How Core Are Your Deposits?

Tuesday, June 18, 2013

10:15 AM – 11:15 AM

Presented by:
Drew H. Boecher, CFA
Managing Director
Darling Consulting Group, Inc.
260 Merrimac Street
Newburyport, MA 01950
978.463.0400
dboecher@darlingconsulting.com
Historical Fed Funds Effective Rate

Rate Cycles from 1960 to Present

- Last 5 full rate cycles in blue
- Average rate 5.5% since 1960
- Historic lows
  - ZIRP since 2009
  - 500bp below 2007
  - 600bp below 2000
  - 1000bp below 1989
  - 1900bp below 1981

- Which way next?
How Will Your Deposits React to Rising Rates?

What’s your institution’s playbook for the next rising rate cycle?
3 Strategic Benefits of Deposit Studies

Organizational Cash Prizes Available for Understanding …

1. **Know Your Pricing & Depositor Behaviors**
   - Seamless communication of pricing strategy at ALCO important
   - Identify potential “stickiness” factors (direct deposit, bill pay, relationships)
   - Segment your accounts to measure “sticky” depositor behavior

2. **Know Your Loan Extension Capacity**
   - Identify your deposit capacity to support holding longer-term loans
   - Design deposit marketing programs for best retention and profitability

3. **Know What Deposits You Can Hedge**
   - Identify deposit accounts that can support hedging strategies now
How Core Are Your Deposits?

A. Strategic Benefits to Understanding Your Deposits
   - Importance, 2 Options, SWOT, Pricing & Stickiness, Hedging, Loan Extension, Art & Science

B. Regulators, Deposit Studies, & Fables
   - Regulatory Pendulum, Regulatory Expectations, 3 Little Deposit Study Pigs, Sample Bank

C. Strategic Deposit Studies & the Basic Math You Need to Know
   - Analysis, Communication, Beta, Decay, Volatility, Sample Bank

D. Sensitivity Analysis & Stress Testing
   - IRR Sensitivity Analysis, Liquidity CFP, Stress Testing Guidance for Banks over $10B

E. Deposit Modeling Surveys & Conclusions
   - Surveys, Pricing, Hedging Possibilities, Stickiness, Next Steps
NMDs Important Strategically

Important Modeling Assumption

• Represents 58% of industry total funding
• Deposits are the “lifeblood” of financial institutions
  – facilitating ability to lend, invest, and drive earnings

• As you’ve lowered rates, have funds rolled in?
  – Industry had 9% annual growth rate since 2008
  – Not much more downward rate room at many banks
  – Focus upon asset side of balance sheet

• Much “untapped” value and risk in deposit base
Two Key Non-Maturity Deposit Options

Greatly Complicate NMD Modeling and Strategy…

• Rate option – bank possesses a rate option
  – Bank can change rates paid on NMD at any point
  – Relationship between NMD rates and market rates is known as “beta”

• Volume option – customer has a volume option
  – Customers can change deposit volumes by adding or withdrawing funds
  – Earnings simulation assumes constant volumes
  – EVE assumes decay over time
Deposits in a SWOT Context

*Deposits are Important in a Wider Value Creation and Preservation Context…*

Enterprise Strategy & Risk Management – “ESRM”

- **Enterprise Strategy Mgmt**: Strategy to implement Helpful to achieving objectives
- **Enterprise Risk Mgmt**: Risks to mitigate Harmful to achieving objectives

**Internal Origin**
- **S**: Strengths
- **O**: Opportunities

**External Origin**
- **W**: Weaknesses
- **T**: Threats
Strategic Benefit #1: Strategic Pricing

Clear Pricing Communication & Stickiness Factor Segmentation

- Do all members of ALCO understand how you’ve priced your deposits in the past and how you intend to price them if rates rise?
  - Do you have quantitative & qualitative support for your betas?
  - Are team members aware of your rising rate NMD betas?
  - If Yes, strategic communication simple
  - Can know pricing impact on IRR position immediately with any rate move

- Do your NMD accounts contain both stable and volatile balances?
  - Do you expect that all of your MMDAs will behave the same?
  - How would depositors react to your Perfect Storm?
  - What portion of your depositors will leave when rates rise?
  - 9% annual growth since 2008 is above 1% industry growth 2004-2008
Strategic Benefit #2: Capacity for Extension

Do Your Deposits Provide the Capacity for Loan Extension?

