



# Washington Bankers Association 2019 Executive Development Program Asset/Liability management

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## Brain Teaser to Start!

- You have an 11-minute hourglass and a 7-minute hourglass. You need to measure exactly 15 minutes. How do you do it?



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## What Is Asset/Liability Management?

- Asset/liability management (ALM) is the process of planning, controlling and monitoring financial performance to achieve financial goals of the capital plan.
- Financial risks are measured to determine if plan can be met in reasonable risk situations
  - Credit risks
  - Interest rate movements
  - Changes in liquidity position
  - Changes in regulatory expectations



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## Asset/Liability Defined

- Asset-liability management
  - The decision making process used to select & price assets & liabilities in order to meet financial performance goals
  - When done right, it is NOT simply a regulatory appeasement tool!
- Constraints:
  - Managing risks to board established acceptable levels
  - Meeting regulatory expectations
    - Capital
    - Earnings
    - Concentrations
  - While meeting financial targets



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## 6 Parts of the ALM Process

1. Set achievable financial goals
2. Identify levels of financial risk
3. Develop appropriate risk measurement systems
4. Integrate measurements into management process (the ALCO process)
5. Evaluate new ideas before implementation to determine risk
6. Implement & track new strategies to maximize performance

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## Financial Goals

- Earnings (ROE, ROA, Net Interest Margin)
  - No earnings, no survival.
  - Earnings provide engine to grow
- Capital (Real and Regulatory)
  - Measure of solvency
  - Balancing act between regulatory need and shareholder return
    - Too little in reserve may cause failure in unforeseen events
    - Too much in reserve costs shareholders money
- Managing goals requires the ability to project cash flows and future plans for assets and liabilities.
  - Financial risks develop from changes in actual versus expected cash flows



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Comptroller of the Currency  
Administrator of National Banks  
US Department of the Treasury

## Perspectives on Capital Planning

- **OCC Definition from April 2010 presentation titled *Capital Planning: The New Normal***

- Capital planning is one piece of a framework that must include business strategy, risk management, and corporate governance
- Capital planning is both art and science.
  - **It is not simply a mechanical mathematical exercise**
  - **It must look to the future and to stresses that had not been previously contemplated both on the business and on capital itself**
- The “new normal” means going back to the basics on many topics:
  - **Setting clear and understandable risk tolerances**
  - **Identifying and understanding risks across the enterprise**
  - **Developing and maintaining robust stress testing**
  - **Better linking capital to risk vs. setting arbitrary ROE and debt rating targets**



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## Capital Is King

- Since the economic crisis of 2009, financial institutions have been urged to increase capital levels
  - Examination reports
  - Regulatory guidance
  - New and proposed capital regulations
- Increasing capital results in less “leverage”
  - Deleveraging is saying more capital!
- Remember financial institutions manage ROE
  - $ROE = ROA * \text{leverage}$ 
    - $\text{Leverage} = \text{assets} / \text{capital}$
    - More capital = less leverage = less equity growth or shareholder return!
    - In order to grow assets (capital) more, must increase earnings in a commodity based industry! What does that spell for your strategic plan?



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## Capital Planning – Key To Risk\Return

- What is a capital plan?
  - Strategic alignment of planning, purpose, and implementation
    - Intersection of board goals, market opportunities, implementation plans
    - Sets umbrella for risk\return\strategy decisions in your institutions
- Defines targeted performance & connections between
  - Operating strategy,
  - Risk appetite\tolerance
  - Financial risk management needs,
  - Potential earnings, growth and capital options.
- Capital plan ensures strategic plans connect to desired results
  - Sets implementation process
    - Product design\pricing
    - Deliver channels



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## Capital Planning Defined

- “Capital planning is a dynamic and ongoing process that, in order to be effective, is ***forward-looking*** in incorporating changes in a bank’s ***strategic focus, risk tolerance levels, business plans, operating environment,*** or other factors that materially ***affect capital adequacy.***”
- The most effective capital planning considers both short- and longer-term capital needs and is ***coordinated with a bank’s overall strategy and planning cycles, usually with a forecast horizon of at least two years.***
  - From OCC 2012-16

Sound like a strategic plan?



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## Why is a Capital Plan Important

- Business strategies need to be developed and applied in the context of a business plan or strategy.
- Issues confronting FI's
  - Past asset quality issues affected earnings and capital accumulation in many shops.
  - The increased capital standards.
  - Formerly high liquidity levels that have dried up causing rising deposit costs that are decreasing spreads
  - Maturing loans and investments going back out at lower rates.
- Your capital plan feeds:
  - Core funding growth goals
  - Non-Regulatory core funding goals
  - Goals for overall level of investments
  - Goals for business plan or strategy we will be evaluating and stress testing

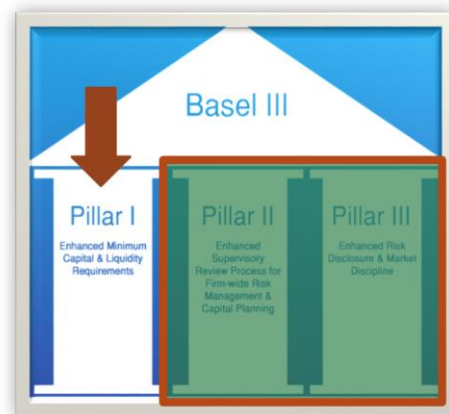


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## Bank BASEL III Capital Requirements

- How much capital is enough?
- New capital regulations
  - Changed focus from total assets to risk assets
  - New definition of “real” capital
    - Common equity vs.
    - Tier 1
  - Changed the ratios used for compliance
  - Established new MINIMUM standards
    - Expects you to hold MORE than minimums for safe & sound operation – a “buffer”
  - No guidance or process for determining the necessary “buffer” levels?



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## BASEL III Capital Definitions

### Common Equity Tier 1 Capital

- Common stockholder's equity,
- **Plus** Qualifying noncumulative perpetual **preferred** stock (including related surplus), and
- **Plus** Minority interest in the equity accounts of consolidated subsidiaries;
- **Plus** outstanding cumulative **preferred** perpetual stock;
- **Minus** all **intangible assets** except mortgage servicing rights that are included in tier 1 capital.

### Tangible Equity

- Subset of equity that is not **"preferred"** and not **"intangible"**.
  - Critically undercapitalized shops are those with this ratio below 2%
    - Will normally be closed within 90 days
- So what is that list then?
- Common Stockholder equity
  - Minority interests in equity of consolidated subsidiaries
  - Mortgage servicing rights

This definition is important later...



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## BASEL III Capital Definitions

### Additional Tier 1 Capital

- Qualifying perpetual preferred stock
- Bank-issued small business lending fund (SBLF) and TARP
- Qualifying tier 1 minority interests
- Note total tier 1 capital is sum of common equity and other tier 1 amounts

### Tier 2 Capital

- Allowance for loan and lease loss (capped at 1.25% of risk weighted assets)
- Qualifying preferred stock
- Subordinated debt
- Qualifying tier 2 minority interests
- Less deductions in tier 2 unconsolidated subsidiaries



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## PCA Basel I &amp; Basel III Requirements

Regulatory Capital Minimum Ratios (%)		
	Current Rule	Interim Final Rule
Tier 1 Leverage Capital	3.0 / 4.0	4.0
Common Equity Tier 1 Risk-based Capital	n/a	4.5
Tier 1 Risk-based Capital	4.0	6.0
Total Risk-based Capital	8.0	8.0

**Effective on January 1, 2015, for all banks**



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## PCA Basel I &amp; Basel III &amp; New CBLR Requirements

Regulatory Capital Minimum Ratios (%)		
	Prior Rule	Final Rule
Tier 1 Leverage Capital	3.0 / 4.0	4.0
Common Equity Tier 1 Risk-based Capital	n/a	4.5
Tier 1 Risk-based Capital	4.0	6.0
Total Risk-based Capital	8.0	8.0

**Effective on January 1, 2015, for all banks**



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# These are Minimums

the overall U.S. banking system. The agencies' general risk-based capital rules indicate that the capital requirements are minimum standards generally based on broad credit-risk considerations.<sup>60</sup> The risk-based capital ratios under these rules do not explicitly take account of the quality of individual asset portfolios or the range of other types of risk to which banking organizations may be exposed, such as interest-rate, liquidity, market, or operational risks.<sup>61</sup>

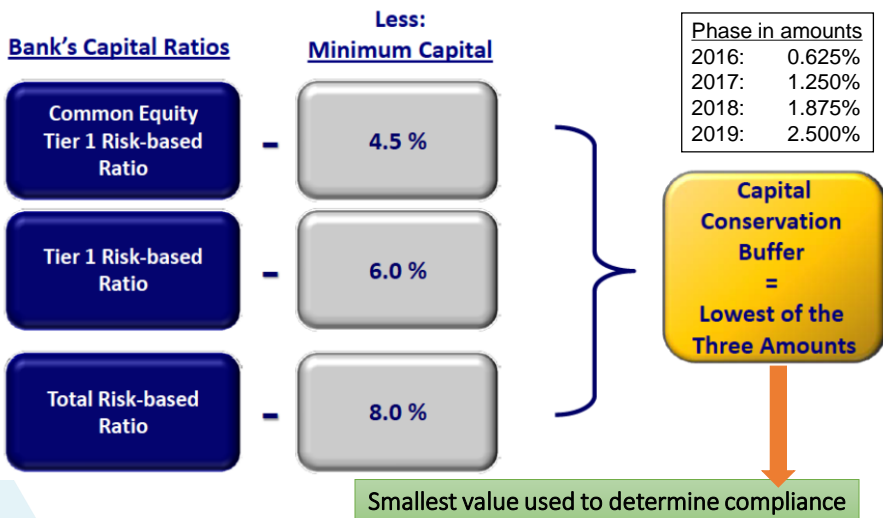
A banking organization is generally expected to have internal processes for assessing capital adequacy that reflect a full understanding of its risks and to ensure that it holds capital corresponding to those risks to maintain overall capital adequacy.<sup>62</sup> The nature of such capital

