ALLL Model Validation
Are You Compliant with the 3 Main Components?

July 25, 2014

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Questions, Polls & Slides

- To ask a question during the webinar, feel free to enter it into the chat box along the right hand side of your screen. Slides are available there, too.
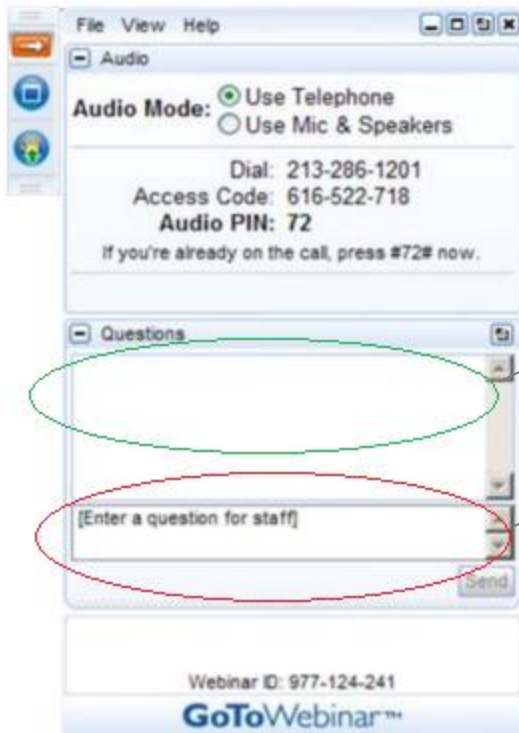
Link to download slides

Area to ask questions

About the Presenters

Mike Budinger – Credit Risk Consulting National Practice Leader – Crowe Horwath

Mike brings 15 years of financial institution experience and currently leads the firm's effort to design and deliver credit risk and model validation services across commercial, card, mortgage and retail credit programs. He has played a key role in the development of Crowe's Model Risk Management practice.

Ryan Michalik – Manager, Credit Risk Consulting Practice – Crowe Horwath

Ryan brings over 10 years of financial institution experience and currently focuses on ALLL methodology review and model validation. He also has experience validating credit loss and stress testing models, and leads loan review engagements.

Ed Bayer – Managing Director, Financial Institutions – Sageworks

Ed is the managing director of Sageworks' financial institutions division. He previously served as a senior risk management consultant, with a primary focus on ALLL provisions and stress testing loan portfolios.

Our Topics for Today's Webinar

- ALLL Trends
- Regulatory Expectations
- Model Risk Management Guidance
- Validation Activities
  - Conceptual Design
  - Ongoing Monitoring
  - Outcome Analysis
- Question & Answer

Lessons Learned From The Recession

- Deficiencies in loan administration and loan review resulted in delayed recognition of problem loans.

- ALLL levels were not raised to appropriately reflect the increased risk in the loan portfolio.

- Historical look-back periods were too long or not weighted appropriately to reflect recent charge-off activity.

- Regulatory scrutiny and expectations for levels of documentation enhanced significantly.

- Under provisioned banks were susceptible to failure due to reduced capital levels.

Reserve Coverage Lower Today Than Pre-Recession
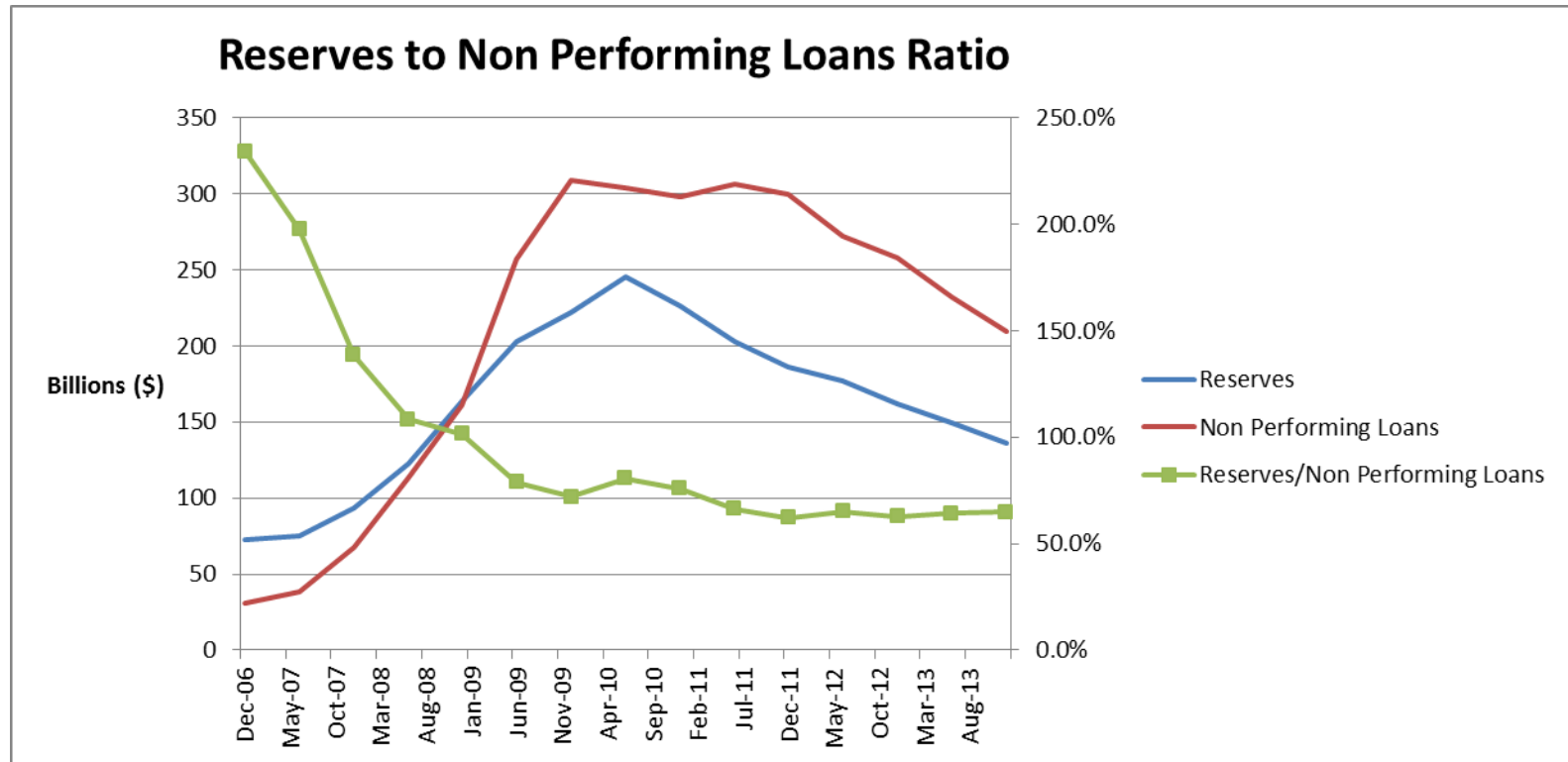
Reserves to Non Performing Loans Ratio

Billions ($)