• Heated debates raging about holding long-term fixed rate loans
  – Investment portfolio yields insufficient to cover operating expenses
  – Competitive lending environment with demand for long-term fixed rate loans

• Given historical low rate environment, facing at least 3 alternatives:
  – Accept shrinking margins with the hope balance sheet can support overhead until asset yields improve
  – Take on additional credit risk to maintain yields and accept the downside risk
  – Take on additional interest rate risk (for example, book longer-term loans)

• Consider how funding sources might behave in a rising rate environment
  – Robust deposit analysis can increase comfort level with deposit duration
  – Robust deposit analysis can increase comfort level with pricing sensitivity
  – Sensitivity analysis and stress testing can show the impacts of being wrong
  – Armed with this information, can make better strategic decisions
Strategic Benefit #3: Hedging IRR

Are You Aware of Deposit Hedging Possibilities?

• Do you have deposit accounts with a strong relationship to market rates?
  – Most banks have a few such accounts
  – Opportunity today with hedges priced at historical lows
  – Pricing will become unattractive when rates rising
  – Today may not be right time to hedge, but good time to know alternatives

• Have you done IRR hedging in the past?
  – Don’t do what you don’t understand
  – Training is a vehicle to understanding
  – Are you aware of accounting requirements for hedging?
  – In-house accounting or out-sourced hedge accounting?
The Art & Science of Risk Management

Must Balance the “Art” and the “Science” of Risk Management to Win…

Art – Qualitative Judgment

- Creative, Open, Possibilities
- Verbal, right brain
- Community Bank focus & obsession
- “The Brain is the Computer”

- Informed by past
  - Individual “expert” experiences

Science – Risk Quantification

- Logical, Rigid, “the Answer”
- Math, left brain
- Mega Bank focus & preoccupation
- “The Computer is the Brain”

- Informed by past
  - Organizational experiences
Risk Quantification: Probability & Expected Values

Will Banks One Day Need to Quantify Expected Values Like Casinos?

Coin Flipping Game

Heads → Win $20
Tails → Win $10

Bank risk modeling also has uncertain outcomes...

...but there are predictable long term trends that can be quantified.
Risk Quantification: Probability & Expected Values

Will Banks One Day Need to Quantify Expected Values Like Casinos?

Coin Flipping Game

Heads $20
Tails $10

What would you pay to play?

Even though the outcome of any particular game is uncertain, there is a predictable long-term trend that can be quantified.

Bank risk modeling also has uncertain outcomes…

…but there are predictable long-term trends that can be quantified.

Will firms that rigorously apply expected value math have better outcomes over the long run? Is there a competitive advantage?

Las Vegas casinos are experts at capitalizing on expected value.

Would you pay $14?
Would you pay $16?
Lower than the expected value
Higher than the expected value
Agree to play!
Refuse to play!
How Core Are Your Deposits?

A. Strategic Benefits to Understanding Your Deposits
   Importance, 2 Options, SWOT, Pricing & Stickiness, Hedging, Loan Extension, Art & Science

B. Regulators, Deposit Studies, & Fables
   Regulatory Pendulum, Regulatory Expectations, 3 Little Deposit Study Pigs, Sample Bank

C. Strategic Deposit Studies & the Basic Math You Need to Know
   Analysis, Communication, Beta, Decay, Volatility, Sample Bank

D. Sensitivity Analysis & Stress Testing
   IRR Sensitivity Analysis, Liquidity CFP, Stress Testing Guidance for Banks over $10B

E. Deposit Modeling Surveys & Conclusions
   Surveys, Pricing, Hedging Possibilities, Stickiness, Next Steps
Regulatory Pendulum

Good Times

Free Enterprise ("new economy")
Optimism
Decreased Regulation
“Geniuses” & “Heroes”

Example:
1999 boom led to GLBA repeal Glass-Steagall

Bad Times

Question Capitalism ("end of capitalism")
Pessimism
Increased Regulation
“Idiots” & “Villains”

Example:
Great Depression 4Q08 Financial Crisis

Now: increased emphasis on stress testing & deposit studies
Regulators Know NMD Importance

Institutions must address uncertainties associated with NMD assumptions. Universal need for supportable assumptions has accelerated “deposit studies.”

