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New supervisory guidance on model risk management:

Overview, analysis, and next steps

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Features of new guidance

- Issued as supervisory guidance (21 pages) – not as a risk bulletin. This is a stronger form of regulatory guidance.
  - This is a replacement of OCC Bulletin 2000-16 and provides guidance to OCC examining personnel and national banks on prudent model risk management policies, procedures, practices, and standards.
  - The OCC expects all national banks to consider the new guidance and modify their model risk management frameworks as necessary.
- Issued by OCC and Fed. FDIC and NCUA are <u>not</u> formal co-issuers.
- Expands on existing regulatory guidance – most importantly by broadening the scope beyond model validation to include all aspects of model risk management.
- Based on supervisory and industry experience over the past several years.

Structure of new guidance

- Overview of model risk management
  - Revised “model” definition
  - Expanded model risk definition
  - Discussion of model risk management
- Model development, implementation, and use
- Model validation
  - “Effective challenge” standard
  - Key elements of comprehensive validation
    - Evaluation of conceptual soundness
    - Ongoing monitoring
    - Outcomes analysis
  - Validation of vendor and other third-party models

Structure of new guidance ***(continued)***

- Governance, policies, and controls
  - Board of directors and senior management
  - Policies and procedures
  - Roles and responsibilities
  - Internal audit
  - External resources
  - Model inventory
  - Documentation

Primary areas of impact

- Comprehensive model risk management program requirements
- Annual model review requirements
- Increased standing of model risk management unit
- More formalized and expanded model governance and controls
- Increased role for internal audit
- Greater risk management of vendor models
- Management of aggregate model risk

Comprehensive model risk management program requirements

The bar has been raised significantly with respect to the scope, formality, rigor, and prominence expected of banks' model risk management programs. Program features that were previously considered "industry leading practices" are now minimum regulatory expectations.

- "Model risk should be managed like other types of risk."
- New guidance adopts a life-cycle view of model risk and, as such, the bank's model risk management framework is expected to include standards for model development, use, and maintenance to which all model owners, users, and other stakeholders will be held.
- Broader roles and responsibilities for enterprise-wide model risk management – it is not just the responsibility of the model validation unit:
  - Model developers / owners
  - Model users
  - Model validators
  - Senior management
  - Board of directors
  - Internal audit

Comprehensive model risk management program requirements *(continued)*

- Formal and explicit role of model risk mitigation controls to address risks and limitations self-identified by model developers, or identified during independent model validation – for example:
  - Sufficient communication of model risks and limitations to senior managers and model users
  - Model use limitations
  - Regular model performance monitoring
  - Supplementing model results with other analysis / estimates
  - Use of conservatism
- Responsibility for model risk mitigation controls may be assigned to individuals, committees, or a combination of the two, and should include risk measurement, limits, and on-going monitoring.

Comprehensive model risk management program requirements (continued)

- Technology spend and process controls should be commensurate with model risk:

  "*Model risk management also involves substantial investment in supporting systems to ensure data and reporting integrity, together with controls and testing to ensure proper implementation of models, effective systems integration, and appropriate use.*"

- Model risk management is an on-going process – not a periodic activity:
  - Monitoring model risks and limitations identified during model development and independent validation.
  - Monitoring of model process risks (e.g., internal and external data inputs, computer code, and system integration).
  - Monitoring environmental changes (i.e., products, exposures, activities, clients, or market conditions) that may impact model risk.
  - On-going validation of material model changes.
  - Regular model performance monitoring (i.e., back-testing, benchmarking, sensitivity analysis, and stress testing).
  - Model risk reporting to senior management and, as necessary, the board of directors.

Annual model review requirements

Leveraging Basel II requirements, the new guidance directs banks to conduct periodic model reviews – at least annually – to determine whether models are working as intended and whether existing validation activities are sufficient. This is likely to be a new or expanded process for many banks.

- This is not meant to be a full revalidation; rather, it could be designed as an annual model-specific risk assessment.
- The first step of this process would be to identify changes in the model's risk profile based on:
  - Changes in the bank's internal (e.g., policies, products, customers, markets, etc.) and external (e.g., markets, regulation, etc.) environments that would potentially impact the model's estimates.
  - Changes in model use.
  - Advances in industry modeling methodologies.
  - Results of applicable internal and external audit testing.
  - Regulator feedback.
  - Results of on-going monitoring (e.g., back-testing, benchmarking, and IPV)
- Based on this updated model-specific risk assessment and a review of prior validation activities, one or more of the following outcomes would apply:
  - Previous validation work and conclusions are affirmed. No additional work required.
  - Certain updates to previous validation work are required.
  - New validation activities are required.

Increased standing of model risk management function

For many institutions, the role of the model risk management unit may need to be elevated to meet the new supervisory guidance.

- The model risk management function needs to be influential; have explicit authority to challenge model developers and users, and to elevate findings; and have sufficient stature to bring about changes.
- Influence can be reflected in reporting lines, title, rank or designated responsibilities, and should be evidenced by a pattern of actual instances in which models, or use of models, have been appropriately changed as a result of validation.
- Sufficient standing of model risk management function is required to demonstrate "effective challenge" – which is the regulatory standard to which all model risk management activities will be held.
- The model risk management function must have commitment and support from senior management, and should be integrated into the bank's overall risk management framework.

"*Even if model development, implementation, use, and validation are satisfactory, a weak governance function will reduce the effectiveness of overall model risk management*."

