

Model Risk Management

Global Update 2019

Latest insights into the evolution of model governance practices across North America, Europe and Asia



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Introduction

Model risk is still nascent within typical banking risk inventories. While originally viewed as a sub-domain of operational risk, it has evolved and is increasingly considered as a risk category on its own. Similarly, model risk management (MRM) has evolved as a clearly defined discipline over the last decade, fueled by spikes of regulatory intervention in the aftermath of the 2008-2009 financial crisis.

The publication of supervisory guidance on MRM during 2011 by the Federal Reserve Board within the eponymous supervisory letter SR11-7 is widely considered as the key event that launched and shaped MRM practice globally. It has influenced not only industry practice but also the measures adopted by other regulators and supervisors outside the US, triggering a wave of MRM activity spreading from the US epicenter through Europe and more recently to banks in Asia.

In this publication, we take a closer look at MRM eight years after SR11-7, reflecting on how practice has evolved and the trends taking MRM into the future.

Overview

The findings from our latest global MRM survey (see sidebar) show that most banks still have some way to go in the journey from MRM as a costly compliance exercise to an efficient and strategically valuable exercise in risk management. Four main themes stand out:

1.

The scope of the MRM function is expanding.

Most banks have now extended coverage beyond traditional models to include a wide range of analytics used across many departments. This has been accelerated by rapid development in the use of AI and machine learning techniques to improve and automate analysis, decision-making and customer handling, with these advanced approaches also posing challenges in ongoing monitoring and management of models.

2.

Quantification and reporting of model risk continue to be a challenge.

Whilst various approaches have been developed by different institutions, there is no consensus on which model risk metrics should be used and how they can be communicated effectively to senior management. This has been compounded by the growing complexities of this emerging discipline, particularly in some Asian and European banks with less experience in managing model risk.

3.

Model risk is becoming more than a regulatory exercise.

Whilst the development of current MRM practices was largely driven by post-financial crisis regulatory changes, a growing number of institutions now also view MRM as a way to gain competitive advantage, both by avoiding model-related issues and enabling the deployment of sound and robust advanced analytics.

4.

Efficiency is now a focus for advanced institutions.

As demands on MRM functions increase, firms with well-established frameworks are shifting their efforts toward greater efficiency without compromising effectiveness. This typically involves a combination of process standardization, automation of validation testing and increasing use of tool-based monitoring approaches.

In addition, many banks are now grappling with two key enablers to meeting the future demands on MRM functions:

- **Technology**

The technology for improving MRM, including software to track the workflow as models progress through their lifecycle, is maturing rapidly. No single dominant tool exists, which forces risk managers to manage and customize several vendor tools or develop their own.

- **Talent**

An acute shortage of talent is proving to be a challenge for banks trying to improve how they manage model risk – especially because the discipline now requires expertise in data science and advanced analytics. In attracting and retaining talent in this area, banks are not only competing with other banks; they are going toe-to-toe with FinTechs and other companies that need AI and analytics skills.

In the following sections we explore each of the main themes described above before taking a look at the future developments we believe will shape MRM in the next decade.

Risk Dynamics, part of McKinsey & Company since 2016, has been working side-by-side with financial institutions, regulators and supervisors for over 15 years on shaping model risk management practices. Our international MRM surveys and roundtable events began in 2010 and have recently expanded their coverage from North America and Europe to include also Asia and Australia. Besides banking, special editions of the survey exist for insurance and asset management sectors. Through these events we have convened over 75 leading global banks and gathered benchmarks on a range of important topics. Combined with our global footprint in MRM advisory support, this gives us an unrivaled view of MRM practices and trends worldwide.

1. The scope of the MRM function is expanding

Banks have broadened their view on model inventories, going beyond regulatory and risk-related forecasting models. They have also deepened their end-to-end view of model life cycles by enhancing frameworks, processes and tools in each step.

What's more, the rapidly growing and increasingly widespread adoption of advanced analytics and big data across institutions has propelled the use of models into new areas of the business and novel applications. In fact, 80% of the institutions we surveyed said that expanding models across their business is a priority, and 30% believe their current application of models is too limited.

At the same time, banks are increasing their attention on model risk management and governance for third parties. They now realize they operate in a digital ecosystem that transcends traditional banking industry boundaries – one in which partnerships and joint ventures with FinTechs, analytics vendors and data providers have become the new norm.

