Dynamic Scores

Proactively Managing Through-the-Cycle Risk Prediction

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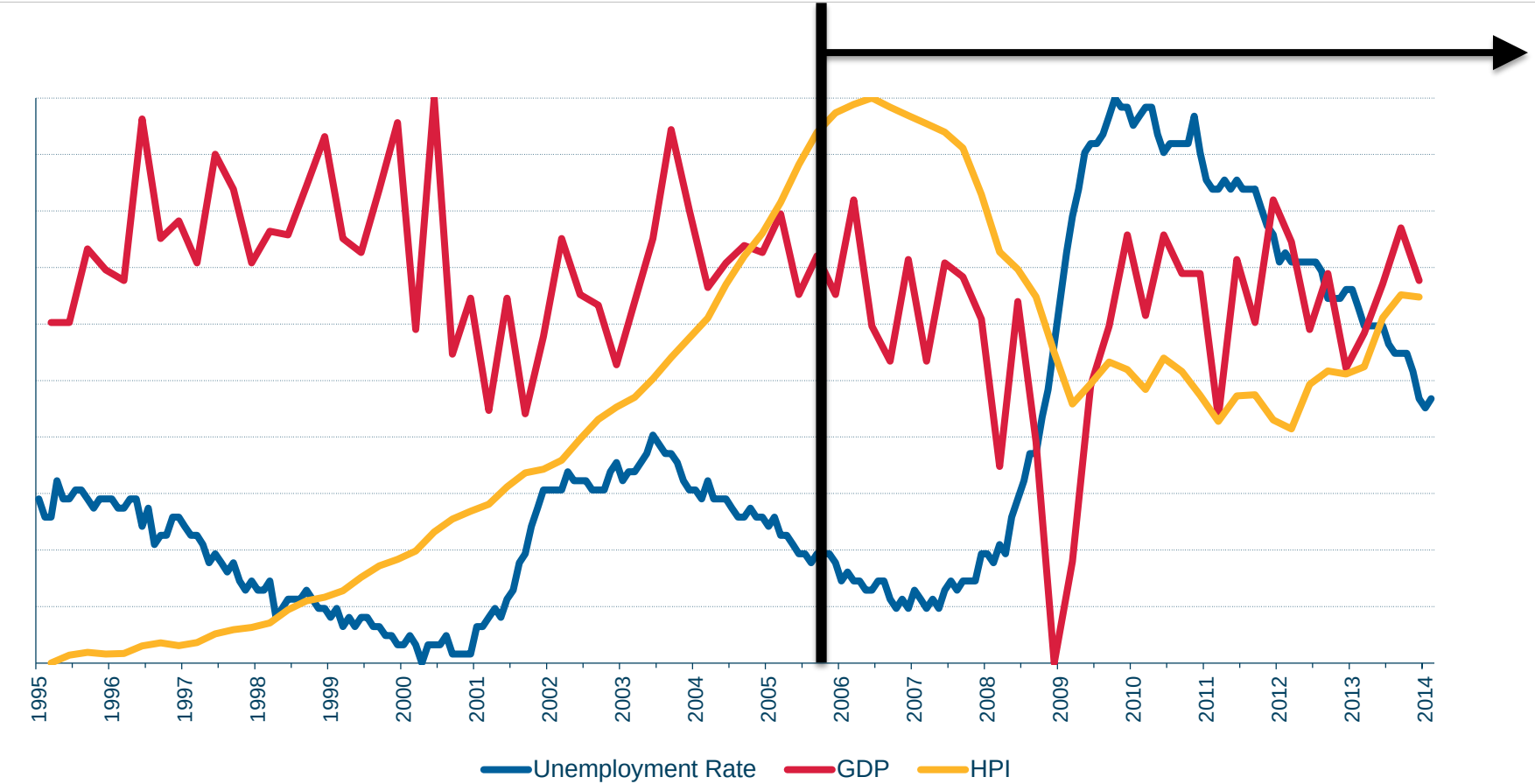
Credit Scores and the Changing Economy

- Current practice is to rebuild scores when the economy changes sufficiently
- Belief is that changes to the economy result in . . .
  - Decrease in Power of scores
  - Odds-to-Score alignment changes
  - Changes in Rank ordering of consumers
- Dynamic Scores are an alternate approach to current practice, allowing for scores to change dynamically with the economy, while maintaining power, alignment and allowing for rank-ordering changes