Legend:
- Reserves
- Non Performing Loans
- Reserves/Non Performing Loans

Source: SNL

Population: Regulated Depositories; Commercial Banks, Savings Banks, and Thrifts

Large Proportion of Banks Unprepared for the Crisis

Total Reserves to Non-Performing Loans

Legend:
- ≥ $1 Reserve to $1 NPL
- 75¢ - 99¢ Reserve to $1 NPL
- 50¢ - 74¢ Reserve to $1 NPL
- 25¢ - 49¢ Reserve to $1 NPL
- 1¢ - 24¢ Reserve to $1 NPL

Source: SNL

Population: Regulated Depositories; Commercial Banks, Savings Banks, and Thrifts
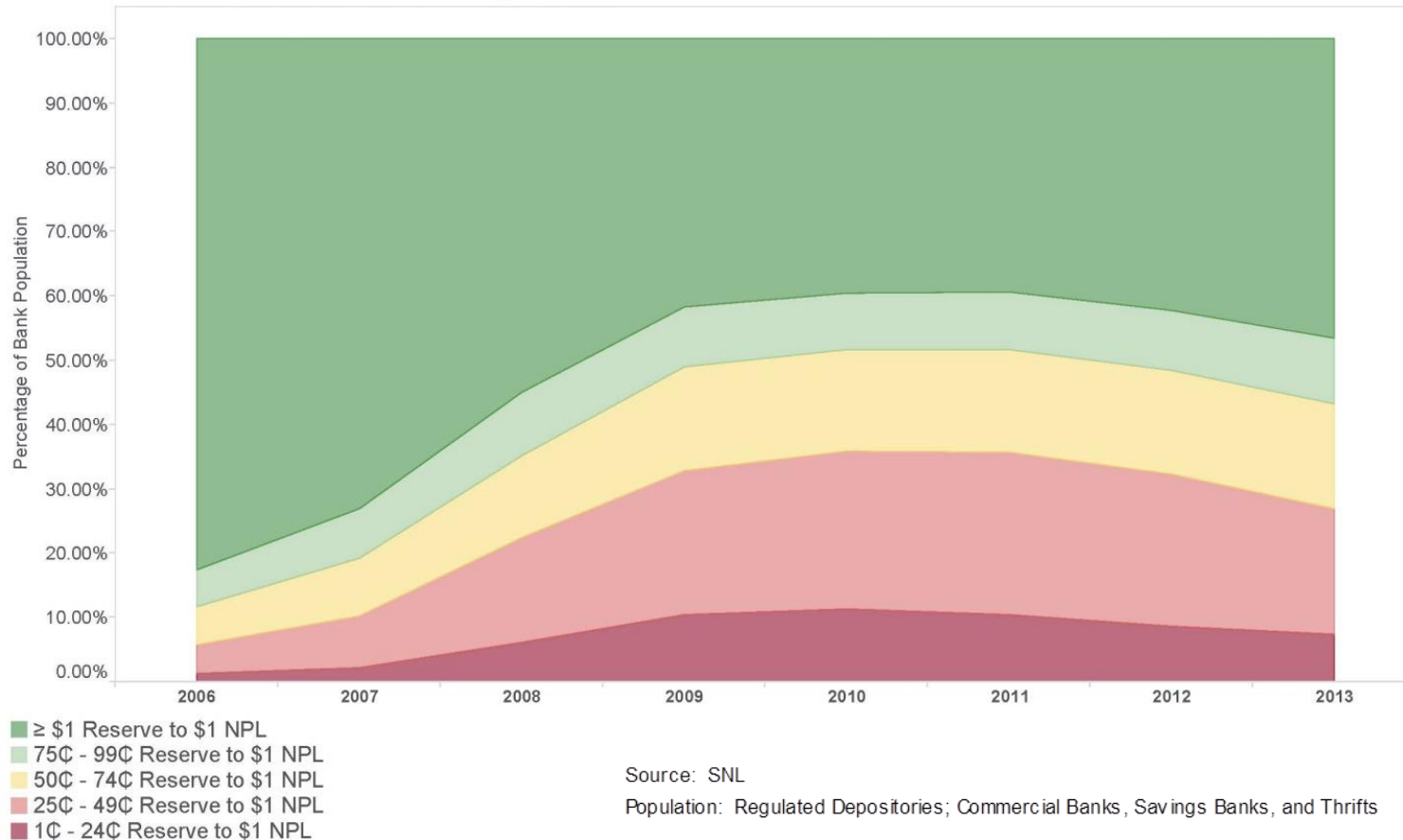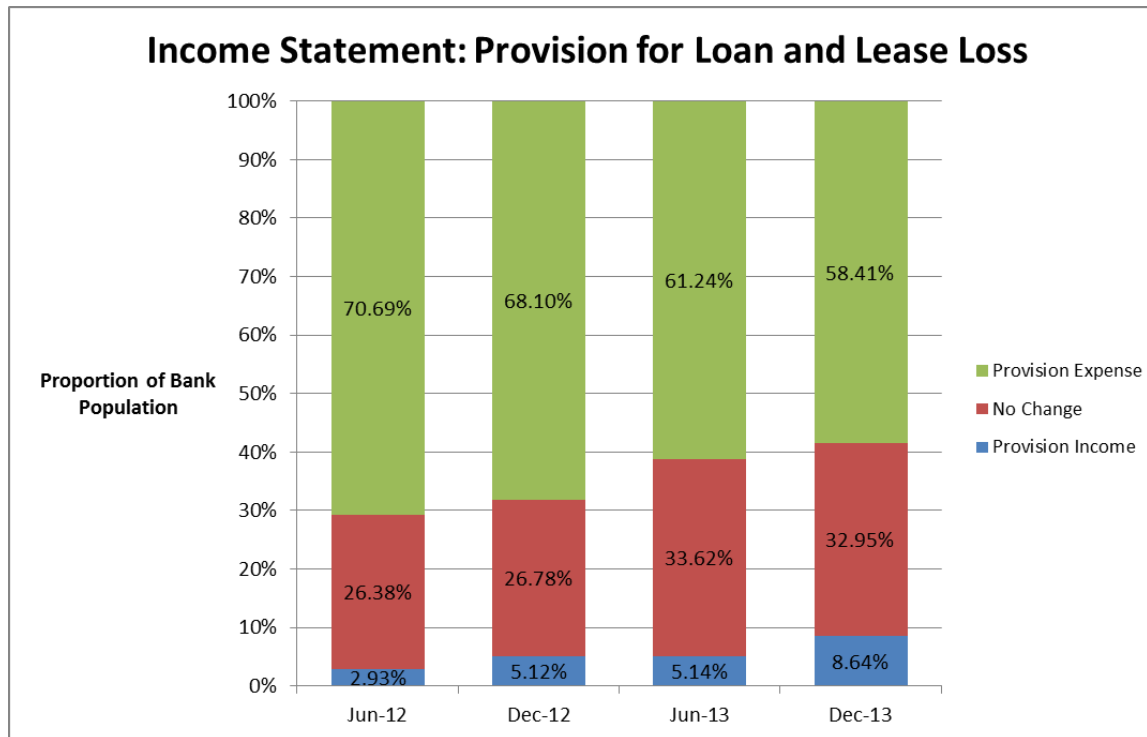
Credit Quality Has Improved and ALLL has Declined
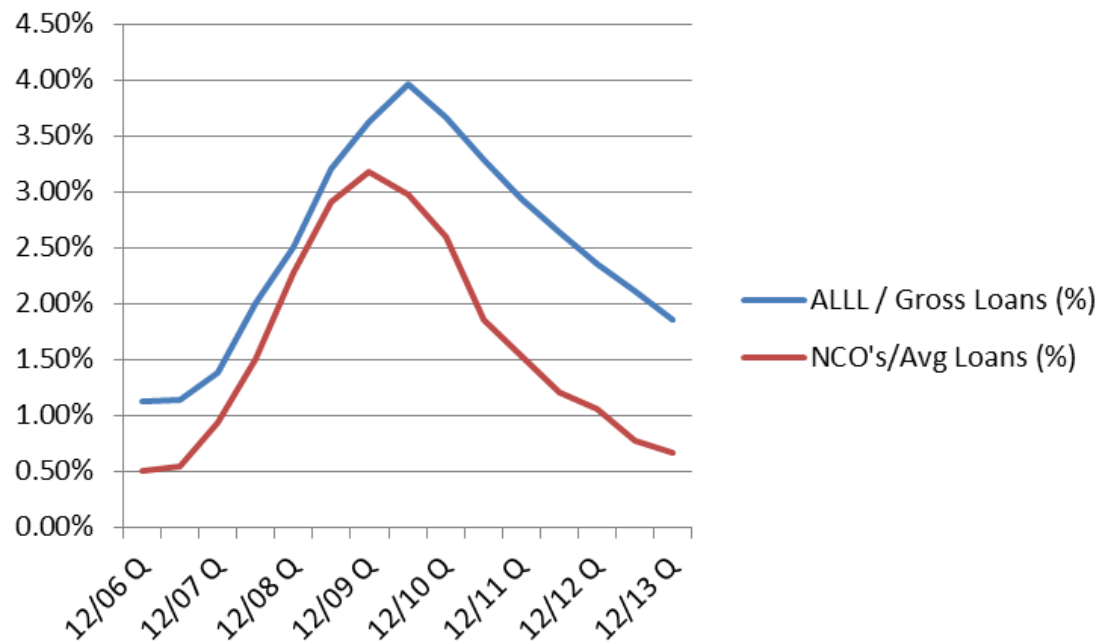
Source: SNL
Population: Regulated Depositories; Commercial Banks, Savings Banks, and Thrifts

