

10 Common Mistakes In A/LM Modeling

...and ways to use your model better

Presented by
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Model Validation Observations

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Why the Standardization of Non-Maturity Shares

1. Uncertainty
 - a. Out of sample forecast risk
 - b. Impact from crisis/recession (surge deposits)
 - c. Technology
2. NMS observations in the CU industry
 - a. Wide dispersion of valuation assumptions
 - b. No market consensus on values
 - c. NMS comprise > 70% of liabilities on average
3. Standardization approach
 - a. 1% benefit for Base case scenarios
 - b. 4% benefit for shocked scenario (currently +300bps)

NEV Supervisory Test – Risk Thresholds

Risk Level	Post-shock NEV	NEV Sensitivity (%)
Low	Above 7%	Below 40%
Moderate	4% up to 7%	40% to 65%
High	2% up to 4%	65% to 85%
Extreme	Below 2%	Above 85%

Note: NCUA has made use of a NEV metric in the current Examiner's Guide since 2000 in Chapter 13

Top 10 “Findings”

6. No decay rates or decay rates don't change as rates rise
7. No deposit servicing cost spreads (for NEV)
8. Assumptions provided are not the assumptions used in the model
9. Insufficient audit trail for institutions, examiners, and model validators to validate assumptions and input
10. Loan values in +200 may often be at a premium to book – due to overly optimistic values today

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EXCERPT
of issues found in a
recent model validation

Loans for which the price is assumed to be 100% or higher
Scenarios +100 through +500
Dollars in millions

Assets	Book Value	+ 100 bps	+ 200 bps	+ 300 bps	+ 400 bps	+ 500 bps
Credit Cards	\$ 75,000	X	X			
New Autos	\$ 160,000	X				
Used Autos	\$ 210,000	X	X	X		
Other Autos and RVs	\$ 15,000	X	X	X		
Share Secured Loans	\$ 2,000	X	X	X	X	X
Open Signature / LOCs	\$ 30,000	X	X	X	X	X
Closed Signature Loans	\$ 40,000	X	X	X	X	
10Yr Fixed Mtg	\$ 5,000	X				
10Yr Fixed Mtg - Jumbo	\$ 1,000	X				
30Yr Fixed Mtg	\$ 210,000	X				
ARMs - 1 Year	\$ 1,000	X	X	X		
ARMs - 3 Year	\$ 7,500	X	X	X	X	X
ARMS - Other	\$ 2,500	X	X	X	X	X
ARMS - 3 Year Jumbo	\$ 1,000	X	X	X	X	X
ARMs - 5 Year	\$ 18,000	X	X	X	X	X
ARMS - 5 Year Jumbo	\$ 20,000	X	X	X	X	X
I/O Mortgages	\$ 15,000	X	X	X	X	X
ARMs - 7 Year	\$ 10,000	X	X	X	X	X
ARMS - 7 Year Jumbo	\$ 20,000	X	X	X	X	X
ARMs - 10 Year	\$ 10,000	X	X	X	X	X
ARMS - 10 Year Jumbo	\$ 30,000	X	X	X	X	X
Comml. Participation Loans	\$ 40,000	X				
Total Loans (which don't devalue to book until +200bps shock or higher)	\$ 923,000	\$ 923,000	\$ 507,000	\$ 432,000	\$ 206,000	\$ 166,000
Percent (of above Total Loans)		100.00%	54.93%	46.80%	22.32%	17.98%
Percent of Total Loan Portfolio	\$ 1,300,000	71.00%	39.00%	33.23%	15.85%	12.77%

Top 10 “Findings”

1. Cost of funds as rates increase does not tie to history (2006-2007) – could be due to pricing betas, deposit mix, or both

Back Testing Total COF

Current Analysis	Declining	Base	Shock +300
Interest Income	\$23,573	\$25,342	\$32,591
% Change from Base	-6.98%	0.00%	28.61%
Interest Expense	\$2,319	\$2,799	\$9,644
% Change from Base	-17.16%	0.00%	244.49%
Net Interest Income	\$21,254	\$22,543	\$22,947