Recent Guidance & Deposits

- Interagency Policy Statement on Funding and Liquidity Risk Management (3-17-10)
- Interagency Advisory on IRR (1-11-10)
- Advisory on IRR FAQs (1-12-12) – assumption questions 11 and 12

Risk type

- LIQUIDITY
- INTEREST RATE
- INTEREST RATE
Regulator Expectations

Important Points of Regulatory Emphasis…

• Recommend **sensitivity analysis** where material
• Assess **management’s understanding** of NMD assumptions and any studies
• Recommend that assumptions are supported by both logical **qualitative** and **quantitative** factors
• Recommend **start collecting data** if no quantitative support presently exists
• Recommend a “**no growth**” NMD scenario in simulation if projecting material growth
Three Deposit Study Alternatives

*Like the Little Pigs Fable, Only One Decision Works Out…*

- **Fable of the 3 little pigs and the big bad wolf**
  - 3 decisions, only 1 works out
- **Fable of 3 little bankers and the big bad Fed**
  - 3 decisions, only 1 ultimately works out
  - Study should be informative, educational, and clarify strategic issues
  - Can do internal deposit analysis or out-sourced study, but be strategic!

<table>
<thead>
<tr>
<th>Pig #1</th>
<th>Pig #2</th>
<th>Pig #3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wait for</strong> regulators to mandate documentation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Build a house of straw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Get eaten</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Do something</strong> to avoid regulatory criticism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Build a house of wood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Last an exam longer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Anxiety, then get eaten</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Do a strategic study</strong> for benefit beyond compliance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Build a house of brick</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Wolf (Fed) down chimney</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Wolf does not bother again</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Live happily ever after</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case Study: Fictitious “FMS Bank”

Thinking Through Deposit Analysis for a Sample Bank

• Suppose you are a $1 billion commercial bank
• Growing steadily since 1990 with some acquisitions
• Ratio of Loans/Assets = 75%
  – Mix commercial, CRE, and consumer loans
• Ratio of Deposits/Assets = 90%
  – NMDs at 80% assets (consistent NMD growth)
  – Mostly Savings & MMDAs
Case Study: FMS Bank

Thinking Through Deposit Analysis for a Sample Bank

Funding Mix

Source: SNL Financial, LC
Case Study: FMS Bank

NMDs Bigger Percentage, So “Let’s Do a Deposit Study…”
# How Core Are Your Deposits?

## A. Strategic Benefits to Understanding Your Deposits
- Importance
- 2 Options
- SWOT
- Pricing & Stickiness
- Hedging
- Loan Extension
- Art & Science

## B. Regulators, Deposit Studies, & Fables
- Regulatory Pendulum
- Regulatory Expectations
- 3 Little Deposit Study Pigs
- Sample Bank

## C. Strategic Deposit Studies & the Basic Math You Need to Know
- Analysis
- Communication
- Beta
- Decay
- Volatility
- Sample Bank

## D. Sensitivity Analysis & Stress Testing
- IRR Sensitivity Analysis
- Liquidity CFP
- Stress Testing Guidance for Banks over $10B

## E. Deposit Modeling Surveys & Conclusions
- Surveys
- Pricing
- Hedging Possibilities
- Stickiness
- Next Steps
Analysis Communication Framework

*Analysis Considers All Deposit Facts and Assembles Toward Clearly Communicated Strategic Conclusions*

Humility

Specifics

Confidence

Conclusion

General

Specific Specifics

www.fmsinc.org | 800-ASK-4FMS
Key Term Definitions

Basic Math Quantification Improves ALCO Communication

Key Terms

- **Beta** – the correlation between NMD rates and market rates (or % move)

- **Decay Rate** – the speed at which a NMD balance runs off

- **Average Life** – the average period of time a NMD balance is outstanding

- **Volatility** – the fluctuation in NMD balances (Surge – upward balance fluctuation since a specified time)

Math You Should Know

- **Algebra** (Stats: “Linear Regression”)
  - Expected Return on a Stock is Return on Market x Beta factor
  - \( R_{(stock)} = \beta \times R_{(S&P 500)} \)
  - \( NMD \text{ rate} = Beta \times \text{Market rate move} \)
  - \( R_{(NMD)} = \beta \times R_{(LIBOR)} \)

