Second Annual Stress Test Modeling Symposium Boston, MA

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Session 1A: Residential Mortgages
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Session 1a: Residential Mortgages: Benchmark Stress Testing Models

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- **Topic 1: Benchmark Stress Testing Models**

- **Goals:**

    - **Discuss the role and purpose of benchmark models.**

    - **Discuss considerations when selecting a benchmark model (or benchmark mortgage model).**

- **Context:**

    - **Consider the following definition:** Source: businessdictionary.com

        - **Benchmark:** Standard, or a set of standards, used as a point of reference for evaluating performance or level of quality. Benchmarks may be drawn from a firm's own experience, from the experience of other firms in the industry, or from legal requirements such as environmental regulations.

    - Is a benchmark intended to fulfill a 'minimum standard', 'standard of excellence', or act as a 'second opinion'?

        - Interpret Fed and OCC model risk guidance to emphasize a benchmark model as a credible alternative or 'second opinion' estimate.

        - Guidance summary found on next slide.

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- Federal Reserve Board and OCC guidance on benchmark models.

  – Source: Supervisory Guidance on Model Risk Management , April, 2004.

  – Summary (paraphrased excerpts).

    - Benchmarking is comparison of a given model with an alternative internal or external model.
      - Data and or methodology can differ between the two.
    - Potential sources of benchmark credit risk models.
      - Vendor firms, industry consortia, retail credit bureaus.
    - Benchmark models should be rigorous and complete to ensure reasonable comparisons.
    - Differences between the model and benchmark estimates should be investigated and explained.
      - Evaluate sources and degree of differences within the context of comparisons.
    - Benchmarking may suggest revisions to the model.
      - Differences do not necessarily impugn the model.
      - The benchmark itself is an alternative prediction.
      - Differences may be due to different data or methods.
      - Strong agreement with the benchmark is supportive of the given model but should be interpreted with caution to avoid complacency (a false sense of comfort).

- **Two examples of benchmarking related to stress testing models.**

  - Fed Supervisory Capital Assessment Program (SCAP) models themselves are benchmark models.
    - Fed SCAP models act as external benchmark models for firm internal models.
      - Consistent methodology (same model) applied across firms.
      - Not made highly transparent to industry to avoid risk of a 'model monoculture' and disincentive for banks to invest in internal modeling capability.
    - Firm internal models act as external benchmark models for the Fed SCAP models as well (from perspective of the Fed).

  - Benchmarking of Internal Models, by Damir Filipovic and Daniel Rost, 2004, Swiss Finance Institute.
    - Establishes 'standards' for internal solvency and economic capital (EC) modeling practices.
      - Benchmarking study initiated by the CRO Forum, a consortium of large (global) insurance firms.
    - Not aware of any similar effort in US in context of CCAR/DFAST modeling.
      - Should there be?

Session 1a: Residential Mortgages: Benchmark Stress Testing Models

- Fed/OCC guidance indicates…

  - Benchmarking is comparison of a given model with an alternative internal or external model.

  - Differences between the model and benchmark estimates should be investigated and explained.

- Assume an internal primary model. How does choice of an internal or external benchmark model effect comparability of primary and benchmark models?

Mortgage Stress Testing Benchmark Models (presuming primary model is internal)						
Benchmark Model	Benchmark Model Consideration					
	Data		Methodology		Transparency	
	Pro	Con	Pro	Con	Pro	Con
Internal (firm level)	Controls for data differences between primary and benchmark models.	Primary and benchmark models may suffer from the same internal data limitations (length of data series, economic cycles captured, availability of risk variables, etc.)	Fosters clear implications of methodological differences between primary and benchmark model.	Risk that primary and benchmark model suffer from insular firm modeling practice.	High internal transparency. Model fully under internal control.	Likely low external transparency due to proprietary model concerns (of course regulators would have access).
External (industry level)	May mitigate internal data weaknesses by adding robustness in development data.	Complicates ability to isolate impact of methodological and data differences. Example: external model developed on securitized loan data vs. primary model developed on internal bank owned loan data.	May provide exposure to alternative methodologies and development perspectives not otherwise evaluated.	External models may not be specifically geared for CCAR/DFAST use. Example: Default defined at 90+ dpd, FCL completion, or REO sale vs. 180+ dpd event most relevant for bank write downs.	At least translucent (if not fully transparent) to a wide audience.	Vendor transparency restrictions limits reconciliation with internal model.

