



STRATEGIC ANALYTICS

Predicting Credit Score Calibrations through Economic Events

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Overview

- **Review of Score-Odds Calibrations**
- **Understanding Portfolio Dynamics**
- **Dual-time Dynamics**
- **Scenario-based Forecasting**
- **Score-Odds Predictions**



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Review of Score-Odds Calibrations

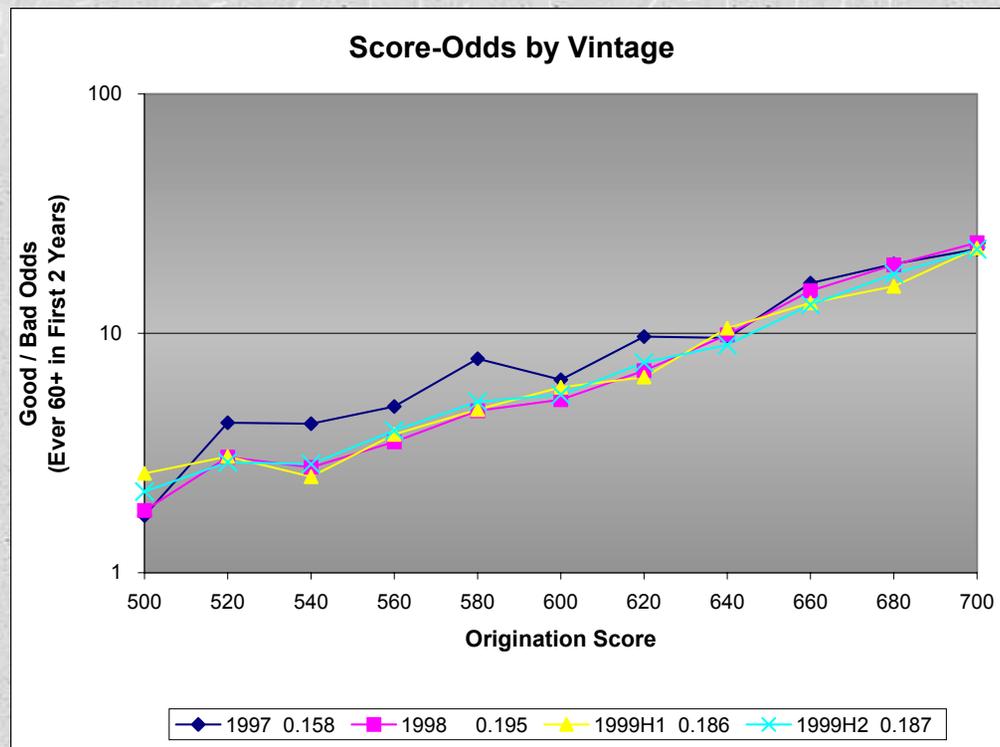
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Score-Odds Analysis

- **Bureau scores have been shown to maintain effective rank ordering of consumers through a variety of environments.**
- **Score-odds calibrations calibrate credit scores to the specific odds of delinquency.**
- **For purposes of managing new originations, a common approach is to plot the odds of ever being 60+ DPD during the first 2 years of product ownership versus the score at origination.**
- **Re-estimation of score-odds calibrations are used as a guide in adjusting cut-off scores for originations.**

