"The expected level and quality of challenge required to understand and manage model risk have never been higher. In this paper we present ideas that we hope will help to generate conversations that improve the effectiveness and efficiency of model risk management, reduce tension among participants, improve the morale of the development and validation groups, and push model validation to be a truly value-adding function that contributes to the continued improvement of a financial institution’s model infrastructure.”
INTRODUCTION

Since the financial crisis, regulatory standards, and the corresponding capabilities of financial institutions, have increased for model development, validation, and broader model risk management (MRM). During the same period, a surge of high-priority, time-sensitive model development and re-development was triggered by the annual CCAR cycle and related regulatory feedback. Similarly, institutions such as insurers and U.S. subsidiaries of foreign financial institutions are now undertaking significant model development efforts as they become subject to additional regulatory requirements such as CCAR and resolution planning. As a result of the struggle to enhance internal capabilities to address the changing environment, a strain has been placed on the model development and validation functions, which commonly leads to organizational tension and inefficiency. We believe there are opportunities to refine the way that MRM and developers interact to improve efficiency and effectiveness without compromising the need to maintain independence and provide challenge.

There has been a steady evolution of model risk management and regulatory expectations for model validation. In 2000, the OCC released guidance that set expectations for the model validation function.1 As dependence on models grew in banking, expectations for effective model risk management grew to include an agenda broader than model validation, as described in regulatory guidance in 2011.2 Meanwhile, internal expectations have also evolved. In particular, before the financial crisis, modelers tended to have more freedom to independently develop models that they felt were reasonable for the intended purpose without strict governance or oversight. Over time, this freedom was restricted as the level of review and criticism of their work increased due to the evolution of modern MRM practices.

While most industry practitioners would agree that these changes were for the broader benefit of institutions’ ability to manage risk, they have led to more tension between model development and validation (and at times, the line of business experts impacted by the process). For example, model developers may resist the additional MRM scrutiny and feedback that did not exist before the financial crisis. One source of this tension can occur when the model risk management function is overly focused on checking compliance with specific process requirements and, as a result, the function operates too mechanically by following prescribed steps to review a model.

We believe that these challenges leave opportunities to improve upon existing practices and save time and resources. Refining the culture of interactions between model developers and model risk can improve efficiency and make these interactions less stressful and frustrating. In addition, the MRM function can increase effectiveness by focusing on challenging models’ overall conceptual appropriateness and more deeply understand the business implications of model limitations and weaknesses.

Through our work with financial institutions – both on model development and model validation – we have developed a deep appreciation for the perspectives of both groups and have observed practices that are more (and less) effective for the management of model risk. In this paper, we share a non-comprehensive list of pitfalls we have observed across the industry and we suggest alternative approaches to improve interactions between model development and model validation functions, to enhance model risk management processes, and to ultimately improve the quality of analytical tools at financial institutions. The exhibit below illustrates areas where we commonly observe challenges within model development and model risk management organizations; each area will be discussed further in the sections that follow. We expect that institutions will have made progress along some of these dimensions, but likely not all of them. We hope that readers of this paper will find our observations and suggestions thought-provoking and useful as financial institutions and insurers consider ongoing enhancements to modeling and model risk management.

Exhibit 1: Overview of areas that pose challenges in a typical modeling/model risk management framework

1. **MODEL RISK MANAGEMENT GROUP CULTURE (OBJECTIVES, TEAM MANAGEMENT AND DEVELOPMENT)**
   - Model validation effectiveness is commonly measured by the group’s ability to execute an established list of model review tasks within allowed timeline
   - Inconsistent levels of resources and talent may exist between model development and validation teams
   - Typically limited flexibility for resources to rotate roles between model development and validation due to institutions’ concerns over maintaining independence

2. **GOVERNANCE, POLICIES, OVERSIGHT**
   - At times, debated issues cannot be resolved easily and there is no clear escalation path to reach a conclusion
   - “Failing” a model causes significant re-work and may result in missed deadlines (e.g., for CCAR)