- **Statistics** (Standard Deviation)
Case Study: **Beta** at FMS Bank

*Eyeball NMD Beta Since 2004…*

**Interest Bearing Non-Maturity Deposits**

![Graph showing trends in Interest Bearing Non-Maturity Deposits over time.](image)

*Source: SNL Financial, LC*
Case Study: Beta at FMS Bank

Rising Rate Betas…Single Factor Regression

Full Rising Cycle 437bp Increase from March 2004 - June 2006

<table>
<thead>
<tr>
<th>Account Type</th>
<th>Beta</th>
<th>R-Squared</th>
<th>Functional Result</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>MMDA</td>
<td>56%</td>
<td>89%</td>
<td>Yes</td>
<td>High R-Squared</td>
</tr>
<tr>
<td>MMDA - Business</td>
<td>56%</td>
<td>89%</td>
<td>Yes</td>
<td>High R-Squared</td>
</tr>
<tr>
<td>MMDA - Cash Mgr Reserve</td>
<td>56%</td>
<td>89%</td>
<td>Yes</td>
<td>High R-Squared</td>
</tr>
<tr>
<td>NOW</td>
<td>0%</td>
<td>5%</td>
<td>No</td>
<td>Low R-Squared</td>
</tr>
<tr>
<td>NOW - Business</td>
<td>0%</td>
<td>5%</td>
<td>No</td>
<td>Low R-Squared</td>
</tr>
<tr>
<td>NOW - Health Savings</td>
<td>0%</td>
<td>5%</td>
<td>No</td>
<td>Low R-Squared</td>
</tr>
<tr>
<td>Public DDA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Public MMDA</td>
<td>56%</td>
<td>89%</td>
<td>Yes</td>
<td>High R-Squared</td>
</tr>
<tr>
<td>Public NOW</td>
<td>0%</td>
<td>5%</td>
<td>No</td>
<td>Low R-Squared</td>
</tr>
<tr>
<td>Public Savings</td>
<td>3%</td>
<td>63%</td>
<td>Possible</td>
<td>Moderate R-Squared</td>
</tr>
<tr>
<td>Savings</td>
<td>3%</td>
<td>63%</td>
<td>Possible</td>
<td>Moderate R-Squared</td>
</tr>
<tr>
<td>Savings - Business</td>
<td>3%</td>
<td>63%</td>
<td>Possible</td>
<td>Moderate R-Squared</td>
</tr>
<tr>
<td>Savings - IRA</td>
<td>3%</td>
<td>63%</td>
<td>Possible</td>
<td>Moderate R-Squared</td>
</tr>
</tbody>
</table>

• High $R^2$ over 80% provides useful quantitative information
  – Hedge possibilities for MMDA
The Coefficient of Determination: $R^2$

A Simple Explanation of the Power of $R^2$

- Suppose that there is a simple linear regression model
  - There are two variables, $x$ and $y$
  - For example, $x$ is **3 month LIBOR** rate and $y$ is **NMD rate**
  - The goal is to be able to use $x$ to predict $y$, so use a regression to quantify the linear relationship between $x$ and $y$

- $R^2$ is a measure of how close the linear relationship between $x$ and $y$ is
  - When $R^2$ is close to 1, the relationship is almost exactly linear
  - When $R^2$ is close to 0, the relationship is barely predictive

- $R^2$ gives the percent of the variability in $y$ that is explained by $x$
  - For example, if the $R^2$ is 60%, then the introduction of $x$ into the regression model explains 60% of the variability in $y$
  - The remaining 40% of the variability can be explained by other factors that are not modeled or by randomness
Case Study: **Beta** at FMS Bank

Management’s Judgment Can Override the Math...

- If high $R^2$ and more conservative $\rightarrow$ **quantitative** (study) betas used
- If low $R^2$ $\rightarrow$ **qualitative** (model) betas used
- If high $R^2$ and less conservative $\rightarrow$ management decision considering strategy
Case Study: **Decay Rates** at FMS Bank

*Can Use Account Closure or Volume Decay Method*

- **Baseline Aggregate Average Decay of 13%**
  - Largest accounts - DDA and MMDA (s) in this range
  - NOW Account lower than aggregate average (9%)
Case Study: **Average Lives** at FMS Bank

*Can Use Account Closure or Volume Decay Method*

- Baseline aggregate average life of 6.5 years
  - MMDA 6 years, NOW 7 years, DDA 5 years
  - Stressed average lives = 3.5 to 5.0 years on average
Case Study: Baseline **Volatility** at FMS Bank