Reserves Being Released Into Income

Income Statement: Provision for Loan and Lease Loss

Source: SNL
Population: Regulated Depositories; Commercial Banks, Savings Banks, and Thrifts

Banks Have Revisited ALLL Methodologies and Models

- Revised assumptions such as look-back and loss emergence periods.
- Developed quantitative models such as probability of default/loss given default and migration analysis
- Consolidated data into a central data warehouse.
- Implemented a vendor solution to improve the production process and enhance documentation.
- Performed sensitivity analysis
- Engaged third parties to develop new ALLL methodologies and models.

Regulatory Guidance on Model Risk Management

The Office of the Comptroller of the Currency (OCC) and the Federal Reserve published Supervisory Guidance on Model Risk Management in April 2011 (OCC 2011-12, SR 11-7).
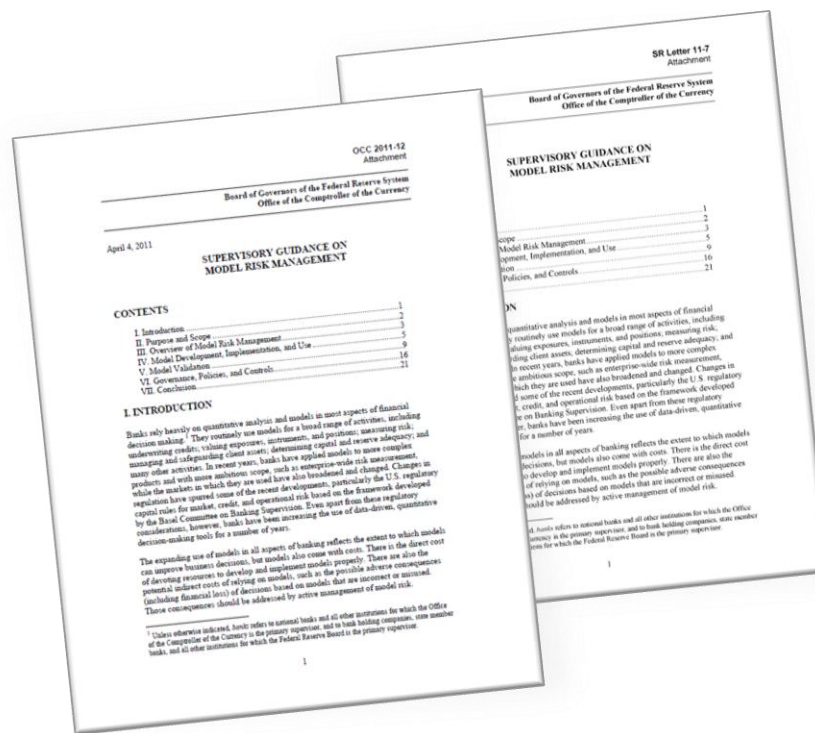
Three Primary Areas of Focus:

Model Development Implementation, and Use

Model Validation

Governance, Policies, and Controls

Poll Question

- When did you last complete an ALLL model validation?

Understanding Examiner Validation Expectations

- Increasingly focused model examination teams (such as the OCC "RAD" Team)
- Model validation involves a degree of independence from model development.
- Validation should identify model weaknesses and limitations rather than just rendering a model valid or invalid.
- Bank management should provide oversight to third party validation activities and have a thorough understanding of findings.
- Validation should be performed by staff with appropriate competence and influence.
- The scope and rigor of validation activities should be in line with the potential risk presented by the uses of the model.

Poll Question

- How did you complete your model validation?

Understanding Examiner ALLL Expectations

- Increased focus on loss selection period and portfolio segmentation
- Approach should be clearly documented
- Methodology should be consistently applied
- Sample exam questions
  - What changes in your bank profile would require an adjustment to the ALLL methodology?
  - What approach was taken to validate your ALLL model, what were the results, and how did you respond?
  - How do you decide when a model needs adjusting?
  - If using a vendor model, how well do you understand the model?
  - How did you confirm that your historical loss factors accurately predict forward looking losses?
  - What controls are in place to mitigate the use of Excel spreadsheets?

Model Risk Assessment

- **Complexity**
  - Highly technical (use of quantitative methods)
  - Quantity of variables; Lines of Code
  - Relation with other models
  - Volatility or stability
  - Data quality
- **Materiality**
  - Supports key financial assertions (i.e. – capital)
  - Under the regulatory microscope
  - Critical element of business decisions or strategic plans
  - Impacts customers
- **Maturity**
  - Period of time the model has been in place
  - Automated versus Manual

| Model	ALLL	Customer Profitability Model
Financial Statement Impact	High	Medium
Complexity	High	Low
Reputational Risk	High	Low
Regulatory Scrutiny	High	Low
Maturity	Medium	Low
Level of Prior Validation Findings	Medium	Low
Model Rating	**High**	**Low**

Risk Based Validation

- New Model: All components should be validated.
- Mature Model: Model revisions should be validated. Reference to prior validation can be made for unchanged components.
- Internal Audit can be leveraged to conduct testing such as reconciliation and review of model controls.