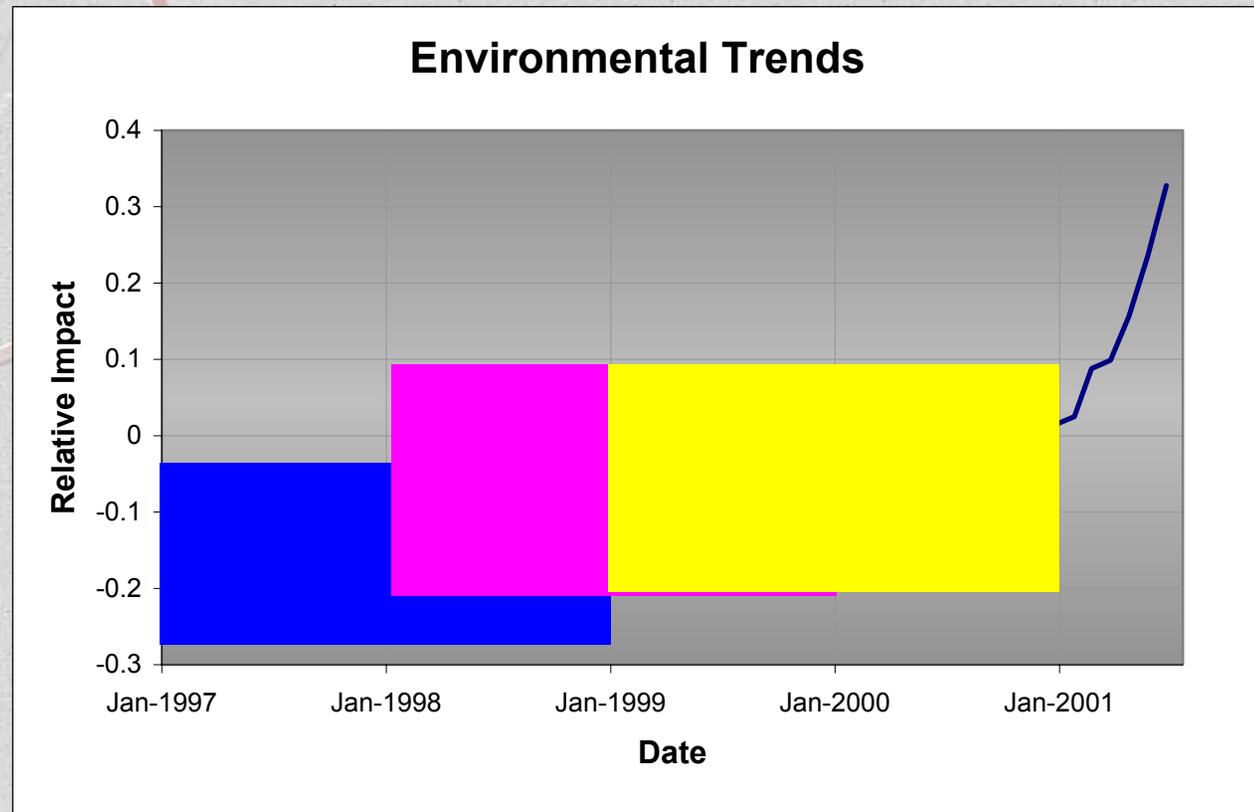
Score-Odds Calibrations Over Time

- Each vintage experiences a potentially different environment.
- The 1997 vintage performed better in its first 2 years than 1998 and 1999



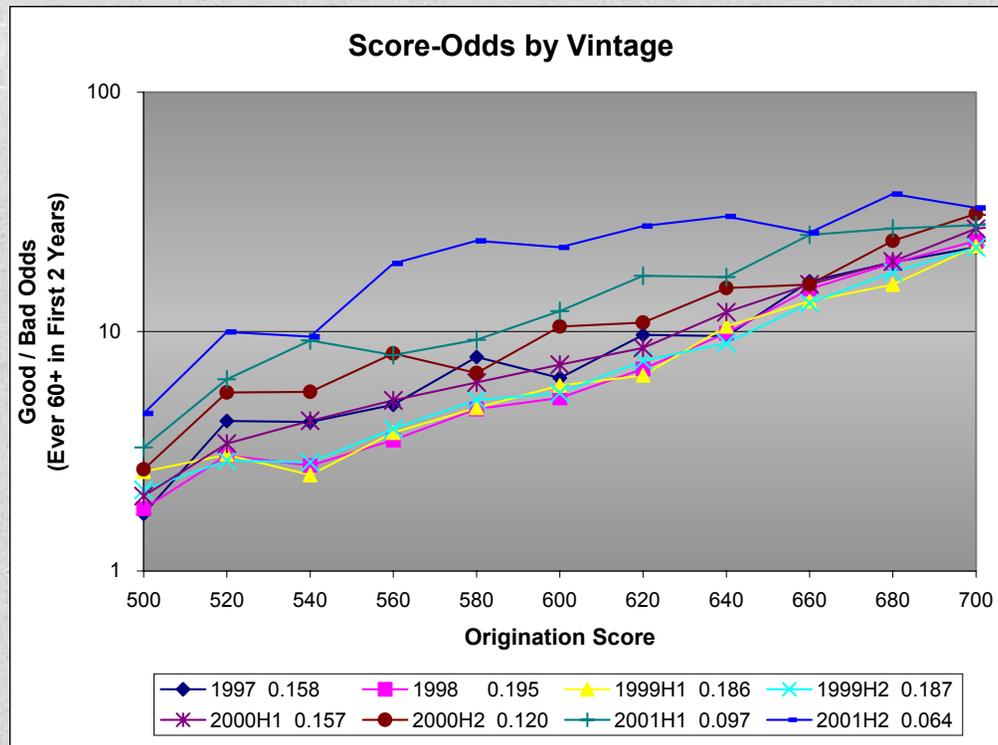
Environmental Trends

- **An independent measure of environmental impacts (via Dual-time Dynamics) confirms that the 1997 vintage lived through a better environment.**



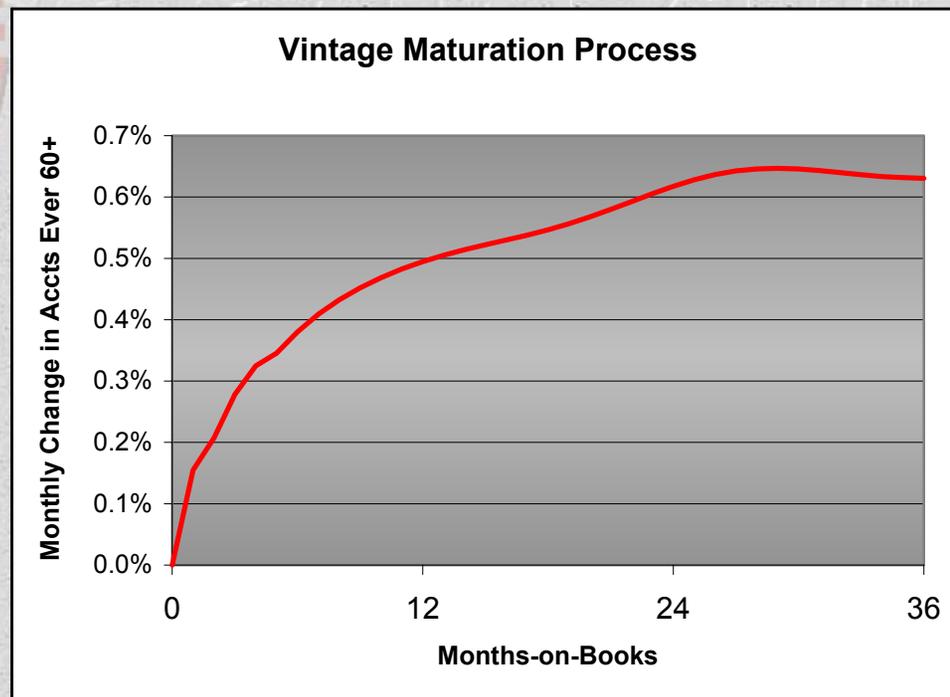
Score-Odds on Maturing Accounts

- Including recent vintages is problematic because they have been observed for a shorter period of time.