*Can Use Standard Deviation Over Average Monthly Changes*

- Baseline 6% aggregate volatile NMD estimate
  - Utilize 5%-10% for volatile NMD in normal Liquidity Planning
- Strategic Risk Tolerance question:
  - At what % NMD runoff do we take action (alter duration of assets or borrowings to offset the IRR exposure)?
  - Conservative to runoff this % immediately for EVE modeling
Case Study: **Stress Volatility** at FMS Bank

*Can Use Two Standard Deviations Over Average Monthly Changes*

- Stressed 12-17% aggregate volatile NMD estimate
  - Calculated average monthly balance changes and adding two standard deviations
  - Translates to $136M-$185M of Stressed Volatility
- Strategic Risk Management Implications:
  - Math supports 12-17% annual NMD runoff stress test for IRR & liquidity purposes
  - Consider 25% annual NMD runoff stress test for IRR & liquidity purposes
How Core Are Your Deposits?

A. Strategic Benefits to Understanding Your Deposits
   - Importance, 2 Options, SWOT, Pricing & Stickiness, Hedging, Loan Extension, Art & Science

B. Regulators, Deposit Studies, & Fables
   - Regulatory Pendulum, Regulatory Expectations, 3 Little Deposit Study Pigs, Sample Bank

C. Strategic Deposit Studies & the Basic Math You Need to Know
   - Analysis, Communication, Beta, Decay, Volatility, Sample Bank

D. Sensitivity Analysis & Stress Testing
   - IRR Sensitivity Analysis, Liquidity CFP, Stress Testing Guidance for Banks over $10B

E. Deposit Modeling Surveys & Conclusions
   - Surveys, Pricing, Hedging Possibilities, Stickiness, Next Steps
Supervisory Guidance on Stress Testing for Banks over $10B

Four Approaches

1. Scenario Analysis
2. Sensitivity Analysis
3. Enterprise-Wide Stress Testing
4. Reverse Stress Testing
APPREACH #2: Sensitivity Analysis

Supervisory Guidance on Stress Testing for Banks >$10B

- Assessment of exposures when **certain variables**, parameters, and inputs are “**stressed**” or “**shocked**”

- Test the **impact of assumptions on outcomes**

- Differs from scenario analysis in that it involves changing variables without an explicit reason or narrative, in order to **explore** what occurs under a range of inputs and **extreme** levels

- Estimate the impact from a change in **one or more key variables**

- Can be **used for scenario design**

- Sensitivity analysis examples
  - Loans – prepayment rate changes and credit rating migration
  - Credit loss impact of increase default rates and falling collateral values
  - **Deposits** – impact of beta changes, volume changes and combinations
Case Study: **Baseline Earnings Simulation**

Need a Baseline From Which to Sensitivity Test

---

**Sample Bank Base Simulation**

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Net Interest Income ($000)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 1</strong></td>
<td>23,500</td>
<td>24,200</td>
<td>24,900</td>
<td>25,600</td>
<td>26,300</td>
<td>27,000</td>
<td>27,700</td>
<td>28,400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 2</strong></td>
<td>28,400</td>
<td>29,000</td>
<td>29,600</td>
<td>30,200</td>
<td>30,800</td>
<td>31,400</td>
<td>32,000</td>
<td>32,600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 3</strong></td>
<td>32,600</td>
<td>33,200</td>
<td>33,800</td>
<td>34,400</td>
<td>35,000</td>
<td>35,600</td>
<td>36,200</td>
<td>36,800</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 4</strong></td>
<td>36,800</td>
<td>37,400</td>
<td>38,000</td>
<td>38,600</td>
<td>39,200</td>
<td>39,800</td>
<td>40,400</td>
<td>41,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Year 5</strong></td>
<td>41,000</td>
<td>41,600</td>
<td>42,200</td>
<td>42,800</td>
<td>43,400</td>
<td>44,000</td>
<td>44,600</td>
<td>45,200</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NII SUMMARY**