Year and Responsible Party	ALLL Model Validation Plan																
	Conceptual Design					Ongoing Monitoring and Process Verification						Outcome Analysis					
	Methodology	Alternative Models	Developmental Evidence	Alignment	Assumptions and Limitations	Code Review	Model Replication	Data Reconciliation	Parallel Testing	Reporting	Assessment of Control Environment	Back-Testing	Peer Group Benchmarking	Performance Monitoring	Stress Testing	Sensitivity Analysis	Directional Consistency
Pre-Implementation																	
Independent Validation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Year 1																	
Independent Validation						✓						✓	✓	✓	✓	✓	✓
Internal Audit								✓			✓						

Model Validation – "Black-Box" Models

Validation of external models may be constrained in the scope and depth. There are a variety of functional, or blackbox testing approaches including:

- Understand from vendor what access will be provided
- Request/Review Vendor Model Documentation
  - Review the model specifications, documentation, implementation specifications, and vendor testing results.
- Model Verification
  - Complete a model implementation verification assessment (is it running properly within the bank's system?)
- Model Validation in the Box
  - Define and execute a series of functional tests

Vendor - External Models

Conceptual Design · System Validation · Process Validation · Data Validation · MODEL
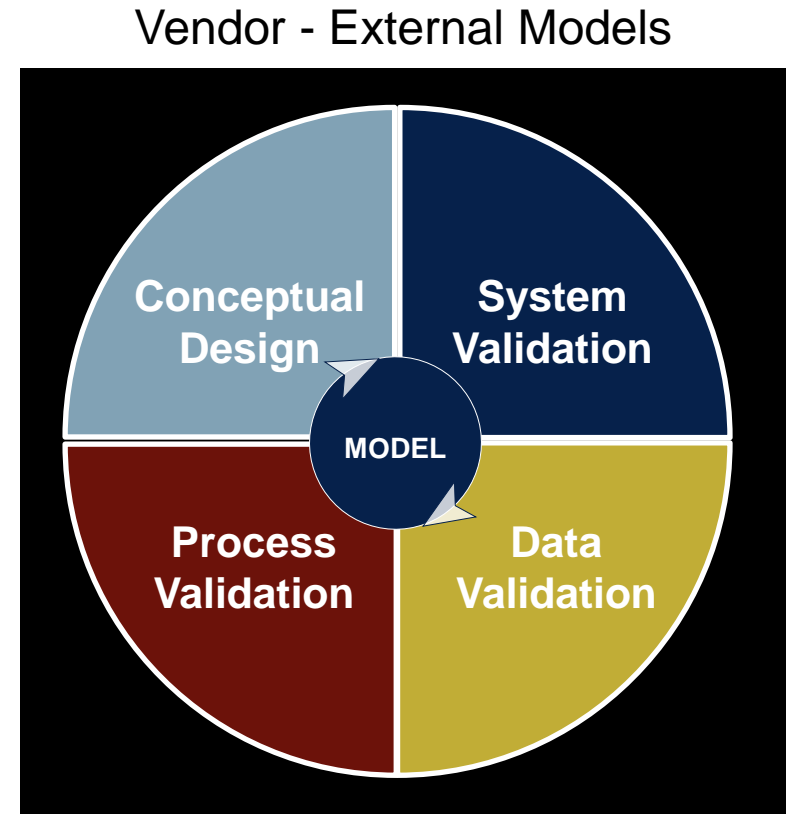
Key Elements of Comprehensive Validation

Evaluation of Conceptual Soundness

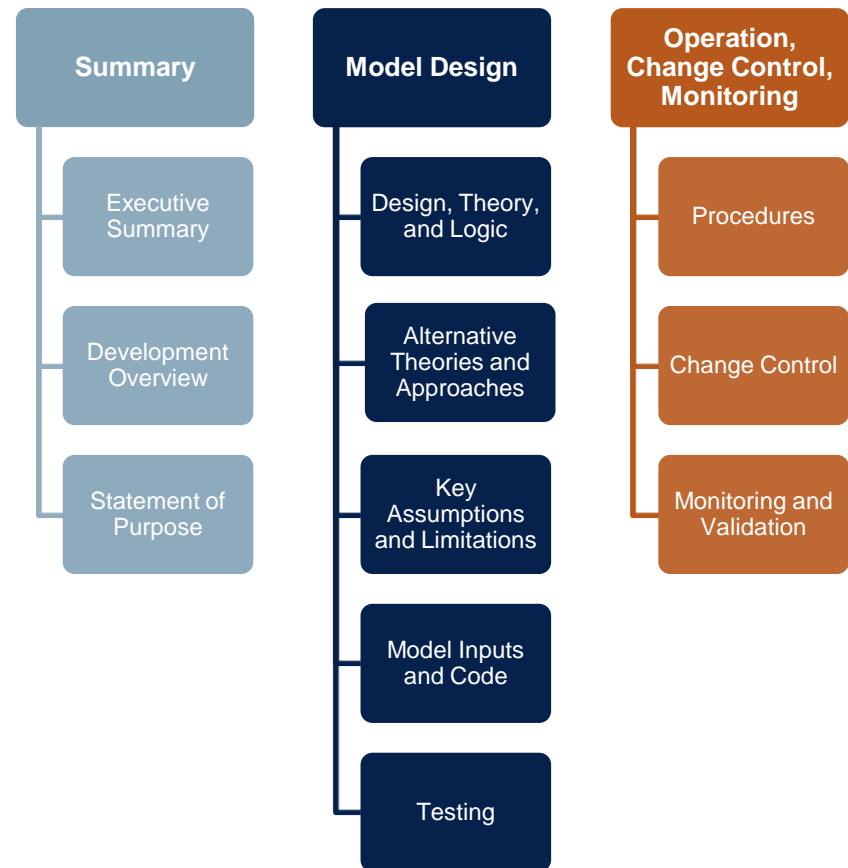**Ongoing Monitoring and Process Verification**

Outcome Analysis

Evaluation of Conceptual Soundness

Develop an understanding of the model and assess documentation.

- Question and Answer Sessions with Management
- Question and Answer Sessions with Development Team
- Review Development Documentation
- Review Allowance Polices and Procedures

Summary
- Executive Summary
- Development Overview
- Statement of Purpose

Model Design
- Design, Theory, and Logic
- Alternative Theories and Approaches
- Key Assumptions and Limitations
- Model Inputs and Code
- Testing

Operation, Change Control, Monitoring
- Procedures
- Change Control
- Monitoring and Validation

