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CECL and ALM Validations

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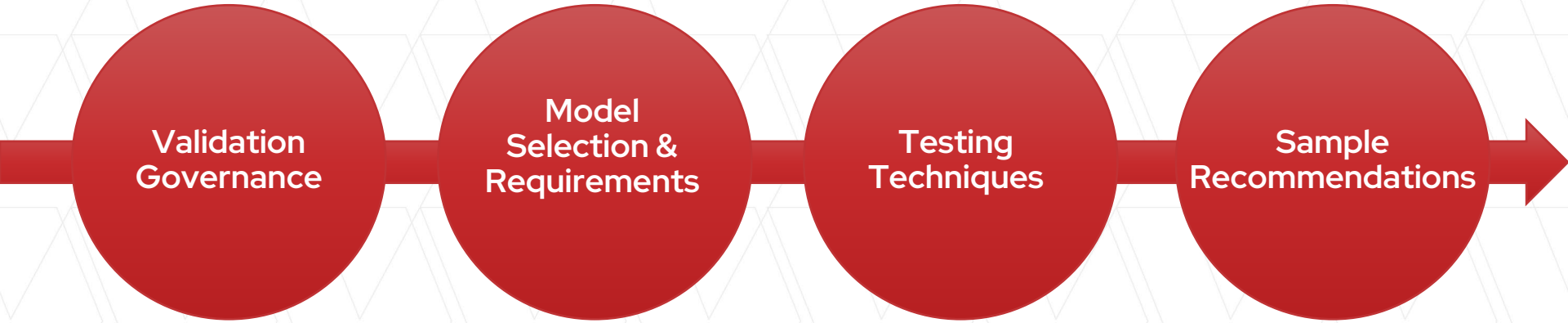
Agenda



Slides 10-33

CECL Model Validation
- CECL Policy
- Model Types
- Model Testing
- Sample Recommendations

Slides 34-53

ALM Model Validation
- ALM Policy
- NII
- NEV
- Sample Recommendations

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Today's speaker

FRANK WILARY

Principal and Co-Founder

Mr. Wilary has over 30 years of diversified experience in the financial services industry and has served financial institution clients for the past 22 years. Areas of expertise include asset-liability management, credit loss modeling, capital markets, structured finance, derivatives, and information systems.

Frank co-founded Wilary Winn in 2003 and his primary responsibility is to lead the research, development, and implementation of Wilary Winn's new business lines. He works to ensure that new products and services meet the firm's high standards before transferring primary responsibility to one of its business line leaders. Frank ensures that client deliverables are of the utmost quality, the valuation process is consistent, and that best practices are used across the firm's lines of business.

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Wilary Winn

Wilary Winn's mission is to strengthen community financial institutions.

One of the ways we strengthen community financial institutions is through validations – both CECL and ALM. We validate all the industry's primary models.

- For CECL validation our goal is to perform an efficient replication of the CECL calculation while providing our clients with actionable modeling improvements and process insights.
- For ALM validation we first obtain data and assumption set inputs and perform an independent replication. We then analyze the data aggregations, inputs and results in comparison to industry standards. As a final step, we make overall recommendations regarding our client's interest rate risk profile based on the organization's risk tolerance.

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Model Validation & Interagency Guidance

- **Supervisory Guidance on Model Risk Management SR 11-7 / OCC 2011-12:**
  Issued by the Federal Reserve and OCC, it emphasizes the importance of model validation for mitigating model risk and ensuring models are performing as intended. Key focuses include model development, implementation, and ongoing monitoring.

- **Gold Standard Approach to Model Validation:**
  - Thorough review of model documentation
  - Full evaluation of model assumptions
  - Data quality assessment
  - Independent replication
  - Sensitivity and stress testing
  - Benchmarking and back-testing

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Model Validation & Interagency Guidance

Supervisory Guidance on Model Risk Management SR 11-7 / OCC 2011-12 Excerpts

"The use of models invariably presents model risk, which is the potential for adverse consequences (including financial loss) from decisions based on incorrect or misused model outputs and reports."

"Model validation is the set of processes and activities intended to verify that models are performing as expected, in line with their design objectives and business uses."

"All model components, including inputs, processing, and reporting should be subject to validation."

"Validation should be done by people who are not responsible for development or use and do not have a stake in whether a model is determined to be valid."

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Model Validation & Interagency Guidance

Supervisory Guidance on Model Risk Management SR 11-7 / OCC 2011-12 Excerpts

An effective validation framework should include three core elements:

- **Evaluation of conceptual soundness, including developmental evidence** – assessing the quality of the model design and construction.
- **Ongoing monitoring, including process verification and benchmarking** – such monitoring confirms that the model is appropriately implemented and is performing as intended.
- **Outcomes analysis, including back-testing** – a comparison of model outcomes to corresponding actual outcomes.

The three core elements listed above are also listed in the AICPA CECL Practice Guide

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AICPA CECL Practice Aid

AICPA CECL Practice Aid: Offers audit considerations for CECL, focusing on internal controls, data reliability, model assumptions, and audit committee oversight.

“Has management created robust processes to develop the expected credit loss model and model validation controls to verify the model is performing as expected?”

“The auditor’s understanding of the model includes understanding management’s validation process.”

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SEC SAB 119

Staff Accounting Bulletin No. 119: Provides updated guidance on measuring current expected credit losses (CECL) under ASC Topic 326, focusing on systematic methodologies and the necessary documentation for allowance estimates. Emphasizes governance and internal control considerations.

“The staff believes that management should support its validation process with specific validation procedures performed, including findings of an independent reviewer.”

