The Federal Reserve’s Model Validation Program

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The views expressed are my own and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.
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 overemphasize 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?