**How will you do this?**

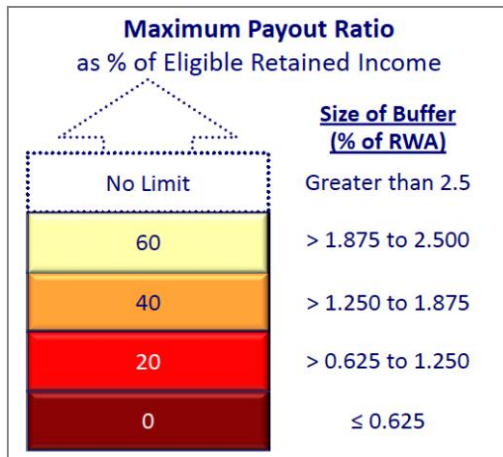
In light of these considerations, as a prudential matter, a banking organization is generally expected to operate with capital positions well above the minimum risk-based ratios and to hold capital commensurate with the level and nature of the risks to which it is exposed, which may entail holding capital significantly above the minimum requirements. For example,



# Capital Conservation Buffer



## Capital Conservation Buffer



- Restricts capital options based on buffer size
  - Dividends
  - Share buybacks
  - Discretionary payments on Tier 1 instruments
  - Discretionary bonus payments
- Eligible retained income:
  - 4 most recent quarters NI b4 current quarter,
  - net of capital distributions and discretionary bonus payments
- Regulator may impose further restrictions based on risk profile



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## Capital Conservation Buffer

Conservation Buffer Example	Determination of Buffer and Limit		
	Example Bank Ratios (%)	(less) Minimum Regulatory Capital Ratios (%)	Result (%)
Common Equity Tier 1 Risk-based Capital Ratio	7.50	4.50	3.00
Tier 1 Risk-based Capital Ratio	8.50	6.00	2.50
Total Risk-based Capital Ratio	9.00	8.00	1.00

Maximum Payout Ratio 20%

- Bankers need to pay close attention to all capital ratios to avoid potential restrictions on dividends, capital actions and bonus pay.



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## But wait, there's a new Capital Ratio Coming to Town...

- Community Bank Leverage Ratio
  - Designed to lower burden on smaller, well-capitalized banks
  - Open to banks with total consolidated assets <\$10 billion, ***and***
  - Limited levels of off-balance sheet exposures, trading assets/liabilities, mtg servicing assets, and deferred tax assets (DTAs)
  - If filing the “advanced approach”, not qualified for CBLR
- Calculation
  - Tangible equity capital / total consolidated assets
    - Tangible equity capital is total bank or holding company equity capital, prior to minority interests, excluding AOCI, DTAs, goodwill, and other intangible assets (other than mtg servicing rights)
- If CBLR > 9%, all other capital requirements are waived
  - Examiner judgement of risk can restrict if high risk levels are deemed to be present



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## So, what's in your capital wallet?

- Tangible equity...
- Common Equity...
- Common Risk Based Equity...
- Total Risk Based Equity...
- Community Bank Equity...



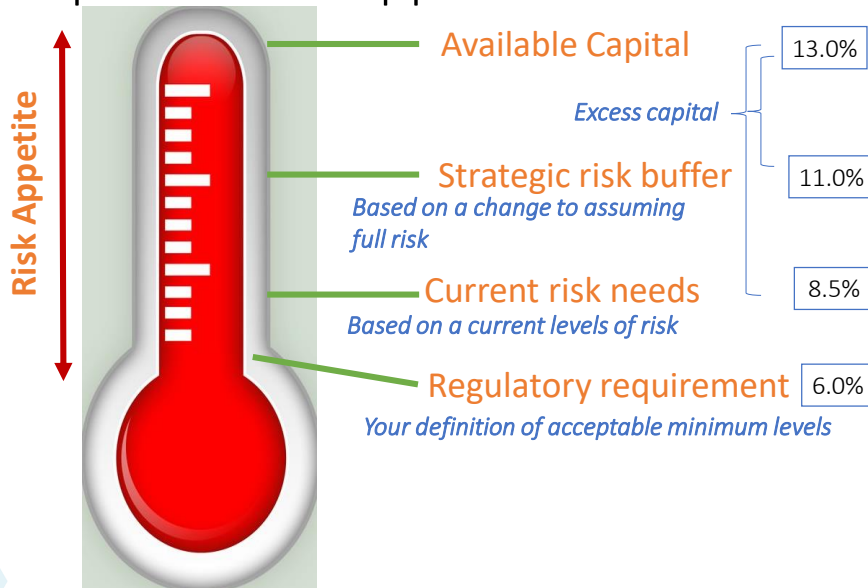
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## Defining Capital & Risk Appetite



## Effective Capital Planning Process

- **Set the planning horizon**
  - 2 year minimum (regulatory)
  - Ideally 3 to 5 year
- **Step 1 – Set long-range goals**
  - Balance equation of earnings, capitalization, & growth
  - Define desired balance sheet mix
    - Loans, investments, Non-earning assets
    - Core deposits, borrowing levels, other liabilities, capital
    - This sets up discussion on risk appetite
- **Step 2 – Set annual goals**
  - Determine annual progress goals
    - Think of training for a marathon if you have never run?
    - What is the plan that leads us to the desired financial goals?
    - Helps set risk tolerance
    - Provide framework for drilling down in greater detail
- **Step 3 – Model the base plan**
  - Determine if the plan can be achieved
- **Step 4 – Stress test the plan**
  - Model with alternative key assumptions to retest results

## Setting Achievable Financial Goals

- Step 1: Assess Long-Range Goals
  - 30% dividend payout ratio
  - Goal to increase capital 1% from 8% to 9%
  - Grow assets 5% per year
  - ROA Requirement = 2.02%!
  - Historical ROA 1.0%
- Is this a realistic set of goals? What can we “give up” to meet everyone’s wishes?

ROA Required to Reach a Desired Capital Ratio							
Beginning Assets	Total Capital	Target Capital Ratio	Annual Asset Growth	Additional Capital Needed	% of NI Divided Payout	\$ Dividend	Required ROA
\$ 200,000	\$ 16,000	9.00%	0.00%	\$ 2,000	30.00%	\$ 857	1.43%
\$ 200,000	\$ 16,000	9.00%	5.00%	\$ 2,900	30.00%	\$ 1,243	2.02%
\$ 200,000	\$ 16,000	9.00%	10.00%	\$ 3,800	30.00%	\$ 1,629	2.59%
\$ 200,000	\$ 16,000	9.00%	15.00%	\$ 4,700	30.00%	\$ 2,014	3.12%



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## ROA Needed to Reach 12% ROE

ROA targets to achieve 12% ROE		
Capital/Assets	ROE	ROA
6%	12%	0.72%
7%	12%	0.84%
8%	12%	0.96%
9%	12%	1.08%
10%	12%	1.20%
11%	12%	1.32%
12%	12%	1.44%
13%	12%	1.56%
14%	12%	1.68%

Will raising industry capital targets bring capital into the industry or drive it out?

Banking’s basic leverage equation:

$$\text{ROE} = \text{ROA} * \text{Leverage}$$

Where:

$$\text{Leverage} = \text{Assets}/\text{Capital}$$

Higher Capital = Lower ROE or the need for higher ROA to support growth

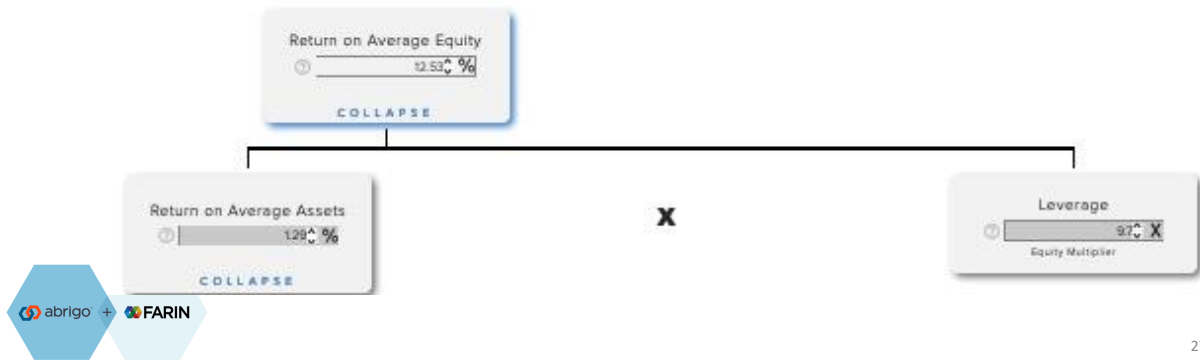


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## ROE = ROA \* Leverage

- Return on Equity: Net Income/Average Equity
  - Measure of return on stockholder investment
- Return on Assets: Net Income/Average Assets
  - Measure of return on the resources of the bank
- Leverage: Average Assets/Average Equity
  - How many assets are we putting to work for each \$1 of equity?