<table>
<thead>
<tr>
<th>Year</th>
<th>Down 100BP</th>
<th>Base</th>
<th>Up 200BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 NII</td>
<td>93,524</td>
<td>108,572</td>
<td>123,610</td>
</tr>
<tr>
<td>Year 2 NII</td>
<td>94,376</td>
<td>109,369</td>
<td>124,314</td>
</tr>
<tr>
<td>Year 3 NII</td>
<td>92,357</td>
<td>107,223</td>
<td>121,335</td>
</tr>
<tr>
<td>Year 4 NII</td>
<td>91,220</td>
<td>105,942</td>
<td>119,452</td>
</tr>
<tr>
<td>Year 5 NII</td>
<td>93,371</td>
<td>109,395</td>
<td>117,549</td>
</tr>
</tbody>
</table>
Case: Volume Sensitivity Testing

25% of NMDs Switch to FHLB Borrowings

Sample Bank Base Simulation

Sample Bank Stress Test: Non-Maturity Deposit Migration

NE SUMMARY

<table>
<thead>
<tr>
<th>Year</th>
<th>Base</th>
<th>Up 200BP</th>
<th>Up 400BP 24M</th>
<th>Flat Up 500BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 Final</td>
<td>100,672</td>
<td>99,816</td>
<td>99,677</td>
<td>99,274</td>
</tr>
<tr>
<td>Year 2 Final</td>
<td>98,305</td>
<td>97,714</td>
<td>97,109</td>
<td>96,733</td>
</tr>
<tr>
<td>Year 3 Final</td>
<td>97,233</td>
<td>101,355</td>
<td>102,644</td>
<td>102,615</td>
</tr>
<tr>
<td>Year 4 Final</td>
<td>96,842</td>
<td>104,482</td>
<td>107,848</td>
<td>109,138</td>
</tr>
<tr>
<td>Year 5 Final</td>
<td>95,945</td>
<td>107,048</td>
<td>114,648</td>
<td>117,597</td>
</tr>
</tbody>
</table>

NII SUMMARY

<table>
<thead>
<tr>
<th>Year</th>
<th>Base</th>
<th>Up 200BP</th>
<th>Up 400BP 24M</th>
<th>Flat Up 500BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 Final</td>
<td>100,572</td>
<td>99,000</td>
<td>98,777</td>
<td>99,110</td>
</tr>
<tr>
<td>Year 2 Final</td>
<td>98,005</td>
<td>96,502</td>
<td>96,742</td>
<td>96,150</td>
</tr>
<tr>
<td>Year 3 Final</td>
<td>97,223</td>
<td>92,017</td>
<td>92,500</td>
<td>70,872</td>
</tr>
<tr>
<td>Year 4 Final</td>
<td>96,042</td>
<td>96,103</td>
<td>96,807</td>
<td>68,090</td>
</tr>
<tr>
<td>Year 5 Final</td>
<td>95,945</td>
<td>97,759</td>
<td>97,744</td>
<td>95,571</td>
</tr>
</tbody>
</table>

CHANGE / DIFFERENCE IN RESULTS

<table>
<thead>
<tr>
<th>Year</th>
<th>Base</th>
<th>Up 200BP</th>
<th>Up 400BP 24M</th>
<th>Flat Up 500BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1 Final</td>
<td>0</td>
<td>-320</td>
<td>-320</td>
<td>-1,158</td>
</tr>
<tr>
<td>Year 2 Final</td>
<td>0</td>
<td>-1,122</td>
<td>-11,167</td>
<td>-14,248</td>
</tr>
<tr>
<td>Year 3 Final</td>
<td>0</td>
<td>-2,316</td>
<td>-17,103</td>
<td>-21,043</td>
</tr>
<tr>
<td>Year 4 Final</td>
<td>0</td>
<td>-3,349</td>
<td>-17,261</td>
<td>-22,548</td>
</tr>
<tr>
<td>Year 5 Final</td>
<td>0</td>
<td>-5,328</td>
<td>-17,394</td>
<td>-22,018</td>
</tr>
</tbody>
</table>

In the Up 200bp, Up 400bp, and Flat Up 500bp scenarios 25% of non-maturity deposits shift to a 1Y FHLB Advance every month over 5-10. Please refer to the Stress Test Methodology page for additional documentation.
Case: Beta Sensitivity Testing