Account Maturation Dynamics

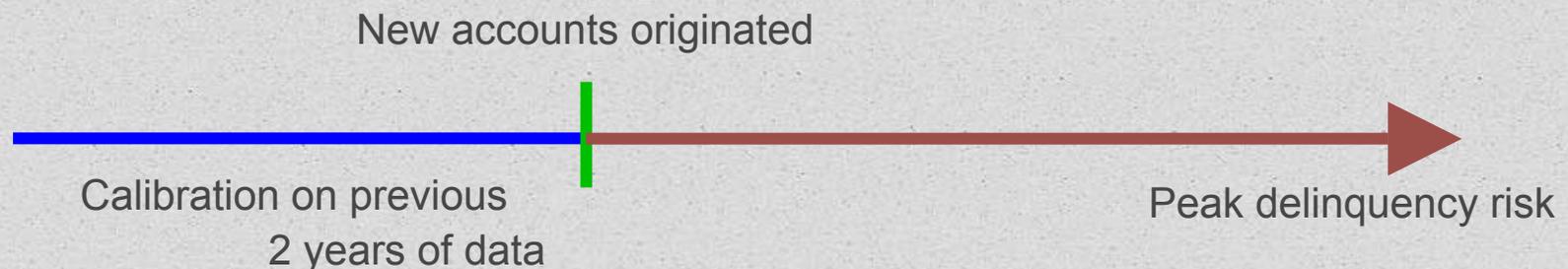
- **Peak delinquency risk may not occur for several years after booking. This portfolio shows peak delinquency risk between 24 and 36 months-on-books.**



Originations Timeline

Trailing score-odds calibrations have several problems:

- **Cannot use the most recent vintages because of immaturity of the accounts.**
- **Accounts booked today will have peak delinquency up to several years in the future. Setting cut-off scores based upon a calibration to the previous 2 years' data implicitly assumes that the macro-economic environment will remain unchanged for 4 to 5 years.**



Creating an Ideal Approach

The technique just illustrated is simplistic. We need a score-odds calibration methodology that:

- **Uses the full history of both old and new vintages.**
- **Normalizes for changes in business practices, e.g. improved collections scores or systems.**
- **Can be projected under changing macroeconomic environments.**

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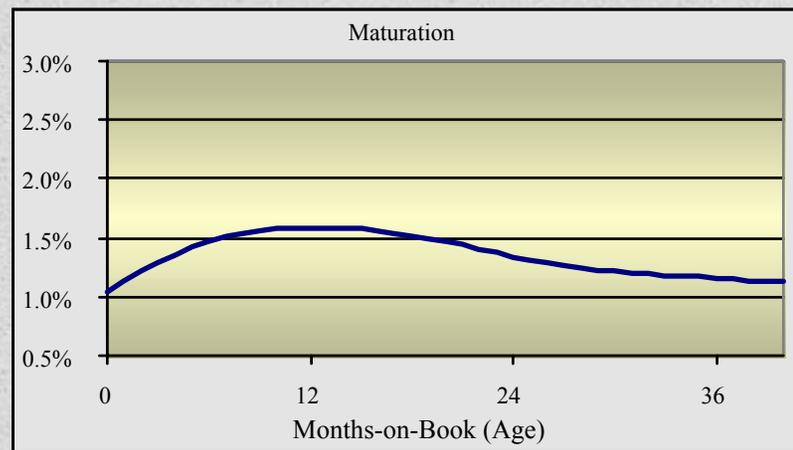
Understanding Portfolio Dynamics

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Components of Portfolio Performance

- **Vintage Lifecycle**

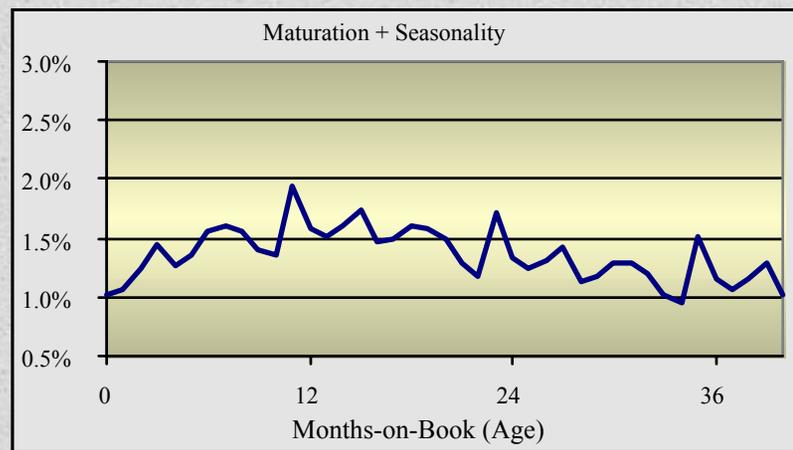
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Components of Portfolio Performance

