Overview of Model Risk Control Operations

By Sagar Balan & Vishwanathan Iyer

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This industry benchmarking activity aims to highlight the challenges faced by MRC teams across banks. It also captures several interesting responses by the ecosystem to the evolving situation.

Executive Summary

Easy availability of statistical tools, computational power and talent to build models has resulted in an explosion of models built by banks every year. Some of the bigger banks in the U.S. build upward of 750 models every year.

These models are all pervasive and span critical bank functions ranging across liquidity management, capital adequacy and planning, securitization et al. And, thereby, play a critical role in many billion dollar decisions executed by banks on a daily basis.

The inherent risks associated with the pervasive nature of models, mandates thorough validation of the entire model lifecycle. The financial crisis and increased regulatory oversight have significantly increased the attention towards risks faced by banks due to discrepancies in these models.

Across the ecosystem of model risk control & validation in financial services, leaders deal with three high priority challenges:

- Dealing with Scale
- Ambiguities in validation
- Trade-off between the roles of auditor vs. consultant

The rest of the paper deals with these challenges and the solutions which are evolving continuously in the ecosystem.

Dealing with Scale

Stringent regulatory oversight has resulted in an increase in the number of models under the purview of the model validation teams. Other contributors to the challenge of scale include elaborate stress testing under supervisory guidelines from the Dodd-Frank Act for Stress Test (DFAST) and compliance with Comprehensive Capital Analysis and Review (CCAR). Some banks have also started internal scrutiny of marketing models, which exponentially increases the number of models to be validated by the MRC teams in a calendar year.

Banks are responding to these developments through incremental steps. Setting up a powerful and independent governance body is often, the first step in that direction.

Governance Body

The effectiveness of the model governance body varies widely across banks and that is a critical factor to successful scalability. Achieving discipline through the right amount of empowerment is a key challenge dependent on the commitment and vision of the senior management.

In the near-ideal situation, a separate governance body defines and monitors the life-cycle of the validation process. This team institutionalizes processes, documentation standards & defines bank wide risk & validation policies. The team typically is headed by the COO & the CRO of organization.

This demarcation enables the model validation team to focus purely on the validation of the process and not be burdened by the approval, project management, and documentation aspects of the model life-cycle.

Focus Area	Role of the independent governance body
Documentation	‣ Enforces strict documentation standards on LOBs ‣ Does not allow MRC team to validate until LOB documentation is up to the mark
Enforcing compliance	‣ Sets org-wide policies for model validation & exclusion ‣ Drive the LOB teams to quantify the improvement in case of model upgrade ‣ Thereby, reducing iterations between LOB & MRC teams
Workflow Mgmt	‣ Owns project management of the entire validation life cycle ‣ Enables having all the artifacts in place before MRC team begins validation
Org. Model Inventory	‣ Organizes the models into categories based on materiality ‣ Enforces cadence for frequency of validation and risk ratings

Model Documentation

The governance body plays a critical role in defining and monitoring the model documentation process by various LOBs. Documentation standards vary significantly across line of business modelers in the same bank. Governance teams enforce higher standards by not allowing the model to pass through to the model validation team unless the documentation has met the desired standards.

Categorization of model inventory

In order to manage the scale of model validation to a reasonable degree, governance teams play a critical role in framing the rules which determine the model validation inventory.

The primary metric determining model categorization is the materiality associated with models. Most firms try to quantify the models by directly or indirectly quantifying the dollar value associated the models into 3 to 5 broad categories with appropriate cadence set up based on the segregation. In addition, validation teams do rely on other layers of qualitative judgment such as regulatory importance and business criticality while categorizing model inventory.

Models in the top most categories undergo a thorough validation at least once a year with a quarterly monitoring process to ensure appropriate controls on the accuracy of the model outcome. In the lower categories, a decline in materiality is accompanied with a reduced validation frequency and a more hygiene-first approach.

Frameworks for determining the materiality varies across different classes of models. E.g. Materiality of Retail Impairment models & Wholesale credit models is determined by different set of criteria.

Exclusion of Models

There may be models or classes of models for which it would be impractical and inappropriate to impose all the stringent validation requirements, due to their low impact on decision making and levels of risk. In such cases, the line of business (LOB) documents the reasons for exclusion of these models and agrees with the governance body. However, the LOB model owner remains responsible for ensuring that a level of control is maintained for excluded models, commensurate with their complexity & impact.

Change of management of data, source code

Given the onerous documentation, source code and data management demands, organizationally, the roles of math-auditor and compliance are delineated. Governance teams enforce the documentation, source code and data management compliance to the business, while liaising with the MRC team which focuses on getting the math right.

Spreadsheet management

Frequently, spreadsheets are created to consume data from other spreadsheets. They support secondary processes such as data reconciliations or prepare data for consumption by BI solutions. Governance teams enforce strict spreadsheet management through the creation of an excel cell data warehouse with a full time series of changes in all cell contents and values. This provides a direct connection for data queries across multiple spreadsheets e.g. data validation.

Dealing with Ambiguities

Banks interpret regulatory guidelines in multiple ways and that leads to ambiguous situations during model validation. The following section outlines some of these ambiguities and how banks are responding to them.