3. **DEVELOPMENT, VALIDATION PLANNING AND EXECUTION**
   - Model development
     - We see increasing participation from model validation in model development meetings
     - However, the development process still commonly proceeds to completion before getting formal, written feedback from the model validation team
   - Independent model validation
     - Formal model validation tends to follow development after the model is finalized and documented
   - Issue identification and resolution
     - Validation template exists which provides guidance on required tests/analyses
     - Model development guidelines commonly exist, but not jointly agreed-upon by development and validation

Source: Oliver Wyman analysis

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3 It is important to note that any program to improve efficiency of the interactions between model development and model risk management must not violate the fundamental requirement that model risk management maintain independence and provide effective challenge. This is non-negotiable when considering potential improvement opportunities.
1. OPPORTUNITIES TO ENHANCE MODEL RISK MANAGEMENT GROUP CULTURE

A primary goal of model validation should be to add value by improving the institution’s model infrastructure. This must be supported with hiring, training, and overall model risk culture.

COMMON PITFALLS

Historically, model validation was more of a “checking” function to confirm that models were accurate and conceptually reasonable. As the number of and reliance upon models has increased over time, model risk management has evolved beyond validation to include a broader set of activities requiring additional skills (particularly, skills related to well-controlled data management, detailed business knowledge to support conceptual assessment, and strong written and verbal communication skills). However, since model risk is not easily measurable, some institutions manage model risk by the success in executing a list of activities rather than seeking opportunities to more critically assess individual models, including a deeper understanding of the model’s purpose as it relates to the business and of the impact of model weaknesses and limitations.

In addition, as we discuss below, at times we observe that the model development and model validation teams have imbalanced skill levels, which can cause frustration and erode the mutual respect that is critical to an effective model validation process. Even though the fundamental skills necessary to develop and validate models are similar, there is infrequent movement between model development and model validation functions, which reduces the natural collegiality, culture exchange, and mutual understanding which such movement might create.

REFINEMENT OPPORTUNITIES

Model risk management culture

Expectations should be set that model validation should not only be performed to execute a set list of pre-defined activities to check the conceptual and analytical performance of models. The validation function should also seek to provide critical review of each individual model and work towards improving the bank’s overall quantitative capabilities and to better understand and manage model risk to create business impact. To achieve this shift in culture, these expectations need to be clearly communicated from senior management and incentives should be aligned.
to achieve this (i.e., performance should not only be measured against the ability to complete a check-list of tasks by a specified deadline but also for maintaining business perspective and for productive, value oriented, interactions with model developers and the lines of business).

**Staffing**

Some institutions have traditionally placed more focus on hiring strong resources into the model development function and staffed model validation as a secondary priority, with varying levels of skill. Additionally, either due to past experience or current level of interaction, model developers may have deeper business knowledge of the portfolios with which they are working. Regulators have given clear guidance that model validation resources must be equally qualified to allow them to challenge and engage in academic debates with the model developers. While progress has been made in this area, financial institutions should be careful to maintain a balanced level of skill and business expertise across the development and validation groups. Beyond meeting the prescribed regulatory expectations, hiring equally qualified resources across groups will promote more productive discussions about the nuances, and potential shortcomings, of models being developed and reviewed.

**Roles & responsibilities**

As consultants, we have the opportunity to frequently change roles across model development, model validation, and advising on overall model risk management governance and policies. This gives us an appreciation and empathy for how other individuals in the process feel, particularly when debates arise. This experience provides a valuable perspective and can help to facilitate more collaborative and efficient interactions between the model development and validation functions. Financial institutions may find it beneficial to allow this sort of movement across roles where developers and validators can change roles and gain broader experience. This approach can give staff a better appreciation for the “other side,” improve job satisfaction, and reduce turnover. Indeed, we hope that one outcome of the ideas to reduce tension presented throughout this paper is a greater enjoyment of the work and a corresponding lower rate of turnover. *It is important that these refinements do not (in reality or in appearance) impair the ability of the model validation team to remain independent or provide effective challenge to the model development process. For example, people should generally not rotate to the specific team with which they were engaged as either a developer or a validator.*
2. OPPORTUNITIES TO ENHANCE MODEL RISK GOVERNANCE