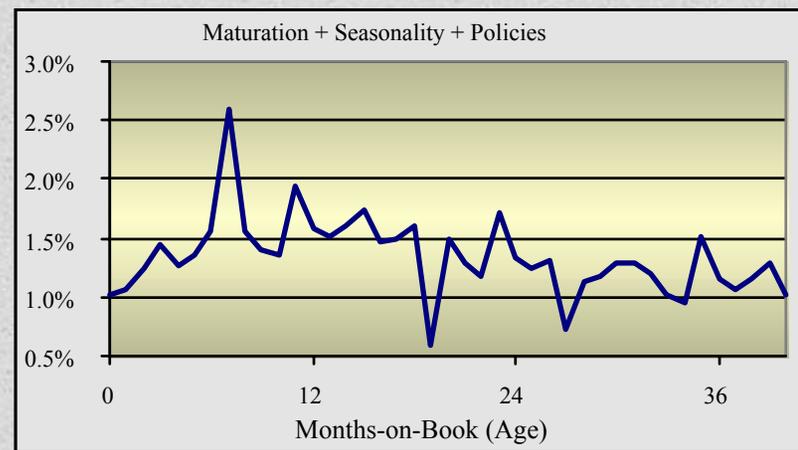
- **Vintage Lifecycle**
- **Seasonality**

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Components of Portfolio Performance

- **Vintage Lifecycle**
- **Seasonality**
- **Management Actions**

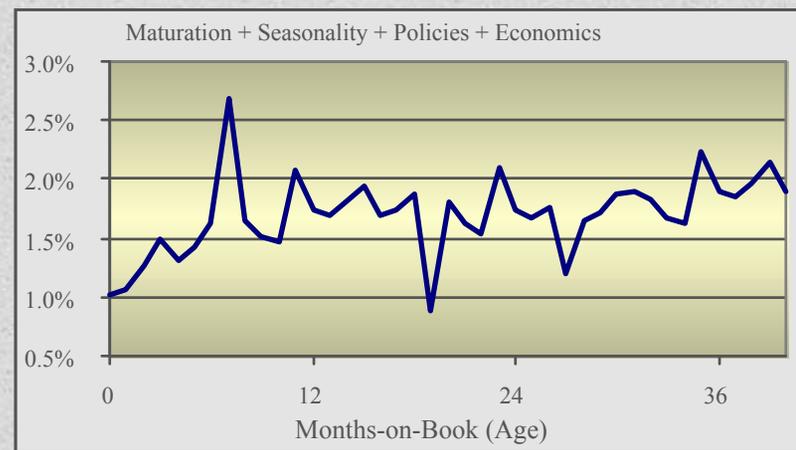


Components of Portfolio Performance

- **Vintage Lifecycle**
- **Seasonality**
- **Management Actions**
- **Competitive & Economic Environment**

**Maturation
(age-based)**

**Exogenous
(time-based)**





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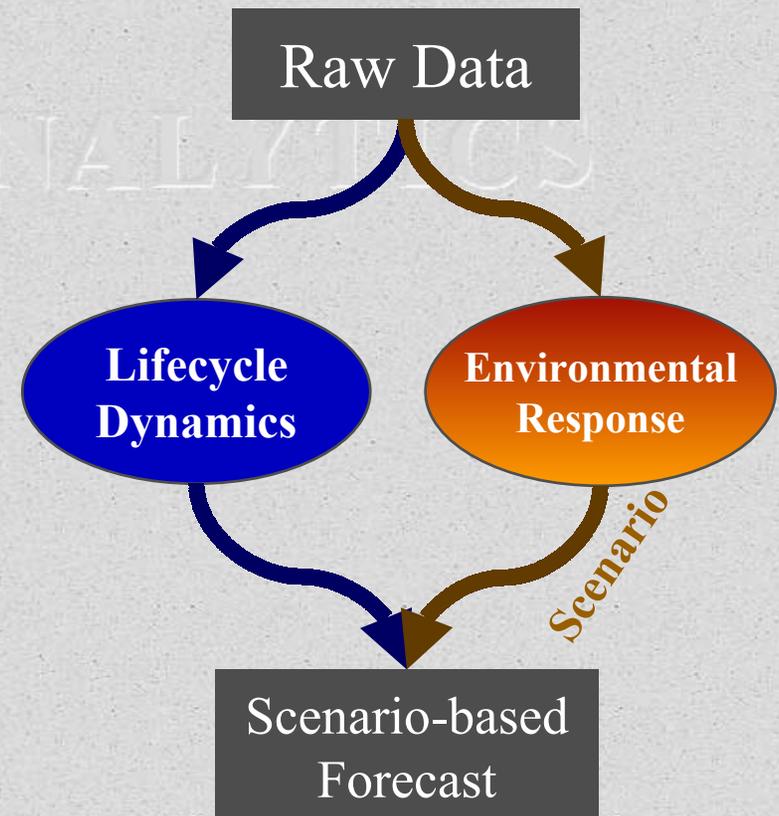
Dual-time Dynamics (DtD)