North American perspective

Not surprisingly, banks are significantly expanding their MRM activities, covering almost anything that looks like a model. For example, a growing number of institutions capture End User Computing tools – the smaller and typically less complex calculations and analytics used by individuals in day-to-day work – within their model risk analysis. Newer model classes such as cyber risk, conduct risk and research are also typically included. This casts a very wide net for managing model risk – far wider than in other regions.

Managing model risk relating to machine learning is also on a pronounced upswing. It comes with many unique challenges: new modeling

techniques with greater levels of complexity and additional risks (e.g., bias and opacity). AI models are increasingly being used in areas such as fraud detection, marketing campaigns, employee conduct monitoring, compliance, algorithmic trading and in some cases credit decisioning.

With so many more models in play across large banks, risk managers need more efficient ways to identify and evaluate them.

European perspective

In Europe, recent regulations have forced banks to redevelop Basel Pillar 1 models significantly and reassess their needs for other models. But these updates of existing models have diverted attention from the expansion of model risk management across the analytical landscape, with banks only recently beginning to add other managerial models (such as compliance and conduct-related models, business models, and human resources models) into the inventory.

AI models are gradually taking shape and are being included in inventories. However, adoption is happening at a slower pace than in North America and Asia due to the regulatory requirements banks are facing, such as the Targeted Review of Internal Models (TRIM) missions conducted by the European Central Bank. For example, the TRIM program has required banks to spend on average 4-8 weeks preparing and then 8-12 weeks supporting intensive review exercises servicing teams of on-site inspectors for single regulatory

model domains including credit risk, market risk, and counter-party credit risk. However, validation of AI models remains top of mind and is a rapidly developing practice.

Asian perspective

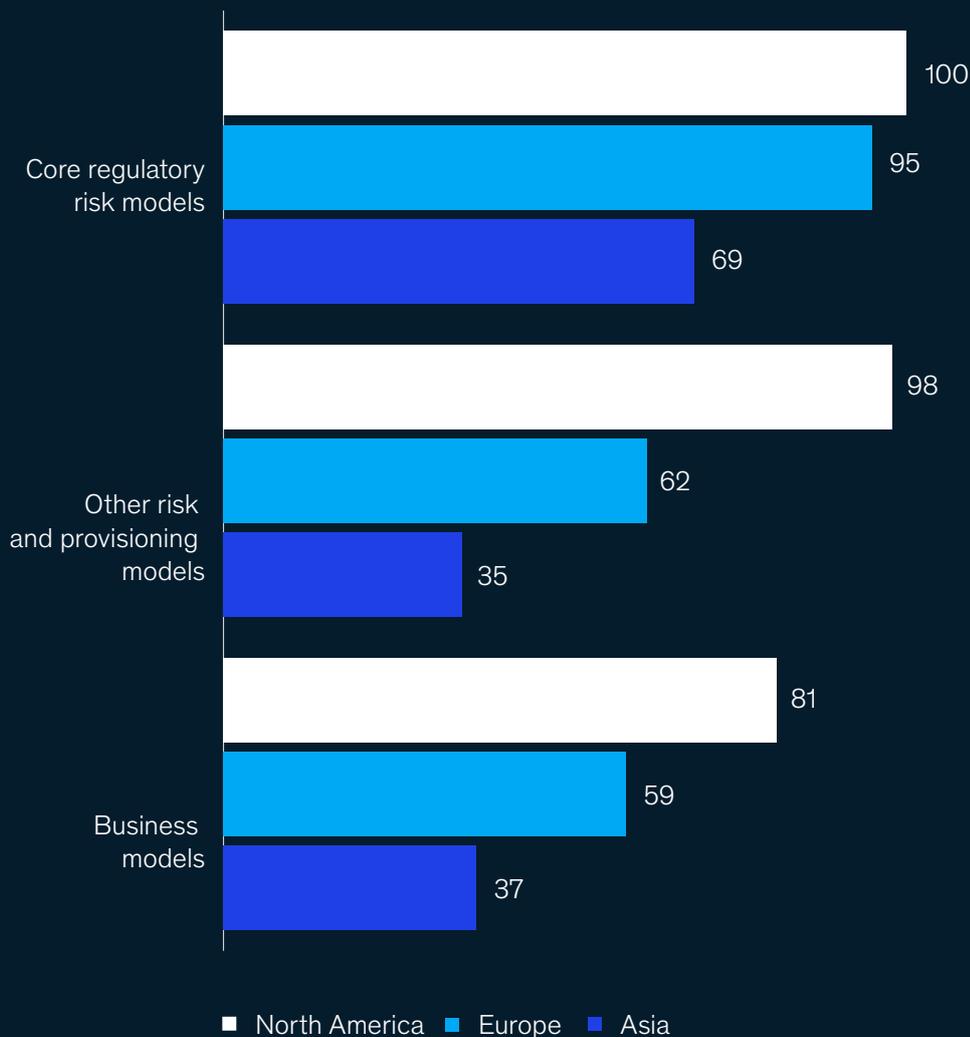
MRM is still less mature and not yet widely adopted in Asia. Amid a lack of strong regulatory guidance, Asian banks have primarily focused on building inventories of their regulatory risk models, namely Basel and more recently IFRS9 models.

