

The Federal Reserve's Model Validation Program

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Overview

- Use of advanced quantitative analytics in supervision
- Mitigating model risk
- Developing the Federal Reserve's Model Validation Program
- A couple of conceptual issues in building stress models



Quantitative Tools in Supervision

- Advanced quantitative tools have become a growing component of banking supervision.
 - Use of models in stress testing receiving the most notice
 - Many other important uses for supervision
- Important to understand the goals, objectives, and limitations of quantitative tools within supervision.
 - Quantitative analysis can be a partial substitute for more traditional supervisory activities.
 - Mainly, it functions as a complement to “on-the-ground” supervision.



Quantitative Tools in Supervision

- ***Benchmarking:*** Independent supervisory analysis provides discipline by establishing a frame of reference for assessing bank analyses.
 - Supervisory benchmarks can also be used to set regulatory parameters.
- ***Focusing supervisory resources:*** Often, the most valuable aspect of quantitative analysis is to shed light on key questions for supervisory investigation.



Model Risk

- Increased use of quantitative models in supervision raises concern over model risk.
- Model risk can result from numerous factors:
 - Inherent uncertainty - large uncertainty may exist even in a well-specified model, particularly models of stress
 - Conceptual flaws
 - Data limitations
 - Operational or control problems (e.g., coding errors, mishandling of data)



Model Risk

- Model risk is elevated for the Federal Reserve as it expands the use of models in the supervisory process.
- Mitigating model risk requires:
 1. Robust processes around model development, implementation, and use
 2. A sound model governance structure
 3. An effective independent model validation program



1. Robust processes for model development, implementation, and use

- Model development processes need to:
 - Be adequately resourced in terms of skill and quantity of staff
 - Pay attention to the important operational and production aspects of model development
 - Continuously challenge our preconceived ideas and biases



2. Sound model governance structure

- Development of Federal Reserve models for stress analysis relied heavily on expert “model teams” to build models relevant for various risk/portfolio areas.
- While strong expertise at the model team level is critical, there is the need for oversight and governance to:
 1. Address overarching policy issues that are not model-specific
 2. Ensure model quality
 3. Address issues of “cross-model” consistency
 4. Provide clear communications to decision-makers on model methodology and results



3. Independent validation program

- Model validation program initiated in 2011 with goals to:
 - Improve model quality
 - Build confidence in supervisory stress analysis
 - Conform to supervisory standards (e.g., SR Letter 11-7)
- Validation program is multi-disciplinary
- Key challenge: developing an appropriate validation program while models are in their formative stage and undergoing substantial change



Principal Elements of the Validation Program

- Establish expectations for model documentation, governance, and operational controls
- An independent review process for CCAR models with:
 - Large number of skilled and independent reviewers
 - Criteria for implementing model changes
 - Tracking of change process
 - Communication of validation findings to decision-makers
- Ongoing communication between the validation program and those responsible for governance of model development



Principal Elements of the Validation Program

- Establishment of the Model Validation Council - an expert and independent external advisory group.
- Evolutionary design of the program to:
 - Take account of the developmental state of supervisory stress models
 - Allow for validation program's need for "learning by doing"



The Model Validation Council

- Proposed in 2011 with first meeting in May 2012
- Purpose was to improve quality of the validation program and to build public confidence in the quality and independence of the validation effort
- Strictly advisory body: MVC members are expected to give advice on model validation standards, the quality of the review process, and model decisions made by validation program.
- Members:
 - Chair: Frank Diebold (UPenn)
 - Peter Christoffersen (U. Toronto)
 - Mark Flannery (U. Florida)
 - Philippe Jorion (UC Irvine)
 - Chester Spatt (Carnegie Mellon)
 - Allan Timmermann (UC San Diego)



Some Conceptual Challenges: Thinking about Estimation Uncertainty

- Effective minimum regulatory capital requirements require establishing a single number (or at least a narrow range).
- Confidence intervals are wider for extreme values of the explanatory variables with additional uncertainty if functional form changes during stress.
- More data reduces this issue but won't eliminate it.
- Thinking through model goals are important in addressing these issues of model uncertainty.



Some Conceptual Challenges: Thinking about Performance Testing

- Supervisory stress analysis produces forecasts conditional on a stress scenario.
- Models essentially produce “conditional forecasts” and therefore accuracy of out-of-sample forecasts (back-testing) would seem the natural approach.
- However, observed periods of severe stress will be few, so back-tests might only tell you how well model performs in non-stress periods.



Some Conceptual Challenges: Thinking about Performance Testing

- Question: How much (if at all) do you overweight stress periods in your estimation and/or performance testing?
 - You can over emphasize as well as underemphasize stress periods.
 - Put another way, the model that performs best in conditional forecasting near the means of the data may not perform the best at the tails.
 - However, you have few sample observations at the tail to confidently estimate the special characteristics of tail events.
- This suggests that back-testing is an important but likely limited tool.
- Benchmarking and sensitivity analysis should also be important components of performance testing.
 - These tools often require “expert judgment” that should be clearly explained.



Stress Analysis Combines Statistical Rigor with Expert Judgment

- There are many of these types of issues in modeling stress.
- A strong validation program will identify “bad models”, ensure high quality, and reduce operational risk.
- Validation will not produce “the way” for modeling stress.
- The Federal Reserve is committed to building a strong, independent, and multi-disciplinary validation program.



Questions?



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