Powerful, New Analytics

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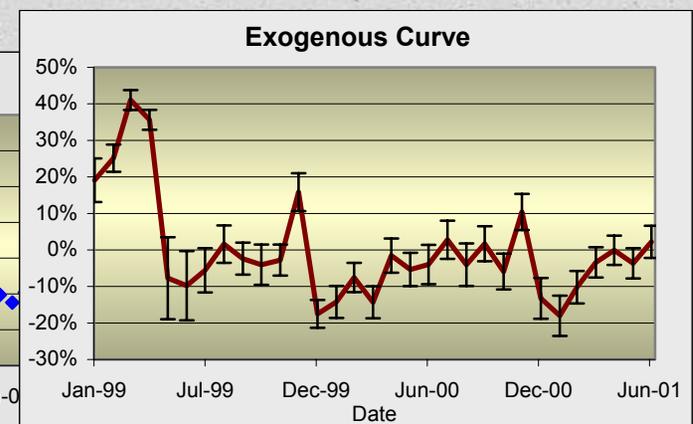
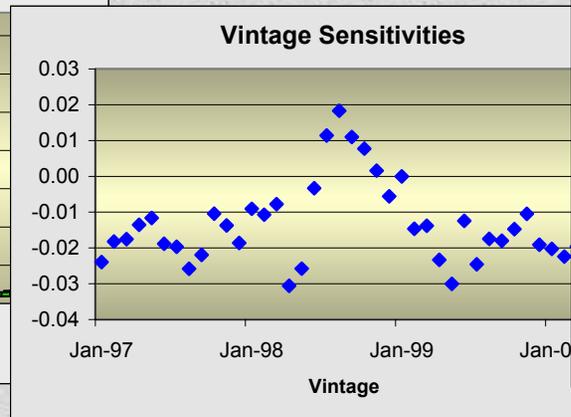
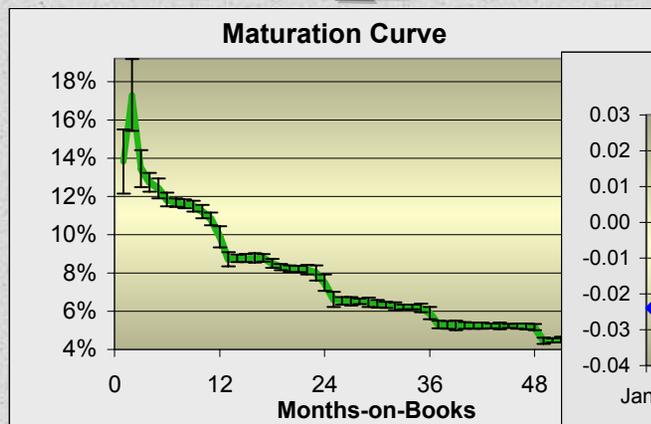
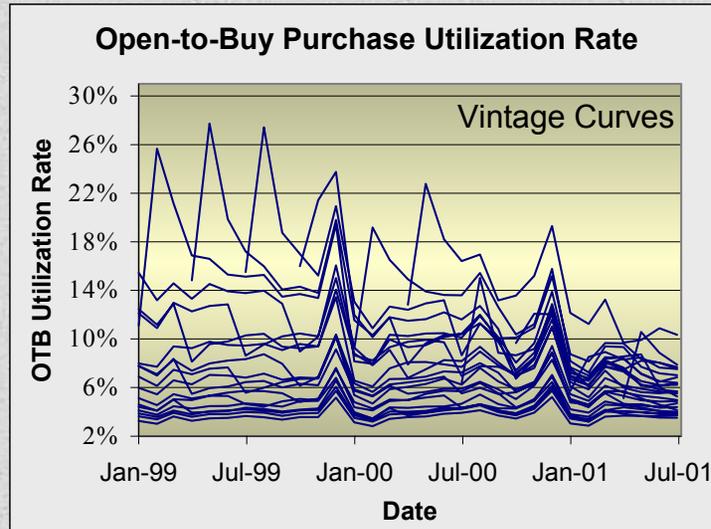
Dual-time Dynamics Modeling

- **Behavior is decomposed into natural dynamics and environmental response.**
- **Captures the full nonlinear dynamics of the components.**
- **All historical data is made relevant for the present.**
- **Past environment may be replaced with a future scenario.**



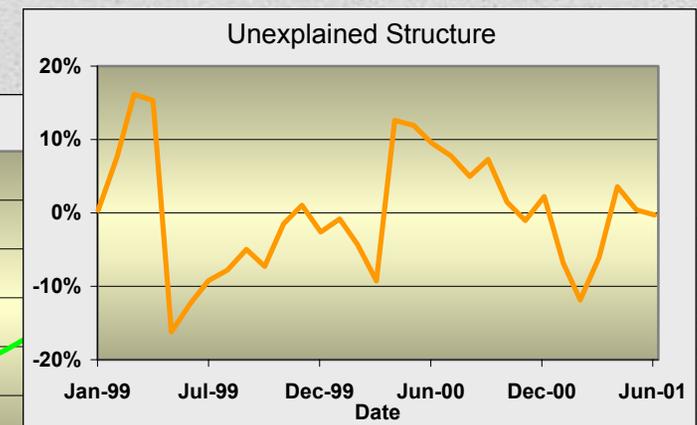
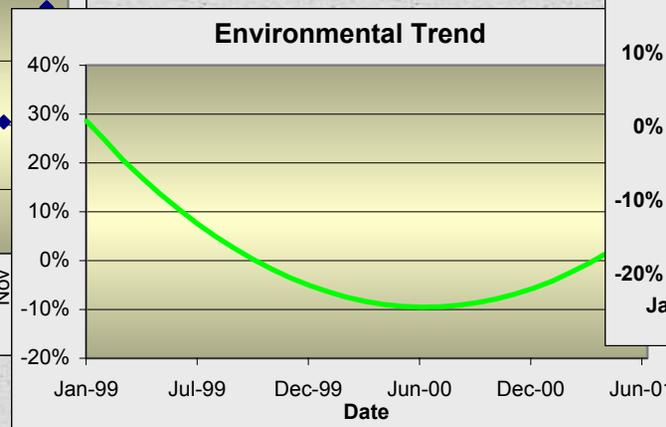
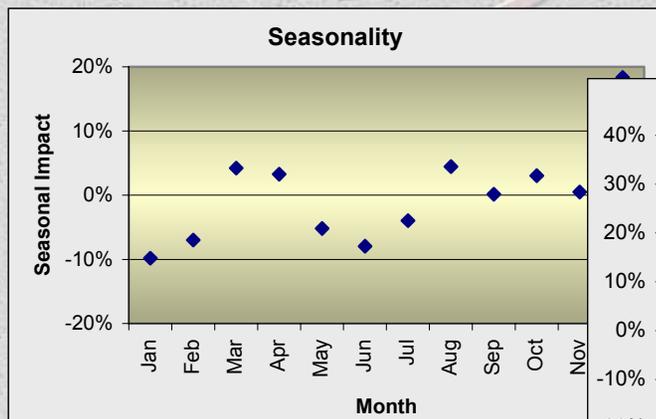
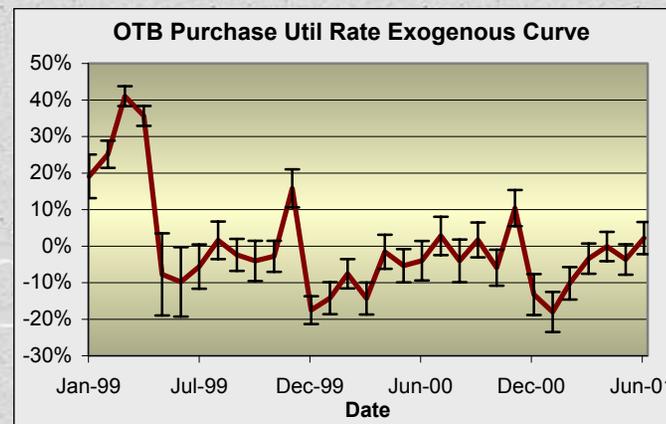
Dual-time Dynamics (DtD)