CECL Model Validation

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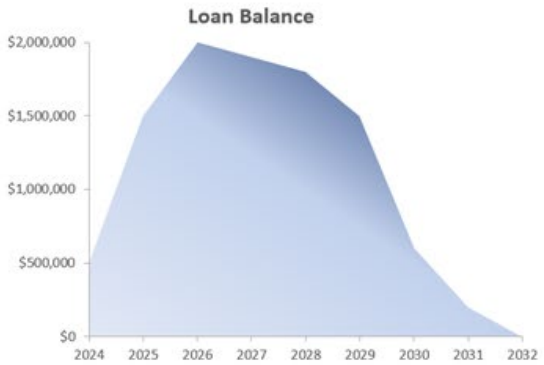
FAS ASC 326 – CECL

Current Expected Credit Losses (CECL) requires companies to recognize lifetime expected credit losses not only based on past events and current conditions, but also on reasonable and supportable expectations regarding loan balances and loan losses over time.

Why was CECL implemented?

- Response to the **2008 financial crisis**
- Forward looking estimates
- **Goal**: timely recognition of expected credit losses



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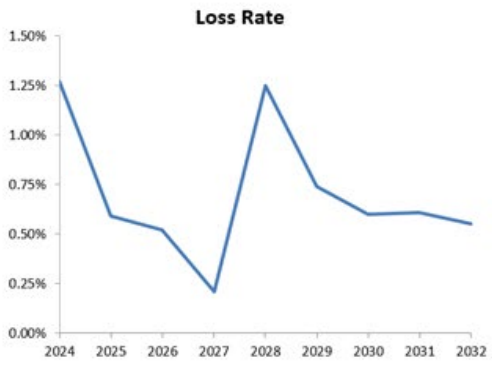

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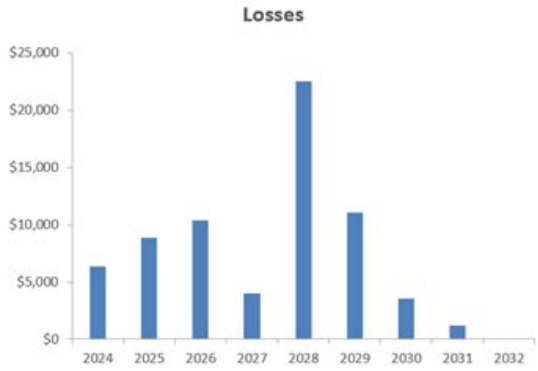

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CECL Model Types – WARM Model

- The **Weighted Average Remaining Maturity (WARM) Model** estimates expected credit losses based on the weighted average remaining maturity.
- Applies historical loss rates to project future losses over the remaining life.
- The WARM model calculates a pool's weighted average remaining maturity based on contractual attributes, adjusted for prepayment assumptions.

CECL Example: WARM Methodology

Loan Category	2024 Balance	Annual Loss Rate %	Wtd. Avg. Remaining Maturity	CECL Amount	CECL Percent
Calculation Steps	*A*	*B*	*C*	*D=AxBxC*	*E=D/A*
Credit Card	135,000,000	0.86%	2.75	3,198,690	2.37%
Auto Loan	180,000,000	0.52%	1.88	1,746,144	0.97%
Auto Lease	90,000,000	0.59%	1.75	926,100	1.03%
1-4 Family (1st)	270,000,000	0.02%	4.91	318,163	0.12%
1-4 Family (Jr)	162,000,000	0.03%	3.22	175,240	0.11%
Home Equity	81,000,000	0.03%	3.45	80,482	0.10%
CRE - Owner Occ	216,000,000	0.49%	5.24	5,568,653	2.58%
CRE - Non Owner Occ	234,000,000	0.56%	5.12	6,728,417	2.88%
Total	**1,368,000,000**	**0.35%**	**3.89**	**18,741,889**	**1.37%**

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CECL Model Types - Vintage Model

Vintage Model

- The **Vintage Model** tracks credit losses based on the origination date (or "vintage") of the loans.
- Credit losses are estimated based on the historical performance of each vintage cohort.
- Provides insights into how different economic cycles or underwriting standards impact losses over time.

CECL Example: Vintage Methodology

Origination Vintage	Origination Amount	Net Charge-Offs Year 1	Year 2	Year 3	Year 4	Year 5	Remaining Lifetime Net Charge-Offs (%)	Remaining Lifetime Net Charge-Offs ($)
2019	22,000,000	0.03%	0.42%	0.24%	0.12%	0.03%	n/a	n/a
2020	19,000,000	0.03%	0.69%	0.30%	0.18%	0.03%	0.03%	5,700
2021	15,000,000	0.01%	0.24%	0.12%	0.15%	0.03%	0.18%	27,000
2022	17,000,000	0.02%	0.30%	0.22%	0.15%	0.03%	0.40%	68,000
2023	14,000,000	0.01%	0.41%	0.22%	0.15%	0.03%	0.81%	113,750
2024	13,000,000	0.02%	0.41%	0.22%	0.15%	0.03%	0.83%	108,277

Unadjusted Net Charge-Offs ($)	322,727
2024 Amortized Cost	56,068,704
Unadjusted Net Charge-Offs (%)	0.58%
Qualitative Adjustments	0.25%
Total ACL % for 2024	0.83%
Total ACL $ for 2024	462,899

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CECL Model Types – PD Model

Probability of Default & Loss Given Default (PD/LGD) Model

- The **PD/LGD Model** estimates credit losses by calculating two key components:
  1. Probability of Default (PD)
  2. Loss Given Default (LGD)
- PD is typically estimated using historical data.
- LGD is calculated using historical recovery rates in the event of default.