Data

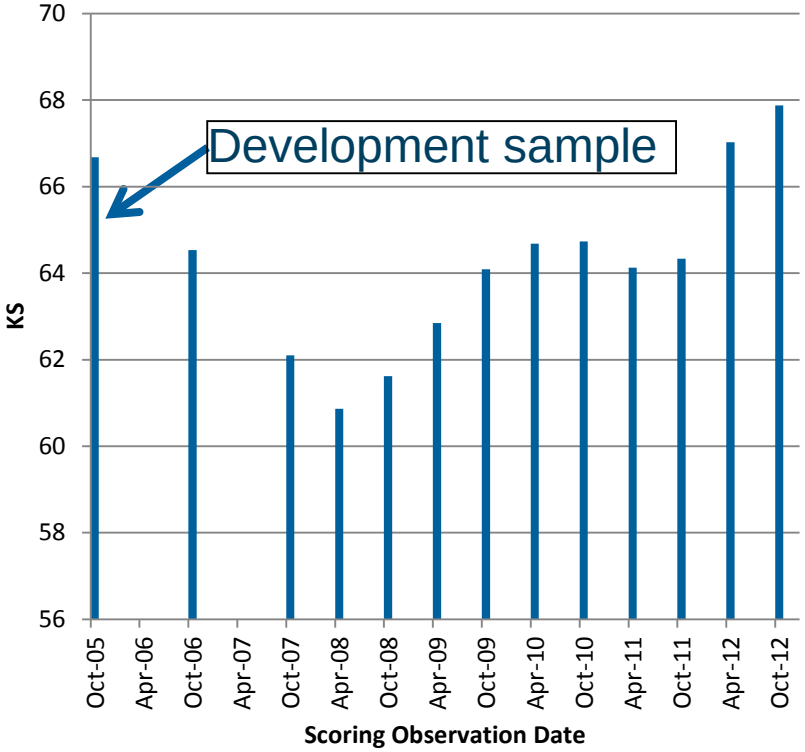
- Broad-based sample of US Credit Bureau Data
- Data from October 2005-October 2014, snapshots (mostly) every six months
- 24-month credit delinquency performance on all scores