Evaluation of Conceptual Soundness

Assessment of Model Methodology

- Alignment to regulatory requirements, industry practice and complexity relative to the banking profile.
- Types of Models
  - Historical Charge-off
  - Roll Rate
  - Vintage Loss
  - Migration Analysis
  - Expected Loss (PD, LGD, EAD)

$$z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \cdots + \beta_k X_k$$

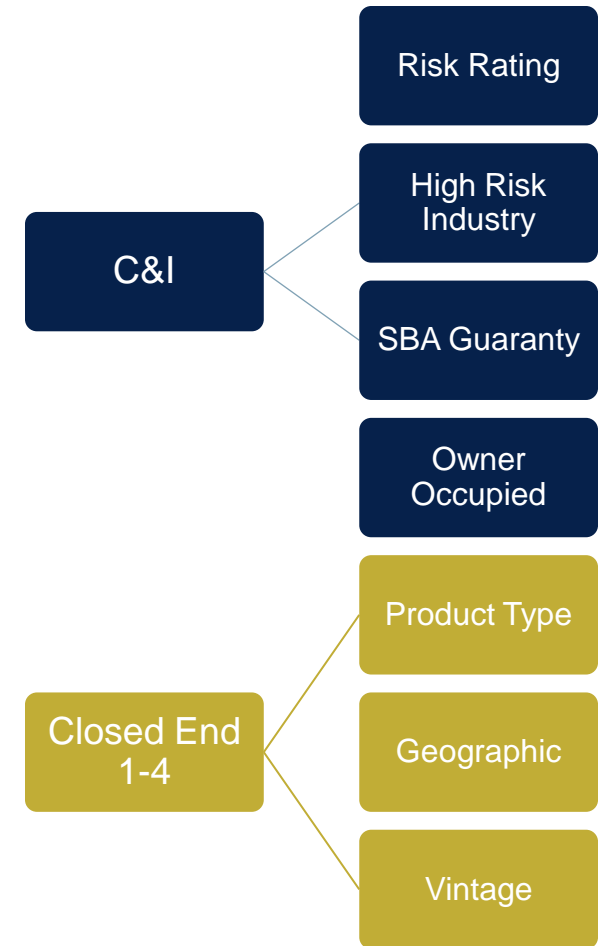# Evaluation of Conceptual Soundness

Relevance of Data Inputs

- Historical Loss Models:
    - Is there an established loss history?
    - If using proxy loss history, is it appropriate?
    - Will the length of the look back period adjust the allowance to reflect current conditions?
    - Are there weightings applied to the look back period? If so, are they supported?

- Migration Analysis
    - Is the timing of the transition matrices appropriate for the segment?

Evaluation of Conceptual Soundness

Portfolio Segmentation

- Segmentation should be granular enough to group loans with similar risk characteristics.
- Validation should develop an understanding of the loan portfolio characteristics through discussion with management and sub-segmentation development if necessary.

C&I
- Risk Rating
- High Risk Industry
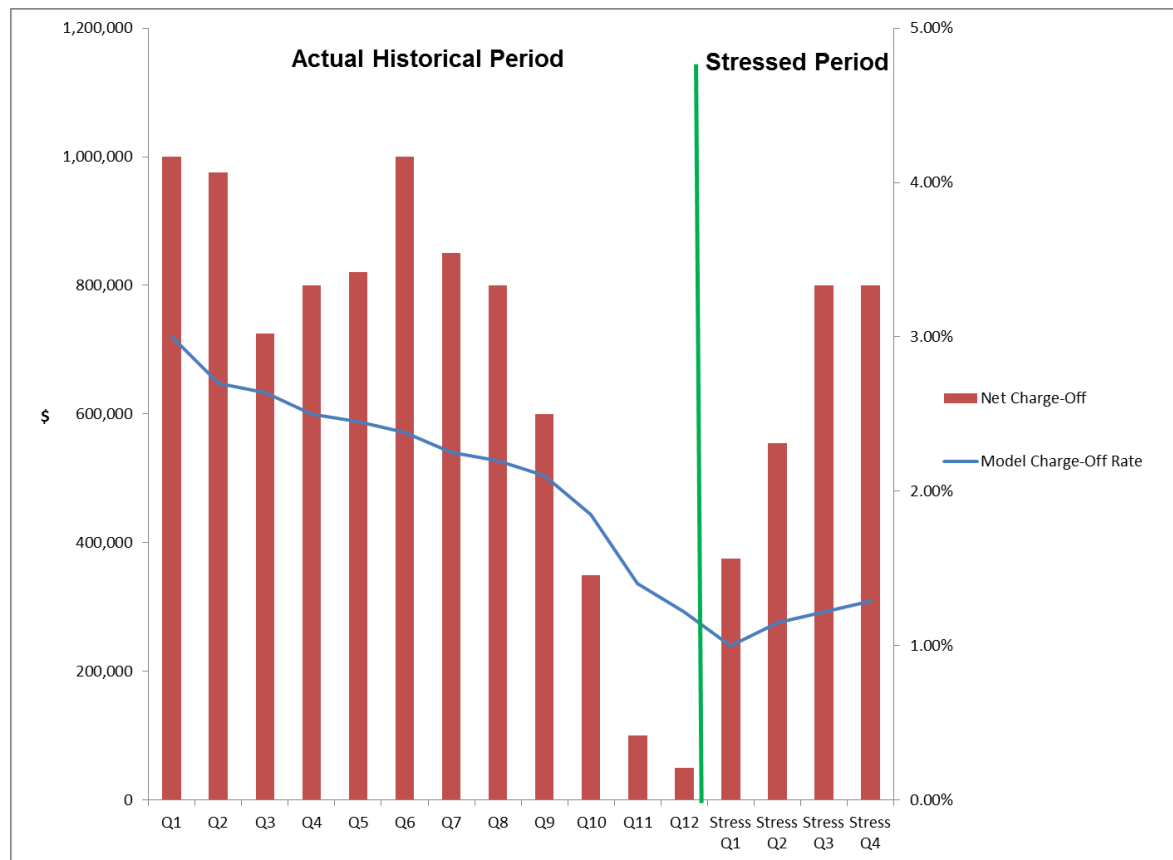- SBA Guaranty
- Owner Occupied

Closed End 1-4
- Product Type
- Geographic
- Vintage

Evaluation of Conceptual Soundness

- Loss rates should a have monotonic relationship with risk rating

Risk Rating	Loss Rate %
1	0.25%
2	0.37%
3	0.98%
4	1.25%
5	1.72%
6	1.94%
Watch	1.64%
SM	5.50%
Sub	23.40%

Evaluation of Conceptual Soundness

- Stress test model inputs to observe changes in model output.

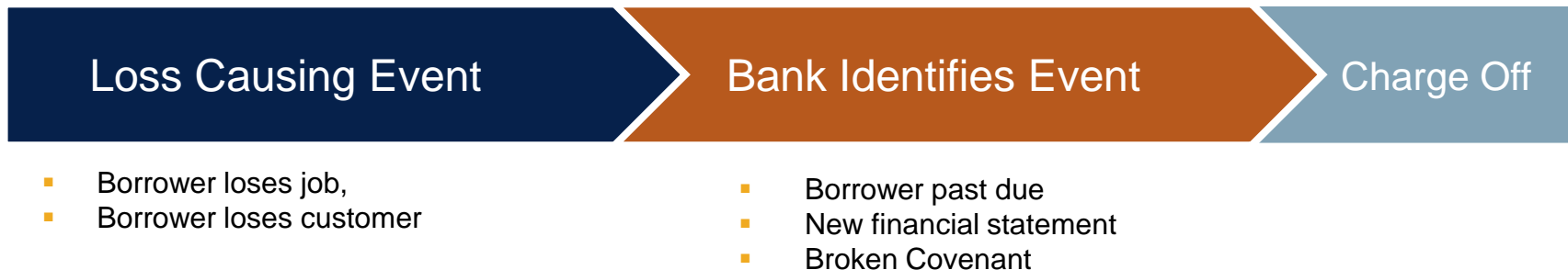# Evaluation of Conceptual Soundness

Sensitivity Analysis to Assess Look Back Periods

Methodology	ALLL/Loans	ALLL ($)	%Change
Current Methodology:			
24 month; Equal Weighting	1.45%	9,787,500	
Alternative Methodologies:			
12 Month; Equal Weighting	1.20%	8,100,000	-9.8%
36 Month; Equal Weighting	1.74%	11,745,000	16.7%
24 Month; 60/40 Weighting	1.32%	8,910,000	-9.8%
36 Month; 50/30/20 Weighting	1.54%	10,395,000	5.8%

Evaluation of Conceptual Soundness

Support for Loss Emergence Periods

- Does the Bank have documented back-testing of charge-offs to support a timeline from loss causing event through charge-off?
- Have differences in loans type, monitoring, and structure been documented to support the selected period?

