Mission Possible: Producing Defendable and Reasonable CECL Results With or Without Models

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How to Make Estimates Defendable?
A “reasonable and supportable” argument depends on…

» Benchmarking/Backtesting
» Applicability
» Transparency
» Monitoring
» Assumptions
» Narrative
Agenda

1. C&I Credit Loss Estimation
2. CRE Credit Loss Estimation
3. Retail Credit Loss Estimation
4. Key Take-Aways
C&I Credit Loss Estimation
Benchmarking/Backtesting

» Weighted Average Remaining Maturity (WARM): calculating average historical quarterly net charge off rate over a time window, applying it to the current portfolio with balance run off projections to produce a lifetime loss rate

<table>
<thead>
<tr>
<th>Avg Quarterly Loss Rate</th>
<th>Stressed Period (2008-2011)</th>
<th>Benign Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>WARM</td>
<td>2.55%</td>
<td>0.62%</td>
</tr>
<tr>
<td>Avg Quarterly Loss Rate</td>
<td>0.32%</td>
<td>0.07%</td>
</tr>
</tbody>
</table>

» Model-free approaches to CECL

![Chart showing Quarterly Loss Rate from 2004 to 2018]
Applicability Analysis: Risk Drivers Distribution

How to justify using a vendor model estimated on proxy data?

![Age Percentage Distribution](image1.png)

Age Percentage = Age / (Contractual Term)

![Balance Weight Distribution](image2.png)

Balance Weight

- Model Estimation Dataset
- Bank ABC Portfolio

![Credit Spread at Origination Distribution](image3.png)

Balance Weight

- Model Estimation Dataset
- Bank ABC Portfolio
# Transparency of Methodology

<table>
<thead>
<tr>
<th>Approach</th>
<th>PD/LGD</th>
<th>Loss Rate</th>
<th>Non-Model Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td>Borrower-level, granular</td>
<td>Simple</td>
<td>Simplest</td>
</tr>
<tr>
<td></td>
<td>Explicit R&amp;S period</td>
<td>Data readily available</td>
<td></td>
</tr>
<tr>
<td><strong>Challenges</strong></td>
<td>Requires more input data</td>
<td>Prepayment/amortization embedded</td>
<td>Relies on qualitative</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>adjustments</td>
</tr>
<tr>
<td><strong>Moody’s Solutions</strong></td>
<td>RiskCalc + GCorr Macro</td>
<td>Lifetime Loss Rate</td>
<td>Historical Loss</td>
</tr>
<tr>
<td>(as Examples)</td>
<td></td>
<td></td>
<td>Analyzer</td>
</tr>
<tr>
<td><strong>Input Portfolio Data</strong></td>
<td>Borrower Financial Statements (e.g., EBIDTA,</td>
<td>Loan Characteristics (e.g., age, size)</td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>Leverage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Macroeconomic Variables</strong></td>
<td>US Unemployment, Equity, VIX, and BBB Spread</td>
<td>US Unemployment Rate, BBB Spread</td>
<td>N/A</td>
</tr>
</tbody>
</table>
C&I Lifetime Loss Rate Model Validation Support

Abstract
This document consolidates relevant C&I Lifetime Loss Rate Model materials to support financial institutions performing validation of a vendor model, as outlined by the U.S. supervisory guidance on model risk management, known as SR 11-7.

The organization of the document follows the three key elements of effective model validation outlined in SR 11-7: Evaluation of Conceptual Soundness, Ongoing Monitoring, and Outcome Analysis. The first section describes the model development process in detail, including methodology and specification, data processing, variable selection, as well as assumptions and limitations. The second section establishes the ongoing monitoring process, presenting the process verification testing done for the model and creating the performance monitoring report that will be executed on a regular basis. Finally, we conduct diagnostic and performance evaluation tests to ensure that the model is statistical valid, and that model results are reasonable.
**Assumptions**

Credit losses are driven by the risk factors in a selected Methodology

- Applied PD/LGD and loss rate models on a 2018Q4 portfolio from Moody's CRD
- Portfolio lifetime loss rates
  - Moody's Loss Rate = 0.85%
  - Moody's PD/LGD = 0.79%

![CECL Loss Rate Diagram]
Narrative

Loss Rate Approach: Credit Spread at Origination

- Construction sector has a higher credit spread at origination, driving the loss rate higher

PD/LGD Approach: Current Liability to Sales Ratio

- Communication has a higher current liability to sales ratio, driving the loss rate higher
CRE Credit Loss Estimation
Benchmarking + Applicability

Historical CRE Call Report Net Charge-Off Rates

<table>
<thead>
<tr>
<th>Segment</th>
<th>Balance ($ mil)</th>
<th>Remaining Life (years)</th>
<th>Net Charge-Off (Benign periods)</th>
<th>Net Charge-Off (Stressed periods)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Annual NCO Rate</td>
<td>CECL</td>
</tr>
<tr>
<td>Construction</td>
<td>$24,343</td>
<td>2.68</td>
<td>0.31%</td>
<td>$202</td>
</tr>
<tr>
<td>Multifamily</td>
<td>$19,619</td>
<td>3.93</td>
<td>0.04%</td>
<td>$31</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>$50,134</td>
<td>3.97</td>
<td>0.17%</td>
<td>$338</td>
</tr>
<tr>
<td>Total CRE</td>
<td>$94,096</td>
<td>3.63</td>
<td>0.17%</td>
<td>$581</td>
</tr>
</tbody>
</table>