CECL Example: PD/LGD Methodology					
Year	Average Loans	Net Charge-Off	Non-Performing Assets	Probability of Default	Loss Given Default
	A	*B*	*C*	*D = C / A*	*E = B / C*
2014	104,000,000	80,000	2,000,000	1.92%	4.00%
2015	100,000,000	440,000	3,000,000	3.00%	14.67%
2016	106,000,000	290,000	2,000,000	1.89%	14.50%
2017	105,000,000	380,000	1,000,000	0.95%	38.00%
2018	103,000,000	160,000	500,000	0.49%	32.00%
2019	107,000,000	230,000	2,000,000	1.87%	11.50%
2020	130,000,000	440,000	1,000,000	0.77%	44.00%
2021	119,000,000	580,000	4,000,000	3.36%	14.50%
2022	128,000,000	420,000	1,000,000	0.78%	42.00%
2023	130,000,000	170,000	700,000	0.54%	24.29%

10-Year Median:		
Probability of Default PD)	1.41%	*F = MEDIAN (D)*
Loss Given Default (LGD)	19.48%	*G = MEDIAN (E)*
Unadjusted 2024 ACL %	0.27%	*H = F x G*
Qualitative Adjustments	0.25%	*I*
Total ACL % for 2024	0.52%	*J = H + I*
Current Balance	125,000,000	*K*
Total ACL $ for 2024	655,955	*L = J x K*

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CECL Model Types – DCF Model

- The **Discounted Cash Flow (DCF) Model** estimates expected credit losses by projecting the future cash flows.
- Based on contractual attributes, adjusted for prepayment and default assumptions.
- The difference between the amortized cost and the discounted cash flows represents the expected credit loss.

CECL Example: DCF Methodology

Projection Year	Performing Balance	New Defaults	In Foreclosure	Amortization Factor	Expected Amortization	Voluntary Prepayments	Amortization From Defaults	Actual Amortization	Expected Interest	Interest Lost	Actual Interest	Principal Recovery	Principal Loss	Amortized Default Balance In Recovery Monrh	Loan Cash Flows
2023	100,000,000			1.0000											
2024	77,485,264	896,973	5,863,693	0.9209	7,344,486	14,314,431	41,155	7,303,332	4,485,139	24,604	4,460,535	-	-	-	26,078,298
2025	59,310,612	691,479	8,921,980	0.8378	6,529,678	11,023,877	70,382	6,459,296	3,479,533	40,892	3,438,640	642,440	179,395	821,835	21,564,254
2026	44,698,778	525,886	6,776,655	0.7504	5,775,053	8,373,142	62,248	5,712,805	2,646,267	31,100	2,615,167	486,729	138,296	625,025	17,187,843
2027	33,006,054	393,021	5,055,995	0.6586	5,107,639	6,247,118	55,054	5,052,585	1,977,685	23,242	1,954,443	361,935	105,177	467,112	13,616,081
2028	23,699,916	286,945	3,682,890	0.5620	4,517,356	4,550,528	48,692	4,468,665	1,443,910	16,969	1,426,941	262,435	78,604	341,039	10,708,569
2029	16,340,339	202,749	2,593,587	0.4606	3,995,292	3,204,600	43,064	3,952,228	1,020,234	11,990	1,008,244	183,581	57,389	240,970	8,348,654
2030	10,564,198	136,378	1,735,442	0.3539	3,533,562	2,144,289	38,087	3,495,475	686,255	8,065	678,190	121,538	40,550	162,087	6,439,491
2031	6,072,247	84,488	1,065,044	0.2418	3,125,194	1,315,954	33,686	3,091,508	425,146	4,996	420,150	73,140	27,276	100,416	4,900,752
2032	2,618,266	44,326	546,646	0.1239	2,764,020	675,429	29,793	2,734,227	223,049	2,621	220,428	35,785	16,898	52,682	3,665,868
2033	-	-	99,814	-	2,444,071	186,917	12,723	2,431,348	68,564	536	68,027	7,762	8,434	16,196	2,694,055

Time To Liquidation	12 Months
Conditional Repayment Rate	15.00%
Conditional Default Rate	1.00%
Loss Severity	20.00%

Loan Rate	5.00%
Net Present Value of Cash Flows	96,976,129
Amortized Cost	100,000,000
CECL Amount	3,023,871

Wilary Winn CECL Validation Process

Wilary Winn CECL Validation Areas

- CECL Policy
- CECL Model Selection
- CECL Testing
- Benchmarking of Financials to Peers to Understand the Client's Business Model

Following will be the specific testing subcomponents performed by Wilary Winn related to each high-level CECL validation topic.

Wilary Winn CECL Validation Process

CECL Policy Checklist

Validation	Validation Subcomponent
CECL Policy	1. Governance / Authority
	2. Documentation
	3. Internal Control
	4. Data Validation
	5. Model Validation
	6. Model Change Update Process
	7. Policy Updates
	8. Listing of Key Model Assumptions
	9. Monitoring Plan
	Identify potential gaps between CECL Policy objectives and business needs.
	Document findings and preliminary recommendations for better alignment.

Since the implementation of CECL Policies is a fairly recent event, we see considerable variability in the quality of client's policies and often have recommendations on how they can be substantially improved to meet best practices.

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Wilary Winn CECL Validation Process

CECL Model Implementation Checklist

Validation	Validation Subcomponent
CECL Model	1. Summary of Results
	2. Model Selection / Implementation
	3. Segmenting Process
	4. Individually Evaluated Loans
	5. Lookback Period
	6. Credit Scoring
	7. Risk Ranking
	8. Delinquent Loans
	9. Economic Variables Selection Assessment
	10. Economic Variables Reversion
	11. Economic Variables Regression Analysis
	Identify potential gaps between the CECL Model and business needs.
	Document findings and preliminary recommendations for better alignment.

The granularity of most of the CECL models we validate is at the product level. Model accuracy increases substantially with increased granularity (FICO score ranges, LTV, etc.)