Loss Emergence Period

Loss Causing Event	Bank Identifies Event	Charge Off

- Borrower loses job,
- Borrower loses customer

- Borrower past due
- New financial statement
- Broken Covenant

Ongoing Monitoring and Process Verification

- Review of Model Code for data staging, segmentation, and calculations.
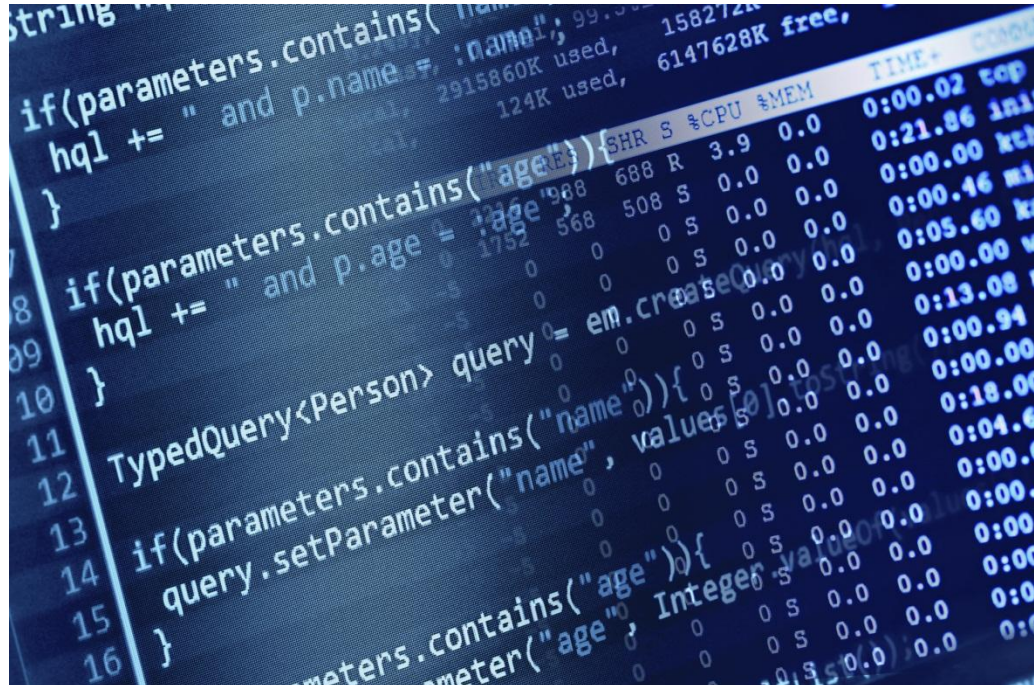
Ongoing Monitoring and Process Verification

Replication of model to test implementation

- Documentation should be transparent to allow for replication
- Output of models should equal

Development Model   Validation Model
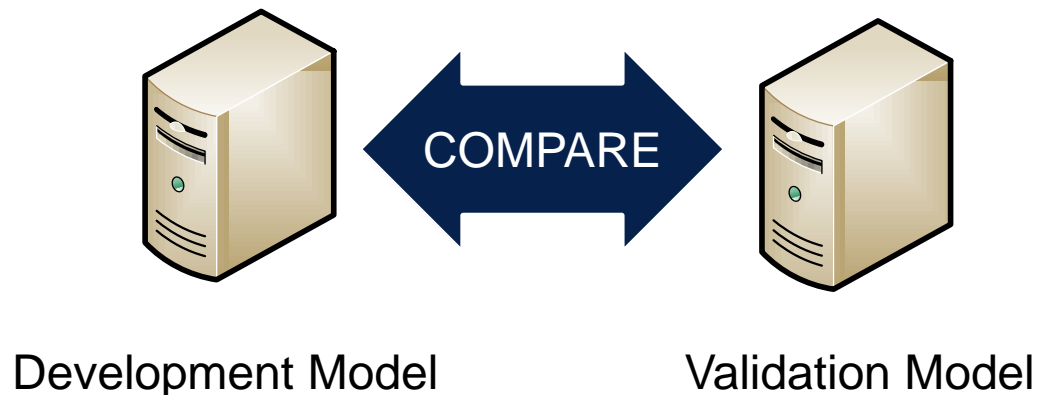
Ongoing Monitoring and Process Verification

Data Input Testing

- Reconcile key data inputs such segmentation balance, charge-offs, and recoveries back to accounting systems
- Assess completeness of data inputs
- Assess internal reconciliation processes

Reconciliation Variance of Model Data to GL			
	Dec-11	Dec-12	Dec-13
Outstanding Balance	0.00%	0.00%	0.00%
Change Offs	0.15%	0.00%	0.12%
Recoveries	0.30%	0.00%	0.15%

Ongoing Monitoring and Process Verification

Model Revisions and Control Environment

- Does the bank have established change controls procedures?
- How are changes requested and approved?
- How are changes tested before implemented into production?
- Is the model restricted to approved personnel?
- Are manual processes limited?
- How is data backed up?
- Are model changes version controlled?

Ongoing Monitoring and Process Verification

- Model Reports - Assess reports derived from model outputs to verify that they are accurate, complete, and informative, and that they contain appropriate indicators of model performance and limitations.