- A unique technology for modeling portfolio dynamics
- Unparalleled accuracy for quantifying maturation and management controls
- Patent-pending technology derived from techniques in nonlinear dynamics



Decomposing the Exogenous Curve

- The exogenous curve measures the relative impact of external factors upon the intrinsic consumer dynamics
- e.g. “20% higher utilization of unused credit line than would have been expected from the maturation process”
- To ascertain cause-and-effect, the exogenous curve is further decomposed into seasonality, environmental trends, management actions, and intrinsic volatility





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Scenario-based Forecasting

via Dual-time Dynamics

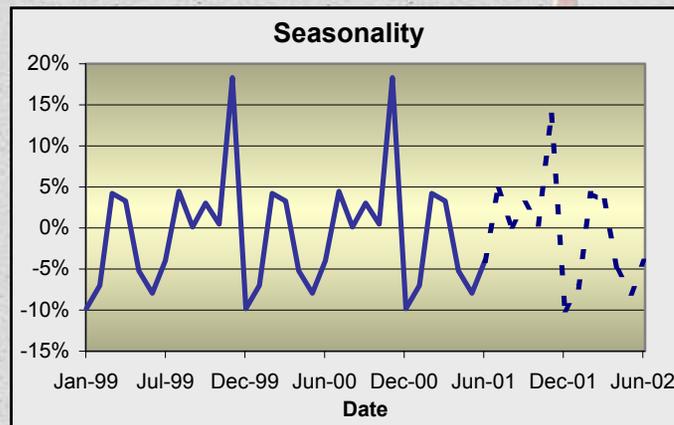
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Exogenous Scenarios

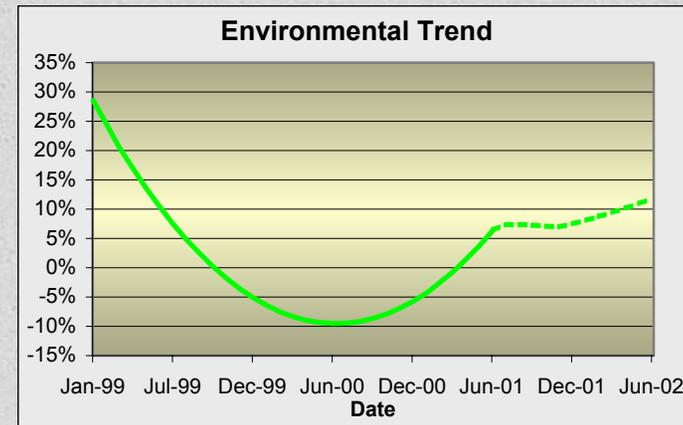
Decomposition generates elements that are familiar and visual

Scenario's for the future environment are best managed by adjusting seasonality and economic response separately

