VENDOR SUPPORT OF MODEL RISK MANAGEMENT OF VENDOR MODELS

Supported by GARP's U.S. and European
Buy Side Risk Managers Forums

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Model risk management (MRM) is an important element of risk management at financial firms. The widespread use of vendor models poses unique challenges for model risk management activities because modeling expertise is external to a client firm ("client") and because some model components may be considered proprietary.

Vendor models must nevertheless be incorporated into a client's model risk management framework following the same principles as applied to in-house models. Moreover, regulators have been very clear that ultimately the client is responsible for any issues that arise from their use of vendor models. Regulators may limit client use of vendor models for which the client is unable to obtain adequate model risk management support from the vendor. Thus, for models provided by vendors, cooperation by the vendor in certain elements of model risk management is a necessity.

This document aims to improve communication between vendors and clients by specifying the kinds of support clients may need from vendors for their risk management of vendor models. This document is not a complete specification of the needs of all clients. Moreover, each client-vendor pair is likely to have different circumstances, and therefore the importance and relevance of each element discussed herein will vary across pairs, as will the ways in which client expectations are met. Specific elements described below may or may not be needed in any given situation. Practices may vary, for example, based on the inherent risk and complexity of the model, the regulatory requirements that the client is subject to, or whether the model is used as a primary model or a challenger model. Moreover, the details of how vendors manage risk and how information is transmitted will vary.

Clients should understand that the support described in this document may be costly for vendors to provide and that clients may need to pay more to obtain additional support. Clients should understand that the expertise of client personnel who interact with the vendor matters to the effectiveness and cost of support.

Clients and vendors should understand that compromise is likely to be efficient. They should negotiate how client needs will be met taking costs on both sides into account.

Organizations define the term "model" differently.[1] Ultimately, the client must decide whether any given vendor product is a "model" and whether its model risk management framework applies.

This document is not a guide to, nor a complete specification of, model risk management practices at client firms. Rather, this document is intended to help vendors understand the needs of clients related to risk management of models provided by vendors. Examples are sometimes provided to aid understanding.

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[1] For example, "Model refers to a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical theories, techniques, and assumptions to process input data into quantitative estimates."

Some elements of model risk management of vendor models are done entirely in-house at the client and thus not discussed herein. Other elements are affected by the organizational separation between vendors and clients.

This document has nine sections, each answering a question:

1. What model risk governance practices do clients need the vendor to describe?

2. What aspects of model methodology do clients need the vendor to disclose?

3. What support do clients need related to implementation testing and controls?

4. What support do clients need for performance monitoring and oversight?

5. What assistance do clients need in making their own judgments about fitness for purpose?

6. What support for usage controls do clients need?

7. What information do clients need about interconnected models and platforms?

8. What change management support do clients need?

9. What organization of documentation do clients need?

1.0   What Model Risk Governance Practices Do Clients Need the Vendor to Describe?

Clients may need vendors to provide a description of their model risk governance framework and practices.[2] Proper governance gives clients confidence that the products and services received from the vendor are sound, reliable and well-understood. Moreover, regulators of financial firms have requirements for model risk management by clients of third-party vendor models. As a practical matter, adequate model risk management by vendors may be an important element of compliance with regulatory expectations.

Governance refers to the risk management processes and policies that promote model reliability, suitability and fitness for purpose. Standards and controls are needed for all aspects of the model's life cycle, including design, implementation and usage. Clients may need to know whether the vendor's governance arrangements and model risk management program include:

- Model approval processes

- Model development standards

- Model review/validation, including for conceptual soundness and implementation

- Performance monitoring and oversight

- Change management controls

- Documentation

The vendor may need to provide written descriptions of such activities and the associated governance arrangements, to explain them to clients, and to inform the client if material changes occur. As described further below, clients may need to conduct such activities as well, but the vendor's governance may be needed as a foundation.

Even with robust model life cycle controls and governance, risks can never be eliminated. From time to time, things can still go wrong, so two-way communication between vendors and clients is important. Information about issues encountered by the vendor should be provided to clients.

Vendor Review of Conceptual Soundness and Implementation

Independent review of model methodology, implementation and operation is an important component of model risk management. Though the client may also perform such reviews related to its own uses, reviews conducted by the vendor can provide reassurance to the client that the model will perform as specified. Reviews should be conducted an entity independent from model developers and owners (for example, an individual that is not the model owner, or a committee, or an external third party). Reviews may be proportional to the materiality and complexity of the model. Clients might need to receive information about:

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[2] A copy of policies governing the vendor's model oversight, control, and reporting process might provide most or all of what is needed. However, other forms of transmission of information may be sufficient where vendors prefer not to release internal policies.

- The nature of arrangements for independent review and testing, including how independence is achieved.