Model validation findings are necessarily controversial at times. Model governance processes should support the enforcement and timely resolution of identified issues

COMMON PITFALL

As issues are identified by model validation, developers may agree (e.g., where a mathematical error has occurred) or hold their ground and debate its validity or importance. At times, agreement on the appropriateness of an issue cannot be reached and an unnecessary amount of time is invested in debating the issue, which causes further inefficiency and tension between model developers and validation (which we have observed persist even into subsequent interactions regarding unrelated models). This conflict is particularly sensitive in cases where model validation intends to “fail” a model, which can have an impact on downstream deadlines such as the submission of a bank’s capital plan.

REFINEMENT OPPORTUNITIES

The model governance structure should include an escalation channel that can quickly resolve disputes and support enforcement of issues, as needed. In addition, the governance process should allow for the reconsideration of the criticality of issues identified by model validation (to a less severe level) from an independent perspective, where appropriate. Institutions should also have a solution where a model can potentially be “failed” without significant negative consequences (e.g., impact on CCAR submission timeline). For example, validation may approve a model contingent upon resolving specific short-term and long-term remediation requirements if a model has conceptual or analytical performance issues.

The ultimate goal is that by having clear escalation channels, time spent on counter-productive arguments between model developers and validation will be reduced. Further, again using CCAR as an example, by having an option where model validation can “fail” a model without jeopardizing the bank’s capital plan submission, pressure is reduced on the validation team to allow sub-par models to pass due to looming deadlines. Where implemented effectively, despite in some ways ‘softening’ the approach of model risk management, these governance practices should overall strengthen, not weaken, the ability of model risk to provide effective challenge.
3. OPPORTUNITIES TO ENHANCE PLANNING AND SEQUENCING OF MODEL DEVELOPMENT AND VALIDATION

3A.

The stakes are high when formal validation feedback comes only after development is fully or mostly complete

COMMON PITFALL

Model development and model validation processes tend to be organized sequentially with limited formal communication during the development process. In some cases, models are developed – sometimes without providing any notice to the validation team – and only shared with model validation after the development and model documentation are at least mostly completed. Since model development tends to take weeks or months to complete, there has been a significant amount of effort invested in the process and any required revisions identified by the model validation team could drive significant re-work of the model development process and documentation. It is not surprising that there is reluctance to agree to changes that would trigger this re-work and it is not surprising that the natural reaction to model validation findings tends to be defending the current approach and pushing back on any requests to revisit earlier parts of the development process.

Financial institutions have recognized this in some cases and have made varying attempts to involve model validation sooner in the development process. For example, model validation may be included as a silent participant during model development meetings. However, without a more formal process to review the proposed conceptual and analytical model approach and provide feedback, this “light” participation may suggest implied acceptance of approaches that were not immediately rejected. This can actually lead to issues later in the process if those approaches are then challenged at a later stage in the validation process once a more formal/thorough review has been performed.
REFINEMENT OPPORTUNITIES

Model risk management can work with the model developers to identify opportunities to embed formal check-points where model developers have an opportunity to receive feedback on planned conceptual approaches, development data, and initial results (see Exhibit 2). The validation team can ask questions and point out areas that will be explored in more detail during formal validation so developers can anticipate the need to consider potential issues proactively during the ongoing development. Findings of these initial conceptual reviews should ideally be memorialized through a brief memo, which will encourage more careful consideration of the early assessment by the validation team. By prioritizing discussions on key topics such as conceptual approach, available development data, and anticipated model limitations/weaknesses, any disagreements between model developers and validation can be surfaced and resolved earlier in the process, reducing the risk of reworking significant components of the model or putting model implementation deadlines into jeopardy. Initial reactions to this process may suggest it adds time, but a well-written memo can be quickly incorporated into the final model validation report to offset the effort invested earlier in the process. It is important that these interactions do not (in reality or in appearance) impair the ability of the model validation team to remain independent or provide effective challenge to the model development process. The considerations raised can be either incorporated into the models or not incorporated, without penalty, with thoughtful justification provided.