However, there is an increasing recognition of a need for more complete MRM approaches in response to the very aggressive adoption of

machine learning models in the region across a wide range of use cases. This has been further propelled by an increasing number of sizable digital attacker banks, particularly in China, but also in Indonesia, and Vietnam, and a rapidly growing FinTech sector in the region (especially in Singapore, Malaysia and Thailand).

North America banks leading the way with adding non-regulatory models to inventories

% of respondents



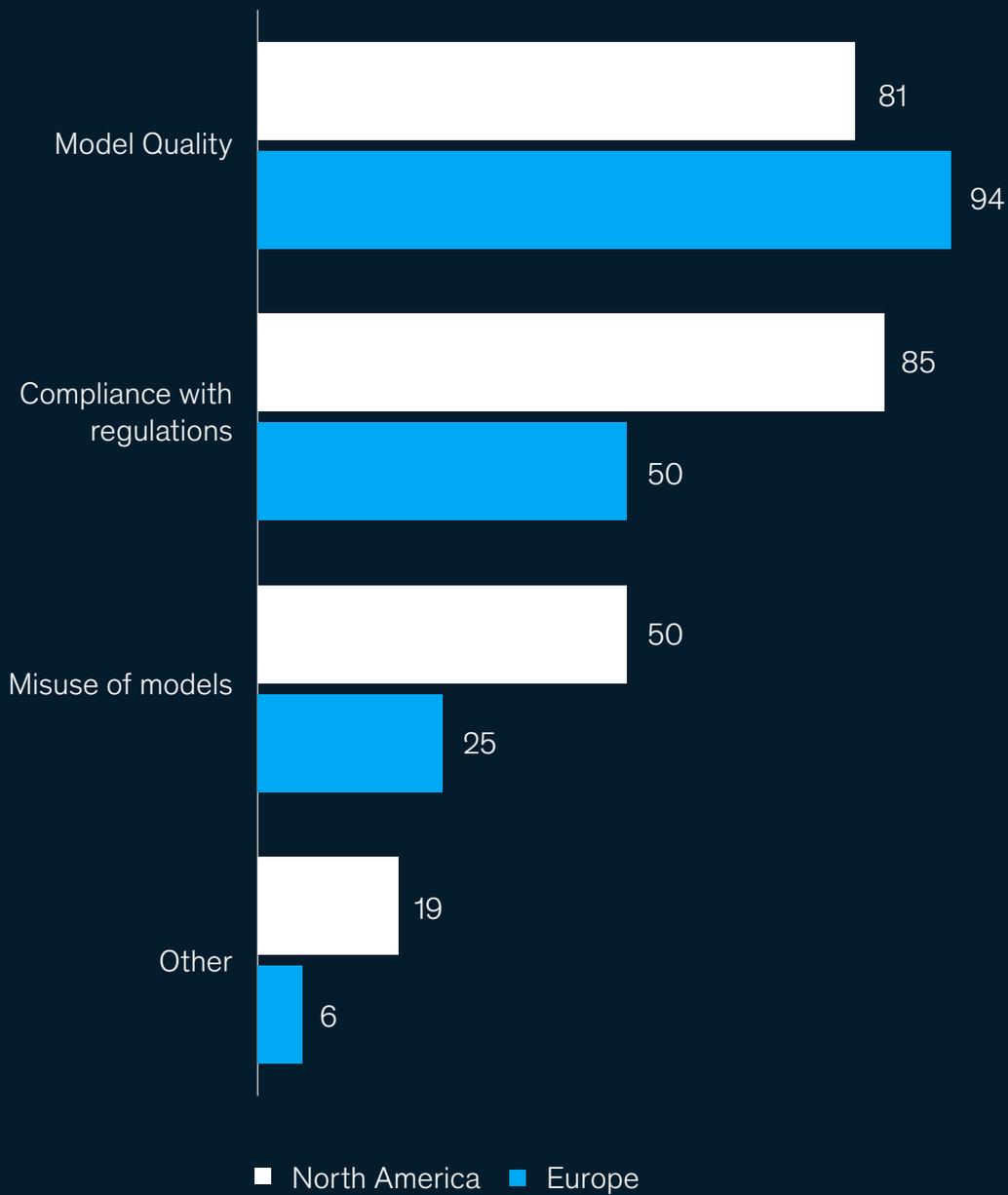
2.