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## ALM Financial Goals

- Balancing Earnings, Growth & Capital
  - No earnings, no survival.
  - Earnings provide engine to grow
  - Grow too fast, capital and earnings pressure
  - Regulatory pressure to grow capital forces trade-off
    - Make more net income
    - Slow growth or shrink
- Set **PRIORITY** on specific goals!



What happens in this game if 3 teams pull together?

Think about growth, earnings, capital & risk



$$ROE = ROA * (Assets/Capital)$$

$$NI/AC = NI/AA * AA/AC$$

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## Sample of Prioritized Goals

### • 2018-2020 Goals in Priority Order:

1. Maintain current capital ratios with not less than a Tier 1 ratio of 9.5%
2. Earnings – (0.5%, 0.75% ROA),
3. Dividends- \$1 mm / yr
4. Increase Loan/Assets to 80% over 3 years,
  - Shift from RE to CRE in loan mix
5. Asset growth rate is the variable for plan
  - Manage growth rates to achieve to goals



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## Capital Goal Setting

- **Step 2: Move from Macro View (Step 1) to Annual Goals**
  - Set Year by Year goals for
    - Capital/Asset
    - Growth
    - Earnings
    - Dividend Payout
  - Establish a Priority for goals
    - Does Capital win over earnings or growth?
    - Is it time now to grow and let capital drop for a while?
    - Board establishes priority and risk limits
- **Step 3: ALCO and Management takes the results and determines viability and required actions necessary to hit annual goals**
  - Using ALM modeling what are the required changes to meet the overall plans
  - May involve more risks but can be measured against established limits



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# Setting Achievable Financial Goals

## • Stepping into Goals

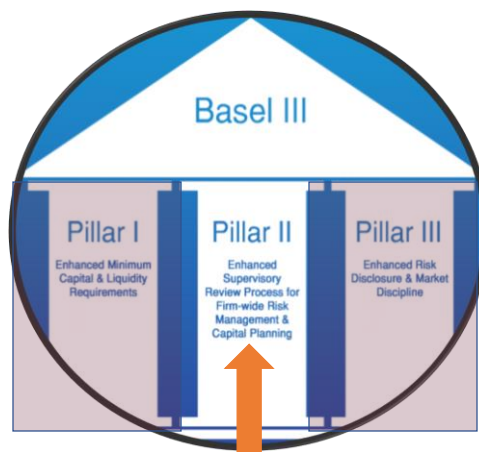
- Slowed growth rate of assets and planned capital target
- Dividend payout stays at 30%
- ROA returns to manageable levels

Year	Beginning Assets	Total Capital	Start Capital Ratio	Targeted Capital Ratio	Annual Asset Growth	Assets After Growth	Additional Capital Needed	% of NI Divided Payout	Required Net Income	ROA
Current	\$ 200,000	\$ 16,000	8.00%	8.25%	0.00%	\$ 200,000	\$ 500	30.00%	\$ 714	0.36%
Year 2	\$ 200,000	\$ 16,500	8.25%	8.35%	3.00%	\$ 206,000	\$ 701	30.00%	\$ 1,001	0.49%
Year 3	\$ 206,000	\$ 17,201	8.35%	8.45%	4.00%	\$ 214,240	\$ 902	30.00%	\$ 1,289	0.61%
Year 4	\$ 214,240	\$ 18,103	8.45%	8.50%	5.00%	\$ 224,952	\$ 1,018	30.00%	\$ 1,454	0.66%
Year 5	\$ 224,952	\$ 19,121	8.50%	8.50%	5.00%	\$ 236,200	\$ 956	30.00%	\$ 1,366	0.59%



# New Capital Standards

- Phase 2 - Build supervisory approach to new standards
  - What assessments will be made for risk profile
    - Interest rate risk
    - Liquidity risk
    - Credit Risk
  - How much additional capital is deemed enough for potential risks?
- Requires a capital plan



The new set of regulatory expectations...  
integrating risk management & capital planning





## ALCO's Primary Responsibilities

- Manage the level of net interest income/net income
- Management of balance sheet structure
  - Loan/investment & deposit/borrowing mix
  - Growth rates
  - Controlled through loan & deposit pricing
  - Investment portfolio management
    - Earnings impact
    - Liquidity needs
  - Wholesale funding
  - Capital utilization
- Risk measurement and management
  - Interest rate risk
  - Liquidity risk
  - Credit risk
  - Regulatory risk

So with a set of prioritized goals established, ALCO can now determine how best to meet these goals and what risks are inherent in hitting the targets.



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## How Do I make More \$?

Risk Appetite



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## Understanding Financial Risks

### • What financial risks impact core earnings?

- Credit risk: will the borrower of funds repay the committed amount?
- Liquidity risk: will we have enough funds to meet the demands for loans or deposit withdrawals?
- Interest rate risk: to what extent will the core earnings change if market interest rates change?

### • Factors in measuring risks

- Must be able to project cash flows (principal & interest)
- Must understand what may cause changes in flows
  - Embedded options
  - Pricing/customer behavior



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## How Much ROA Should You Make?

- Many institutions underperform potential earnings
  - Lack of risk taking
  - Concern over market conditions
- Most agree with concept of risk\return
  - what's missing from the "trade-off" talk is the notion of an expected or optimal return.
- Would you be happy earning 3% if you knew that 5% was possible with your situation?
  - "Optimal earnings frontier" sets out the target for the highest potential return given a defined level of risk
    - The expected level of risk for expected return



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## What Can You Really Expect to Earn?

- “Efficient earnings frontier”
- Concept of risk vs return concept is well accepted
- What’s missing in the “trade-off” talk is concept of maximum return.
- “Efficient earnings frontier” defines highest potential return for a defined amount of risk
  - Returns are limited by amount of risk accepted
  - Is THE target for evaluating risk\return trade-offs
  - Returns are not infinite unless risk can be expanded!
  - Think about all your “policy limits”

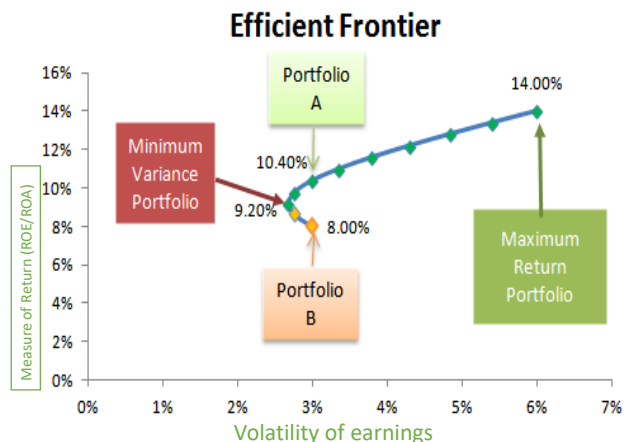


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## Optimal Earning Asset Combinations

- Mapping each “mix” vs. earnings volatility helps show risk\return options
- Most often higher returns mean higher volatility
  - What strategy has higher earnings potential and less “risk”



Where is your current and projected performance vs. actual?  
Given your “risk appetite” what is your “domain” of optimal return?



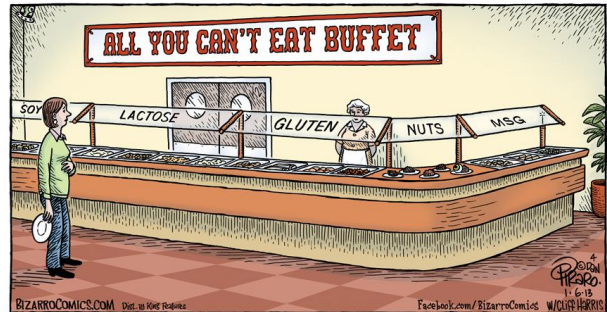
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## What's The Difference?

### Risk Tolerance

- Given an appetite for a particular risk sector, how much exposure are we willing to extend?
- Example: Concentration limits, EVE limits, etc. help define tolerance



Remember, earnings come from managing risk, not avoiding it.  
What **CAN** you manage? What **WILL** you manage?



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## Enterprise Risk Management (ERM)

- Definition:
  - An integrated approach to identifying, assessing, managing, and monitoring risk in a way that maximizes business success.
- Requires
  - Risk Management Systems to Assess “What Could Go Wrong”, as well as,
  - Understanding of what must go right to be successful



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## ERM and the ALCO

- ERM is a fancy name for an “integrated” or “dynamic” ALCO process
- Requires a straddle of old approaches and new ideas to be meaningful
- “This is a growing process...there are no right answers...”
  - Comments from the former OCC Deputy Director.
- Capital plan drives it all...



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## Interest Rate Risk

Risk Appetite



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## What Is Interest Rate Risk?

- Interest Rate Risk is the risk that an institution's **earnings AND market value** will change as market interest rate change.
  - Measures the amount of change in earnings or value under different rates.
  - The earnings at risk portion measures short-term changes to the income statement.
  - The market value at risk element measures long-term risks to earnings and relative value of assets & liabilities.
  - Both measures indicate the impact on earnings capacity – only difference is the horizon evaluated.