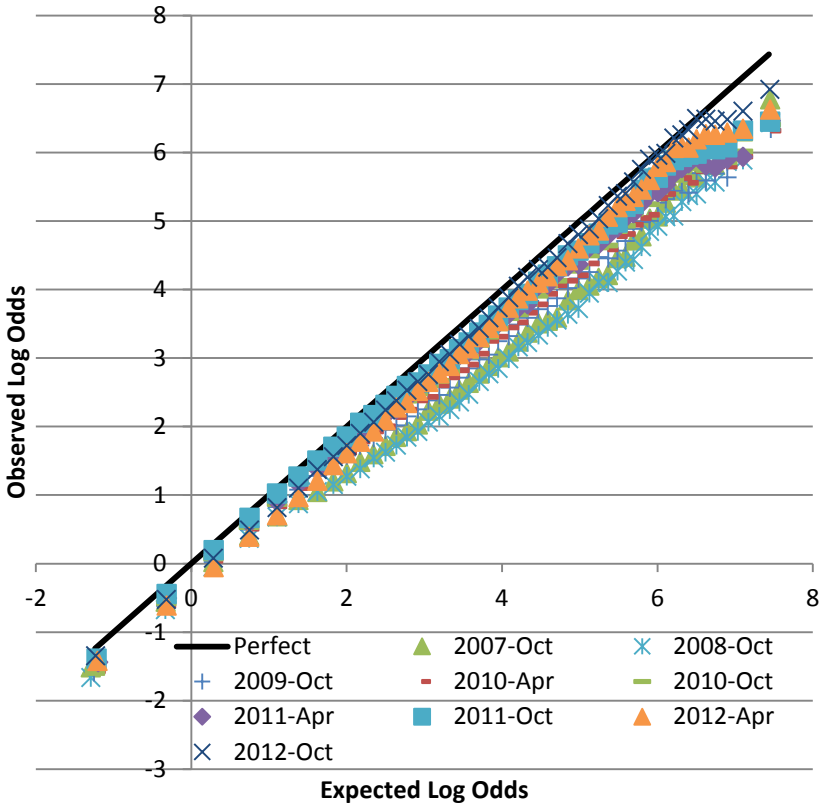
Key Economic Indicators, United States



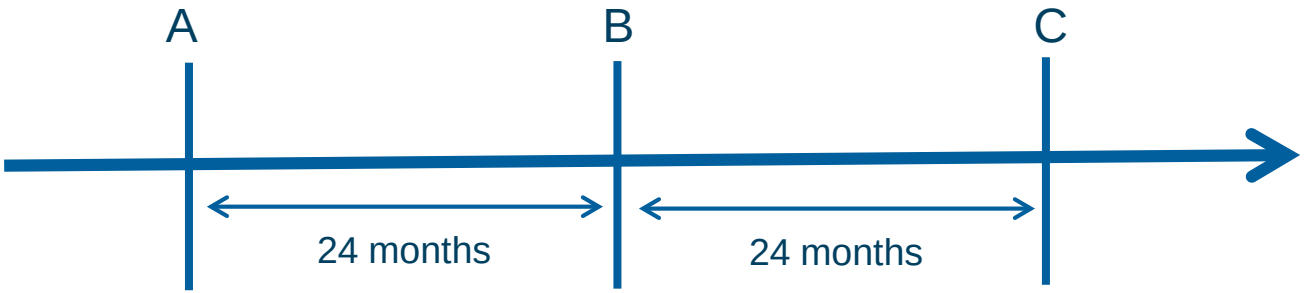
Business As Usual

Score developed in “Boom” economy



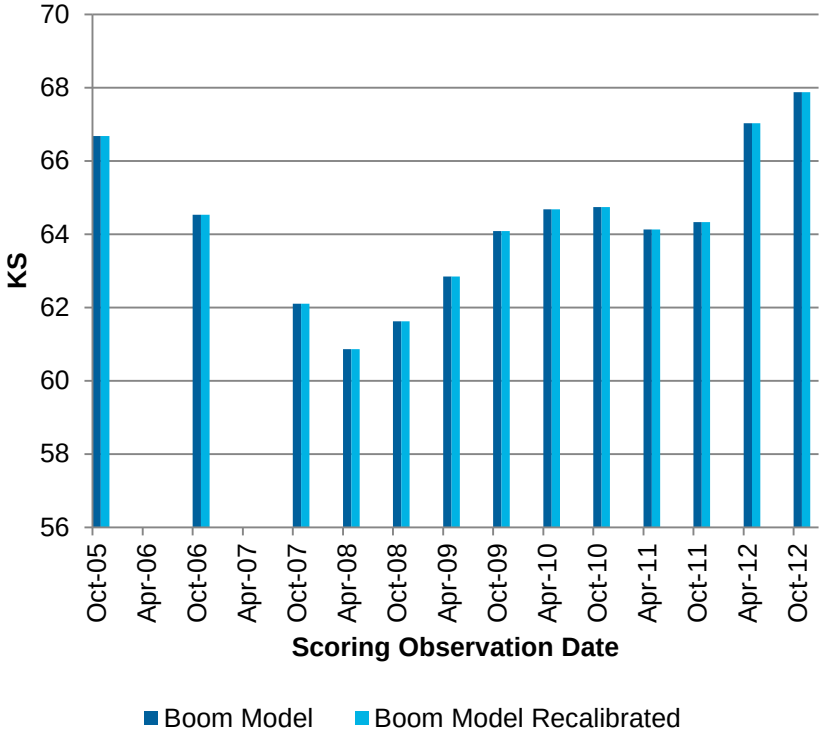


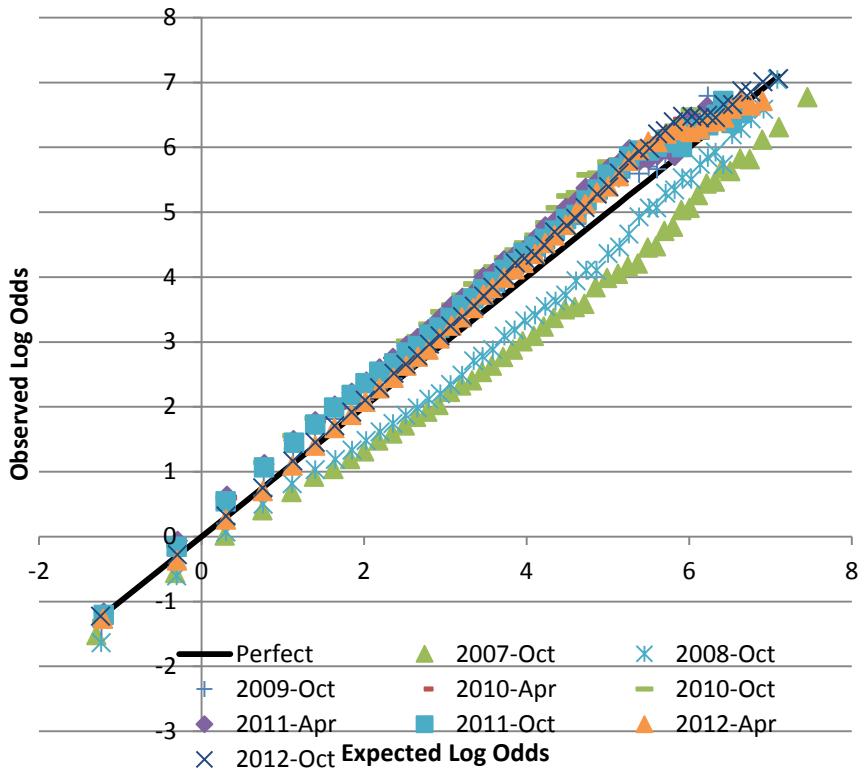
Business As Usual Realignment



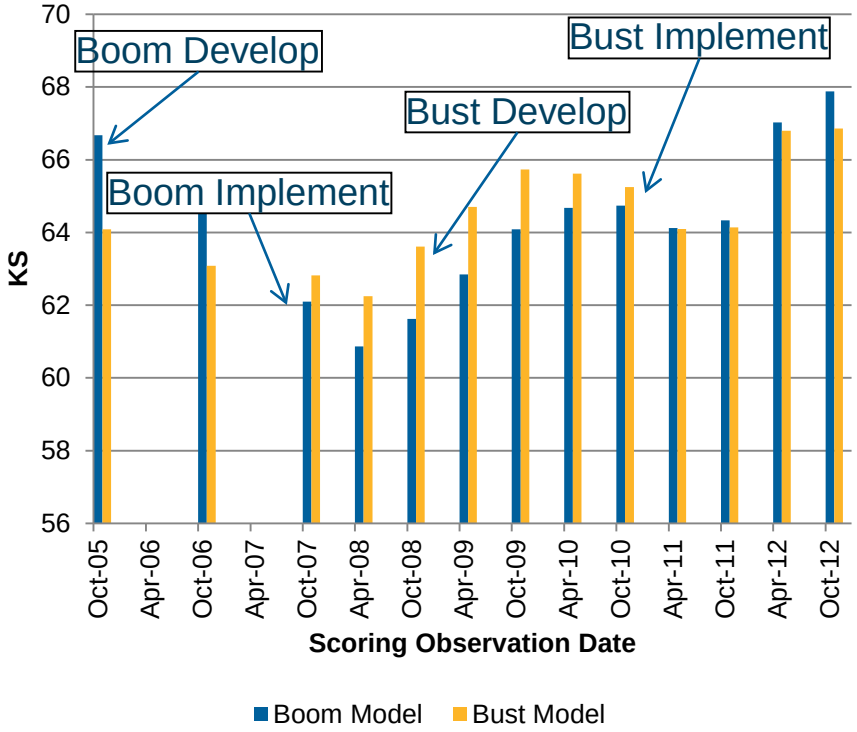
- Banks calculate log-odds to score relationship based on observation A through performance B:
  - $\ln(\text{odds}) = \alpha_A * \text{Score} + \beta_A$
- Use this relationship to get best estimate of odds at time B for use in strategies, reserve setting, etc.