Quantification and reporting of model risk continue to be a challenge

Rather than model risk management simply being a technical exercise, all banks see stakeholder management and engagement of senior executives as key success factors. However, the true impact of setting up an MRM framework is still hard to grasp. While summarizing market risk in a single 'Value at Risk' quantity turned it into a widely used management tool, the same quantification of model risk is difficult both for individual models and portfolios. This intractability can limit how compelling model risk management seems in the context of bank-wide risk management.

Typical Model Risk KPIs reported to top management

% of respondents



SOURCE: McKinsey-Risk Dynamics MRM Survey for North America, Europe and Asia, 2019

In Asia 80% of banks surveyed assess model risk through validation reports/findings only and the remainder do not report model risk at all – therefore no data on typical model risk KPIs is available

Counterintuitively, despite this challenge being based in the complexity of model risk, we may see improvements as a result of the increasing use of advanced analytics. In particular, as models and analytics become more widely used across organizations, the profile of model risk management increases and management pays more attention. Catchy headlines around machine learning only help to reinforce this effect. Whilst widespread and standardized model risk reporting may still be lagging behind the use of new modeling techniques, this analytical evolution appears to be driving the right trends.

North American perspective

As a result of the stress testing framework developed after the financial crisis, model risk management and reporting received significant attention as part of the Fed's annual Comprehensive Capital Analysis and Review exercise (CCAR) and Dodd-Frank Act stress test (DFAST) exams. This regulatory focus has helped put MRM on the agenda for the board and senior management, leading to integration of model risk into firms' risk appetite and extending the focus beyond regulatory models.

Many North American banks have experimented with a range of practices on reporting model risk. Whilst some more quantitative approaches have been attempted, most banks now use more qualitative or judgement-based approaches based on model quality and compliance with internal standards. However, no dominant approach has emerged as the industry standard. Aggregating model risk across models in a way that is easy for management to understand continues to be a challenge.

European perspective

As with North America, MRM in Europe was largely kick-started by regulators in various ways, including recent guidance provided by the ECB in 2018 as a direct result of TRIM. However, it is only as institutions have started to understand the added value of effective MRM and the potential impact of model failures that they have developed fully fledged frameworks, with largely qualitative reporting mirroring the approaches used in the US.

Asian perspective

Our research into banks in Asia shows a conflict between the rapid adoption of advanced analytics and big data-powered analytics and an ongoing lack of awareness of model risk among senior management. With a growing enterprise-wide

focus on MRM and increased supervisory scrutiny, educating the C-suite about the benefits of good governance will be a key success factor for the region.

Risk management teams also need to find a language to communicate a technical subject like model risk to a senior audience and establish an appropriate governance structure that drives the right discussions on each level of the organization, such as dedicated working groups and committees for model risk. To support this, the validation function will need to migrate from mainly technical review to a more holistic MRM function covering the entire model landscape in an organization.

3.

Model risk is becoming more than a regulatory exercise

In the absence of a universal, global regulation for model risk management, most development has been driven by the guidance in Supervisory Letter SR 11-7 issued by the Fed in 2011. In the US, the Fed’s strong push combined with unusually comprehensive guidance drove banks to lead the way in establishing common practices for MRM. Over time, this has gradually migrated to other regions as banks with US exposure adopt SR 11-7 in their global operations and gradually establishing it as the industry standard.