Total Yield on Earning Assets	3.18%	3.41%	4.39%
Total Cost of Paying Liabilities	0.33%	0.40%	1.37%
Net Interest Spread	2.85%	3.01%	3.02%
Net Interest Margin	2.86%	3.04%	3.09%

COF change
32%

Jun-2006	Sep-2006	Dec-2006	Mar-2007
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*Cost of Funds / Avg. Assets	1.96	1.90	1.99	2.67
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Actual COF change
45%

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Back Testing Total COF

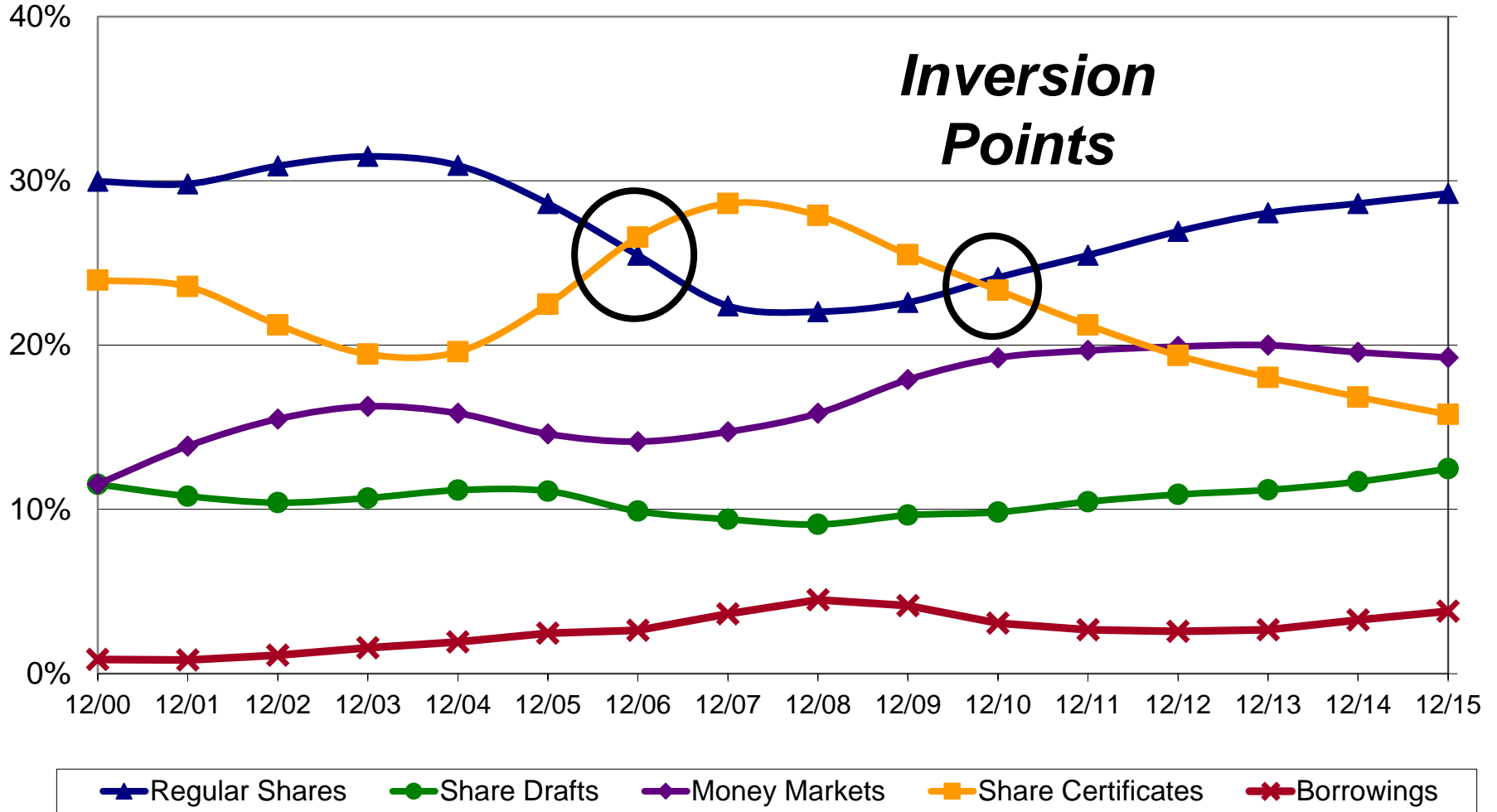
Beta Calculations Proof

	(A) Base	(B) Shock +300	(B-A) Difference	C Rate Change	(B-A)/C Beta
Simulated COF Change	0.40%	1.37%	0.97%	3%	32%

	(A) Current	(B) March '07	(B-A) Difference	C Rate Change	(B-A)/C Beta
Current vs. Historical COF	0.40%	2.67%	2.27%	5%	45%

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Distribution of Funding as a % of Assets



Deposit Growth

There has been growth in the number of deposit accounts, but even more of the growth is the average balance.

Using credit unions with assets >\$1 billion as an example:

Growth since 2007	Regular Shares	Money Markets
# of Accounts	54%	32%
Average Balance per Account	64%	72%

Top 10 “Findings”

1. Cost of funds as rates increase does not tie to history (2006-2007) – could be due to pricing betas, deposit mix, or both
2. Net interest income (NII) results improve in a rising rate environment, despite having a material amount of fixed-rate, long-term assets

What often sounds like there is no assumption or a neutral assumption.

- No deposit growth
- No loan growth

Is the Assumed New Business Profitability Reasonable?

