# RATE FILING SUPPORT FOR PREDICTIVE MODELS

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## Agenda

- CDI's Historic Rate Filing Focus
- Current Regulations Referencing Models
- Use of Outside Actuarial Consultants
- Types of Models Being Filed
- CDI's Model Checklist Questions
- Responses Which Have Raised Red Flags

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## CDI's Historic Rate Filing Focus

- Rates Cannot Be Inadequate, Excessive, nor Unfairly Discriminatory
- Proposition 103 Passes in 1988, and Establishes a Prior Approval Mechanism
- CDI Initially Focuses Primarily on the "Excessive" Standard
- Over the Last Five Years, With More Adequate Staffing, the CDI Begins to Allocate More Resources to the "Unfairly Discriminatory" Standard
- Given the Prevalence of Models in Rate Filings, the CDI Begins Training Staff on Model Reviews

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## Current Regulation Referencing Models

§2644.4 (c) – Projected Losses

- Earthquake and Fire Following Earthquake (FFEQ) May Be Based on Complex Catastrophic Models
- The Use of Such Models Shall Conform to the Standards of Practice as Set Forth by the Actuarial Standards Board (ASOP's)
- Projected Losses Derived from the Model Must Meet All Applicable Statutory Standards

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## Use of Outside Actuarial Consultants

- Beginning in 2014, the CDI Has Contracted with Outside Actuarial Consulting Firms to Assist With Model Reviews
- Consultants Were Asked to Review Only the Models (And Not the Overall Rate Levels in Each Filing)
- To Protect the Proprietary Components of the Models, Non-Disclosure Agreements Were Secured Between the Insurers and Consultants
- Consultants Also Conducted Training Sessions For the Rate Regulation Branch Staff

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## Types of Model Applications Being Filed

- Classification Segmentation (Including Rating Bands and Territories)
- Catastrophe (Earthquake and FFEQ)
- Brush/Wildfire (For Territories)
- Wildfire Scoring for Individual Properties
- Tier Placement

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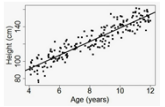
## Types of Model Being Filed

- GLM's
- Decision Trees
- Sequential Analysis
- Territory Clustering
- Weight of Evidence
- Ensemble
- Black Boxes



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## Areas Covered by Model Review Checklist Questions

- Scope of the Analysis
- Data
- Variables and Adjustments
- Assumptions and Modeling
- Regulatory Compliance
- Changes from Prior Analysis


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## Scope of the Analysis

- Intended Application of the Model
- General Operation of the Model
- Major Sensitivities and Dependencies Within the Model
- Key Strengths and Limitations of the Model


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## Data

- Documentation Regarding the Data Sources
- Reliance on Data, Models, and/or Information Supplied by External Parties
- Process for Reviewing Reasonableness, Consistency, And Comprehensiveness of the Data
- Findings of the Data Review, Including Material Limitations Which Have Been Identified
- Description of Any Limitations of the Analysis Resulting From Data Limitations

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## Variables and Adjustments

- Descriptions of the Target Variables
- Definitions of the Predictor Variables
- Process for Identifying Questionable Data Values
- Offsets, Weights, or Other Variables Used
- Adjustments Made to the Data (i.e., Trend, Development, Exclusion of Catastrophe Losses, Capping, Etc.
- Report Reconciling Raw Data to Modeling Data

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## Assumptions and Modeling

- Type of Model (GLM, Decision Tree, etc.) and General Framework for Model Selection (Including Selection of Predictor Variables and Parameters)
- Software Used to Fit the Model (e.g., Emblem, SAS, R, etc.)
- Key Assumptions Made (i.e., Choice of Error Distribution, Link Function, etc.)
- Filters Applied to Exclude Observations from Model Fitting Process

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## Assumptions and Modeling (Cont.)

- Model Coefficients and p-Values (If Applicable)
- Reversals or Other results Not Expected a Priori
- Adjustments Made to Indicated Model to Derive The Final Proposed Model
- Methods Used to Validate Assumptions
- Documentation Showing Goodness of Fit
- Model Projection Results Compared to Historical Actual Results

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## Regulatory Compliance

- Use of Credit
- Use of Predictor Variables Which Cause or Result in Disparate Impact
- PPA Class Plan Requirements
- Price Optimization
- Adherence to CDI Checklists

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## Changes from Prior Analysis

- Description of Material Changes to Model
- Reconciliation of the Results to the Prior Model, Given the Changes in Assumptions, Parameters, and Data


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## Responses Which Have Raised Red Flags

- Use of Stale Data
- Use of Countrywide Data, Which May Differ Significantly from California Data
- Model Data Which Does Not Reconcile with Other Data in Filing
- No Explanation for Missing Data
- No Explanation for Data Adjustments
- No Explanation for Data Which Was Removed

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## Responses Which Have Raised Red Flags (Continued)

- Groupings of Data Which Do Not Make Sense
- Target Variables Which Do Not Measure Risk
- Predictor Variables Which Overlap with Other Rating Variables
- Predictor Variables Which Are Prohibited
- Use of Ad Hoc Software
- Use of a "Black Box" Model

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## Responses Which Have Raised Red Flags (Continued)

- No Justifications Provided for Assumptions Made
- No Test Results on Holdout Samples
- Reversals Which Do Not Make Sense
- A New Model Which Produces Results Significantly Different Than the Prior Version
- Results Which Are Not Intuitive

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## Model Support – In Summary

- Include Supporting Narrative
- Provide as Much Documentation as Possible
- Use California Data, Whenever Possible
- Use Current Data
- Provide Supporting Exhibits in Excel, With Formulas Intact
- Include Supporting Graphs and Lift Charts With Clear Labeling