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Wilary Winn CECL Validation Process

CECL Model Testing Checklist

Validation	Validation Subcomponent
CECL Testing	1. Historical Loss History
	2. Independent Replication
	3. Loan Attributes
	4. Prepayment
	5. Default
	6. Loss Severity
	7. Delinquent Loans
	8. Discount Rates
	9. Quantitative Testing
	10. Qualitative Adjustment Testing
	11. Back testing
	12. Benchmarking / Peer Group Comparison
	13. Stress Testing
	14. Unfunded Loan Commitments
	15. Securities
	16. ASC 326
	17. SR 11-7 / OCC 2011-12
	18. SEC SAB 119
	19. Comparison to WW Risk Management DCF

For comparative purposes, we perform a CECL analysis using our granular, discounted cash flow approach for determining the allowance for credit losses.

Wilary Winn CECL Validation Process

Benchmarking

Validation	Validation Subcomponent
Business Model	1. Balance Sheet
	2. Loan Portfolio Composition
	3. Asset Quality
	4. Capital
	Identify potential CECL implications from the business model.
	Document findings and preliminary recommendations for better alignment.

Using peer group comparisons, Wilary Winn performs benchmarking to better understand our client's business model in the context of making improvement recommendations for their CECL process.

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CECL Testing 1: Replication

ABC CU
Advanced Vintage Analysis as of December 31, 2024

Loan Category	Total Balance	Look Back	Vendor XYZ Base Loss Rate	WW Calculated Base Loss Rate
1st Mortgage	819,211,714	6 Years	0.00%	0.00%
HELOC 0-80%	567,515,220	10 Years	0.13%	0.13%
HELOC 81-90%	548,389,704	10 Years	0.13%	0.11%
HELOC 91-100%	501,360,910	0 Years	0.00%	0.00%

SR 11-7 / OCC 2011-12: Documentation

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CECL Testing 2: Industry Benchmarking

CU Comparison	Total Loans	Total ACL	Current ACL (%)	Average LTM C/O Rate	Total Delinquent Loans/Total Loans	Current ACL / LTM Charge-Off Rate	Current ACL / DQ Loan Rate
ABC CU	1,144,917	16,308	1.42%	1.00%	1.73%	1.42	0.82
Peer Comp	10,085,372	104,608	1.04%	0.75%	0.87%	1.39	1.19

The relatively high delinquency levels and charge-off rates observed as of December 31, 2024 could justify increasing the ACL even further.

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CECL Testing 3: Quantitative

ABC CU
Forecast Adjustments as of December 31, 2024

Loan Category	Base Loss Rate	Quantitative Forecast Adjustment	National R-Squared	State R-Squared	MSA R-Squared
New Vehicle - Direct	1.43%	0.01%	0.7549	***0.8775***	0.7398
Used Vehicle - Indirect	1.58%	0.27%	0.7682	***0.8887***	0.6146
New Vehicle - Indirect	2.39%	0.09%	0.7877	***0.8747***	0.7011
Used Vehicle - Indirect	2.52%	0.32%	0.7992	***0.8635***	0.6553

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CECL Testing 4: Qualitative

To what extent is the CECL amount determined by quantitative, auditable assumptions?

Loan Category	6/30/2024 Balance	Total CECL Amount	Annual Loss Rate % Excl. Qual.	Wtd. Avg. Remaining Maturity	CECL Amount Excl. Qual.	% of Total
Unsecured credit cards	$ 29,331.00	$ 2,942.36	3.20%	2.79	$ 2,620.95	89.08%
New vehicle	$127,796.00	$ 3,813.93	1.18%	1.88	$ 2,843.00	74.54%
Used vehicle	$272,775.00	$ 7,163.98	0.88%	1.90	$ 4,533.29	63.28%
Secured by 1st lien, 1-4 fam	$ 16,870.00	$ 126.03	0.01%	4.91	$ 8.78	6.97%
Secured by Jr lien, 1-4 fam	$ 84,453.00	$ 493.16	0.01%	3.22	$ 28.83	5.85%
Commercial loans	$ 147.00	$ 0.44	0.00%	1.76	$ -	0.00%
All other (incl. negative shares)	$ 42,436.00	$ 1,763.89	1.65%	2.03	$ 1,423.46	80.70%
First Mortgage Participations	$ 38,600.00	$ 415.56	0.00%	7.19	$ -	0.00%
Total	**$612,408.00**	**$16,719.35**	**0.73%**	**2.55**	**$11,458.32**	**68.53%**

Historical loss experience should be the basis for all quantitative modeling, not a qualitative factor. If the lookback period is extended to a representative window, the quantitatively determined loss rate will capture the ups and downs of charge-off history.

Qualitative Factor	Current Assessment	
Historic loss experience:	Moderate	*In the long view, ABC CU has posted solid loan loss statistics. Due to a large addition of indirect auto dealers and dramatically increased volumes in 2014-2016, ABC CU has suffered higher losses in recent years. This situation has been addressed and delinquency and ratios were declining pre-Covid, however, we began seeing an uptick in mid 2022 that continues today.*