However, some banks have developed other approaches, particularly where local regulators are less prescriptive. Indeed, some regulators are looking for banks to shape the path for industry practice before crafting their own guidance. As a consequence, while the US has set the tone in model risk management, specific practices may still vary by region for some time.

North American perspective

The combination of SR 11-7 and intense regulatory exercises such as CCAR have set expectations for MRM in US banks while establishing a global benchmark. For example, a strict interpretation of the model definition in SR 11-7 extends the reach of MRM well beyond the previous perimeter, with the limit now sometimes being driven by the capacity of the institution to handle the resulting workload.

In addition, as use of analytics and data evolve within banks, legislators are also putting more focus on new and evolving risks posed by machine learning such as issues of transparency, fairness and bias. The introduction of the Algorithmic Accountability Act of 2019 requires companies that use AI to conduct “automated decision system

impact assessments and data protection impact assessments” to look for issues of “accuracy, fairness, bias, discrimination, privacy, and security.” The OCC has proposed an Innovation Pilot Program to help promote FinTech innovation ‘safely’ in partnership with the agency.

European perspective

As North American practices have gradually made the leap across the Atlantic, European banks have received their own regulatory guidance but typically focused on restricted categories of models. For example, the SREP for Pillar II models issued in 2014 provided the first definition of model risk, with the ECB guide to internal models following in 2018 as an output of the TRIM programme forming the first pan-European effort to review and eventually align modeling practices and model governance across ECB-governed banking institutions.

In the aftermath of the TRIM programme, a large number of institutions have started to proactively engage on MRM beyond technical validation. Findings from specific TRIM missions (e.g., lack of formal policies and guidelines for model recalibration, model validation, model monitoring

and robust Margin of Conservatism processes in credit risk models) have demonstrated the need for a wider application of an MRM framework. However, compared to the US approach, some differences remain in model definitions and the comprehensiveness of model inventories.

Asian perspective

With banking regulation in Asia significantly more fragmented than elsewhere, it is no surprise that banks in the region have more varied approaches to MRM.

Most banks take guidance from Basel, IFRS 9 or domain-specific regulations. For their part, regulators remain open to learn in controlled environments (e.g., regulatory “sandboxes” established in Singapore or Malaysia) about new modelling techniques and use cases adopted by banks and FinTech firms.

Nevertheless, leading institutions are not waiting for regulators to enforce MRM practices. Instead, they see it as a necessity to support the aggressive adoption of advanced models in their organizations. MRM is seen both as good risk management and strategic competitive positioning. However, outside these more progressive firms, the wider banking population is still struggling to deal with advanced analytics and its related model risks.

4.