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## Joint Agency Policy on IRR

- First Adopted in 1996
  - Added the S component to CAMEL Rating
  - Developed Qualitative Assessment process for Examination
    - No Uniform Supervisory Measure
- Major Components
  - Board & Senior Management Oversight Roles
  - Risk Management Processes
    - Controls & Limits
    - Identification & Measurement
    - Monitoring & Reporting
    - Internal Audit & Review



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## Joint Agency Policy Statement: 5 Areas of Risk

1. Repricing Risk: Impact of mismatch of repricing timing or amount on earnings/capital
2. Basis Risk: How different balance sheet components respond to market rate movements due to driver response
  - Example: Libor vs. Prime movements
3. Yield Curve Risk: Recognition that Yield Curves do not move the same amounts for all maturities (non-parallel movements)
4. Price Risk: Changes in market values of financial instruments and the impact on the market value of capital.
5. Option Risk: Changes to cash flows resulting from rate movements



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## 2010 FFIEC IRR Guidance

- 2010-1A IRR Regulatory Guidance
  - Issued December 2009
- Restatement of 1996 Joint Agency Policy Statement on Interest Rate Risk
  - FIL-52-96 Joint Agency Policy Statement: Interest Rate Risk
  - <http://www.fdic.gov/news/news/financial/1996/fil9652.html>
- 3 Major Issues:
  - Effective Policies & Governance
  - Effective Measurements
  - Meaningful & Adequate Reporting



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## 2010 FFIEC IRR Guidance

### • *What to Measure*

- To obtain “Well Managed” rating, must measure both earnings & economic value at risk
- Must extend simulation of Income at Risk to minimum of 2 years.
- If you are using dynamic balance sheet modeling, you must also run a static balance sheet.
  - Why? Minimize Assumption Risk
  - Must be able to prove your model is effective at measuring real risks



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## Interest Rate Risk Redefined

### • Income Portion of Definition

- Reinvestment risk is the risk that as one instrument matures and is replaced with another, the funds being reinvested will carry a different interest rate than the funds in the original instrument.
  - Example - a customer's \$10,000 90-day CD yielding 6% is about to mature. Tomorrow we'll pay her \$10,150 P&I. If we wish to continue to fund the asset supported by the CD, we'll have to replace the \$10,000. In order to do so we'll have to pay prevailing market rates, which might mean something other than 6%. At that point the \$10,000 reprices. Our cost of funds may rise or fall.
- Reinvestment risk is not a problem as long as it's occurring at approximately the same speed on both assets and liabilities.



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## Institutional ALCO Approaches

### Regulatory Approach

- Run For Regulatory Compliance
  - Income at Risk - Static
  - Value at Risk - Historical
  - Maybe some Liquidity Testing
- Often outsourced
  - Cost/Time Savings
  - Duplicated Effort for Budgeting
- May Use Same Tool for Budget & Board Reports

### Management Approach

- Used to assess risk/return trade offs
- Run dynamic models of budgets/business plans
  - Regular update and roll of plan
  - Combine with regulatory analysis
- Usually in-house or high-end outsource
  - May split functions



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## Key Interest Rate Risk Question

- If Market Rates Move, How much will Bank Earnings Change?
  - Why do we care?
    - Profitability for Shareholder Distribution
      - Dividends
      - Stock Buy Back
    - Capital/Asset Levels
      - Earnings Feed Capital
      - Growth in Earnings LESS than Asset Growth reduces "safety" of the bank
    - Stock Price
      - Stock prices based on sustainable earnings
      - Investors do not like volatile earnings!
  - How do we traditionally measure this risk?
    - Test the impact of an immediate rise or fall in market rates (shocks)

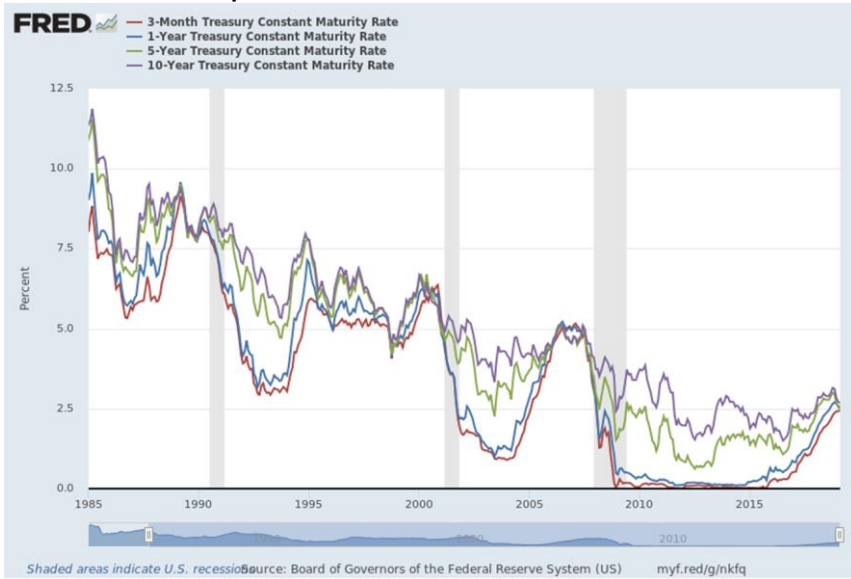


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# Historical Rate Comparison

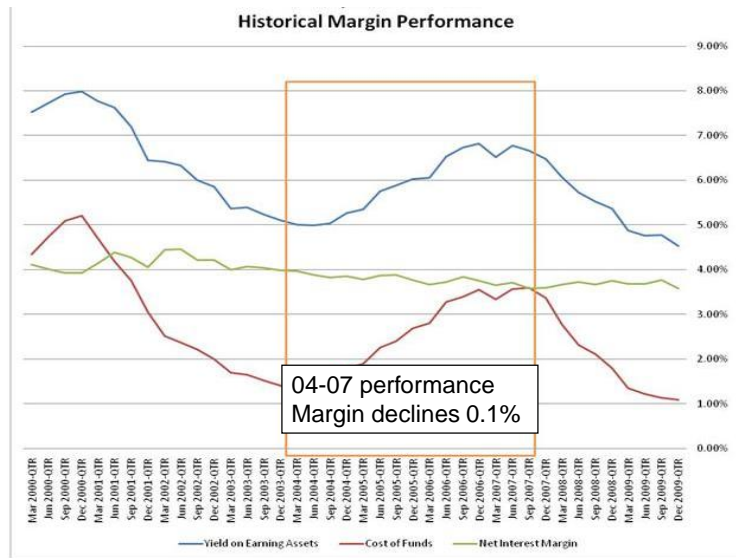
- Since 1986, has there ever been an immediate and parallel rate shock?
- This graphs explains both yield curve and basis risk management!



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# Bank Margin Performance – Changing Rates

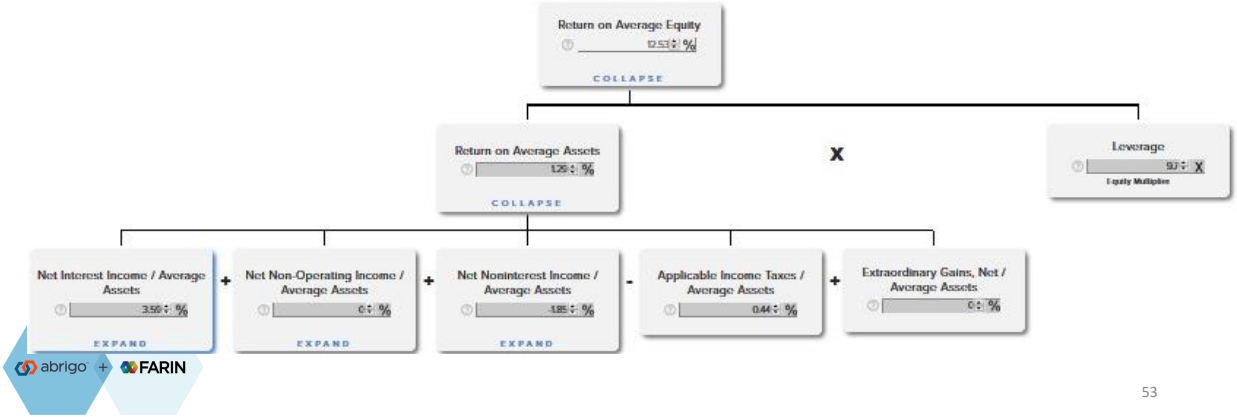


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## Bank Margin Performance – Changing Rates

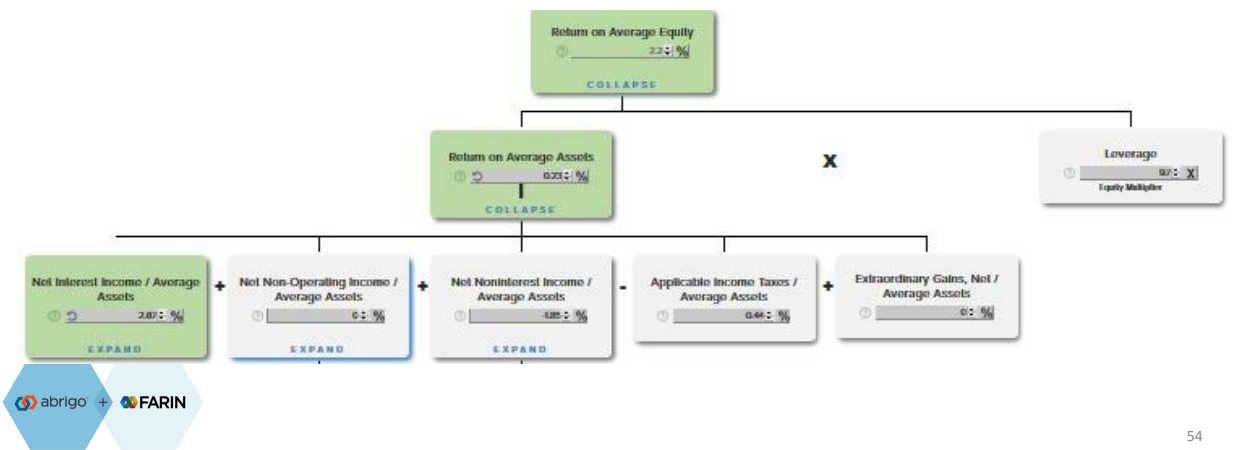
- 2018 Return on Assets = 1.02%, ROE = 9.78%
- Net Interest Income in 2018 = 3.59%
  - What if we see a 20% decline in margin due to rates changing?