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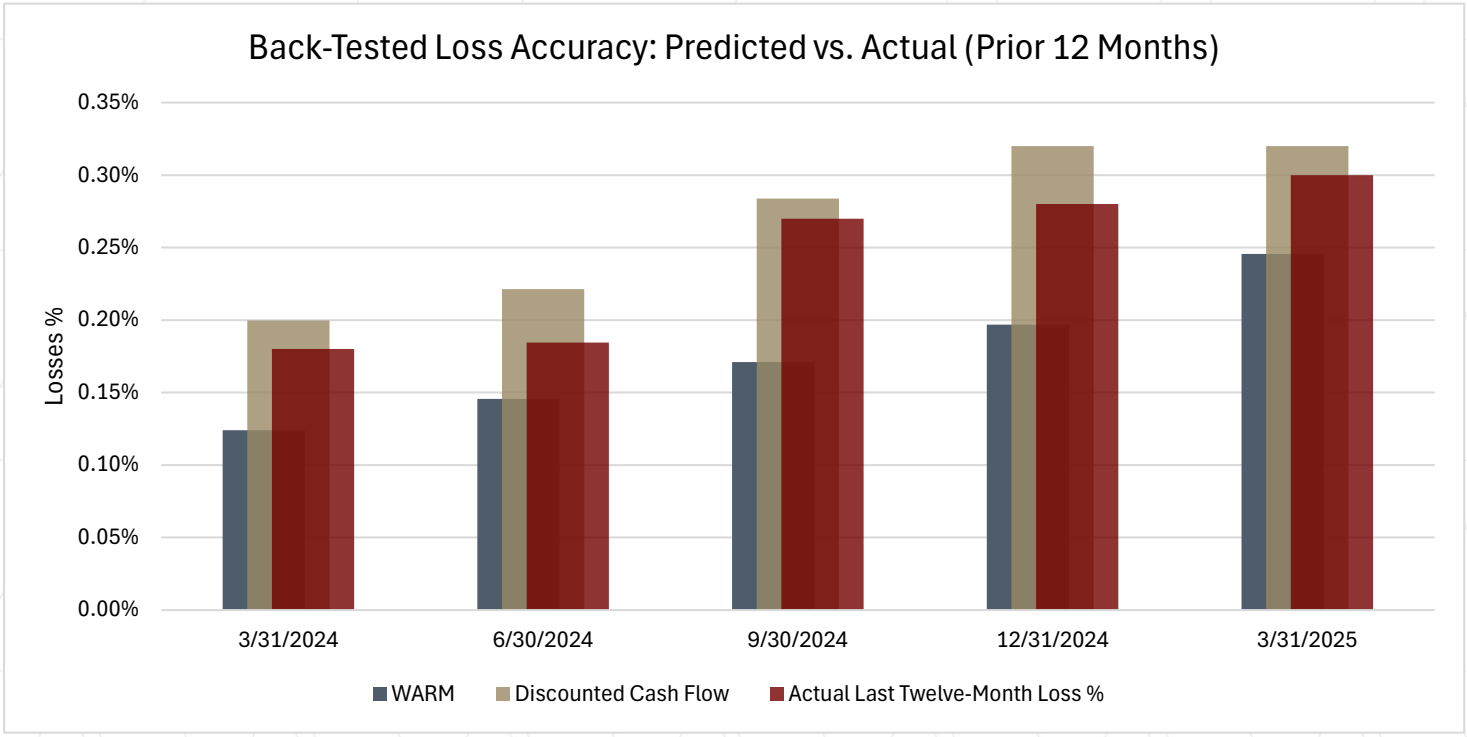
CECL Testing 5: Back Testing



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CECL Testing 6: Independent Valuation

We believe that, in addition to delinquency and loss ratios, ABC CU's asset performance relative to peers is likely explained by product mix (large concentration of used vehicle loans) and by other credit characteristics (LTV, FICO, DSCR, etc.) which ideally would be quantified as well. Therefore, we performed an independent valuation using a Discounted Cash Flow model at instrument level, incorporating these additional risk attributes.

ABC CU
Base Loan Valuation as of December 31, 2024

	Principal Balance	# of Loans	Avg FICO	Avg LTV*	60+ DQ%	WAC	Lifetime WAC	Age	WAM	Avg Life	CPR %	CRR %	CDR %	Severity%	CECL Loss %	CECL Amount
Used Vehicle - Direct	103,557,822	7,596	703	n/a	2.1%	9.1%	9.1%	19	54	1.7	20.7%	16.8%	3.9%	33.7%	2.07%	(2,139,502)
Used Vehicle - Indirect	277,110,517	15,617	688	n/a	3.1%	11.4%	11.4%	16	58	1.9	22.5%	16.3%	6.2%	38.2%	3.90%	(10,812,095)

Validation	Validation Subcomponent	Commentary
Business Model	Identify potential CECL implications from the business model.	ABC CU's higher concentration in Used Vehicle lending mandates a higher allowance.
	Document findings and preliminary recommendations for better alignment.	We recommend applying a dollar adjustment to the CECL amount for Used Vehicles, based on our independent loan valuation outlined in Appendix D.

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Sample CECL Validation Commentary

Validation	Validation Subcomponent	Commentary
CECL Policy	Identify potential gaps between CECL Policy objectives and business needs.	Peer reasonableness assessment and model performance monitoring of the current method and parallel testing of alternative methods have not been established in policy.
	Document findings and preliminary recommendations for better alignment.	WW Risk Management recommends that the policy be amended to reflect the roles of the Credit Committee, Supervisory Committee and management as they relate to data validation, back-testing, internal controls and monitoring for the CECL process.

Validation	Validation Subcomponent	Commentary
CECL Testing	16. ASC 326	The majority (94.14%) of the CECL reserve is quantitative.
	17. SR 11-7 / OCC 2011-12	As ABC CU builds their historical charge-off data we highly recommend continuous monitoring and periodic re-evaluation of different methodologies. The alternative method could also serve as back-up in case the current CECL model is unavailable.
	18. SEC SAB 119	Financial institutions with limited loss experience have more challenges in creating a systematic methodology. For example, there was only one charge-off in the Commercial LOC data history (despite the 8 year look back). Ideally, there would be increased use of industry data to support expected loss rates.