Outcome Analysis

Parallel testing of new model to previous model

- Variance analysis should show where differences exist and document explanation

ALLL/Avg-Loans %: Previous vs New Model
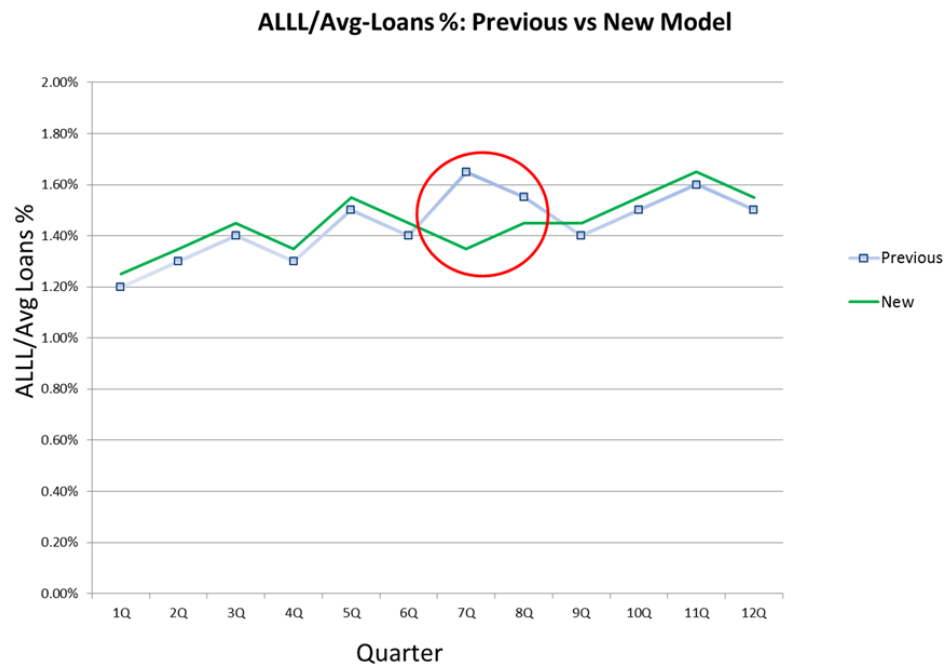
Quarter	Previous	New	Variance	Reason
1Q	1.20%	1.25%	0.05%	Change in look back period
2Q	1.30%	1.35%	0.05%	Change in look back period
3Q	1.40%	1.45%	0.05%	Change in look back period
4Q	1.30%	1.35%	0.05%	Change in look back period
5Q	1.50%	1.55%	0.05%	Change in look back period
6Q	1.40%	1.45%	0.05%	Change in look back period
7Q	1.65%	1.35%	-0.30%	Charge-off data incomplete
8Q	1.55%	1.45%	-0.10%	Charge-off data incomplete
9Q	1.40%	1.45%	0.05%	Change in look back period
10Q	1.50%	1.55%	0.05%	Change in look back period
11Q	1.60%	1.65%	0.05%	Change in look back period
12Q	1.50%	1.55%	0.05%	Change in look back period

Outcome Analysis

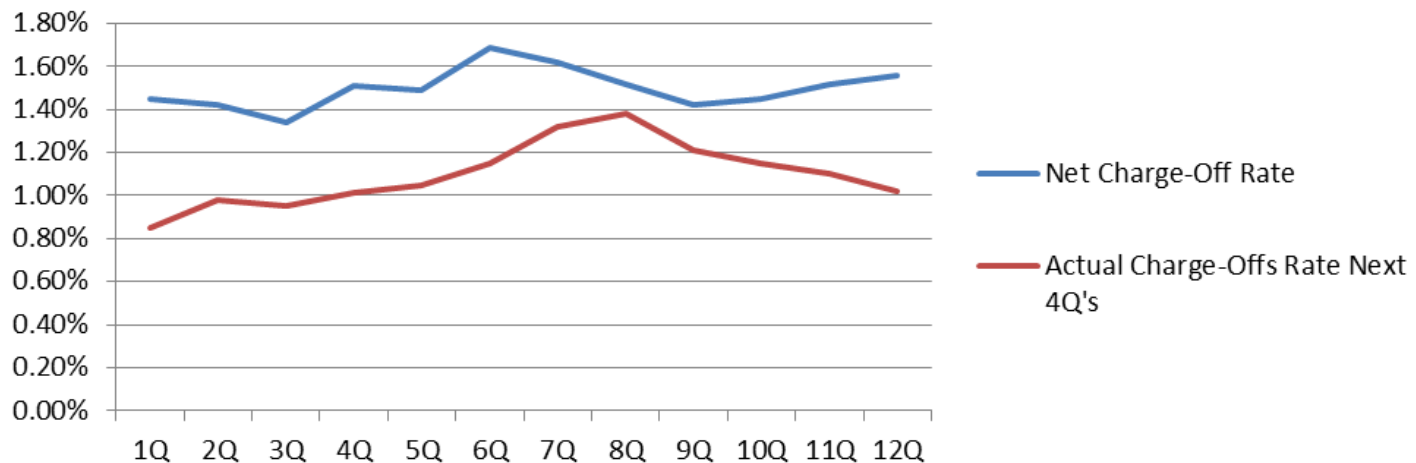Back-testing to compare projected outcome to actual outcome

- Example from transition matrix PD model
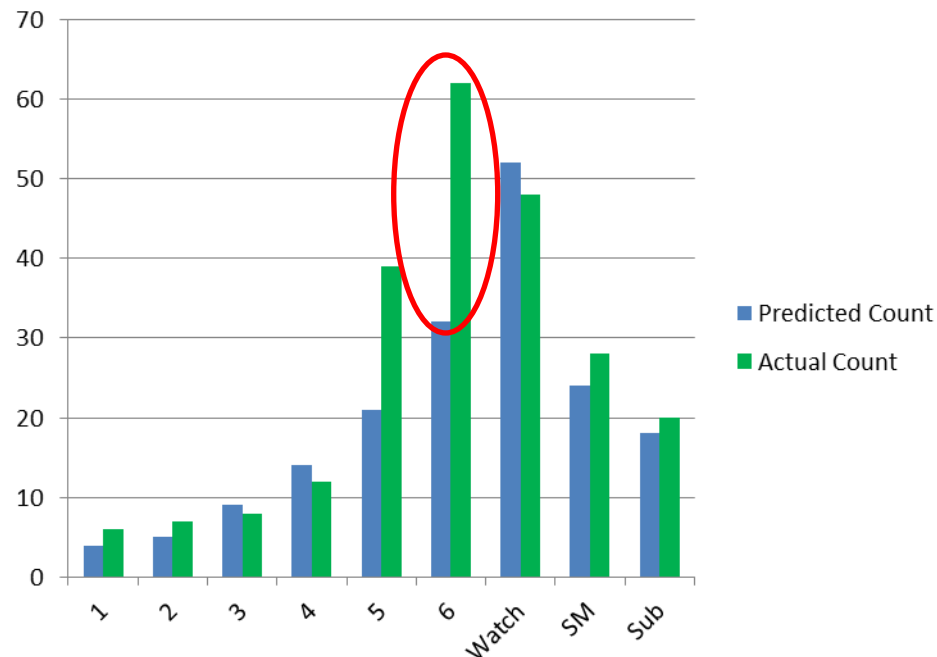
Outcome Analysis

- Comparison of Model Charge-Off Rates to Actual Observed

**Back-Testing Charge-Off Rate Adequacy**
Home Equity Portfolio

Legend:
- Net Charge-Off Rate
- Actual Charge-Offs Rate Next 4Q's

Outcome Analysis

- Peer Group Benchmarking - Use of available industry and peer information to compare outputs

Bank vs Peer Group
Loan Loss Reserves/Gross Loans (%)