Efficiency is now a focus for advanced institutions

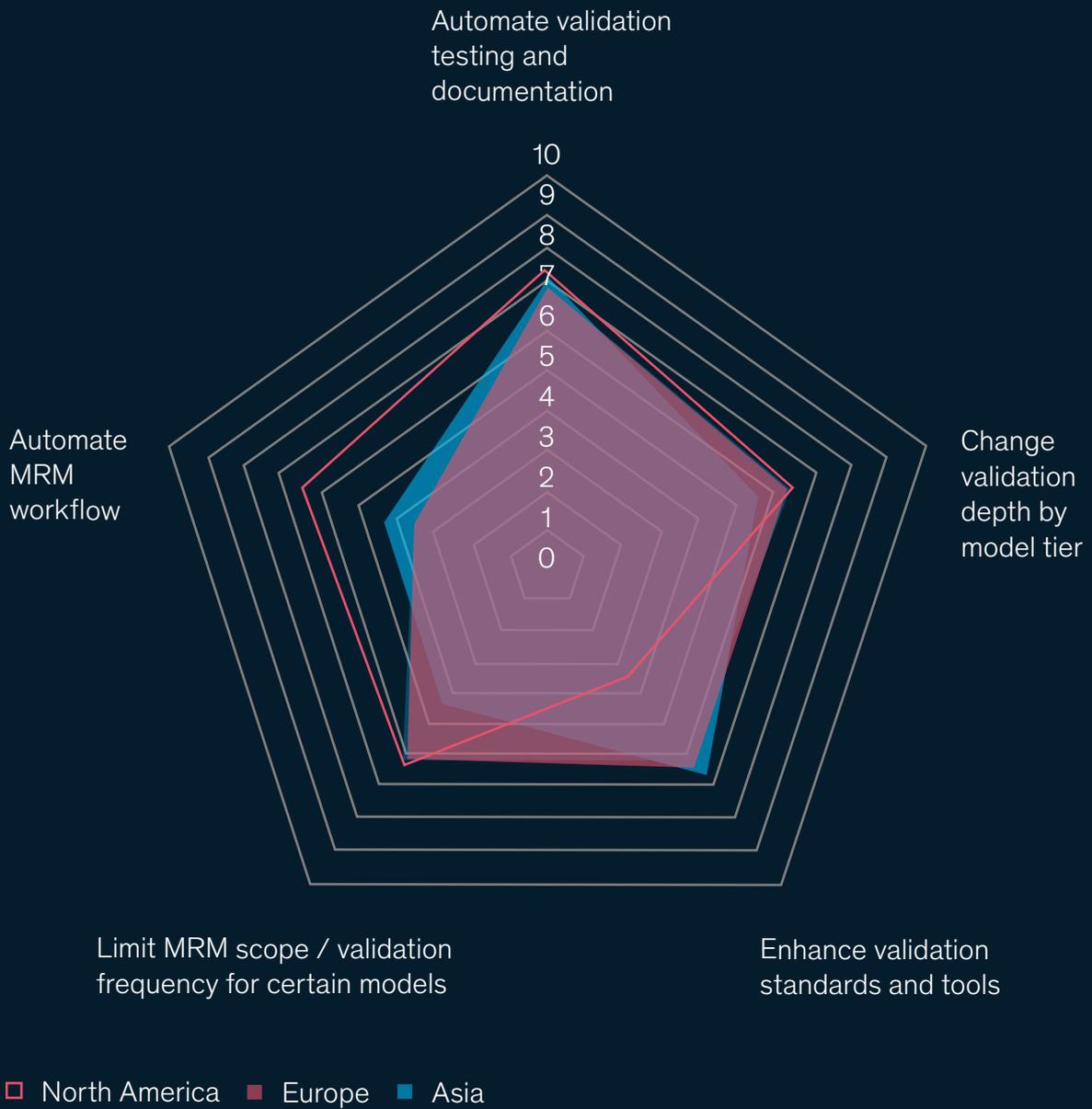
Initially seen as primarily a regulatory cost burden, MRM has consumed increasing volumes of resources as banks race to keep up with expanding model inventories, ongoing tightening of regulatory expectations and growing competition for scarce talent. As approaches have matured, the largest institutions are seeking increased efficiency from MRM without losing the value they now recognize is generated by the discipline.

Whilst in some cases this is simply done by shifting responsibility for many MRM activities to first-line functions, such as model owners and model developers, a range of other efficiency measures is being explored, including:

- **Automating MRM processes:** Banks are exploring ways to automate parts of model development, validation and ongoing monitoring activities including testing and documentation. For example, by linking the infrastructure between development, validation and production, and by embedding all testing in the live environment, some banks have reduced the time it takes to update a model or to monitor model performance.
- **Refining validation depth and define the standards:** Focusing validation activity on the areas that present the highest model risks can increase efficiency while reducing validation effort. Some MRM functions have created a new “ultra-low” tier for new models that pose minimal risk to the institution.

- **Managing the scope of MRM:** As model inventories continue to grow, some firms are trying to establish clear boundaries around which models are covered by MRM. For example, many banks have delegated end-user computing and deterministic tools to another second-line function within the bank outside of MRM.

Planned adoption of efficiency measures by region



SOURCE: McKinsey-Risk Dynamics MRM Survey for North America, Europe and Asia, 2019

North American perspective

With many firms having already invested significantly in developing mature MRM functions, cost pressure is now driving demand for efficiency. These teams are now pushing toward optimum team sizing, outsourcing selected activities and establishing offshore centers as they become more 'business as usual'. Front of mind is the need to be ready for the next wave of development, most likely centered around AI, big data and real-time monitoring, supervision, and calibration of models.