	Base Case		Rate Change		
			3.00%		Save
	% Assets	% Assets	Rate	Rate	% of Mkt
	Base	Up 3%			
Loans	65.7%	65.7%	4.48%	7.48%	100%
Investments	28.8%	28.8%	1.20%	4.20%	100%
Non-Earning Assets	5.5%	5.5%	0.00%	0.00%	
Total Assets	100.00%	100.00%	3.29%	6.12%	
Non-Maturity Deposits	70.2%	70.2%	0.40%	1.39%	33%
Member CDs	16.0%	16.0%	0.95%	3.95%	100%
Borrowings	3.0%	3.0%	0.75%	3.75%	100%
Net Worth	10.8%	10.8%	0.00%	0.00%	
Cost of Funds	100.00%	100.00%	0.46%	1.72%	
Net Interest Margin			2.83%	4.40%	
Operating Expense			3.18%	3.18%	
Prov Loan Losses			0.25%	0.25%	
Fee/Other Income			1.40%	1.40%	
Net Operating Expense			2.03%	2.03%	
					Difference
Return on Assets			0.80%	2.37%	1.57%

The ROA when assuming members **CAN'T** respond to rates changing is typically unreasonable

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Is the Assumed New Business Profitability Reasonable?

	Base Case		Rate Change		
			3.00%		Save
	% Assets	% Assets	Rate	Rate	% of Mkt
	Base	Up 3%			
Loans	65.7%	60.0%	4.48%	6.73%	75%
Investments	28.8%	34.5%	1.20%	4.20%	100%
Non-Earning Assets	5.5%	5.5%	0.00%	0.00%	
Total Assets	100.00%	100.00%	3.29%	5.49%	
Non-Maturity Deposits	70.2%	56.2%	0.40%	1.39%	33%
Member CDs	16.0%	30.0%	0.95%	3.95%	100%
Borrowings	3.0%	3.0%	0.75%	3.75%	100%
Net Worth	10.8%	10.8%	0.00%	0.00%	
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Net Interest Margin			2.83%	3.41%	
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					Difference
Return on Assets			0.80%	1.38%	0.57%

The ROA when assuming members **CAN** respond to rates changing

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Top 10 “Findings”