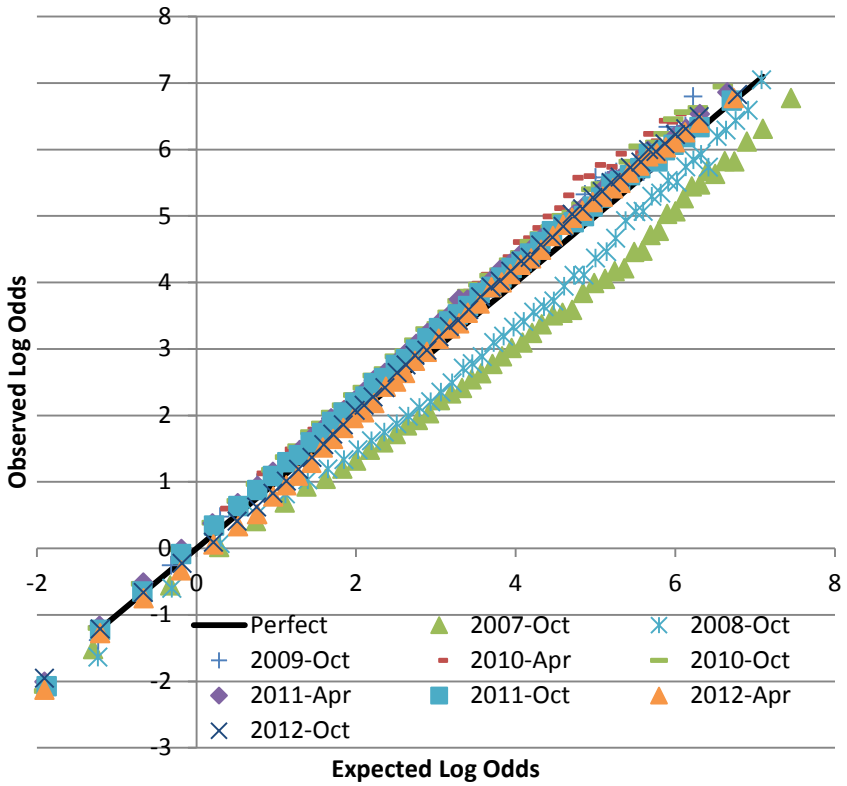
Standard Scores: Power and Recalibrated Alignment