Double NMD Betas

Sample Bank Base Simulation

Sample Bank Stress Test: Beta Sensitivity

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>100,217</td>
<td>98,916</td>
<td>99,987</td>
<td>99,274</td>
</tr>
<tr>
<td>Up 200BP</td>
<td>98,714</td>
<td>98,708</td>
<td>97,883</td>
<td>97,272</td>
</tr>
<tr>
<td>Up 400BP 24M</td>
<td>101,056</td>
<td>103,041</td>
<td>103,616</td>
<td>103,166</td>
</tr>
<tr>
<td>Flat Up 500BP</td>
<td>107,049</td>
<td>114,948</td>
<td>117,857</td>
<td>119,967</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>100,373</td>
<td>98,357</td>
<td>98,357</td>
<td>98,357</td>
</tr>
<tr>
<td>Up 200BP</td>
<td>98,373</td>
<td>98,373</td>
<td>98,373</td>
<td>98,373</td>
</tr>
<tr>
<td>Up 400BP 24M</td>
<td>98,373</td>
<td>98,373</td>
<td>98,373</td>
<td>98,373</td>
</tr>
<tr>
<td>Flat Up 500BP</td>
<td>98,373</td>
<td>98,373</td>
<td>98,373</td>
<td>98,373</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>0</td>
<td>-761</td>
<td>-761</td>
<td>-956</td>
</tr>
<tr>
<td>Up 200BP</td>
<td>0</td>
<td>-2,040</td>
<td>-2,523</td>
<td>-4,041</td>
</tr>
<tr>
<td>Up 400BP 24M</td>
<td>0</td>
<td>-3,041</td>
<td>-5,753</td>
<td>-8,148</td>
</tr>
<tr>
<td>Flat Up 500BP</td>
<td>0</td>
<td>-3,708</td>
<td>-6,419</td>
<td>-9,122</td>
</tr>
<tr>
<td>Year-4 NII</td>
<td>0</td>
<td>-2,016</td>
<td>-4,672</td>
<td>-9,270</td>
</tr>
</tbody>
</table>

In the Up 200bps, Up 400bps, and Flat Up 500bps scenarios NMD betas are doubled. Please refer to the Stress Test Methodology page for additional documentation.
Case: Volume & Beta Sensitivity Testing

Double NMD Betas and Move 25% NMDs to FHLB
APPROACH #3: Enterprise-Wide Stress Testing

Supervisory Guidance on Stress Testing for Banks >$10B

- Involves assessing the **impact** of certain specified scenarios on **bank as a whole**, particularly with regard to capital and liquidity

- Can help **assess the full set of risks** under adverse events, but should be supplemented with other stress tests given limitations in capturing all risks and adverse outcomes in one test

- Scenario design involves **developing scenarios** that affect banking organization as a whole **from macroeconomic, market-wide, and firm-specific events**
  - **Consult with a large set of individuals within banking organization** to gain a wide perspective on how enterprise-wide scenarios should be designed to capture business risks

- Scenario **variables** serve as **link** between **narrative and tangible impact** on organization as a whole
Liquidity Stress Testing

Supervisory Guidance on Stress Testing for Banks over $10B

- Identify **vulnerabilities** related to **liquidity adequacy** in light of both firm-specific and market-wide stress events

- What are the **components of liquidity stress testing**?
  - Explore potential **funding shortfalls**, shortages in liquid assets, the inability to issue debt, exposure to **deposit outflows**, **volatility** in short-term brokered deposits, and sensitivity of funding to a **ratings downgrade**
  - Analyze the **impact of reduced collateral values on borrowing capacity**
  - **Explore** adverse market developments (i.e. freeze-up of credit/funding)
  - **Determine** whether organization has **sufficient liquidity buffer**

- Integral part of organization’s **Contingency Funding Planning**
Case Study: FMS Strategic Stress Testing

Clear Pricing Communication & Stickiness Factor Segmentation

- **Liquidity**
  - Baseline - 10% non-maturity deposit runoff over a year
  - CFP Stress - 25% non-maturity deposit runoff over a year (or a quarter)

- **Interest Rate Risk**
  - Baseline EVE - 10% immediate non-maturity deposit runoff
  - Stress EVE - 25% immediate non-maturity deposit runoff
  - Stress Earnings Simulation – 25% migration to wholesale funding

- **Capital Planning & Enterprise Wide Stress Testing**
  - Severely Adverse Scenario includes 25% non-maturity deposit runoff
  - Deposit behavior part of the stress testing “Perfect Storm”
How Core Are Your Deposits?