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Sample CECL Validation Commentary

Validation	Validation Subcomponent	Commentary
CECL Model	Identify potential gaps between the CECL Model and business needs.	When a sufficient balance history is not available, Vendor XYZ imputes balances using reverse decay rates. The decay rates are based on look back methodologies. They are not adjusted based on actual or forecasted interest rates – a significant deficiency when analyzing residential or commercial mortgages.
		While the Advanced Vintage method could work for larger, well-seasoned, loan pools, it will result in more volatile CECL amounts with smaller pools and newer product offerings.
		Although the method is based on seasoning, it does not incorporate other risk characteristics, such as FICO score.
	Document findings and preliminary recommendations for better alignment.	As ABC CU builds their historical charge-off data we highly recommend continuous monitoring and periodic re-evaluation of different methodologies, especially more prospective methods such as the Probability of Default method or Discounted Cash Flow model.

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Sample Recommendation Policy

We recommend that ABC CU amend its CECL Policy to reflect the roles and responsibilities related to data validation, back-testing and model validation (frequency & scope).

Policy Review

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Sample Recommendation Policy

Since minimum reserve levels, economic adjustments and other adjustments aggregate to 82% of the total ACL, we recommend that the CECL Policy include how these amounts are determined, tested and adjusted.

Policy Review

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Sample Recommendation Lookback

We recommend that ABC CU expand the lookback for losses on the residential real estate static pools beyond four years to included a full peak-to-trough business cycle.

CECL Assumption: Lookback
Valuation technique: Replication

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Sample Recommendation Regressions

The software vendor for ABC CU fits linear regressions between annual charge-off ratios and economic data (unemployment and housing price indices) for the different loan types at MSA, State and National level. While National was selected, our research shown that the performance for auto loans is highly correlated with changes in the local market's unemployment rate and we commend changing to the MSA level.

CECL Assumption: Regression fit
Valuation technique: Replication

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Sample Recommendation Allowance for Credit Losses

WW Risk Management's discounted cash flow model, which is based on the credit attributes of each loan, produced a quantitative reserve of $20,152,100, compared to the total reserve of $18,058,507 produced by the XYZ model. We recommend ABC CU review and consider applying Q factors for Used Vehicles, 1st Mortgages and HELOCs.

Key CECL Assumptions: LTV, FICO
Validation technique: Independent Valuation

ALM Model Validation

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ALM Model Validation

Asset and liability management (ALM) is the practice of managing risks that arise due to mismatches between assets and liabilities and earning an adequate return.

ALM considers interest rate risk, liquidity risk, and credit risk – ideally measured on an integrated basis.

- Interest Rate Risk: the risk of potential loss that can be triggered by movements in market interest rates
- Liquidity Risk: the risk of not having enough cash to meet an organization's financial obligations due to an overextension of assets and/or volatile funding sources
- Credit Risk: the risk of loss due to borrower loan defaults which impact a financial institution's earnings and capital

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ALM Models
NII / EVE

Interest rate risk is measured by assessing the impact of sudden and significant changes to market interest rates in comparison to an expected base case.

Interest rate risk exposure is monitored against pre-determined tolerance levels to interest rate shocks as stated in a financial institution's ALM Policy.

How are risks monitored through ALM?

- Net Interest Income (NII) simulations in differing rate environments
  - Short-term
  - Concrete, quantifiable results
- Economic Value of Equity (EVE) and Duration calculations
  - Long-term
  - Highly theoretical and sensitive to key assumptions

Wilary Winn ALM Validation Process

Wilary Winn ALM Validation Areas

- Policy Review – to assess risk tolerance
  - ALM
  - Concentration Risk
  - Contingency Funding
  - Investment
- ALM Model Testing – independent replication & comparison
  - Earnings Simulation
  - Economic Value of Equity
- ALM Assumption Testing
  - Non-maturity Deposits – beta, decay & effective maturity
  - Loans & Investments – repayment rate, default rate and loss severity
- Benchmarking of Financials to Peers - to understand the business model

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Key ALM Assumptions

- **Conditional Repayment Rates (CRR)** reflect the likelihood of borrowers repaying loans ahead of schedule, influenced by loan characteristics.
- **Conditional Default Rates (CDR)** are determined using loan characteristics including credit score, loan-to-value (LTV) ratio, term, and loan type.
- **Loss Severity rates** are applied based on the expected recovery value of collateral, adjusted for liquidation costs and market conditions.
- **Non-Maturity Share Persistency:** estimation of how long non-maturity accounts will remain with the financial institution
- **Future Pricing:** assumptions regarding how future financial instruments will be priced going forward
- **Discount Rates:** used for determining present value for economic value of equity calculations

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ALM Outputs

Duration

- Measure of price sensitivity to interest rates
  - Calculation involves yield, principal repayment and present value
  - Higher duration implies more price volatility risk

- To significantly reduce or mitigate interest rate risk, asset and liability durations need to match