Cumulative effects then drive the forecast



2001 holiday spending is expected to be weaker than prior years

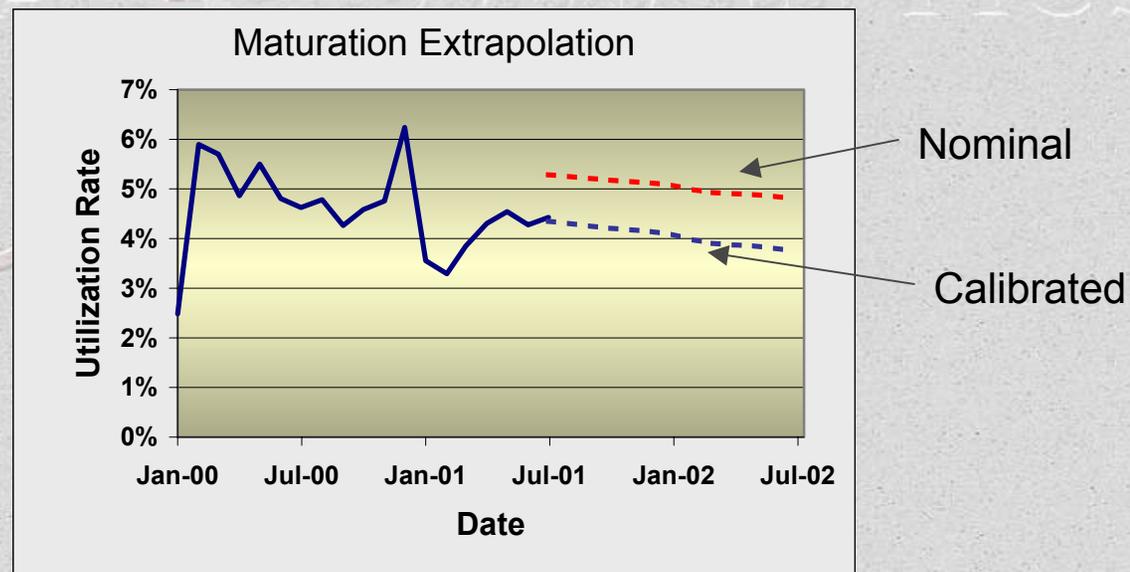


and spending should grow more slowly while in recession

Vintage Forecasting

Forecasts are built up from the vintage/segment level

The DtD engine extrapolates the maturation curve...
and calibrates to the vintage using the vintage sensitivities

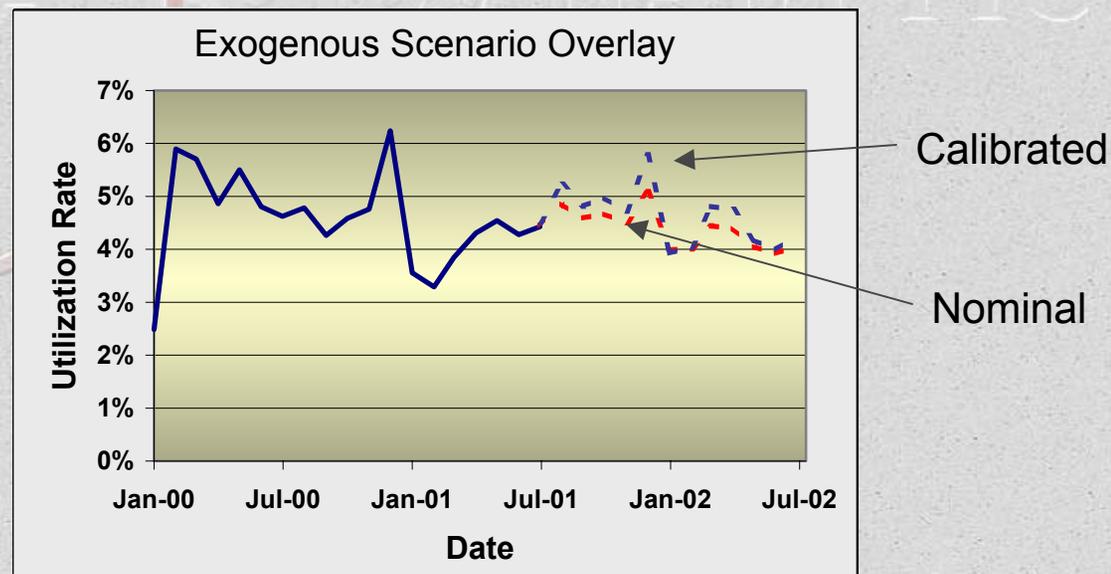


Open-to-Buy Purchase Utilization Rate

Vintage Forecasting

Economic and management actions are then introduced

The DtD engine overlays the chosen exogenous scenario...
and calibrates the exogenous scenario to the vintage using
the vintage sensitivities



Open-to-Buy Purchase Utilization Rate



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Predictive Score-Odds Calibrations

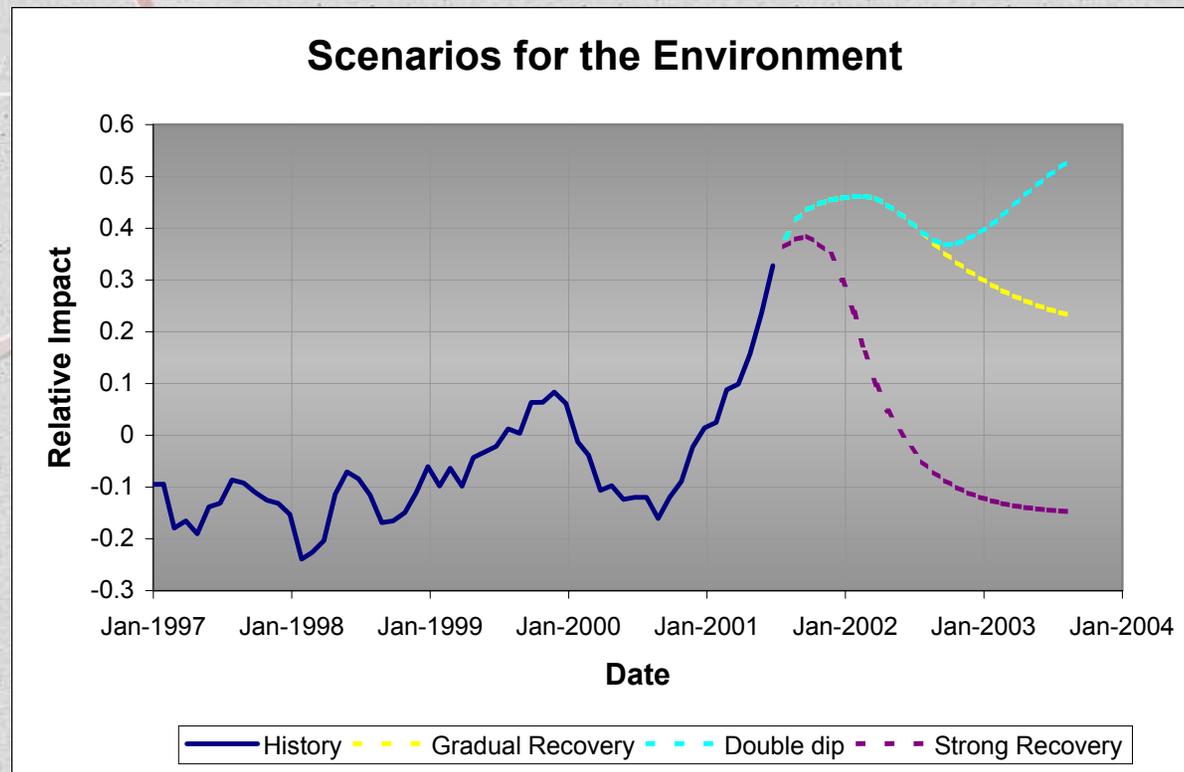
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Predicting Score-Odds Calibrations