- Frequency of reviews.

- Requirements for reviews following major and minor changes to the model.

- Nature and summary of initial reviews and reviews of major changes.

- Nature of reviews of model code and data, which should be in line with robust IT industry standards.

The vendor need not provide its internal validation reports in all cases, but provision of the information mentioned previously may be needed.

2.0   What Aspects of Model Methodology Might Clients Need the Vendor to Disclose?

Clients understand that a vendor may wish to keep some elements of the methodology of its models confidential. However, the client still needs information sufficient to give it confidence that the methodology is sound and fit for the client's purpose.

Clients may need the vendor to provide documentation of methodology sufficient to support the client's understanding and operation of the model. While the vendor's desire to protect intellectual property may limit documentation in some ways, the documentation would ideally include:

- Specification of model methodology with enough detail for clients to assess whether it is adequately fit for their purposes.

- Description of source data used to calibrate or estimate the model specification. The basis for data choices should be described.

- Assumptions and limitations of the model should be clearly described, and limitations that might impact model performance under unusual or severe conditions should be discussed. The client may need information specific to its intended use.

- Data field definitions for both inputs and outputs.

- Description of vendor testing of the model. The tests will depend on the nature of the model. Some examples of tests include accuracy testing, statistical testing, sensitivity testing, backtesting and stress testing.

- Uses of the model that the vendor is aware of.

- Any custom configuration, calibration, or functionality the vendor has provided for the client, including the results of any supplementary tests.

3.0   What Support Do Clients Need Related to Implementation Testing and Controls?

Clients may need the vendor to provide information about its testing of the implementation of the model and about the controls it has established. Where a model is installed on client systems the client may conduct its own tests, but this does not reduce the importance of vendor implementation testing and controls. Clients may need the vendor to provide evidence of:

• Quality controls or other tests or checks performed on the inputs and outputs of the model.

• Testing of the model for proper operation throughout the full range of input values; any limits on input values or other limits on model usage should be disclosed to the client.

In addition to written materials, the client may need the vendor to meet with the client to discuss implementation testing and controls and may need the vendor to be helpful with regard to implementation testing done by the client.

4.0   What Support Do Clients Need for Performance Monitoring and Oversight?

Clients may need the vendor to undertake performance monitoring for each model and to inform the client of results, or to support performance monitoring performed by the client. Where the vendor does performance monitoring, clients may need it to describe its performance monitoring program, including details and frequency of tests, to provide summaries of results, and to address ad hoc client requests related to performance monitoring.

The goal of performance monitoring should be to inform the vendor and the client when a model is no longer performing as intended, or as it has in the past. Model performance changes may require the client to change how it uses the model, so timely information about monitoring results is helpful.

In general, regardless of who does it, performance monitoring should:

• Begin when the model is first implemented and continue periodically.

• Be commensurate with model usage, complexity and availability of data (for example, more tests should be applied to more complex models, and tests should be more frequent when a model is run frequently).

• Include thresholds for performance measures that signal when the model's performance has materially changed. Clients may need the vendor to provide timely reports when results are out of bounds; such reports may need to include information about actions taken by the vendor in response to the exceptions, as well as an overview of model performance.

• Be organized into a monitoring program with proper governance and oversight to ensure monitoring is adequate, and that exceptions are communicated.

In addition to performance monitoring that assesses the sensibility of a model, clients may need the vendor to have a rigorous data quality control process. Clients may need vendors to inform them if data values go outside predetermined ranges or display other anomalies, and if data is not delivered in a timely manner. Clients should be informed if model outputs are expected to be materially in error due to data issues.

Appropriate performance tests are likely to vary with the type of model. Some examples of tests include:

- Outcome Analysis: Analysis of model performance for a range of inputs. May include backtesting.

- Out of Sample Testing: Testing of a model outside the data set used in its calibration or estimation.

- Sensitivity Analysis: Examination of model performance as inputs or parameters change.

- Benchmarking: Comparison of model performance with that of another model.

- Scenario Testing: This analyzes model performance in different scenarios. For example, a risk model calibrated in benign market conditions may not perform well under adverse market conditions. For such models, performance testing should include monitoring of model outcomes in normal, stressed and other relevant conditions, and results should include a description of what is learned about model limitations.

Clients may need the vendor to provide documentation of its performance monitoring program that includes some or all of:

- Metrics and thresholds used to evaluate performance, with justification of each metric and threshold.

- Ranges of values produced by the model under different circumstances, and an explanation of why the range of circumstances is adequate to evaluate performance.

- A description of the vendor's process for periodically reviewing the effectiveness of performance monitoring.

