Benchmarking Residential Mortgage Loss Forecasts

Third Annual Stress Test Modeling Symposium

Federal Reserve Bank of Boston

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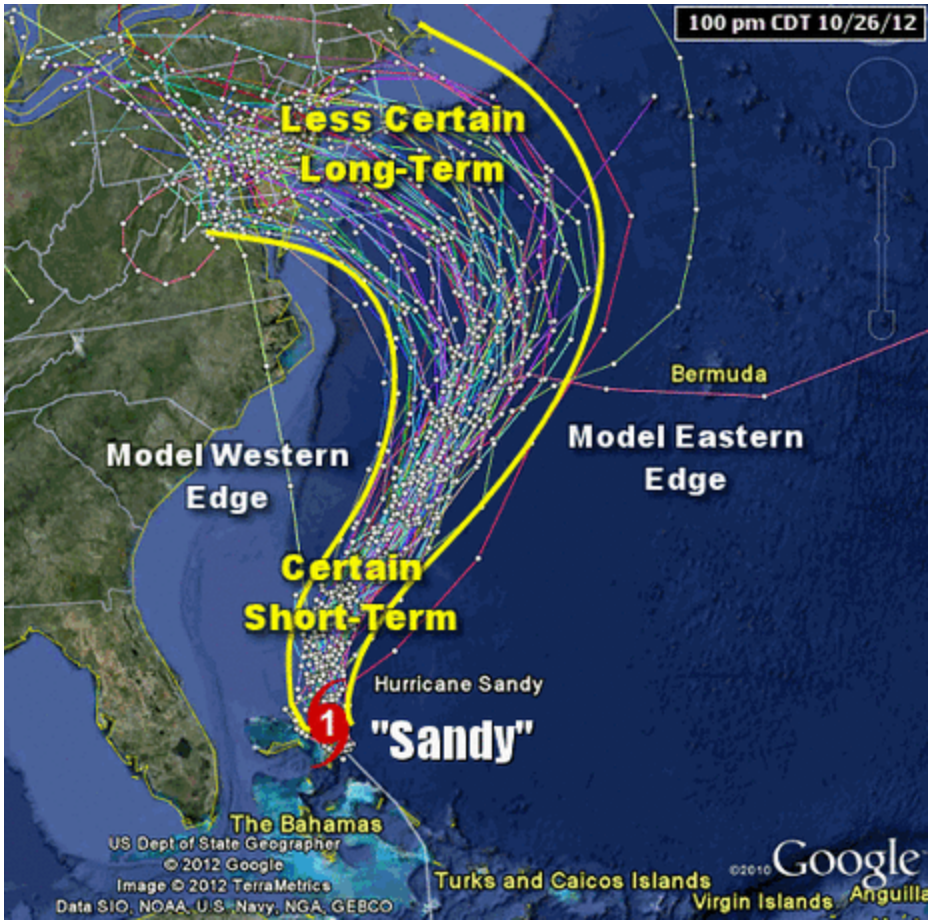
Hurricane CCAR

The Stress Testing Hurricane



Is predicting the path of a hurricane similar to predicting the path of a financial crisis?

Introduction

Benchmark: Standard, or comparison, for assessing performance

- Examples
  - Performance of a security against a bond index
  - Return on USB stock compared to the S&P 500
  - Individual bank loss rates vs. industry-wide loss rates

- Benefits of benchmarking
  - Gives broader view of possible outcomes
  - Assess the effect of business assumptions, which may vary across models (ex. treatment of new volume, off-balance sheet exposures)
  - Assess impact of inherent statistical assumptions
  - Begin to address model risk

- Evolution of benchmarks
  - As modeling progresses, previous production models become benchmarks
  - Other R&D models
  - Models with external data or from vendors

Model Spectrum

	Model 1	Model 2	Model 3	Model 4
Model Level	Loan-level	Hybrid of loan-level and portfolio-level	Portfolio-level (time series regression)	Portfolio-level (seemingly unrelated regressions)
Default Model	Multinomial logistic regressions and Markov Chains	Logistic regressions and portfolio-level Markov Chains	Built in to NCO	Built in to NCO
Loss Given Default	Account-level regressions	Account-level regressions	Built in to NCO	Built in to NCO
Auto-regressive Terms	No	No	Yes	No
Explicit Portfolio Effects	Yes	Yes	No	No
Macroeconomic Variables	State-level variables	State-level variables	National-level variables	National-level variables
Complexity	High	Medium	Low	Low