- **Renormalize the vintages as if they were all the same maturity (months-on-books) during the scenario.**
- **Project the vintages under a scenario for the future environment.**
 - *Using scenarios means that the predictions depend upon management assumptions, but those assumptions are made explicit and available for validation. An audit trail is maintained.*
- **Compute the score-odds calibration under this scenario and maturity.**
 - *Management should consider a range of possible future scenarios to determine the portfolio's sensitivity to environmental change.*

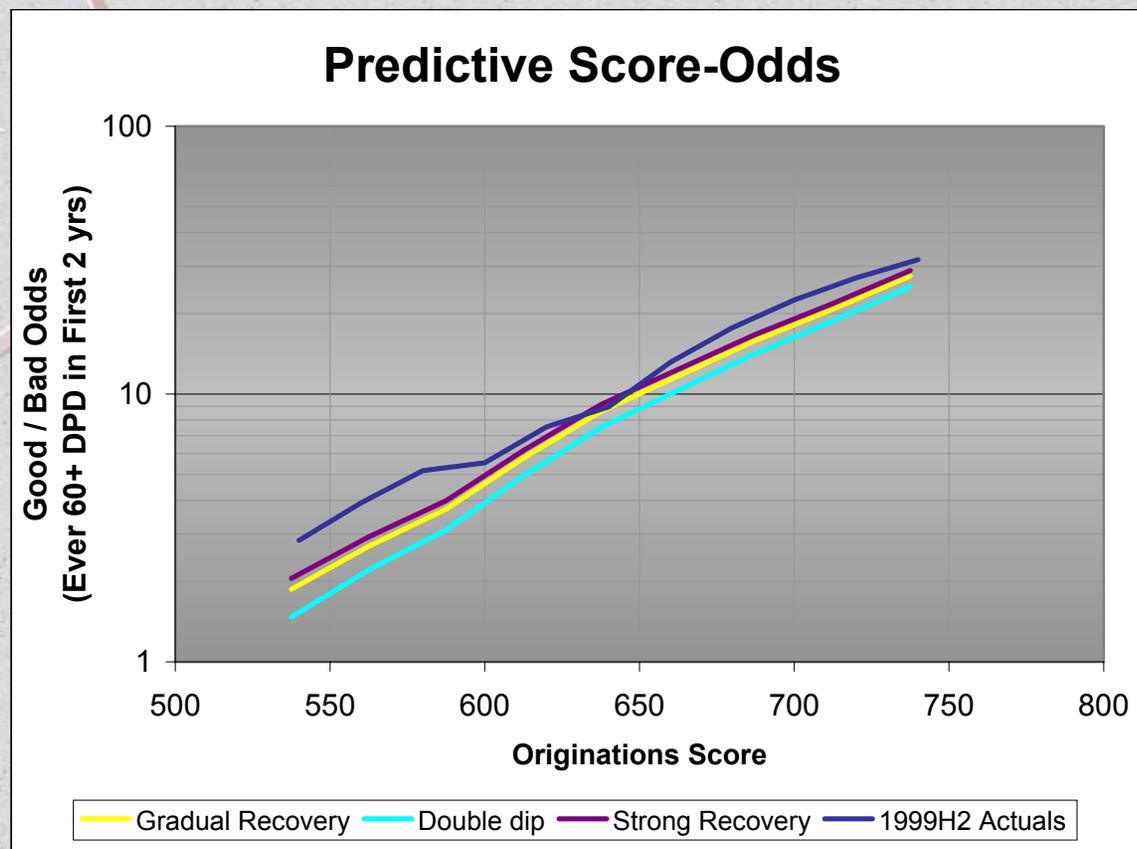
Create the Scenarios

- Shows three possible scenarios for the next two years. At the time, Gradual Recovery was considered the most likely.



Optimal Cut-off Scores

- In this example, to maintain odds of 4:1 would require raising the cut-off score by 32 (Gradual Recovery), 41 (Double-dip), or 28 (Strong Recovery).



Summary

- **Score-Odds calibrations can and should account for future changes in the environment.**
- **Predictive Score-Odds are probably most important for short term loans (less than one full business cycle) that will not experience a broad range of environments.**
- **The Predictive Score-Odds technique leads naturally to optimizing profitability. Including revenue analysis in the Score-Odds calibration makes setting cut-off scores an act of optimizing profit rather than minimizing losses.**