NPLs/Total Loans
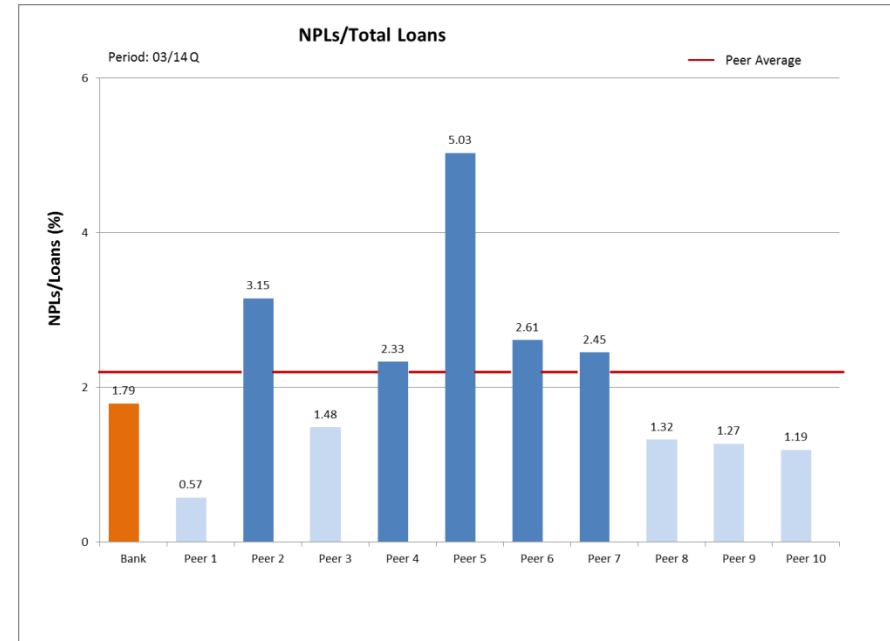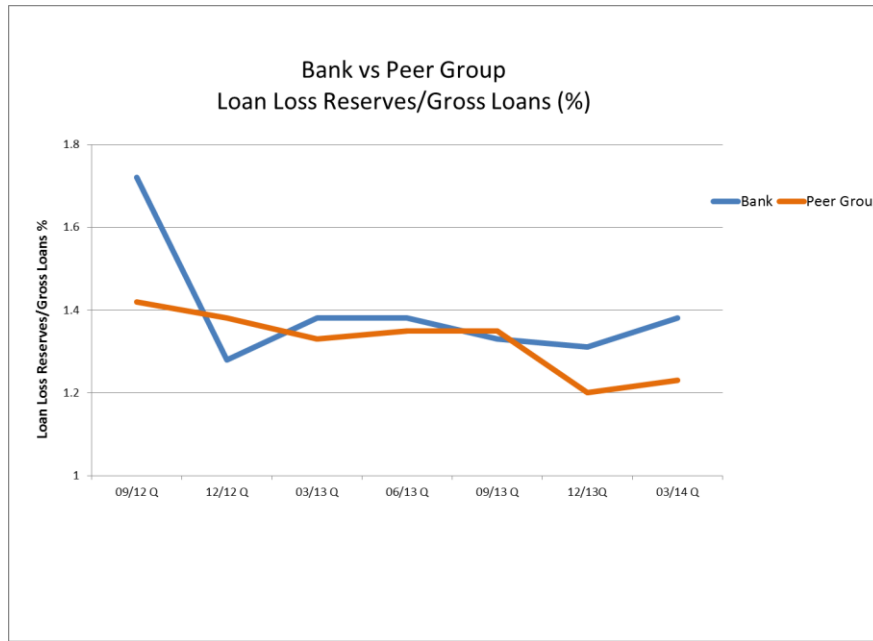
Outcome Analysis

Directional Consistency Testing - Changes in the ALLL should be directionally consistent with credit quality metrics.

- Non-accrual
- Delinquency
- Problem loans
- Charge-Offs
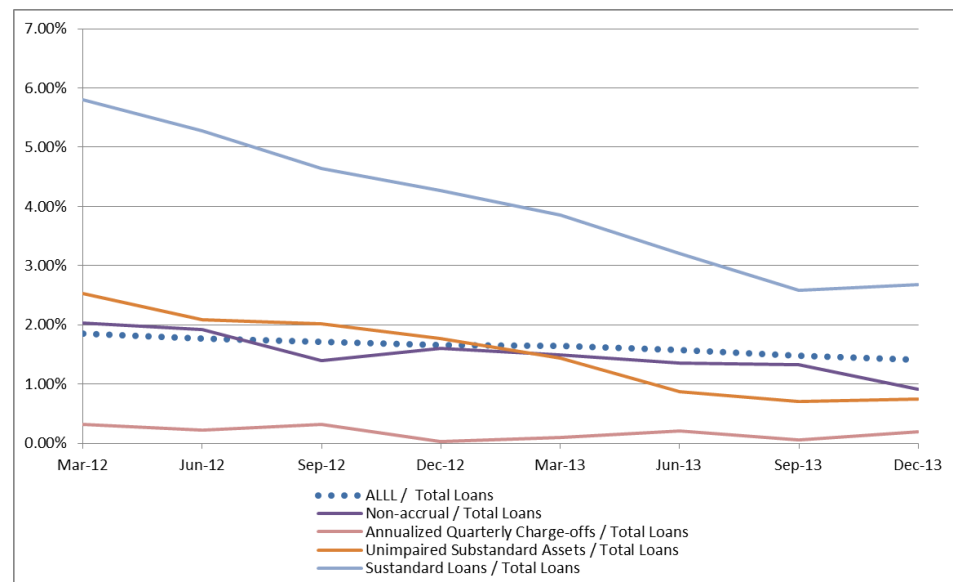
Summary

- Validation is both a risk management and compliance activity.
- Validation is one component of a robust model risk management framework.
- Regulatory scrutiny of ALLL methodologies and models is heightened.
- Evaluation of Conceptual Soundness, Ongoing Monitoring, and Outcome Analysis are all critical activities for a robust validation.

Model Development Implementation, and Use

Model Validation

Governance, Policies, and Controls

Poll Question

- What is your biggest ALLL concern?

How Sageworks ALLL Can Help

- **Data Quality**
  - Integrated with core system, reducing manual error
  - Web-based platform for enhanced flexibility and control

- **Correct Loss Horizon / Prepping for CECL**
  - Able to perform multiple scenarios in mere clicks
  - Archived data allows flexibility in finding appropriate loss horizon

- **Correct Loss Methodology**
  - Ability to perform migration analysis and quickly switch between multiple methodologies

- **Moving to Automation**
  - Reduce time by up to 90%

- **Model Accuracy**
  - Sageworks ALLL externally validated
  - Used by over 300 institutions

Poll Question

- Would you like to see a personalized walk-through of Sageworks ALLL?

How Crowe Horwath Risk Consulting Can Help

- Crowe's specialists review practices, address complexities and help maintain compliance with ALLL interagency guidance and the FASB ASC standards

- Crowe's 9 step approach to validating each ALLL model:

  - **Meeting** with management to review policies and procedures

  - **Checking** policies and procedures for adherence to regulatory guidance and GAAP

  - **Verifying** consistent application of ALLL methods across multiple periods

  - **Testing** model formulas and calculations for accuracy and proper application

  - **Performing** selective sampling and review of impaired loans

  - **Evaluating** ASC 450 calculation processes and documentation

  - **Examining** qualitative and environmental factors

  - **Comparing** the model's projected credit losses to actual losses

  - **Assessing** projected credit losses for directional consistency

Poll Question

- Would you like to learn more about Crowe's model risk management and validation services?

Upcoming Webinar Series

- Sageworks and Crowe have partnered for a series of risk management webinars
  - September 12: ALLL Futures – FASB CECL, Stress Testing & ALLL Production Framework
    - Register now: web.sageworks.com/Crowe
  - September 25: Preparing for Basel III
    - Hear it first at the 3rd Annual Risk Management Summit in Nashville, TN on September 25th.
  - October [Date TBA]: Preparing for Basel III

**Learn more:
sageworks.com/Summit**

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