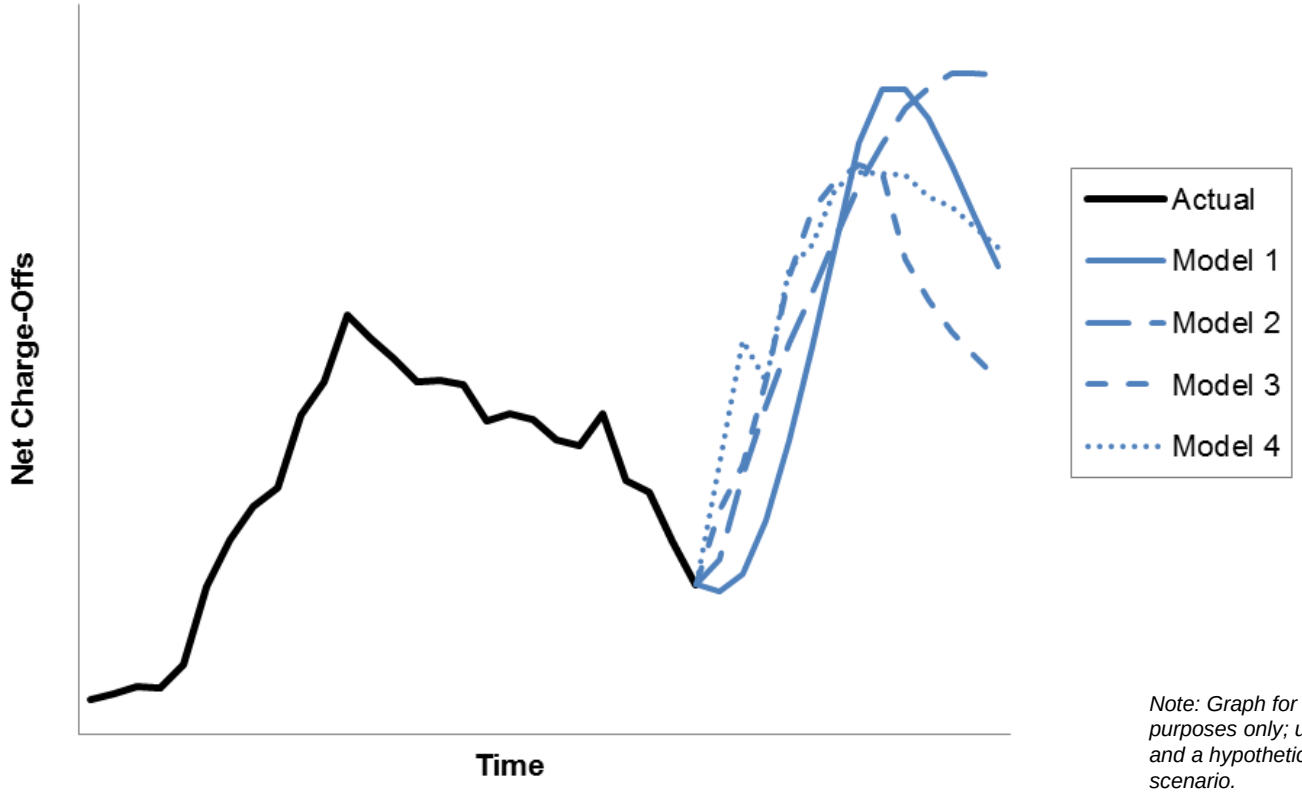
Note: Models 1, 2, and 3 are validated; Model 4 is not validated

Forecasts

Different Models, Different Forecasts

- Each model uses different statistical techniques
- Two account-level and two portfolio-level models
- Treatment of macroeconomic variables results in differing sensitivities and timing of peak losses

