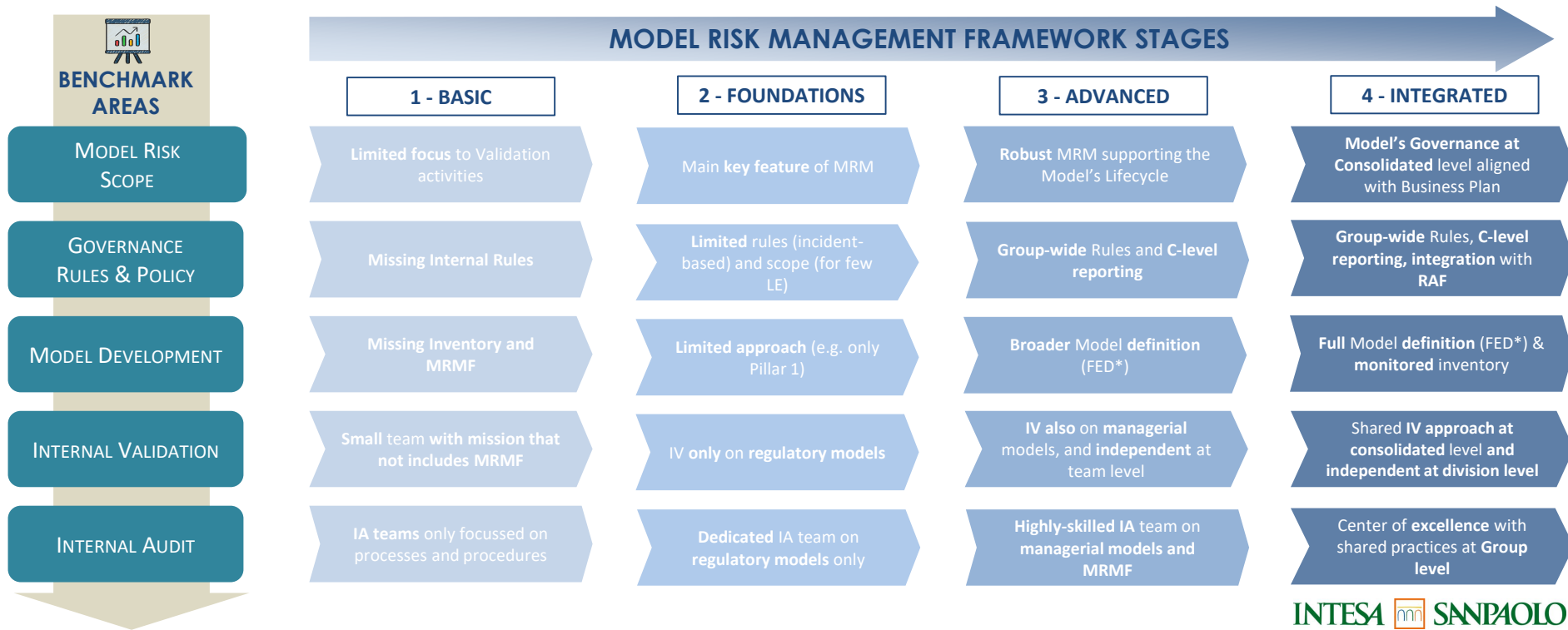
These tools help to define a **robust approach to the MRMF review** through **structured internal standards** that can ensure the identification of the **most critical and strategic areas for improvement**

THE CHALLENGES OF MODEL RISK MANAGEMENT FOR INTERNAL AUDIT

The role of Internal Audit within the Model Risk Management Framework (3/3)

In this period of regulatory uncertainty, **benchmarking could be particularly helpful** as it allows each institution to compare its strengths, weaknesses and approaches with peers.

Benchmark analysis can **support Internal Audit Function** in addressing its priorities in terms of **governance assessment, model risk evaluation**, oversight on the **adequacy of the 1st and 2nd levels of defense**.



(*) FED Guidance on Model Risk Management

TOWARDS A NEW APPROACH TO INTERNAL AUDIT

Internal Audit Function in the context of Model Risk Management

- ❑ In carrying out its activities, Internal Audit has the chance to **act as a catalyst for change and innovation** by enhancing the organization's performance and value creation
- ❑ **Interdisciplinary skills are needed** to cope with the multifaceted nature of risk and increased complex landscape
- ❑ **Model Auditors** focus on validating and ensuring accuracy of models while **Business Auditors** assess broader business context, governance, and strategic alignment of model risk management. **Data Analysts Auditors** concentrate on the quality and integrity of data used in the models (including data quality accuracy)
- ❑ **These roles complement each other** to ensure, within Internal Audit organisation a comprehensive and effective approach to managing model risk within an organization.



THANK YOU!

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