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## Bank Margin Performance – Changing Rates

- Return on Assets drops to 0.25%,
- ROE declines to 2.2%
  - A 20% decline in margin impacts ROA and ROE by 77%



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# IRR Measurement Techniques

Picking the Right Tool to match the job...

- Gap Analysis
  - Measures dollar volume difference between rate sensitive (repricing) assets and liabilities
- Income Simulation
  - Measures impact of interest rate changes on earnings
- Economic Value of Equity (EVE)
  - Present value of all asset, liability, and financial derivative cash flows



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# Static vs. Dynamic IRR Measurement

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Static Systems           <ul style="list-style-type: none"> <li>• Measure IRR in Existing Balance Sheet</li> <li>• Fail To Consider Institution Strategy</li> <li>• Can't Be Used to Evaluate Risk/Return Tradeoffs</li> <li>• Regulatory Systems Are Static</li> <li>• IAR Examples - Gap, Constant BS Income at Risk</li> <li>• VAR Examples - Duration, Current VAR,</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Dynamic Systems           <ul style="list-style-type: none"> <li>• Measure IRR in Future Balance Sheet</li> <li>• Consider Institution Strategy</li> <li>• Evaluate Risk/Return Tradeoffs</li> <li>• IAR Example – Dynamic BS Income at risk,</li> <li>• VAR Example – Running VAR on projected balance sheets under projected interest rate scenarios</li> </ul> </li> </ul> |
|---|--|



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## Advanced Issues in Dynamic IAR

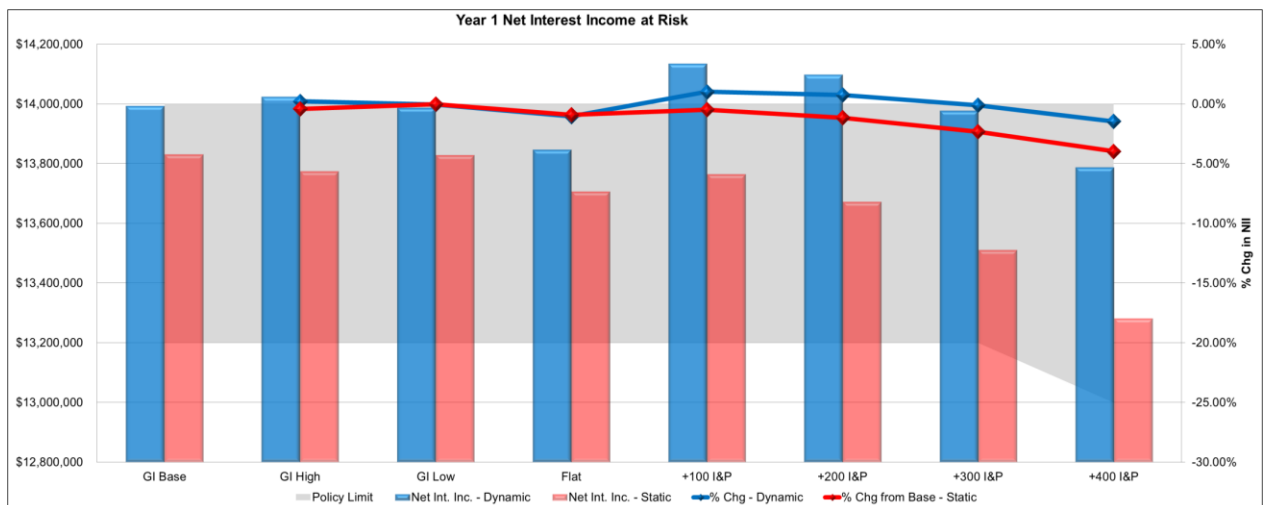
- When running dynamic IAR institution's must consider
  - How rate changes impact
    - Growth rates by rate environment
    - Impact on resulting balance sheet mix
    - How offering rates change on key products
- Often assumptions held constant
  - Will loans continue to grow in +300 bp rates?
  - Are deposit rates going to move the same amount for all rate changes?



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## Static vs. Dynamic IAR

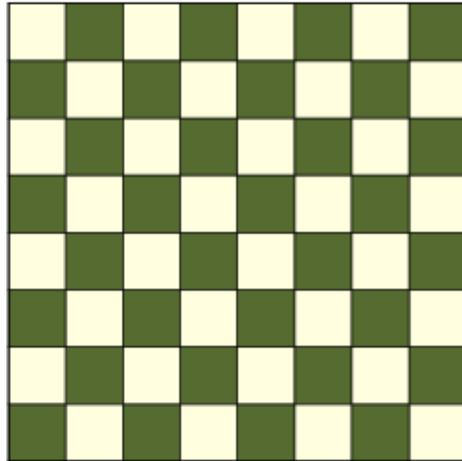


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## Brain Teaser!

How many squares are there on a chessboard? Don't say 64...



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## Measuring Interest Rate Risk

Value at Risk



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## Interest Rate Risk

### • Market Value Portion of Definition

- Market value risk is the risk that a change in market interest rates will raise or lower the market value of instruments in an institution's portfolio.
  - Example: you just purchased a new five year treasury yielding 3%. Immediately after purchase, 5 year treasury rates move to 4%. Because a potential purchaser would expect to earn 4% and your treasury pays 3%, you would need to make up the difference of 1%. That's 1% per year for 5 years or a discount on sale of approximately 5%.
- Market value risk is not a problem as long as the market value of both assets and liabilities is moving in the same direction and at approximately the same speed.



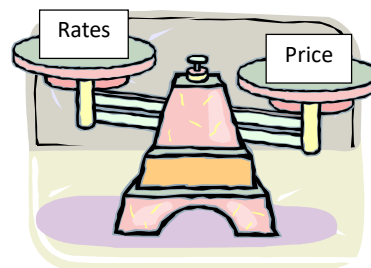
61

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## Value at Risk Concept

- Consider 401K or Personal Investments
- Value of Bonds goes UP when Rates go DOWN...why?
  - Bonds are fixed rates that will earn More as compared to new rates, creating "Market Value" greater than "Book Value"
  - Only real value if you SELL the asset

- Aren't the financial instruments on a balance sheet the same as your 401K investments?



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# Measuring Value at Risk

- Value at Risk is defined by:
  - The present value of net cash flows from all assets
  - Minus the present value of net cash flows from liabilities
  - Plus the present value of net cash flows from any off-balance sheet activities.
- Market value of capital is a derived value and does not necessarily correlate to book value of capital
- Present value is the current worth of a future sum of money or stream of cash flows given a specified rate of return.
- In essence, market value represents a long-term income statement view.



# Reading a Market Value Report

Rate Shock in Basis Points	Value	Net Portfolio Value		NPV Ratio	Min NPV	NPV
		\$ Change	% Change		Policy Limit	Bps Change
+300 bp	31,615	(70,010)	-69%	4.15%	6.00%	-736 bp
+200 bp	55,257	(46,368)	-46%	6.87%	6.00%	-463 bp
+100 bp	81,093	(20,532)	-20%	9.58%	7.00%	-192 bp
+50 bp						
0 bp	101,625	-	0%	11.50%	8.00%	n/a
-50 bp	120,416	18,791	18%	13.28%	n/a	178 bp
-100 bp	134,014	32,389	32%	14.42%	8.00%	291 bp

NPV Ratio after 200 bp shock	Interest Sensitivity Measure			
	0-100 bp	100-200 bp	200-400 bp	Over 400 bp
Over 12%	Minimal (1)	Minimal (1)	Minimal (1)	Moderate (2)
8% to 12%	Minimal (1)	Minimal (1)	Moderate (2)	Significant (3)
4% to 8%	Minimal (1)	Moderate (2)	Significant (3)	High (4)
Below 4%	Moderate (2)	Significant (3)	High (4)	High (4)





## Market Value (EVE/NEV) Choices

- Current/historical EVE/NEV
  - Run analysis on prior quarter end balance sheet position
  - Run sensitivity testing on key variable
  - Assess long-run risks to earnings/capital growth
  - What is the action we take based on results?
- Forecast EVE/NEV
  - Run a dynamic balances sheet forecast (under a scenario)
  - Align balance sheet with economic and rate expectations as well as other variables
  - Take projected interest rates and balance sheet levels and shock those as if they were “historical”
  - Answers the question “would this strategy be OK if I did it and rates/economy went against me?”
  - Repeat this process for difference “scenarios” for growth and mix based on rate and economic projections



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## EVE Summary

- EVE/NEV is a critical measurement for ALCO to incorporate
  - Captures full horizon of risk
  - Expected by examiners more than ever
  - Provides a long-term view of income statement performance
- Use EVE/NEV as a decision making tool on potential strategies
  - Acts as an early warning indicator
  - Helps weed out “Quick Fix” ideas



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## OCC Standard Limits

- Earnings @ Risk Limits
  - % change in Net Interest Income
  - 12 & 24 month time frames?
  - Limits on each rate scenario?
    - Shocks or Scenarios?
  - Typical Limits
    - 400 bp > -20%
    - 200 bp > -20%
    - 100 bp > -10%
    - - 100 bp > -15%?
- Value @ Risk Limits
  - % change in EVE
    - \$ amount or ratio
    - Does this make sense?
  - Do I need limits on each shock?
    - Field says YES
    - Reality?
  - Example
    - +300/-300 -40%
    - +200/-200 -30%
    - +100/-100 -20%