Session 1a: Residential Mortgages: Stressing a Repurchase Reserve Estimate
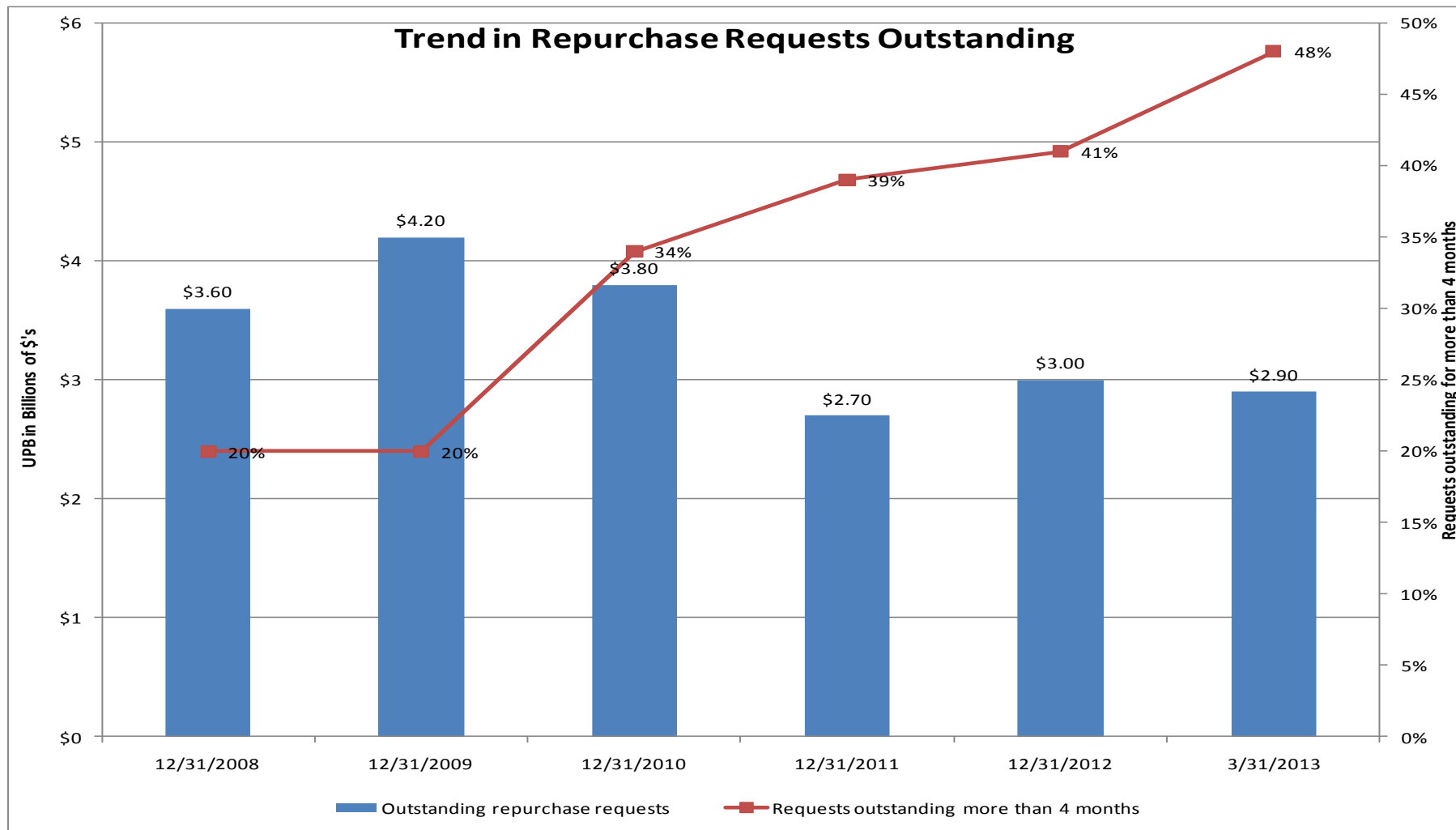
- Introduction:

  - Discuss the topic conceptually from a quantitative modeling perspective.

    - Deconstruct the repurchase process to identify conceptual component modeling tasks.

    - What components should be subjected to stress?
      - Touch on stress mechanism approaches/challenges with each component.

    - Key actors: Borrower, Seller (guarantor), Investor (claimant).