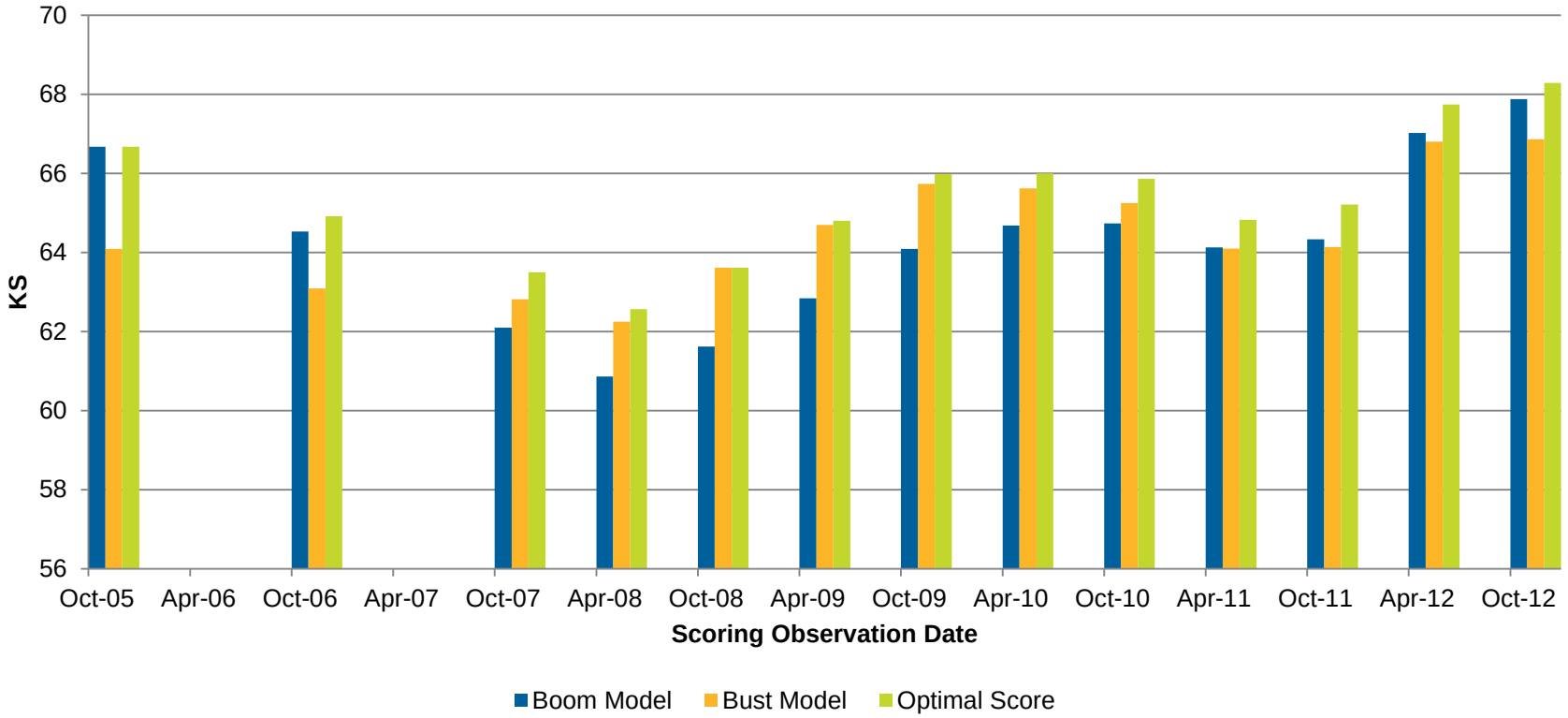


Rebuild Models; power and alignment

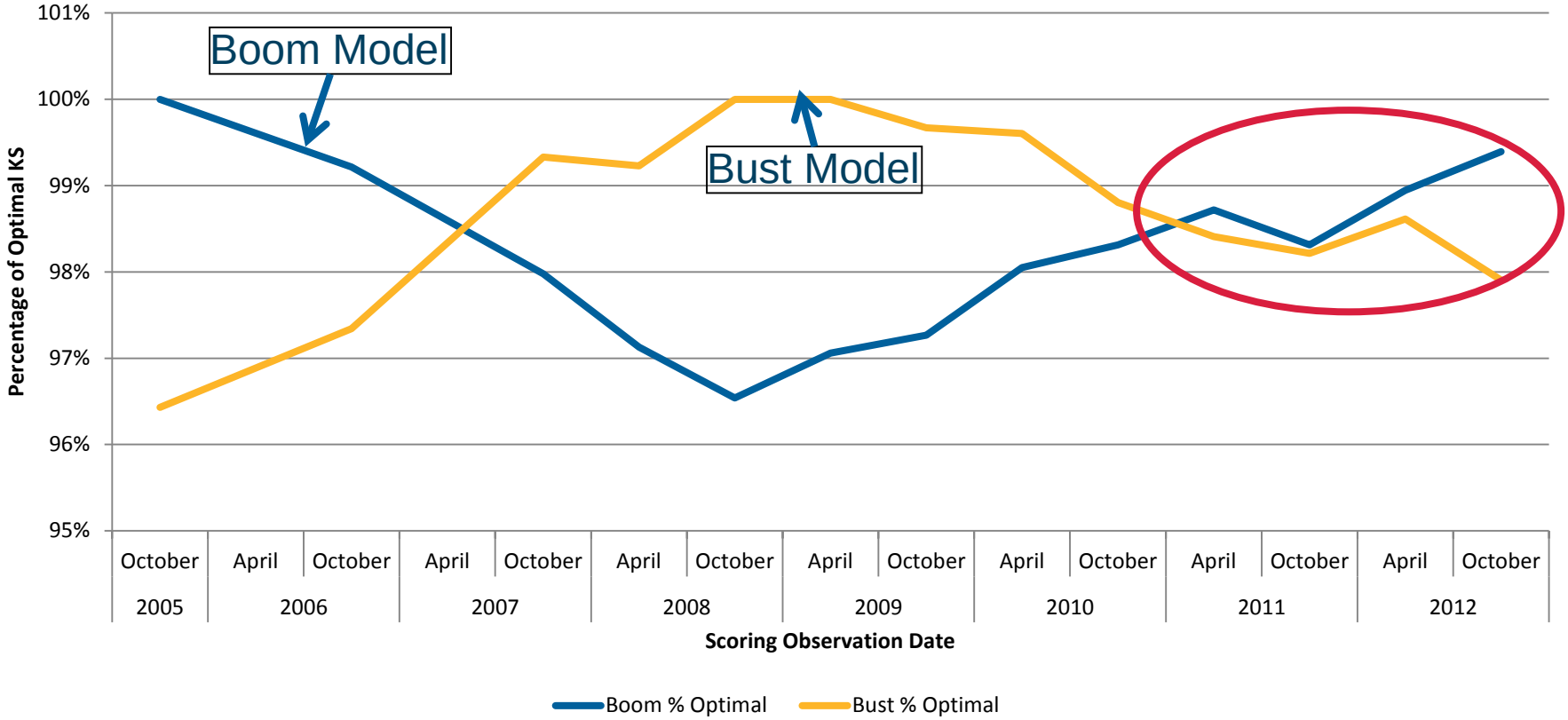




Power of models depends on economic circumstances

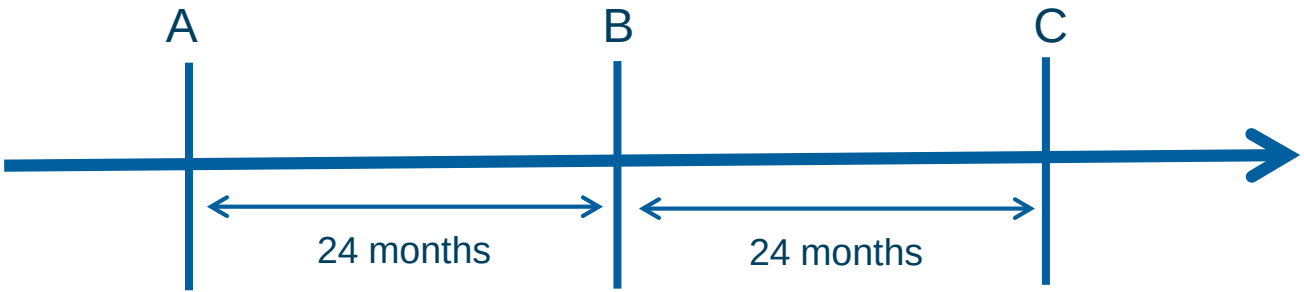


Think about score power like this:



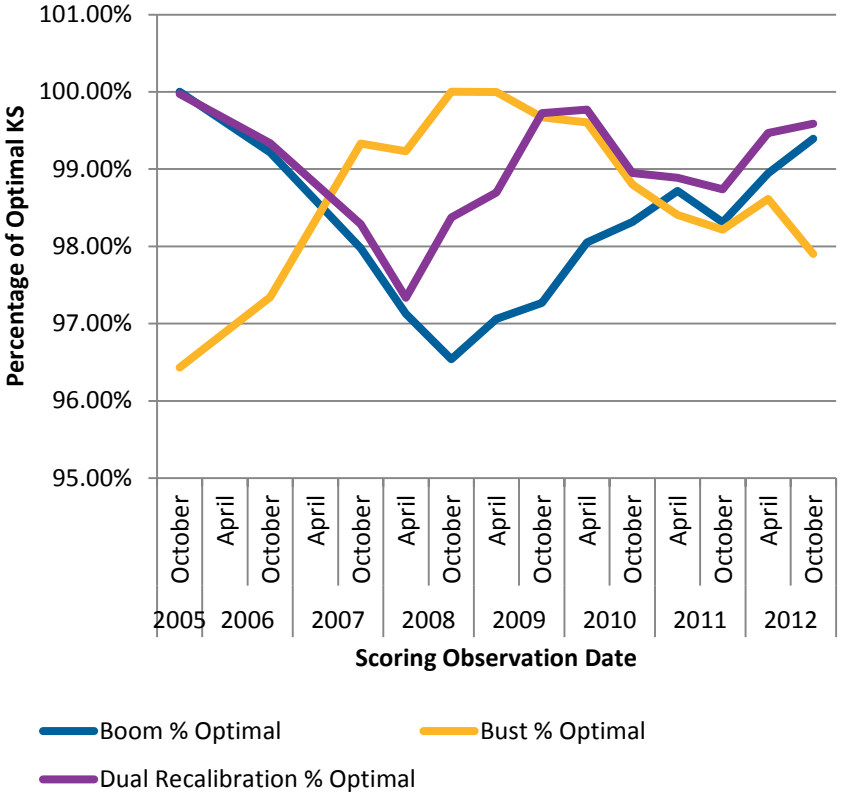
Why Are We Throwing Away Scores?