1. Cost of funds as rates increase does not tie to history (2006-2007) – could be due to pricing betas, deposit mix, or both
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3. Prepayment speed behaviors don't adjust

Prepayment Speeds Don't Change as Rates Change

	-300	-200	-100	FLAT	+100	+200	+300
1st Mortgage Fxd - 30 Yr	16%	16%	16%	16%	16%	16%	16%
1st Mortgage Fxd - 20 Yr	13%	13%	13%	13%	13%	13%	13%
1st Mortgage Fxd - 15 Yr	18%	18%	18%	18%	18%	18%	18%
1st Mortgage Fxd - 10 Yr	8%	8%	8%	8%	8%	8%	8%

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4. Starting NEV ratios are unreasonably higher than the current net worth

We do a lot of model validations... *what we see:*

- >90% of simulations have starting NEV that is higher than the starting net worth
- On average, the starting NEV is shown to be 23% higher than the net worth
 - This dilutes volatility ratios
 - This results in a higher NEV ratio for shocked environments

September 25, 2015

OBSERVATIONS FROM MODEL VALIDATIONS: HIGH STARTING NEV RATIOS

When performing model validations, it is common to see a net economic value (NEV) ratio that is considerably higher than the credit union's current net worth ratio.

Understanding NEV and net worth are two completely different concepts; there are reasons why starting with a high NEV ratio in the base environment may not be reasonable. [...]

[Read More](#) →

validations... *what we*

have starting NEV

\$100 Credit Union	Assumption A	Assumption B
Base NEV	\$10	\$15
Base NEV Ratio	10%	15%
+300 bp Volatility	(\$5)	(\$5)
+300 bp NEV Volatility Ratio	-50%	-33%
+300 bp NEV Ratio	5%	10%

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be

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\$100 Credit Union	Assumption A	Assumption B
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Example A – Withdrawals Don't Change as Rates Change

	-300	-200	-100	FLAT	+100	+200	+300
Chkg <2000	0%	0%	0%	0%	0%	0%	0%
Chkg 2000-4999	0%	0%	0%	0%	0%	0%	0%
Chkg 5000-9999	0%	0%	0%	0%	0%	0%	0%
Chkg 10000-24999	0%	0%	0%	0%	0%	0%	0%
Chkg 25000+	5%	5%	5%	5%	5%	5%	5%
Regular Shares	10%	10%	10%	10%	10%	10%	10%
MM <2000	0%	0%	0%	0%	0%	0%	0%
MM 2000-4999	0%	0%	0%	0%	0%	0%	0%
MM 5000-9999	0%	0%	0%	0%	0%	0%	0%
MM 10000-24999	0%	0%	0%	0%	0%	0%	0%
MM 25000+	23%	23%	23%	23%	23%	23%	23%

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Excerpt from a credit union report package:

Money Market Assumptions		
Rate	Length	Beta
0.30%	24 Mo	50%

Results indicate an improvement in the value of the money market accounts of 11% in a +300 shock

Note: An improvement on a liability is often shown as a negative, which means less debt

Compare Assumptions to Results

The assumptions don't support the results in the package.

A value improvement of more than 3% should raise a flag! Here is why...

Rough calculation

$-1 * (\text{Rate change} * (100\% - \text{Beta}) * \text{Length in Yrs})$

Using the numbers provided

$-1 * (3\% * (100\% - 50\%) * 2) = -3\%$

After the flag was raised, additional details from the model were provided and the average life was about 8 years, not the documented 2 years.

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ARMs - 7 Year	\$ 10,000	X	X	X	X	X
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Things to Remember

- A/LM should provide relevant, reliable decision information
- Assumptions should be reasonable and defensible
- Reviewing the reasonableness of results can guide you to potential issues with model setup or assumptions
- The Top 10 “findings” cover many of the issues that are found but if something doesn’t feel right, ask more questions

Thank You!

**We welcome your questions and comments.
Contact us at cmyers.com or 800.238.7475.**

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