Residential Mortgage Benchmark Loss Forecasts



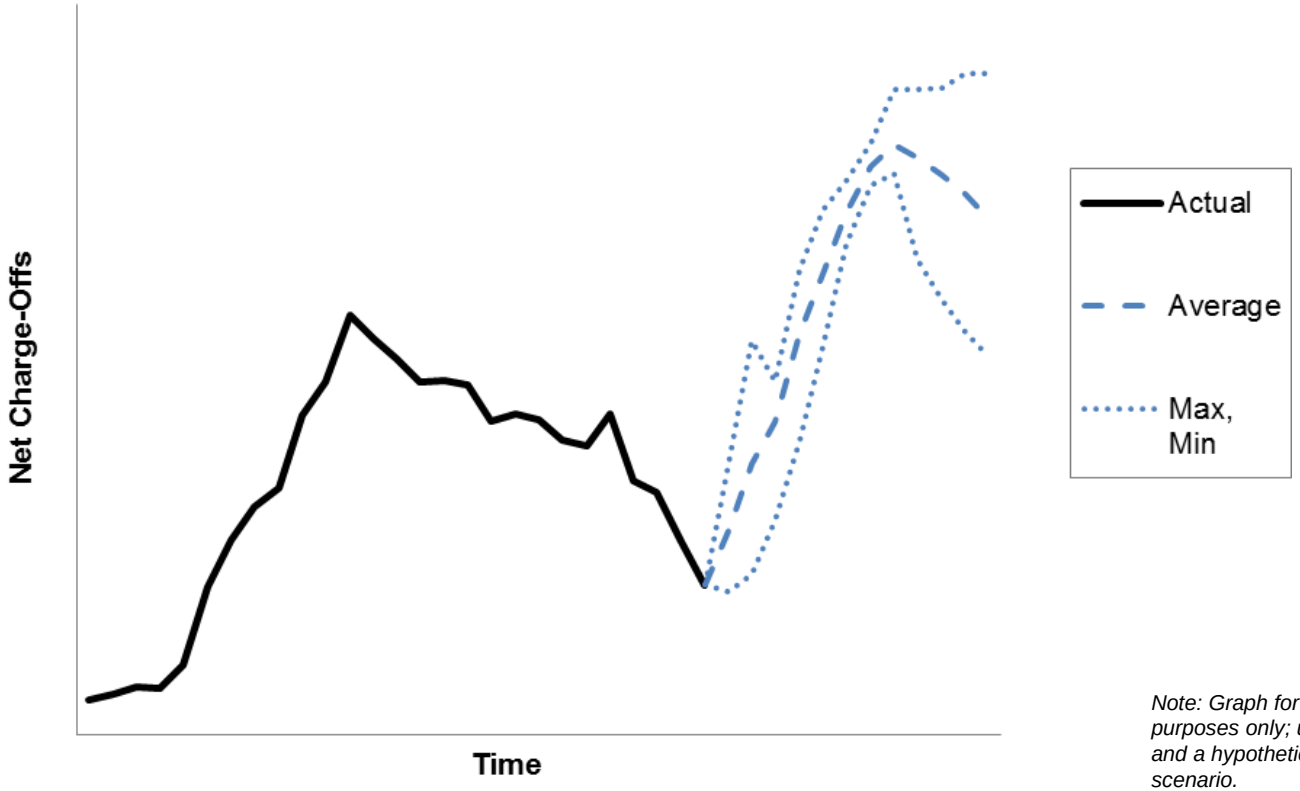
Note: Graph for illustrative purposes only; uses dummy data and a hypothetical stress scenario.

Variation Summary

How can output from several models be summarized?

- Graph below shows the maximum, minimum, and average across the four models
- Averaging may be more useful as the number of benchmarks increase
- Minimum and maximum should not be confused with confidence intervals

Residential Mortgage Benchmark Loss Forecasts



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Sources of Variation

What causes variation in the forecasts between models?

- Top-down models “paint with a broad brush”
  - Components of losses are rolled into the NCO metric
  - Provides less insight into what’s driving losses – defaults, LGDs, portfolio composition
- Borrower Characteristics
  - Models 1 and 2 control for portfolio composition (ex. credit score, LTV, age)
  - Impacts the ‘starting’ point of the forecast
- Macroeconomic Variables
  - Top-down models use national macroeconomic variables
  - Bottom-up models use more granular levels of macroeconomic variables
    - State or MSA-level macroeconomic variables tailor models to the portfolio’s footprint
    - Ability to stress regional concentrations

Use of Benchmarks

How to use the results of benchmarking?

- Identify models weaknesses for management overlays
  - Provide quantitative support for overlays
  - Does a particular model type reflect the current portfolio better than the others?
  - Are there known business changes that make one model preferable over the others?
  - How does backtesting compare across models?
  - Is data limited for a certain model type?

- Promote discussion and R&D
  - Consensus across benchmark models not necessary
  - Concentration risk identification
  - Differences promote discussion amongst modelers, management, and between groups