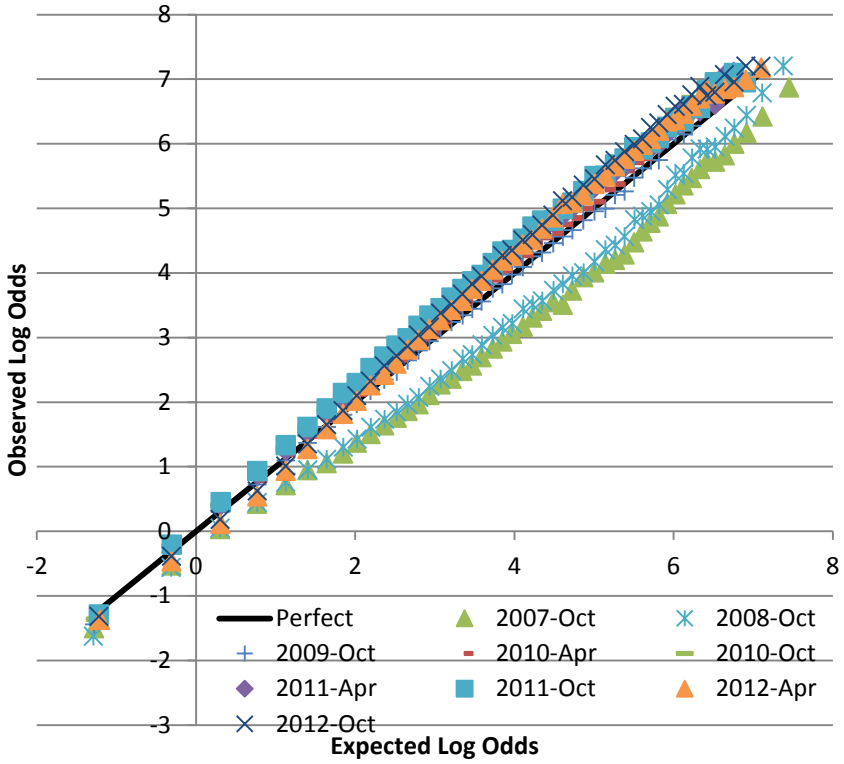
Dual Recalibration



- Normal Recalibration:
  - Banks calculate log-odds-to-score relationship based on observation A through performance B:
  - $\mathbf{ln(odds) = \alpha_A * Score + \beta_A}$
- Dual recalibration:
  - $\mathbf{ln(odds) = \alpha_A * BoomScore + \beta_A * BustScore + \gamma_A}$