A. Strategic Benefits to Understanding Your Deposits
   Importance, 2 Options, SWOT, Pricing & Stickiness, Hedging, Loan Extension, Art & Science

B. Regulators, Deposit Studies, & Fables
   Regulatory Pendulum, Regulatory Expectations, 3 Little Deposit Study Pigs, Sample Bank

C. Strategic Deposit Studies & the Basic Math You Need to Know
   Analysis, Communication, Beta, Decay, Volatility, Sample Bank

D. Sensitivity Analysis & Stress Testing
   IRR Sensitivity Analysis, Liquidity CFP, Stress Testing Guidance for Banks over $10B

E. Deposit Modeling Surveys & Conclusions
   Surveys, Pricing, Hedging Possibilities, Stickiness, Next Steps
Can We Use Industry Decay Estimates?

FAQ #11 in 1-12-12 Advisory on IRR FAQs…

- **Not really** – should “reflect institution’s profile and activities and generally avoid reliance on industry estimates or default vendor assumptions.”
- **Maybe** – “Industry averages provide an approximation, but may not be suitable in every case.”
- **Not long term** – “Industry estimates should be a starting point until sufficient internal data sets can be developed.”
- **Next sentence promoting consultants?** – “An institution can contract with an outside vendor to assist with this process if necessary.”
- **Can do yourself, but analyze your deposits for strategic benefits!**
3 Strategic Benefits of Deposit Studies

Organizational Cash Prizes Available for Understanding …

1. **Know Your Pricing & Depositor Behaviors**
   - Seamless communication of pricing strategy at ALCO important
   - Identify potential “stickiness” factors (direct deposit, bill pay, relationships)
   - Segment your accounts to measure “sticky” depositor behavior

2. **Know Your Loan Extension Capacity**
   - Identify your deposit capacity to support holding longer-term loans
   - Design deposit marketing programs for best retention and profitability

3. **Know What Deposits You Can Hedge**
   - Identify deposit accounts that can support hedging strategies now
Questions?
About DCG

• Independent balance sheet/risk management consultancy
• Serving the industry for three decades
• Substantive and highly dedicated staff (80+ employees)
• More than 500 clients served annually
• Highly regarded speakers, authors, and educators:
  – Numerous professional and industry associations
  – Resource for examiners
DCG’s Services

• ALM model outsourcing and balance sheet advisory services

• Individual project-based services:
  – Model validation & process review
  – Liquidity review (including contingency planning)
  – Core deposit & loan prepayment studies
  – ALCO performance reviews
  – Capital planning / stress-testing

• Education
  – Workshops for management and board of directors
  – ALM model workshops
  – Annual balance sheet management conference
  – Examiner training
DCG Resources Available

• White Papers
  – ALM & ALCO
  – Liquidity Risk Management
  – ALM Modeling & Audits
  – ALCO Performance

• E-Mail Newsletters (Complimentary)
  – ALM Insights
  – DCG Bulletin

• DCG Website – DarlingConsulting.com
About DCG

• DCG provides balance sheet management solutions for banks, thrifts and credit unions across the United States. Our 80+ person professional team offers a unique and comprehensive approach to balance sheet management that incorporates specialized tools, educational programs, and unbiased advice for institutions between $20 million and $200 billion in assets. Working in partnership with senior management and boards of directors, we produce significant, quantifiable results for hundreds of financial institutions throughout the country.

• DCG’s menu of products and services include:
  – Timely and informative educational programs for executives and professional associations
  – Customized and pro-active advisory and consulting services in the areas of balance sheet management, investments and financial and strategic planning
  – Cost-effective outsourcing of the risk management and modeling process
  – Comprehensive model and assumption validation services in support of regulatory model risk management (OCC 2011-12 / SR 11-7) compliance
About DCG (continued)

• Find out more about balance sheet management by visiting our website DarlingConsulting.com

  – DCG WEB SITE Articles on bank profit and risk management
    ▪ Gateway to additional banking industry information/research
    ▪ Register for the annual balance sheet management conference
    ▪ Upcoming educational events around the country

  – ALM Insights & DCG Bulletin – DCG’s complimentary e-newsletters that address a variety of topical balance sheet and risk management issues

  – To register:
    ▪ Visit us: DarlingConsulting.com
    ▪ E-mail us: info@darlingconsulting.com
    ▪ Call us: 978-463-0400