- Duration is calculated with economic value of equity analysis

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Duration

Account	Weighted Avg. Coupon	Avg. Life	Effective Duration	Book Value	Fair Value	Fair Value Percent
Cash	4.33	0.00	0.00	45,667,850	45,667,904	100.00%
Agency Debt	1.84	0.91	0.86	2,498,767	2,468,655	98.79%
Agency CMO	3.35	4.88	4.43	6,330,858	6,166,937	97.41%
Agency MBS	2.78	4.62	3.90	31,010,006	29,848,618	96.25%
Certificates of Deposit	2.30	0.56	0.55	497,000	496,811	99.96%
U.S. Treasury	1.46	0.13	0.12	1,499,879	1,493,200	99.55%
FHLB Stock	6.00	NA	NA	10,451,300	10,451,300	100.00%
CUSO Loan	2.46	5.00	4.60	334,778	306,365	91.51%
AFS FV Adjustment	NA	NA	NA	(1,362,289)	-	NA
Total Investments	3.84	2.03	1.74	96,928,150	96,593,426	99.65%
Consumer Loans	7.84	1.57	1.38	137,803,025	130,258,242	94.52%
Member Business Loans	5.32	2.79	2.36	58,460,609	57,914,333	99.07%
Real Estate Loans	5.14	5.36	3.40	201,569,464	186,586,822	92.57%
Allowance for Loan Losses	NA	NA	NA	(6,260,219)	-	NA
Total Loans	6.20	3.73	2.59	391,572,880	374,759,397	95.71%
All Other Assets	NA	NA	NA	55,406,481	55,406,481	100.00%
Total Assets	**5.65**	**3.38**	**2.40**	**543,907,511**	**527,065,669**	**96.90%**
A+ Checking	0.05	5.67	4.47	42,653,806	33,475,589	78.48%
Freebee Checking	0.00	5.05	4.21	19,579,099	15,770,005	80.55%
Economy Checking	0.05	5.18	4.08	17,239,074	13,838,497	80.27%
Members Choice Checking	0.05	3.48	3.03	14,103,755	12,191,576	86.44%
Business Checking	0.05	4.00	3.17	13,266,842	11,224,010	84.60%
Regular Shares	0.05	5.19	3.83	136,244,103	109,462,820	80.34%
All Purpose Account	0.05	5.53	4.05	10,310,247	8,156,543	79.11%
Christmas and Vacation Club	0.05	0.74	0.69	1,630,168	1,581,540	97.02%
Escrow Account	0.05	0.74	0.69	4,617,326	4,479,593	97.02%
Money Market	0.26	4.90	3.42	42,234,552	34,751,032	82.28%
Investor Choice	0.39	5.15	3.43	41,147,668	33,799,607	82.14%
IRA Savers Accounts	0.30	5.35	3.60	7,305,018	5,916,040	80.99%
Total Non-Maturing Deposits	0.12	5.02	3.73	350,331,657	284,646,852	81.25%
Share Certificates	3.97	0.80	0.77	116,040,593	115,736,153	99.74%
FHLB Advances	3.12	3.12	2.79	9,000,000	8,681,823	96.46%
Other Liabilities	NA	NA	NA	14,191,709	14,191,709	100.00%
Total Liabilities	**1.12**	**3.95**	**2.99**	**489,563,959**	**423,256,537**	**86.46%**
Total Equity				**54,343,552**	**103,809,132**	**191.02%**

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Duration

- Interest Rate Risk (IRR) is created by a mismatch in Asset and Liability durations

Duration			
	CU 1	CU 2	CU 3
Assets	2 years	4 years	3 years
Liabilities	3 years	3 years	3 years
Sensitivity	**Asset Sensitive**	**Liability Sensitive**	**Balanced**

Asset Sensitive – Performs better as rates rise

Liability Sensitive – Performs better as rates fall

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Independent Replication

Independent Replication Comparison Example – Earnings Simulation

	Year-One Interest Income - 12/31/2024						
ABC CU ($000s)	**-300**	**-200**	**-100**	**Base**	**100**	**200**	**300**
Consumer Loans	74,623	78,277	81,896	85,154	88,420	91,625	94,806
Commercial Loans	13,101	13,522	13,943	14,369	14,793	15,217	15,638
Mortgage Loans	55,180	57,335	58,606	59,522	60,341	61,138	61,926
Investments	20,236	26,463	32,453	38,360	44,272	50,114	55,911
Interest Income	163,140	175,597	186,898	197,405	207,826	218,094	228,281

WWRM ($000s)	**-300**	**-200**	**-100**	**Base**	**100**	**200**	**300**
Consumer Loans	73,183	76,462	79,731	82,740	85,661	88,540	91,414
Commercial Loans	13,174	13,594	14,014	14,435	14,855	15,274	15,694
Mortgage Loans	54,231	57,099	58,375	59,194	59,889	60,557	61,218
Investments	20,253	26,486	32,468	38,370	44,277	50,115	55,910
Interest Income	160,842	173,641	184,589	194,739	204,681	214,487	224,236

$ Variance	(2298)	(1956)	(2309)	(2666)	(3145)	(3607)	(4045)
% Variance	-1.41%	-1.11%	-1.24%	-1.35%	-1.51%	-1.65%	-1.77%

	Year-One Interest Expense - 12/31/2024						
ABC CU ($000s)	**-300**	**-200**	**-100**	**Base**	**100**	**200**	**300**
Non-Maturity Deposits	19,419	19,565	22,159	27,239	31,013	35,886	41,135
Certificates	22,427	24,634	28,759	33,057	37,375	41,706	46,051
Borrowings	3,977	6,931	10,879	14,140	14,460	14,529	14,598
Interest Expense	45,823	51,130	61,797	74,436	82,848	92,121	101,784

WWRM ($000s)	**-300**	**-200**	**-100**	**Base**	**100**	**200**	**300**
Non-Maturity Deposits	19,462	19,633	22,157	27,301	31,083	35,966	41,225
Certificates	22,592	24,928	29,073	33,342	37,615	41,888	46,162
Borrowings	4,102	7,110	10,118	14,304	14,525	14,541	14,558
Interest Expense	46,156	51,671	61,349	74,947	83,223	92,396	101,944

$ Variance	333	541	(449)	511	376	275	160
% Variance	0.73%	1.06%	-0.73%	0.69%	0.45%	0.30%	0.16%

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Independent Replication

Independent Replication Comparison Example – Economic Value of Assets

	Economic Value of Assets - 12/31/2024						
ABC CU ($000s)	**-300**	**-200**	**-100**	**Base**	**100**	**200**	**300**
Consumer Loans	1,416,479	1,393,616	1,371,877	1,349,501	1,324,404	1,300,702	1,278,241
Commercial Loans	322,137	314,036	306,317	299,115	292,262	285,752	279,556
Mortgage Loans	1,633,850	1,555,103	1,477,338	1,402,521	1,331,800	1,266,452	1,206,951
Investments	1,163,492	1,139,508	1,116,791	1,095,310	1,075,034	1,055,950	1,038,014
Other Assets	229,709	229,709	229,709	229,709	229,709	229,709	229,709
Assets	4,765,668	4,631,973	4,502,032	4,376,156	4,253,210	4,138,566	4,032,470