3B.

Model developers will struggle to accommodate validation requests unless validation support is included in their work plan

COMMON PITFALL

A further risk of the typical sequencing of activities (where model validation occurs only after model development has been largely completed) is that the validation team will have more questions and requests to understand the nuances of the model being reviewed. Meanwhile, developers have moved onto to other development activities and not planned for the required level of interaction. The result? As questions and requests for additional information/analyses arise, the model developers are focused on a different task and have not allocated sufficient time to engage with the effective challenge process. In order to keep pace with their other deliverables, model developers feel they must push back against validation requests, which adds to tension between the two groups.
REFINEMENT OPPORTUNITIES

The model development workflow should allow for 10-20% of a developer’s time to support the validation process after submission of a model for review. A structure which allows validation requests to be addressed during the normal course of business, rather than requiring extra effort and long hours, reduces the reluctance and pushback caused by necessary validation requests. Planning adequate time to support validation avoids developers feeling overly stressed and improves morale both for the model developers (who less frequently need to put in long hours to deal with model validation requests) and also the model validation resources (who are not constantly met with a ‘No’ to any requests they make). An alternative sequencing of model development and model validation activities is illustrated in Exhibit 2.

Exhibit 2: Illustration of model development/validation cycles: Typical approach and enhanced alternative approach

TYPICAL MODEL DEVELOPMENT/VALIDATION SEQUENCING

ALTERNATIVE MODEL DEVELOPMENT/VALIDATION SEQUENCING

Illustrative check-points to provide initial feedback to development team

Source Oliver Wyman analysis
4. OPPORTUNITIES TO ENHANCE ISSUE IDENTIFICATION AND RESOLUTION

Disagreements over the analytical performance of a model can be reduced by discussing and agreeing upon testing expectations in advance

COMMON PITFALL

Model developers have certain statistical tests and analyses that they deem to be appropriate to assess the analytical performance of a model. The model validation team also has views on the appropriate set of statistical tests and analyses that should be performed and reviewed as part of a model validation effort. The lack of any advance effort to harmonize 1) opinions on the appropriate set of analyses and 2) the appropriate thresholds/benchmarks against which to assess performance, leads to differing/conflicting conclusions on model adequacy.

REFINEMENT OPPORTUNITIES

Model developers and validation should agree on more prescriptive guidelines to clarify details/ expectations, including a model testing plan that can be used to evaluate models. While it will not be possible to precisely define all tests that will be performed for every possible type of model, guidelines and preferred analyses should be transparent to set expectations. One output of the check-point process discussed in Section 3A above could be a discussion of tests, tailored for the specific model in question, that validation intends to review such that developers can consider results of those tests as model development proceeds. Responsibility and ownership for developing this consistent set of tests/analyses can vary (i.e., owned within the 1st line of defense by model owners vs. within the 2nd line of defense by model validation), but the effort should be collaborative so that both groups “buy in” to the guidelines that govern the analytical assessment of models.

If this framework is implemented effectively (i.e., it should be defined up front and it should allow for tailored feedback to be provided during check-points), developers can proactively work to address performance concerns before submitting a model for validation and better defend why a model was selected despite sub-optimal performance against one or more of the agreed-upon tests.
CONCLUSION

The expected level and quality of challenge required to understand and manage model risk have never been higher. Recent changes in modeling approaches, frequently tight deadlines, and limited active coordination between the 1st and 2nd lines of defense all lead to tension between model development and validation processes. We hope that the ideas presented here help to generate conversations that improve the effectiveness and efficiency of model risk management, reduce tension among participants, improve the morale of the development and validation groups, and push model validation to be a truly value-adding function that contributes to the continued improvement of the institution’s model infrastructure.
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