Lack of academia/industry wide standards

Cases where there is no preferred approach across the industry generally leads to flexibility in terms of choice of approach while there also exists uncertainty in terms of appropriateness. In the absence of standard approaches or industry benchmarks, MRC teams recreate the entire data-set, model methodology & create benchmark models from scratch. These models play the role of a challenger model whose performance is compared against the LOB/BU models to determine areas of weakness. This approach also helps the business appreciate the point of view of the MRC team better. Ultimately, quantification of the impact of the model helps the MRC team make the decision.

Dealing with imperfect BU/LOB models

Instances where existing modeling approach has been identified with conceptual or operational flaws, the MRC team observes the requirement for alternative models to improve on the performance of the existing models. In such situations, MRC teams often mandate the inclusion of developmental evidence and testing results to quantify the improvement over the previous version.

Transparency in vendor tools/models

Vendors are mandated to share their methodology along with the implementation details. While dealing with proprietary tools, the MRC team obtains the in-use approach from the vendor and validates by creating mock-ups and reconciling results. Generally, the model owner is responsible for compliance in terms of build, documentation and ongoing monitoring of such models.

Risk Interdependency

Although there is no consistent approach to deal with risk from interdependent models, banks typically use a bottom-up approach and maximize quantitative estimation; however, institutions are not in a position to completely exclude qualitative assumptions. A bottom up approach is required to ensure thorough back-testing, covariance, benchmarking, estimating appropriate confidence intervals to arrive at quantitative measures that are backed with qualitative inputs. In case of models audited under CCAR, generally, banks adjust for model risk in the feeder models with qualitative adjustments instead of calculating capital for each model individually. Banks focus on forecast errors, but assessment of lift over the challengers and portfolio size considerations are also important.

Impact on reserves vs. other business tradeoffs

In addition to determining the impact on capital reserves, MRC teams also play a critical role in determining if the models have collateral impact on key organizational metrics such as customer

acquisition. In such cases, the MRC team evaluates various scenarios and quantifies the impact on reserves vs customer metrics and lets the business take the final call.

Reconciling between multiple data sources

Forecasts by Moody's or S&P are often based on multiple assumptions, many of which are subjective. Rather than provide broad based guidance to the BU/LOB's on the usage of a particular data source, MRC teams often analyze the assumptions based on which BU/LOB teams chose the data source. And, determine the validity of the assumptions under various scenarios.

Quality of Consumer Data

There is often a concern with consumer data (e.g. LTVs and FICO scores are missing for customers). A bank can implement processes to estimate missing data, and have controls to ensure the involved assumptions are accurate. Due diligence is advised to be performed on any data used for a model – there should be no difference in treatment of external vs. internal data.

Qualitative vs. Quantitative vendor tools

SR 11-7 clearly states that qualitative judgment where the output is quantitative, qualifies as a model. If the output is qualitative, eligibility of the process as a "model" is often done on a case-by-case basis. An example is the AML scorecard which filters customers for further review based on a few known "bads" and hence a lot of qualitative judgments are made. The output is quantitative – a "Yes" or "No" for further review. In such cases, banks generally record but cannot validate the senior management judgments in isolation. Often, banks test these assumptions by measuring the performance of models where the assumptions are used as inputs. Benchmarking against alternate vendor models aids in gauging model performance. For instance, banks use prepayment models from AD&Co. for MBS and CMOs. While it is difficult to validate the qualitative aspects of the "black-box" model, benchmarking against cash flows can provide good insight on model performance.

Tradeoff between the role of an auditor vs. a consultant

In theory, given the strict regulatory oversight and demands from a capital adequacy perspective, MRC teams are uniquely positioned to challenge the status quo and perform the role of an internal auditor. Practically, however, it is a significant challenge to tread the tight rope.

Discussion with industry experts validates that the ambiguity is prevalent across firms. Model Risk Control teams, sometimes, strive to identify the gaps in the current implementation and also explore enhancements that can improve the in-use model. The growing perspective is that, validators should primarily focus on communicating the limitations in the existing framework and the onus of enhancement lies with the LOB. Simultaneously, model validation should ensure that the recommendation is internally substantiated by developmental evidence that may include an alternate approach or enhancement to the current implementation. While the LOB can consult the MRC team on areas that need to be addressed, however MRC should refrain from providing details

on correcting methodologies. A detailed log of back-and-forth between the LOB and MRC function is recommended.

	Auditor	Consultant
Roles	‣ Actively manages risk through use of rigorous model risk practices and use of conservative assumptions ‣ LOB to understand the findings and implement changes based on their understanding	‣ Recommends changes to the existing model process and provides alternate approaches ‣ LOB implements the changes based on the recommendations of MRC team
Costs/Benefits	‣ Possibility of losing out on best approaches identified by MRC ‣ More iterations as MRC needs to re-validate models with significant updates ‣ Higher focus on risk identification and better regulatory compliance management	‣ Higher resource cost for MRC ‣ Increased validation turnaround time ‣ Higher statistical acumen involved in building models

Conclusion

Given the rapid evolution of the markets, banks need to take much more systematic and vigilant approach to managing their risk models – regularly identifying the risks underlying their portfolio, developing more sophisticated methods to estimate the impact of those risks, and design contingency plans for stress scenarios. Often overlooked, is the efficiency of the non-quantitative side, which is critical towards building a strong governance framework. Operationally, banks need to streamline the model risk control given the daunting inventory of models and limited resources to achieve annual validation goals. Tackling ambiguities to ensure maximum compliance and assigning the right roles to the available resources are difficult challenges for the function, but the rewards might be much more than what the general perception seems to be.