More formalized and expanded model governance and controls

For many institutions, the use of peer-review committees or model validation committees led by non-senior management level personnel may no longer represent a sufficient level of governance and oversight of model risk. According to the new guidance:

- The extent and sophistication of a bank's governance function is expected to align with the extent and sophistication of model usage.
- Duties of senior management include establishing adequate policies and procedures and ensuring compliance, assigning competent staff, overseeing model development and implementation, evaluating model results, ensuring effective challenge, reviewing validation and internal audit findings, and taking prompt remedial action when necessary.
- In the same manner as for other major areas of risk, senior management, directly and through relevant committees, is responsible for regularly reporting to the board on significant model risk, from individual models and in the aggregate, and on compliance with the bank's policies.
- Board members should ensure that the level of model risk is within their tolerance and direct changes where appropriate. These actions will set the tone for the whole organization about the importance of model risk and the need for active model risk management.

Increased role for internal audit

Under the new guidance, internal audit ("IA") has an expanded role in the bank's model risk management framework – in particular:

- Rather than duplicating model risk management activities (e.g., through performing independent model validation), IA should instead evaluate whether model risk management is comprehensive, rigorous, and effective.
- IA staff is expected to possess sufficient expertise in relevant modeling concepts, as well as their use in particular business lines.
- If some IA staff perform certain model validation activities, the assessment of the overall model risk management framework should be conducted by other parties, such as independent internal audit staff.
- IA should perform assessments of supporting operational systems and evaluate the reliability of data used by models.
- IA should review validation activities conducted by internal and external parties with the same rigor to see if those activities are being conducted in accordance with the new supervisory guidance.
- IA should evaluate processes for establishing and monitoring limits on model usage, and check that model owners and control groups are meeting risk reporting standards.

Greater risk management of vendor models

For many banks, the expected model risk management activities for vendor models will be greater than current activities:

- To determine whether the model is appropriate for the bank's products, exposures, and risks, banks are expected to require vendors to provide developmental evidence explaining the product components, design, and intended use of the model.
- Vendors are expected to provide appropriate testing results that show their product works as expected.
- Banks should expect vendors to conduct ongoing performance monitoring and backtesting, with disclosure to their clients, and to make appropriate modifications and updates over time.
- Banks are expected to validate their own use of vendor products, and may have to rely more on sensitivity analysis and benchmarking to do this.
- A bank's customization choices should be documented and justified as part of the validation.
- Banks are expected to obtain information regarding the data used to develop the model and assess the extent to which that data is representative of the bank's situation.
- Banks are expected to conduct ongoing monitoring of model performance and back-test vendor models using the bank's own outcomes.
- Banks should have contingency plans for instances where the vendor model is no longer available or cannot be supported by the vendor.

Management of aggregate model risk

- Under the new guidance, banks should consider risk from individual models and in the aggregate – where the latter is affected by:
  - Interactions and dependencies among models
  - Reliance on common assumptions, data, or methodologies
  - Any other factors that could adversely affect several models and their outputs at the same time
- While not further elaborated, the following activities may reflect the intent of this guidance:
  - Model risk ratings should reflect an aggregation of risk factors across all upstream inputs and downstream uses of the model – which will require a much greater understanding, documentation, and assessment of model interdependencies than may occur today.
  - Identification and mitigation of other types of aggregate model risks will likely require new policies and processes – for example:
    - High-impact model assumptions – such as house price forecasts – that impact multiple models may need to be centrally inventoried and subject to more centralized, senior-level oversight and governance.
    - A centralized data mapping tool may need to be developed to track the individual and aggregate use of various data fields – with the intensity of supporting data validation and control processes commensurate with the aggregate model risk associated with each field.
    - Limitations may need to be placed on the use of new modeling methodologies (such as new valuation or risk measurement approaches), the use of newly-released third party models, or the use of methodologies known to produce less precise estimates than alternative, more traditional modeling approaches. In some cases, reserves may be estimated and held against these untested models and methodologies to mitigate the risk – with such reserves being released as evidence accumulates supporting the model's or methodology's performance and robustness.

How should banks respond?

- Generally, examiners expect a bank to perform a self-assessment against new regulatory guidance, and have a clear action plan for closing identified gaps, within six months of release.
- It may be useful to include an independent party in the gap assessment process.
- Potential action plan items may include the following:
  – Revisions to policies and procedures
  – Revisions to roles and responsibilities
  – Organizational changes
  – Development of new standards and guidelines for model development, implementation, and use
  – Revised model inventories (including an inventory of model-specific risks and limitations)
  – Mappings of model risk mitigation controls against existing inventory of model risks and limitations
  – Creation / enhancement of on-going model monitoring processes
  – Creation / enhancement of model risk reporting
  – Additional model validation testing (e.g., vendor models)
  – Creation of annual model review process

How we can help

- For over 10 years, PwC has been at the forefront of the professional services industry in developing and refining approaches to model validation and model risk management.

- Our unique combination of advisory and audit-related model validation and governance work for many of the largest global financial services firms provides us with significant exposure to leading practices.

- We have been an industry leader in sharing our point-of-view on model risk management issues through published articles in *American Banker* and *Bank Accounting & Finance*, the PwC *A Closer Look* series, and giving presentations at industry conferences.

- We welcome the opportunity to discuss how we can leverage our regulatory and industry experience in this area to help you address the new supervisory guidance through:

  - Performing the initial gap analysis.

  - Developing action plan items to address any identified gaps.

  - Implementing solutions to address specific action plan items.

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