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## OCC National Statistics – Industry Limits

### • 2015

National Statistics on Risk Limits for Parallel Shocks						
Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-10%	-8%	-5%	-15%	-10%	-5%
100	-10%	-8%	-4%	-15%	-10%	-5%
200	-15%	-10%	-5%	-25%	-20%	-10%
300	-20%	-15%	-10%	-30%	-25%	-15%
400	-25%	-20%	-10%	-40%	-30%	-15%

### • 2017

Statistics on Risk Limits for Parallel Shocks						
Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-10%	-10%	-5%	-15%	-10%	-10%
100	-10%	-10%	-5%	-15%	-10%	-10%
200	-15%	-13%	-10%	-25%	-20%	-16%
300	-20%	-18%	-15%	-30%	-30%	-25%
400	-26%	-20%	-20%	-40%	-35%	-30%



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## Risk Levels – All Banks - 2017

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-16%	-5%	-3%	-1%	6%
100	-8%	-1%	1%	4%	17%
200	-15%	-2%	2%	7%	32%
300	-22%	-4%	3%	9%	46%
400	-30%	-6%	3%	12%	61%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-27%	-7%	-1%	3%	18%
100	-14%	-4%	0%	4%	18%
200	-27%	-10%	-2%	5%	33%
300	-41%	-16%	-4%	5%	46%
400	-57%	-22%	-6%	6%	58%



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## Risk Levels – Banks < \$100 million 2017

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-17%	-5%	-2%	0%	7%
100	-12%	-1%	1%	4%	18%
200	-16%	-2%	2%	7%	35%
300	-25%	-3%	2%	9%	53%
400	-31%	-7%	2%	11%	62%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-22%	-5%	0%	4%	20%
100	-17%	-5%	-1%	3%	23%
200	-35%	-12%	-4%	3%	45%
300	-51%	-19%	-7%	3%	56%
400	-66%	-26%	-10%	4%	62%



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## Risk Levels – Banks \$100 - 250 million

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-15%	-5%	-2%	0%	5%
100	-6%	-1%	1%	4%	16%
200	-13%	-2%	2%	7%	30%
300	-20%	-3%	3%	10%	44%
400	-34%	-5%	3%	13%	59%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-28%	-7%	-1%	4%	20%
100	-13%	-3%	0%	4%	18%
200	-25%	-8%	-1%	7%	34%
300	-39%	-14%	-3%	8%	49%
400	-50%	-17%	-3%	10%	58%



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## Risk Levels – Banks \$250-500 million

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-13%	-5%	-2%	-1%	6%
100	-6%	-1%	1%	3%	14%
200	-12%	-3%	2%	6%	24%
300	-21%	-5%	2%	8%	33%
400	-22%	-7%	3%	11%	46%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-30%	-8%	-2%	3%	17%
100	-14%	-5%	0%	3%	17%
200	-32%	-11%	-2%	4%	28%
300	-51%	-17%	-5%	5%	35%
400	-58%	-22%	-7%	4%	41%



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## Risk Levels – Banks \$500 mil - \$1 billion

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-16%	-5%	-3%	-1%	6%
100	-8%	-2%	1%	2%	10%
200	-15%	-3%	1%	5%	20%
300	-22%	-4%	1%	7%	29%
400	-34%	-7%	2%	10%	32%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-24%	-7%	-3%	2%	15%
100	-15%	-5%	0%	3%	12%
200	-30%	-9%	-2%	4%	20%
300	-53%	-14%	-4%	4%	28%
400	-72%	-22%	-8%	7%	36%



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## Risk Levels – Banks \$1 - \$10 Billion

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-18%	-6%	-4%	-2%	6%
100	-9%	-1%	2%	4%	18%
200	-17%	-2%	3%	7%	35%
300	-28%	-4%	4%	10%	52%
400	-39%	-6%	4%	11%	69%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-33%	-12%	-3%	2%	15%
100	-13%	-3%	1%	4%	18%
200	-23%	-8%	-1%	4%	30%
300	-35%	-12%	-3%	3%	40%
400	-47%	-17%	-7%	2%	58%



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## Risk Levels – Banks > \$10 Billion

**Earnings at Risk - 12-Month, Net Interest Income, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-40%	-8%	-5%	-3%	7%
100	-10%	0%	2%	5%	17%
200	-20%	-1%	4%	9%	32%
300	-27%	-2%	5%	12%	47%
400	-33%	-3%	4%	13%	61%

**Statistics on Economic Value of Equity, Parallel Shocks**

Scenario	Largest Loss	25th %ile	Median	75th %ile	Largest Gain
-100	-17%	-8%	-4%	-1%	9%
100	-8%	-3%	1%	3%	12%
200	-19%	-8%	-1%	2%	21%
300	-31%	-12%	-3%	1%	32%
400	-44%	-21%	-10%	0%	19%



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## Key Risk Factors – Core Deposits

Core deposits – The natural “hedge”



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## Non-Maturity Deposits

### • Segmentation Strategies

- Rates respond very slowly to changes in market rates on non-rate sensitive portion
- Rates respond more quickly to changes in market rates on rate sensitive portion
- Weighted average cost moves relatively slowly in response to changes in market rates
- Lots of barrier to entry options
  - Product design
  - Tiers
  - Transactional
  - Channel

### • Actual Behaviors

- Rates on some of these accounts respond moderately and slowly in response to changes in market rates
- Balances are retained for long periods of time in spite of rate behavior
- Acts like: Stable supply, semi-fixed rate, long-term
- Actual Counterpart – laddered portfolio of fixed-rate long-term CDs



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## Non-Maturity Deposit Life

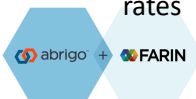
### • Cash Flow Decay rates affected by:

- Life events – death, divorce, population turnover
- Satisfaction with the institution
- Movements in market rates and your pricing strategy.
- Economic events – local (plant closings), and national (911, stock market health, economic outlook, etc.)
- Technology
- Interaction between CSRs and customers
- Flight to quality
- Relationship between CD and NMD rates

### • Key Concept

- Non-maturity deposits don't all 'mature' at the same time
- Instead, balances in accounts decay off the books over time
- Decay rates can be statistically measured
- Once measured, decay rates can be used to forecast cash flows coming off pools of non-maturity deposits

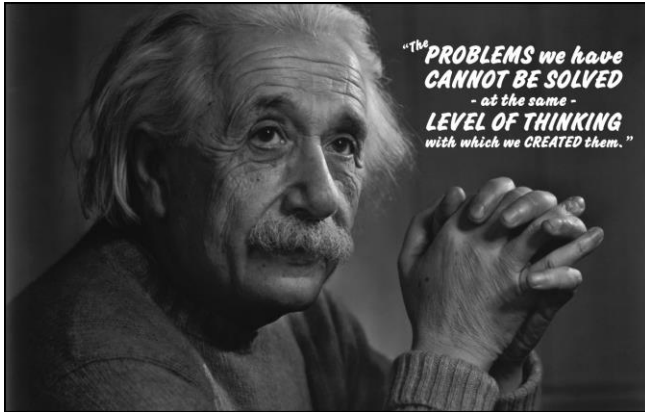
For all these reasons, your decay rates could be dramatically different than national averages.



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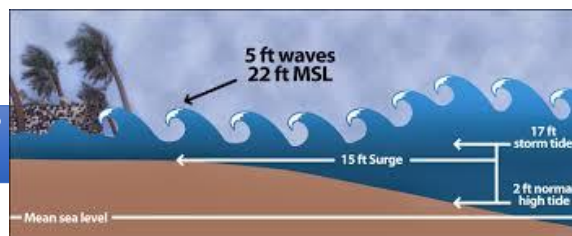
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## 2 Most Common Core Study Outputs

- Pricing Betas – how much of & how soon a change in market rates is passed along to deposit customers
  - Income at risk analysis
  - EVE analysis
- Decay rates – The speed at which non-maturity deposits decay off books over time
  - EVE analysis
  - Liquidity analysis

What's about missing component?  
**SURGE BALANCES**



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## Pricing Betas

- For example, if market rates increase 200 bp and your beta for MMDAs is 0.5 (50%) then the beta would predict you will raise MMDA rates by 100 bp

$$200 \text{ bp} \times 0.5 = 100 \text{ bp}$$

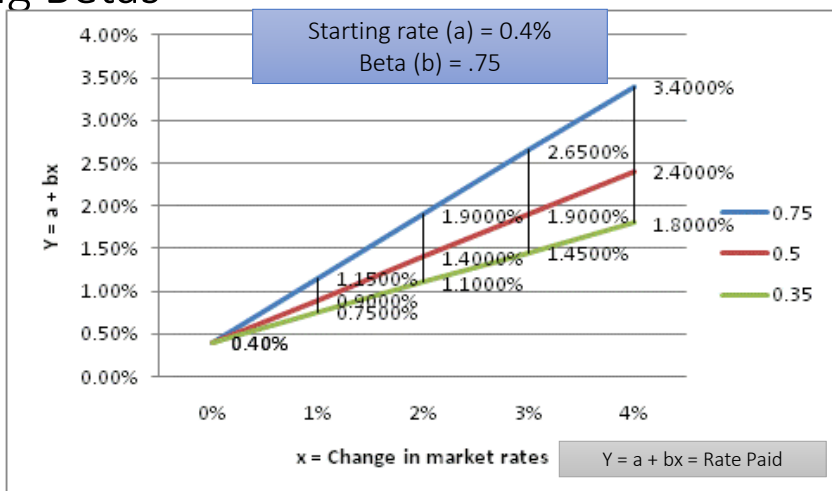
- Betas can be:
  - SWAG'd
  - Derived statistically from historic data
  - Examiners prefer the latter
- Betas can also be modified by use of segmentation strategies.