Dual Recalibration; Power and Alignment





Dual Recalibration: An alternate view

$$\mathbf{ln(odds) = \alpha_A * BoomScore + \beta_A * BustScore + \gamma_A}$$

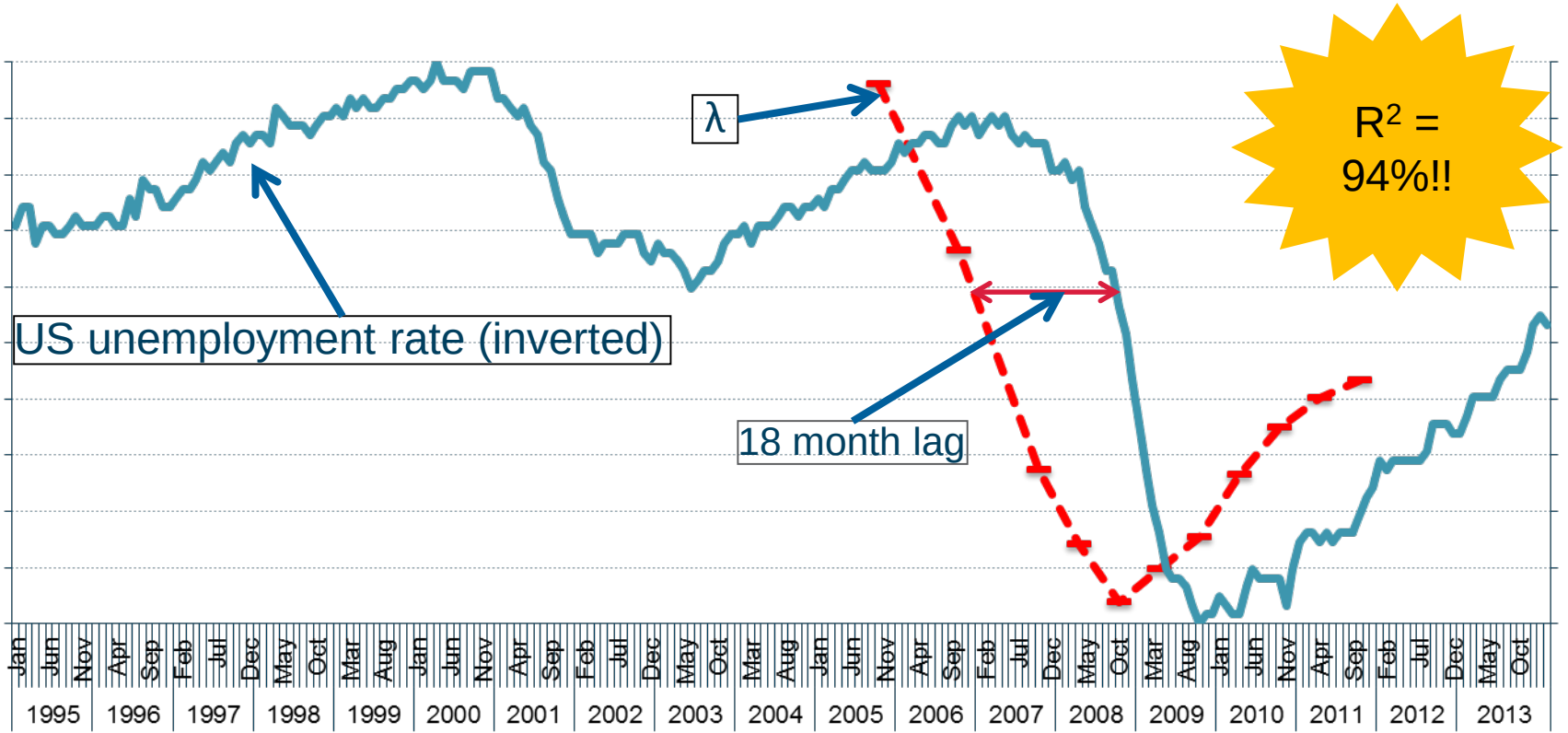
$$\lambda_A = \frac{\alpha_A}{\alpha_A + \beta_A}$$

$$1 - \lambda_A = \frac{\beta_A}{\alpha_A + \beta_A}$$

$$\mathbf{Scaled\ Combination = \lambda_A * BoomScore + (1 - \lambda_A) * BustScore}$$

What does λ_A look like over time?