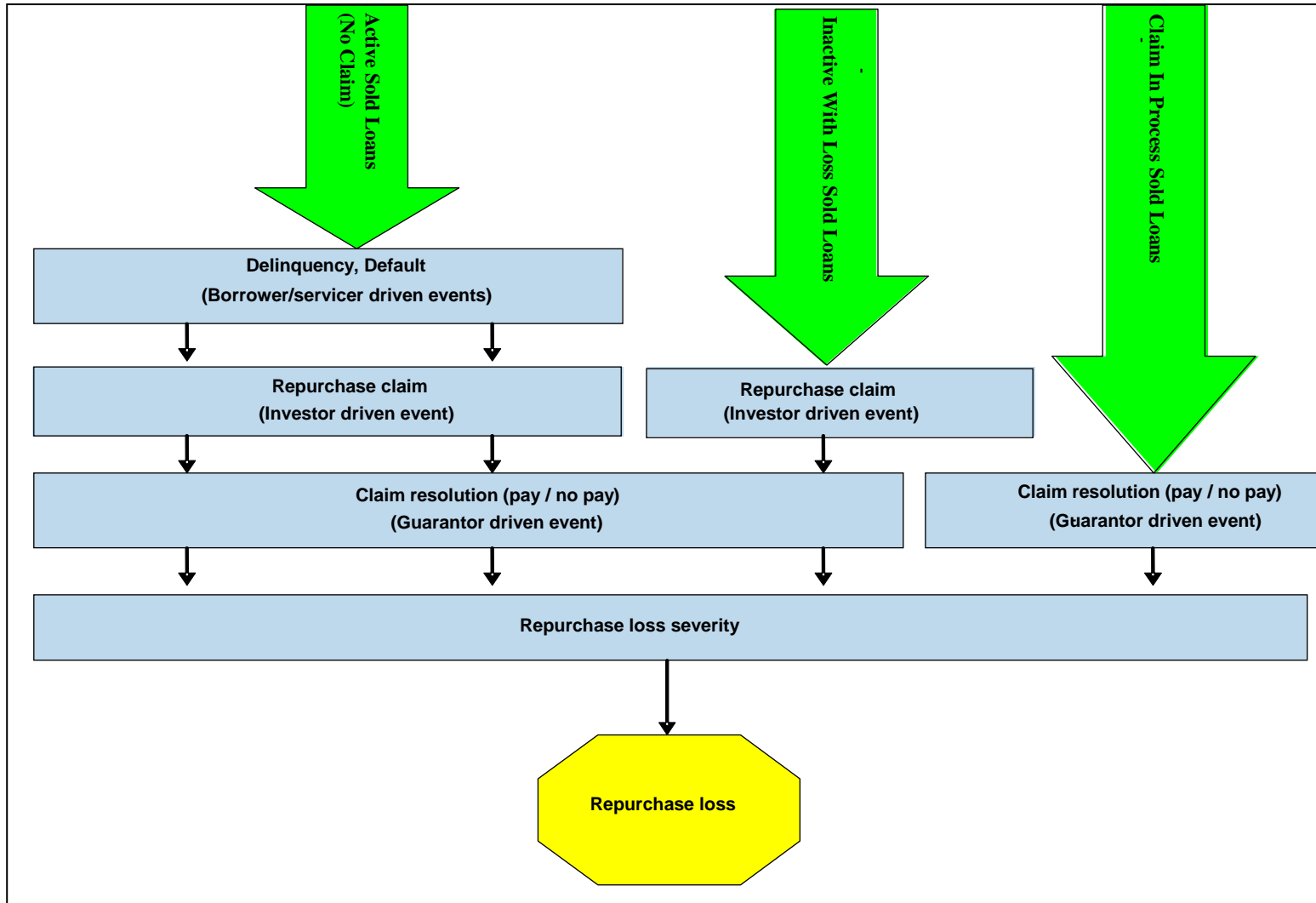# Session 1a: Residential Mortgages: Stressing a Repurchase Reserve Estimate

- UPB of Freddie Mac outstanding repurchase requests issued to single-family seller/servicers based on breaches of representations and warranties through March 31, 2013. **Source: Freddie Mac Investor Update, June 2013.**

Trend in Repurchase Requests Outstanding

Bar values (UPB in Billions of $'s):
- 12/31/2008: $3.60
- 12/31/2009: $4.20
- 12/31/2010: $3.80
- 12/31/2011: $2.70
- 12/31/2012: $3.00
- 3/31/2013: $2.90

Line values (Requests outstanding for more than 4 months):
- 12/31/2008: 20%
- 12/31/2009: 20%
- 12/31/2010: 34%
- 12/31/2011: 39%
- 12/31/2012: 41%
- 3/31/2013: 48%

Legend:
- Outstanding repurchase requests
- Requests outstanding more than 4 months

- Repurchase process deconstruction

Session 1a: Residential mortgages: Stressing a Repurchase Reserve Estimate

- Suppose a baseline repurchase estimate exists. What components are subject to stress?

	Delinquency, default	Repurchase claim	Claim resolution	Repurchase loss severity
Active (no claim)	Stress	Stress	Stress	Stress
Inactive (no claim)	Not applicable	Stress	Stress	Do not stress (use baseline)
Claim in process	Not applicable	Not applicable	Stress	Do not Stress (use baseline)

- Some discussion
  - Stressing delinquency, default , and loss severity components.
    - Active (no claim): Likely able to include macro scenario variables via traditional modeling approaches.
    - Inactive (no claim) and claim in process: Do not stress (use baseline). Baseline severity estimate appropriate under stress because loss amount (make whole amount) is 'historically baked' at the observation date (start of forecast).
  - Stressing claim incidence and claim resolution rates. Active, inactive, claim in process.
    - Hard to include macro scenario variables via traditional modeling. Several complicating factors.
      - Learning over time took place by investors and sellers regarding how to identify loans for claim and how to review/resolve claims.
      - Strategic business relationships between investors and sellers can effect claim submission and resolution outcomes.
      - Bulk claim settlement can alter the timing of claim resolutions and cause lumpiness in resolution data.
    - Maybe a conservative ('worst observed case') historical based approach to stressed claim and resolution rates provides an alternative.