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## Pricing Betas



Questions:

- Which of these cost of funds profiles would you prefer to have with rising rates?
- What would that information allow you to do with asset and funding allocation?



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# Core Study Beta Results

**Figure 1-3  
Beta Results**

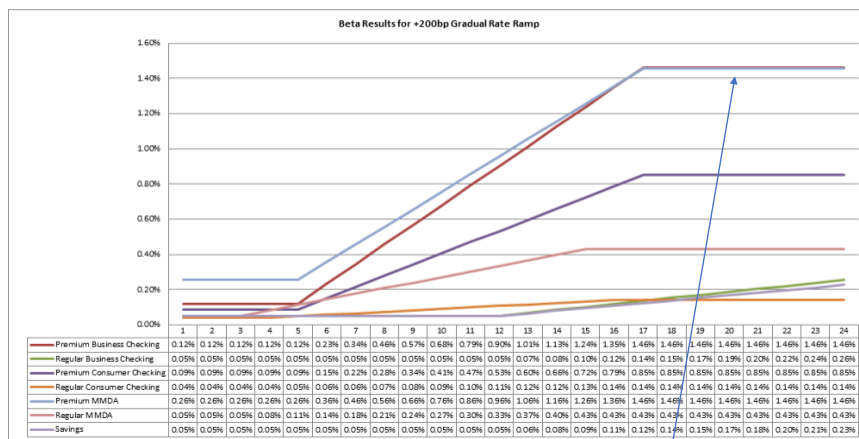
Product Category	Index	Lag (mo)	Position	Corr	Beta	Current Bal	Current Rate
Premium Consumer Checking	Average FHLB Advance - 5 Y	5	4	0.943	0.381	36,972	0.09%
Regular Consumer Checking	Average FHLB Advance - 5 Y	4	12	0.904	0.051	26,805	0.04%
Premium Business Checking	Average FHLB Advance - 12 M	5	2	0.989	0.671	2,941	0.12%
Regular Business Checking	Average FHLB Advance - 12 M	12	10	0.908	0.103	3,134	0.05%
Savings	Average FHLB Advance - 12 M	12	3	0.975	0.088	87,099	0.05%
Premium MMDA	1 Year US Treasury	5	2	0.989	0.601	161,930	0.26%
Regular MMDA	Average FHLB Advance - 2 Y	3	1	0.986	0.189	3,069	0.05%

Study uses a variety of indexes, lags and results show betas ranging between 0.051 to 0.601



## Effect of Beta Study on Deposit Rates 200 bp Ramp Over 12 Months

**Figure 1-4  
Gradual Rate Ramp**



It doesn't matter how long this funding is around, it is variable rate



## Modeling Assumptions - Deposits

- Deposit modeling assumptions & risk
- Aggregate account behavior assumptions
  - All the money stays in same account at “low beta”
- Determining the pricing beta
  - How are changes in interest rates passed along to the deposit costs?
- Pricing lag
  - How soon after a change in market rates will the new rate be paid on the deposits?
- Decay rates
  - Speed (or effective “cash flow life)
  - How soon will non-maturity accounts “mature”?



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## Common Mistake in ALM Modeling

- Many ALM modelers fail to properly apply cost of increasing interest rates on surge balances
  - ALM model fails to “break out” the surge balance into separate line item
  - Pricing beta used on the account represents the “core” repricing
  - Result can be significant underestimation of interest expense in rising rates
- What if some level of surge balances moved by 75-90% of change in market rates?
  - Too much money being treated as low cost, long duration
  - Does this help explain why we have truncation?



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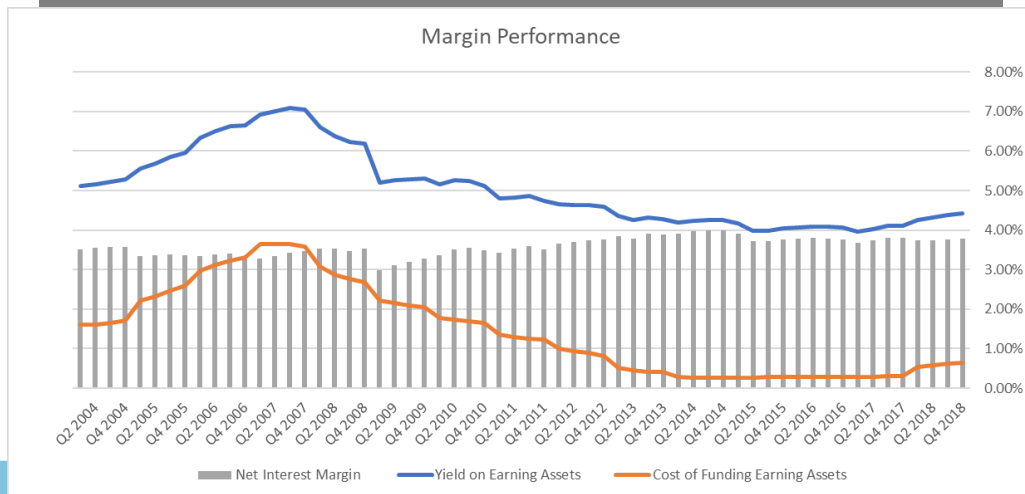
# Common Pricing Assumptions – Beta Issues

- **Simple lag\beta**
  - Assign a number of months to “lag” market rate changes
  - Apply beta to the change
  - Options
    - Ignore recent historical changes in rates
    - Look back to recent rate changes and apply lags\betas
  - Example:
    - Lag changes by 3 months and apply 50% of rate change
    - Current offer rate = 0.25%
    - Immediate rate shock +2%
    - Offer rate increases by 0.5% (2% \* .25%) in month 4 of the forecast
  - Not often do we see the rate driver correlation used for beta calculation
    - Likely a short term interest rate change like Fed Funds or Prime
- **Advanced Formula Approach**
  - Select an index rate (or multiple rates) that mirrors historical volatility
    - One index for “core” balances
    - Second index for “surge” balances
  - Recognizes that many funds in the account are likely to cost more as rates risk
    - Cost of retention of surge or,
    - Cost of replacement
  - Example:
    - 75% of balances @ current rate +25% change in 5 Yr CMT (25% beta), 12 mo. lag
    - 25% of balances @ current rate +90% change in Fed Funds (90% beta), 3 mo. lag



## Pricing Beta – Rate History 3 Mo CMT

Many ALM models base NMD rates on ST index like Prime, FF, 3 Mo Treas.  
But does your actual funding cost match up to what’s been going on with market



## Common Beta Assumptions: Applied

- Assume The following:
  - Deposit beta is a 25% change on 3-month CMT with a 12 month lag
  - Market rates on 3-month CMT had been rising for 3 years rising until most recent rate cut by Fed.
  - You had not moved the offer rate by much over the 3 year rate increase
- Key Question: How do you model the projected offer rate?
- Option 1: Using the change in the trailing 3-month CMT from 12 months prior TIMES 25%
- Option 2: Ignore the past changes in 3-month CMT and only apply to future changes



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## Deposit Pricing & Lags How Long Until the Slack Comes Out?



- What causes slack to come out?
- Growth in loan volume
- Decrease in deposit balances
- Increased competitive pressure
- Continued Fed movements
  - What about the decision to reduce the balance sheet?
- When do you respond?
  - Proactive moves cost NIM
  - Reactive moves threaten liquidity & NIM



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## Risk Limits – Banks < \$100 million

**Statistics on Risk Limits for Parallel Shocks**

Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-12%	-10%	-5%	-15%	-10%	-10%
100	-12%	-10%	-5%	-15%	-10%	-10%
200	-15%	-15%	-10%	-25%	-20%	-16%
300	-23%	-20%	-15%	-35%	-30%	-25%
400	-30%	-20%	-20%	-40%	-38%	-30%

**Statistics on Non-Maturity Deposit Assumptions**

Deposit Type	+100 BPs Repricing Rates			Annual Deposit Decay Rates		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
MMDA	25%	35%	50%	11%	22%	35%
High Yield MMDA	25%	39%	45%	8%	20%	25%
Now-Interest Checking	15%	21%	30%	10%	13%	20%
Savings	15%	23%	30%	8%	13%	20%
Non-Interest Bearing	-	-	-	10%	13%	20%
Other	25%	50%	71%	5%	13%	20%



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## Risk Limits – Banks \$100-250 million

**Statistics on Risk Limits for Parallel Shocks**

Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-10%	-8%	-5%	-15%	-10%	-10%
100	-10%	-8%	-5%	-15%	-10%	-10%
200	-15%	-12%	-10%	-25%	-20%	-15%
300	-20%	-16%	-15%	-30%	-30%	-23%
400	-25%	-20%	-20%	-40%	-35%	-30%

**Statistics on Non-Maturity Deposit Assumptions**

Deposit Type	+100 BPs Repricing Rates			Annual Deposit Decay Rates		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
MMDA	25%	35%	50%	10%	20%	32%
High Yield MMDA	33%	50%	75%	6%	14%	20%
Now-Interest Checking	15%	20%	30%	9%	14%	18%
Savings	15%	22%	34%	8%	13%	17%
Non-Interest Bearing	-	-	-	9%	13%	18%
Other	15%	35%	71%	9%	18%	27%



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## Risk Limits – Banks \$250-500 million