WWRM ($000s)	**-300**	**-200**	**-100**	**Base**	**100**	**200**	**300**
Consumer Loans	1,412,377	1,389,764	1,368,039	1,345,662	1,320,467	1,296,640	1,274,050
Commercial Loans	322,091	314,061	306,454	299,238	292,384	285,867	279,664
Mortgage Loans	1,627,892	1,567,719	1,485,027	1,402,521	1,327,700	1,259,819	1,197,456
Investments	1,164,364	1,140,511	1,117,279	1,095,358	1,074,779	1,055,428	1,037,226
Other Assets	229,709	229,709	229,709	229,709	229,709	229,709	229,709
Assets	4,756,433	4,641,764	4,506,509	4,372,488	4,245,039	4,127,464	4,018,105

$ Variance (000s)	(9,235)	9,791	4,476	(3,668)	(8,171)	(11,102)	(14,365)
% Variance	-0.19%	0.21%	0.10%	-0.08%	-0.19%	-0.27%	-0.36%

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Non-Maturity Deposits

Non-maturity Deposit Assumptions for ALM

- Re-pricing beta
- Effective maturity
- Decay

Depositors have continuous and unlimited options to increase or decrease balances. These options may or may not correlate to market conditions.

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Non-Maturity Deposits

Beta

- Indicates the magnitude of change the financial institution would likely make to its administered rate in response to changes in market interest rates.
- Calculated with linear regression that compares the change in the deposit rate to the change in the benchmark interest rate.
- Betas are assumptions in the ALM analysis.

Account Type	Beta
Share Drafts	0.00 - 0.20
Regular Shares	0.15 - 0.30
Money Market	0.40 - 0.65

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Non-Maturity Deposits

Effective Maturity

- Indicates when the last cash flow for an account type is projected to occur.
- Derived from a second regression analysis modeling the spread between the rate index and deposit rate versus the average balance for the account.

R-Squared	Effective Final Maturity (years)
0	10
0.20	8
0.40	6
0.60	4
0.80	2
1.00	0

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Non-Maturity Deposits

Decay assumptions

A decay rate (runoff rate) analysis can be performed using one of two methods:

- Account number method: This method begins with a set of accounts and balances. These accounts are then tracked in order to determine what happens to the balances over time. In the process, no new accounts are considered.

- Origination date method: This method compares beginning and ending balances of all accounts by account type and also takes new accounts into consideration in order to determine a decay rate.

In most cases, both methods will yield roughly the same results.

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Liquidity Stress Testing

Liquidity Stress Scenarios

Scenario Parameters	Normal	Mild	Moderate	Severe	Adverse 1
CD Runoff	5%	10%	15%	20%	15%
Money Market Runoff	3%	5%	10%	15%	10%
Saving/Checking Runoff	0%	0%	5%	10%	5%
Unfunded Commitments	3%	10%	25%	50%	100%
Reduction to Funding Lines	0%	0%	25%	50%	25%
Scenario Cash Impact					

Scenario Responses	Normal	Mild	Moderate	Severe	Adverse 1
New Certificates (Above Base)					
New Borrowings (Above Base)					
AFS Sales					
Loan Sales					
Reduction in New Lending					

Notes:

1. Scenario Parameters are implemented over a 3-month timeframe.
2. Scenairo Responses are implemented over a 12-month timeframe

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Sample Recommendation 1
Modeling

We recommend that ABC CU review and correct the modeling setup for the noted inaccuracies in its modeling of adjustable-rate loans which specifically relate to interest rate reset and rate floor assumptions.

ALM Assumption: Interest rate
Valuation technique: Replication

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Sample Recommendation 2 Policies

We recommend that ABC CU develop a detailed Concentration Risk Policy for its loan portfolio. This policy should establish concentration limits based on loan type and credit quality. Implementing such policy helps to mitigate risks associated with overexposure to a single loan type or credit segment while supporting a balanced portfolio.

Policy review

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Sample Recommendation 3
Economic Value of Equity Discount Rates

We recommend that ABC CU adjust the discount rates used in economic value of equity analysis based on loan credit quality. This way, a high credit quality loan would be discounted at a lower rate resulting in a higher fair value compared to a low credit quality loan that would be discounted a higher rate resulting in a lower fair value. We believe this discounting methodology derives a more accurate ALM profile.

ALM Assumption: Discount rate
Valuation technique: Replication

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Sample Recommendation 4
Future Pricing

We recommend that ABC CU review its current static reinvestment rate assumptions for all account categories and incorporate market rate movements by integrating index forward curves into future yield projections. This will result in a more dynamic and realistic projection of future interest income and expenses. For example, the static reinvestment rate assumptions applied at the base scenarios were the same as current yields, even for money market accounts that typically respond to market rate movements.

Key ALM Assumption: Future pricing
Validation technique: Replication

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Sample Recommendation 5
NII/EVE/Shock Consistency

1. We recommend aligning the loan prepayment assumptions so that the prepayment speeds applied in the NII and NEV simulations are consistent. This would allow the organization to assess the short-term risks identified in the NII analysis in conjunction with the longer-term risks identified in the NEV analysis.

2. We recommend aligning the decay / withdrawal assumptions used in the NII and NEV calculation. This would result in a more conservative calculation.

3. We recommend aligning the rate shock assumptions used in the NII and NEV calculation. By ramping up the discount rates gradually over time in the NEV calculation, the discounting effect is lessened, which results in a lower percent change from base and a higher fair value calculation than an instantaneous interest rate shock would create.

Key ALM Assumptions: Prepayment speeds, decay rates, shock assumptions
Validation technique: Replication

Questions?

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Thank you!