Score Combination Parameter Versus Economic Data



Dynamic Score Formulation

$$\lambda \rightarrow \lambda(\vec{e})$$

$\vec{e}$ = Vector of Economic Variables

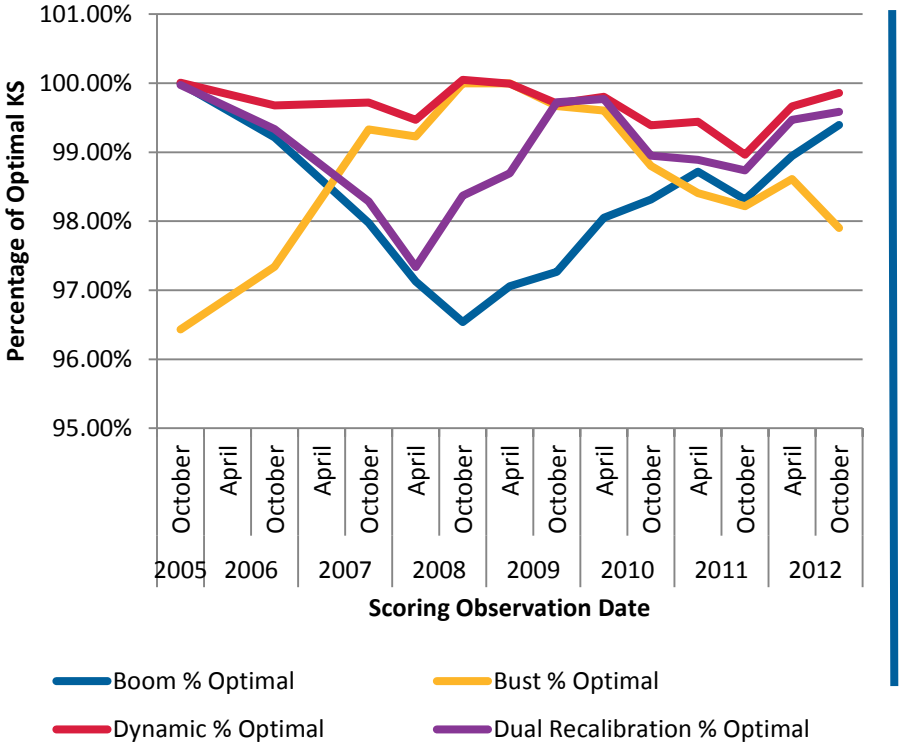
$$\lambda(\vec{e}) \rightarrow [0,1]$$

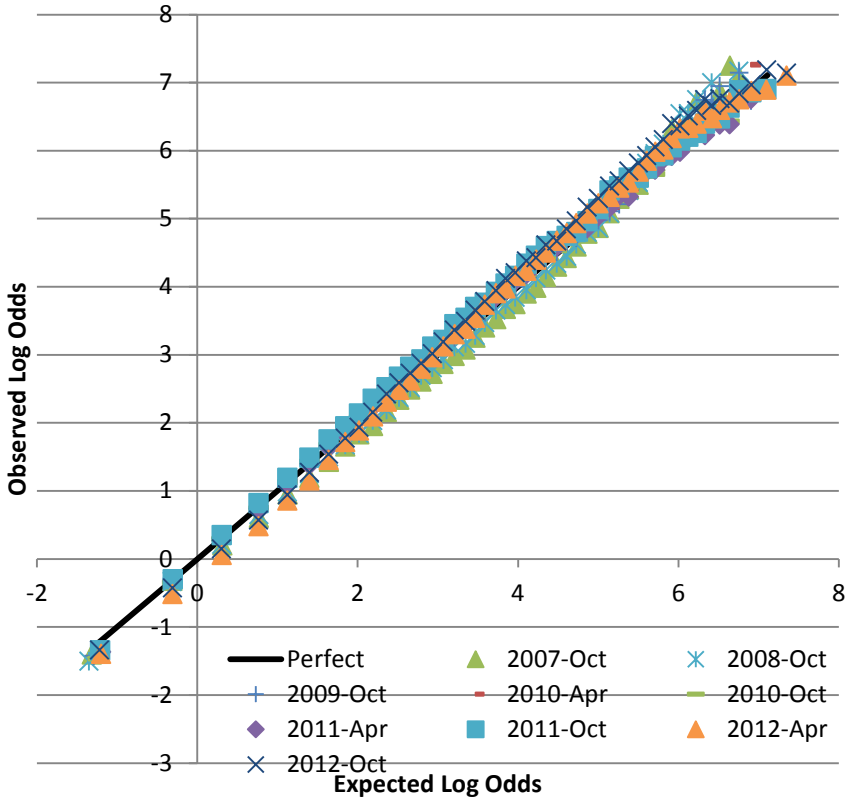
Dynamic Score

$$= \lambda(\vec{e})[\text{Boom Score}] + (1 - \lambda(\vec{e}))[\text{Bust Score}]$$

- For this data, $\vec{e}$ is unemployment with an 18-month future lag
- This approach may require forecasts of economic values dependent upon what data best fits the $\lambda(\vec{e})$ model

Dynamic Score Power And Alignment





Summary

- Standard redevelopments and recalibrations of scores results in slow, delayed reactions to changes in economic circumstances
- Combining boom and bust scores in a two-variable logistic regression improves upon either score individually, but is still slow to react to changes in economic circumstances
- Forecasting the optimal combination provides improvements that give rise to Dynamic Scores that are almost as good as the optimal score at any given point in time

Thank You

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Appendix: EII alignment