5.0   What Assistance Do Clients Need in Making Their Own Judgments About Fitness for Purpose?

Clients must make their own judgments about fitness for purpose and should use documentation provided by the vendor as one input, but clients may need additional assistance from vendors as they make their judgments. For example, fitness is often sensitive to the details of the client processes into which a model or its output will be integrated. Clients know such details but may need help from vendors to understand certain aspects of the model only known by vendors, such as the data used in building the model, performance of the model in specific circumstances, etc.

Because client uses for models may change, clients may need vendors to assist upon request, not only at the time of initial acquisition of a model.

6.0   What Support for Usage Controls Do Clients Need?

Particularly where usage controls are implemented by the vendor, clients may need the vendor to implement such usage controls in a way that allows the client to decide some details.

As background, usage controls are often a part of client efforts to ensure a model is used only for purposes for which it is fit. In some cases, the client can directly control usage, but in others the vendor enforces limits on access and the client may need support. For example, an enforced list of authorized users for each model might be needed (login controls may not be sufficient, especially where a vendor supplies multiple models to the client). It can be helpful if a tool is available to the client to make changes to such a list. As another example, a tool that enables the client to obtain, at any time, a report of all active users and their usage histories may be useful for monitoring model access rights. Documentation of user usage, access, and run controls may be helpful, including an outline of how to set permissions by user types, as well as documentation of system and change logging procedures. Documentation of features for monitoring any up and downstream connections to other systems may also be helpful.

7.0   What Information Do Clients Need About Interconnected Models and Platforms?

Some models depend upon the operation of, or outputs from, other models, programming languages or platforms. Clients may need vendors to inform them of such dependence and cooperate in assessment of the risks flowing from it. Examples include:

- **Dependence on Data Providers:** Clients may need vendors to disclose the sources of data used by the vendor model and the data download process. This information may help the client to assess related risks.

- **Dependence on Upstream Models:** Some vendor models consist of multiple component models; for example, a credit loss model may consist of a PD model, an exposure model, and an LGD model. Clients may need vendors to describe how upstream and downstream models work together to generate model outputs, with particular attention to limitations and inconsistencies that may affect the validity of models used by the client.

- **Dependence on Expert Judgment:** If a vendor model relies on expert judgment to override model outputs, clients may need the vendor to describe the processes and to disclose cases where overrides were made. For example, if model outputs are reviewed and re-calibrated by a panel of portfolio managers, the vendor should disclose how and when this process is conducted.

- **Dependence on Platform or Programming Language:** Clients may need information about platform or programming language versions where the client will receive model code or where performance may be affected. For example, the Python language has a number of releases that differ materially in syntax or in the quality of associated libraries and clients might be affected by the specific version used.

8.0   What Change Management Support Do Clients Need?

Clients may need vendors to promptly inform them of changes to the model, and to maintain an ability to roll back to an earlier version if problems are detected after changes are implemented. Clients may need the vendor to have an effective change control system to track model changes and their impact.

There are two types of changes:

1. **Scheduled Changes:** These are planned changes made to enhance the model.

2. **Unscheduled Changes:** These are changes that are made to a model due to unforeseen circumstances. For example, at times model changes need to be made due to issues identified during performance monitoring or due to model errors.

For either kind of change, clients may need vendors to agree upon a testing and communication protocol in advance, including communication of relevant information and user acceptance testing.

Communication:

- The client may need the vendor to inform the client of changes in advance, with enough time to evaluate the impact of changes on operations and fitness for purpose. A communication protocol for changes should be agreed upon, and any changes to the protocol should be tested. Clients may need vendor personnel to be available to help them understand changes.

- Clients may need information about changes to include:

  ▶ A clear, detailed description of the proposed change, including its rationale and justification and any expected impact on user experience or model outcomes.
  ▶ Updates to model documentation and availability of training, if appropriate.
  ▶ The proposed implementation or release date into production or into a user (client) testing environment, if appropriate.
  ▶ A log of previous changes to the model.

User Acceptance Testing:

- Both client and vendor should agree on the amount of time in advance that notices will be received by the client.

- Where the vendor maintains the list of model users, clients may need the vendor to send change notifications to all registered or subscribed users of the model.

- Clients may need vendors to provide for client evaluation of the changed model before it is released into production. It should be possible to run both pre-change and post-change models, as doing so will assist clients in determining the model's sensitivity to the changes.

- Where the vendor maintains the production environment, clients may request that the vendor, where possible, get positive affirmation from the client that the change was properly received and tested before removing the pre-change version of the model from the production environment.

9.0   What Organization of Documentation Do Clients Need?

Clients may need the vendor to provide appropriate documentation, covering not only how to implement and use the model, but the matters discussed previously. The documentation should be easily usable and well-organized. Documentation need not be in a single, combined document, but where it is not, clients may need an overview or guide to documentation to be provided. Each instance of documentation should specify the date of last update and specify which version or versions of the model are being described.

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