» Benchmark CECL: $1.3 billion - $2.0 billion

90% 80% 10% 20%
## Transparency of Methodology

<table>
<thead>
<tr>
<th>Methodology</th>
<th>PD/LGD Model</th>
<th>Loss Rate Model</th>
<th>Non-Model Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input Requirement</strong></td>
<td>High</td>
<td>Low</td>
<td>None</td>
</tr>
<tr>
<td><strong>Output Granularity</strong></td>
<td>Loan level</td>
<td>Pool level</td>
<td>Segment level</td>
</tr>
<tr>
<td><strong>Key Financial Drivers</strong></td>
<td>LTV, DSCR</td>
<td>Origination LTV</td>
<td>Historical loss</td>
</tr>
<tr>
<td><strong>Geographic Granularity</strong></td>
<td>Metro/submarket</td>
<td>National</td>
<td>None</td>
</tr>
<tr>
<td><strong>Property Types</strong></td>
<td>Multifamily, Office, Retail, Industrial, Hotel</td>
<td>Multifamily, Non-Residential</td>
<td>Multifamily, Non-Residential</td>
</tr>
</tbody>
</table>
Mission Possible: Defendable and Reasonable CECL Results, November 2019

OCTOBER 2019

MOODY'S ANALYTICS

VALIDATION SUPPORT DOCUMENT
OCTOBER 2019

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22
As expected, CRE loss rates increase with origination LTV

If provided, DSCR can improve loss rate estimates
A Secret Weapon
Loans with similar ratios may have vastly different risks due to market conditions

<table>
<thead>
<tr>
<th>Loan ID</th>
<th>Origination Date</th>
<th>Maturity Date</th>
<th>Market</th>
<th>Submarket</th>
<th>LTV</th>
<th>DSCR</th>
<th>Loss Rate</th>
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<tbody>
<tr>
<td>1</td>
<td>7/20/2016</td>
<td>8/1/2026</td>
<td>Phoenix</td>
<td>North Glendale/Peoria</td>
<td>71.1%</td>
<td>1.62</td>
<td>0.6%</td>
</tr>
<tr>
<td>2</td>
<td>9/22/2015</td>
<td>10/1/2022</td>
<td>Phoenix</td>
<td>Northeast Phoenix</td>
<td>65.4%</td>
<td>1.27</td>
<td>6.2%</td>
</tr>
<tr>
<td>3</td>
<td>6/17/2016</td>
<td>6/17/2021</td>
<td>Phoenix</td>
<td>South Scottsdale</td>
<td>72.8%</td>
<td>1.47</td>
<td>0.2%</td>
</tr>
<tr>
<td>4</td>
<td>3/8/2016</td>
<td>8/29/2020</td>
<td>Tucson</td>
<td>Central Tucson/University-North</td>
<td>66.1%</td>
<td>1.55</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Multifamily Market Vacancy Rates

Forecast
Benchmarking & Applicability

Industry Models + Internal Portfolio = CECL Estimate

<table>
<thead>
<tr>
<th>Product</th>
<th>State</th>
<th>Credit Score</th>
<th>Origination Quarter</th>
<th>Outstanding Balance</th>
<th>PD Rate</th>
<th>LGD Rate</th>
<th>ECCL Rate</th>
<th>CECL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer</td>
<td>CA</td>
<td>700-719</td>
<td>2009Q2</td>
<td>$100</td>
<td>4%</td>
<td>99%</td>
<td>4.0%</td>
<td>$4</td>
</tr>
<tr>
<td>Consumer</td>
<td>CA</td>
<td>660-699</td>
<td>2011Q2</td>
<td>$300</td>
<td>6%</td>
<td>95%</td>
<td>5.7%</td>
<td>$17</td>
</tr>
<tr>
<td>Consumer</td>
<td>CA</td>
<td>660-699</td>
<td>2013Q2</td>
<td>$500</td>
<td>7%</td>
<td>90%</td>
<td>6.3%</td>
<td>$32</td>
</tr>
<tr>
<td>Consumer</td>
<td>CA</td>
<td>700-719</td>
<td>2015Q2</td>
<td>$200</td>
<td>4%</td>
<td>85%</td>
<td>3.4%</td>
<td>$7</td>
</tr>
<tr>
<td>Consumer</td>
<td>CA</td>
<td>700-719</td>
<td>2017Q2</td>
<td>$700</td>
<td>5%</td>
<td>95%</td>
<td>4.8%</td>
<td>$33</td>
</tr>
<tr>
<td>Consumer</td>
<td>CA</td>
<td>700-719</td>
<td>2019Q2</td>
<td>$1,000</td>
<td>6%</td>
<td>95%</td>
<td>5.7%</td>
<td>$57</td>
</tr>
<tr>
<td><strong>Sum</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$2,800</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$150</strong></td>
</tr>
</tbody>
</table>

Mission Possible: Defendable and Reasonable CECL Results, November 2019
Transparency of Methodology

What will you need to disclose?

» Estimation methodology
» Model structure
» Drivers
» Parameter estimates
» Development process
» Testing
Monitoring and Assumptions
Narrative

In the end…

…it’s all about the story
Key Take-aways
Key Take-aways

Producing defendable forecasts *is* possible...

...with either a modeled or non-modeled approach.
Remember:

» **B**enchmarking/Backtesting
» **A**pplicability
» **T**ransparency
» **M**onitoring
» **A**ssumptions
» **N**arrative
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