European perspective

While top-tier European institutions are in a similar position to many North American banks, a number are still evolving their MRM function with the resulting upward cost trajectory. In an attempt to shortcut the cost curve, some are already trying to incorporate deployment of efficiency measures directly into their plans to mitigate some of the additional workload. This includes enhancing and standardizing methodology, improving governance and processes, and streamlining the interaction with model developers. More sophisticated approaches such as automation and use of AI tools (e.g., for data quality review) are typically also on the horizon.

Asian perspective

Given the comparative regulatory freedom in the region, banks in Asia have an opportunity to leapfrog the 'compliance' model of MRM that most North American and European banks have experienced and move directly to an optimized long-term operating model. This will require a combination of applying the lessons learnt in the development journeys in other regions and the ready deployment of increasingly available technology solutions (e.g., automation tools and AI-based model monitoring solutions). Given the appetite for advanced analytics, a strong technology-backed MRM approach may even become a basic requirement for managing the risks of next generation models.

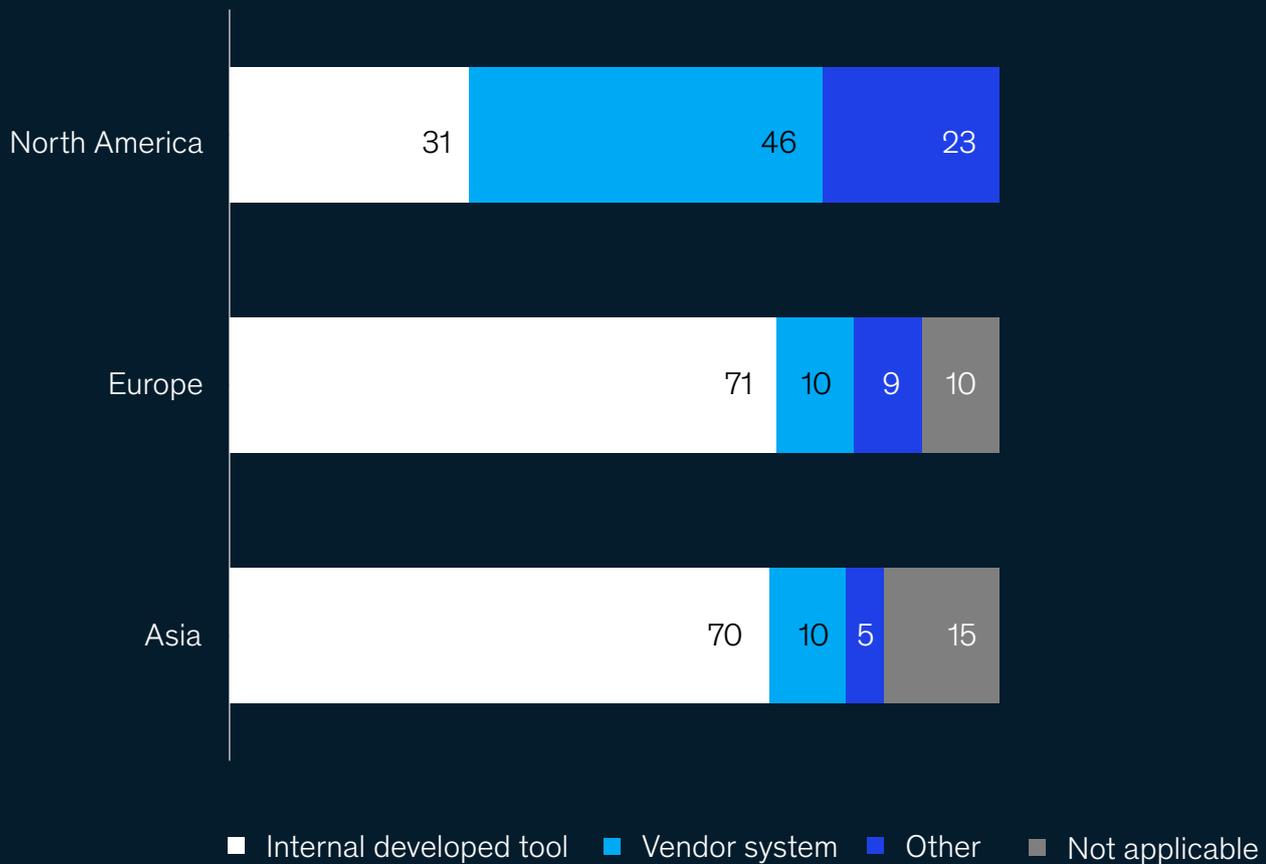
MRM key enablers: technology and talent

North America is clearly leading the pace in technology adoption and investments for MRM, such as the use of dedicated inventory and workflow management solutions. However, other regions are catching up while benefitting from the experience of early adopters in North America and greater choice of vendor solutions, potentially avoiding costly attempts at internal development of solutions.

Modern data-hungry models, in particular machine learning solutions, increase the dependency on large data sources and the supporting technology including model development platforms and data lakes. Firms are increasingly focused on data lineage allowing the impact of data issues to be tracked, affected models identified and any issues mitigated or remediated.

Technology solutions are now being adopted widely to support MRM, but outside of North America most are still internally developed

% of respondents



SOURCE: McKinsey-Risk Dynamics MRM Survey for North America, Europe and Asia, 2019

However, this growth in technology is not yet able to mitigate the human side of the equation. Attracting and retaining talent remains a key challenge across all regions with stiff competition amongst a large financial ecosystem where FinTech firms, shadow banks and digital attackers are all chasing the same talent pool. Many firms are therefore investing in training and career development of their MRM teams, and in some cases experimenting with centers of excellence or dedicated teams focused on new model types such as machine learning.

North American perspective

North American institutions have led the adoption of MRM-specific technology solutions, mostly focused on inventory management, workflow and reporting. However, despite the arrival of vendor software which has gradually replaced internal solutions in recent years, tool-based MRM workflow continues to be a challenge. Despite a range of approaches in use, most banks remain dissatisfied with the ability of their existing tools to automate MRM workflow. This often leads to ineffective tracking and reporting of model risk. The biggest challenge banks mention is inflexible system design, which is unable to meet the fast-changing requirements of effective MRM.

European perspective

Larger firms with established MRM frameworks and model inventories are now investing in related technology. Whilst on a path similar to North American banks, European firms are currently more focused on core workflow and inventory management, and less on wider topics such as automation of testing, model monitoring and end-to-end platforms for development and validation.

European banks are also facing a notable peak in demand for credit risk and market risk talent due to the redevelopment of Pillar 1 credit models, whilst also seeking new capabilities to support the expected wave of validation covering advanced modeling techniques.

Asian perspective

Technology solutions are a particular priority for banks in Asia as they try to solve two challenges: the rapid adoption of AI models requires new model management techniques and an acute talent shortage in most regions (India and China being notable exceptions) is driving a need for efficiency and automation.

Given the investments in advanced analytics, many institutions are looking for fully-specified end-to-end platforms that combine model development with specific model risk functionality including model monitoring, model risk reporting, inventory management, and overall workflow.

Some of the appetite for technology is an attempt to mitigate the difficulties of finding suitably skilled resources, due both to local language barriers and strong competition for analytics talent across all industries – a constraint very strongly felt in several markets in South East Asia. In addition, firms with a global footprint, mostly present in China and Japan, face a growing need for talent with global regulatory expertise.

The future of model risk management

For risk managers looking to prepare for the future of MRM, there are a number of clear trends emerging:

- As competition drives deployment of advanced analytics, model risk will increasingly get board-level focus with a need for appropriate enterprise-wide reporting
- Volumes of data and the complexity of models will grow rapidly, shaping the 'DNA' of institutions and requiring enhancements to MRM frameworks, tools and talent
- End-to-end management of model risk across the 1st and 2nd lines of defense will become commonplace, with a greater burden of monitoring and testing placed on model owners
- The 'war for talent' in the advanced analytics is likely to continue and will affect an organization's ability to address all MRM needs
- MRM functions will be pushed to drive further efficiencies in the face of increasing workload

Longer term, there is the potential for more fundamental changes to model risk management that may affect the strategy and composition of risk management functions within banks:

- Risk management will become more embedded into models with benchmarking, monitoring and potentially active mitigation being incorporated by design, possibly using machine learning techniques to adapt to changes in the modelling environment over time
- AI tools may increasingly become used to perform model validation tasks, perhaps going beyond statistical testing into some elements of documentation assessment and reporting
- Regulators will focus on the ethical application of AI in model outcomes and use, potentially providing guidelines for acceptable use and behavior of AI models

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