**Statistics on Risk Limits for Parallel Shocks**

Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-10%	-10%	-5%	-15%	-10%	-10%
100	-10%	-10%	-5%	-15%	-10%	-10%
200	-15%	-13%	-10%	-25%	-20%	-15%
300	-20%	-17%	-15%	-33%	-30%	-25%
400	-25%	-20%	-20%	-40%	-35%	-25%

**Statistics on Non-Maturity Deposit Assumptions**

Deposit Type	+100 BPs Repricing Rates			Annual Deposit Decay Rates		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
MMDA	26%	40%	51%	10%	17%	30%
High Yield MMDA	35%	50%	72%	10%	20%	26%
Now-Interest Checking	13%	20%	29%	8%	13%	19%
Savings	12%	20%	30%	8%	13%	18%
Non-Interest Bearing	-	-	-	9%	13%	18%
Other	25%	38%	56%	10%	16%	27%



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## Risk Limits – Banks \$500 million - \$1B

**Statistics on Risk Limits for Parallel Shocks**

Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-10%	-10%	-5%	-15%	-10%	-10%
100	-10%	-10%	-5%	-15%	-12%	-10%
200	-15%	-15%	-10%	-25%	-20%	-20%
300	-20%	-20%	-15%	-35%	-30%	-25%
400	-25%	-20%	-20%	-40%	-35%	-30%

**Statistics on Non-Maturity Deposit Assumptions**

Deposit Type	+100 BPs Repricing Rates			Annual Deposit Decay Rates		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
MMDA	30%	40%	55%	9%	19%	30%
High Yield MMDA	50%	75%	80%	14%	20%	25%
Now-Interest Checking	12%	20%	33%	7%	12%	19%
Savings	15%	25%	35%	8%	14%	18%
Non-Interest Bearing	-	-	-	9%	13%	20%
Other	10%	35%	50%	17%	20%	20%



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## Risk Limits – Banks \$1-10 Billion

Statistics on Risk Limits for Parallel Shocks

Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-12%	-10%	-5%	-15%	-10%	-10%
100	-10%	-10%	-5%	-15%	-10%	-10%
200	-17%	-12%	-10%	-20%	-20%	-20%
300	-25%	-18%	-15%	-30%	-30%	-25%
400	-30%	-25%	-20%	-40%	-30%	-30%

Statistics on Non-Maturity Deposit Assumptions

Deposit Type	+100 BPs Repricing Rates			Annual Deposit Decay Rates		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
MMDA	35%	50%	70%	10%	17%	25%
High Yield MMDA	41%	70%	80%	12%	18%	33%
Now-Interest Checking	15%	25%	33%	8%	13%	19%
Savings	13%	25%	33%	10%	14%	20%
Non-Interest Bearing	-	-	-	9%	13%	17%
Other	45%	63%	80%	7%	11%	14%



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## Risk Limits – Banks > \$10 Billion

Statistics on Risk Limits for Parallel Shocks

Scenario	12-Month, Net Interest Income			Economic Value of Equity		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
-100	-10%	-8%	-5%	-15%	-10%	-8%
100	-10%	-7%	-5%	-15%	-10%	-8%
200	-15%	-10%	-8%	-22%	-20%	-15%
300	-20%	-15%	-15%	-32%	-28%	-23%
400	-25%	-21%	-20%	-43%	-33%	-30%

Statistics on Non-Maturity Deposit Assumptions

Deposit Type	+100 BPs Repricing Rates			Annual Deposit Decay Rates		
	25th %ile	Median	75th %ile	25th %ile	Median	75th %ile
MMDA	38%	50%	65%	13%	18%	26%
High Yield MMDA	50%	72%	75%	13%	16%	20%
Now-Interest Checking	22%	25%	35%	10%	14%	16%
Savings	15%	26%	53%	13%	18%	21%
Non-Interest Bearing	-	-	-	12%	14%	17%
Other	33%	43%	50%	8%	12%	24%



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## Median Risk Level Comparison

Median EAR Risk Level by shock by size						
	<\$100 mil	\$100-250	\$250-500	\$500-\$1B	\$1-10B	>\$10B
-100	-2%	-2%	-2%	-3%	-4%	-5%
100	1%	1%	1%	1%	2%	2%
200	2%	2%	2%	1%	3%	4%
300	2%	3%	2%	1%	4%	5%
400	2%	3%	3%	2%	4%	4%
Median EVE Risk Level by shock by size						
	<\$100 mil	\$100-250	\$250-500	\$500-\$1B	\$1-10B	>\$10B
-100	0%	-1%	-2%	-3%	-3%	-4%
100	-1%	0%	0%	0%	1%	1%
200	-4%	-1%	-2%	-2%	-1%	-1%
300	-7%	-3%	-5%	-4%	-3%	-3%
400	-10%	-3%	-7%	-8%	-7%	-10%



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## Median Risk Limit Comparison

EAR Limits by shock by size						
	<\$100 mil	\$100-250	\$250-500	\$500-\$1B	\$1-10B	>\$10B
-100	-10%	-8%	-10%	-10%	-10%	-8%
100	-10%	-8%	-10%	-10%	-10%	-7%
200	-15%	-12%	-13%	-15%	-12%	-10%
300	-20%	-16%	-17%	-20%	-28%	-15%
400	-20%	-20%	-20%	-20%	-25%	-21%
EVE Limits by shock by size						
	<\$100 mil	\$100-250	\$250-500	\$500-\$1B	\$1-10B	>\$10B
-100	-10%	-10%	-10%	-10%	-10%	-10%
100	-10%	-10%	-10%	-12%	-10%	-10%
200	-20%	-20%	-20%	-20%	-20%	-20%
300	-30%	-30%	-30%	-30%	-30%	-28%
400	-38%	-35%	-35%	-35%	-30%	-33%



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## Median NMD Beta Comparison

Median Beta @ +100bp shock by size						
	<\$100 mil	\$100-250	\$250-500	\$500-\$1B	\$1-10B	>\$10B
MMDA	35%	35%	40%	40%	50%	50%
HY MMDA	39%	50%	50%	75%	70%	72%
Int Check	21%	20%	20%	20%	25%	25%
Savings	23%	22%	20%	25%	25%	26%
NIB	0%	0%	0%	0%	0%	0%
Other	50%	35%	38%	35%	63%	43%

- Note how larger banks are increasing beta faster than smaller banks on all deposit types.
- What does that indicate about potential cost of surge in smaller banks?
- How can smaller banks prepare?



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## Surge & Decay

**Figure 1-6**  
**Decay and Surge Summary**

Product Category	Current Bal	Surge %	Base Decay	Truncation
Consumer Checking	77,342	17.77%	2.01%	120
Business Checking	8,749	34.34%	5.27%	120
Savings	88,222	34.54%	1.60%	120
MMDA	165,001	24.34%	7.30%	120

Surge balances can vary considerably. Betas on surge balances are very high as the customer will reprice the balances for you.

Decay rates seem low until you consider we are looking at balance decays rather than account number decays.

This is just regulatory BS



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## Best Decay Rate Methods

### • Single pool account study

- Most common approach
- Track changes in initial study group accounts over time.
- Calculate the changes in account balances and # of account on accounts
  - Strengths
    - Able to correlate changes in actual accounts and balances
    - Recognized as “industry standard”
  - Weaknesses
    - Data required from “pre-crisis” starting point (2007 or earlier) for most relevant analysis
    - Ignores all new accounts
    - Applies old account behaviors to all newly opened accounts



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## Best Decay Rate Methods

### • Emerging Standard: Multi Pool (Vintage)

- Track initial study group (single pool method) and subsequent pools of new accounts over time
- Track behaviors of newer accounts vs. older more seasoned accounts
  - Strengths
    - Doesn't ignore accounts representing > 50% of total deposit balances in a sector
    - Develops better metrics on new account behaviors
    - Helps to estimate “surge” deposits vs. “core”
  - Weaknesses
    - More data and analysis required
    - Many ALM models unable to process outputs properly

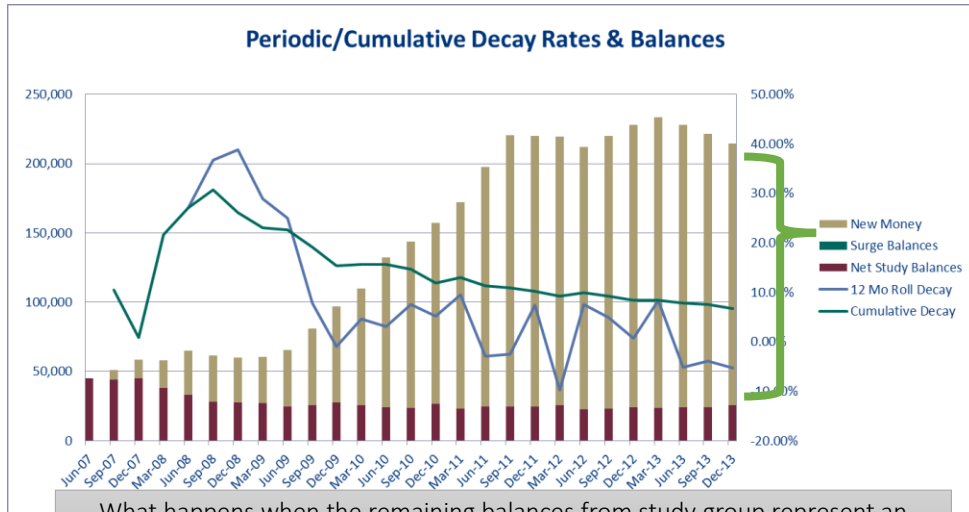


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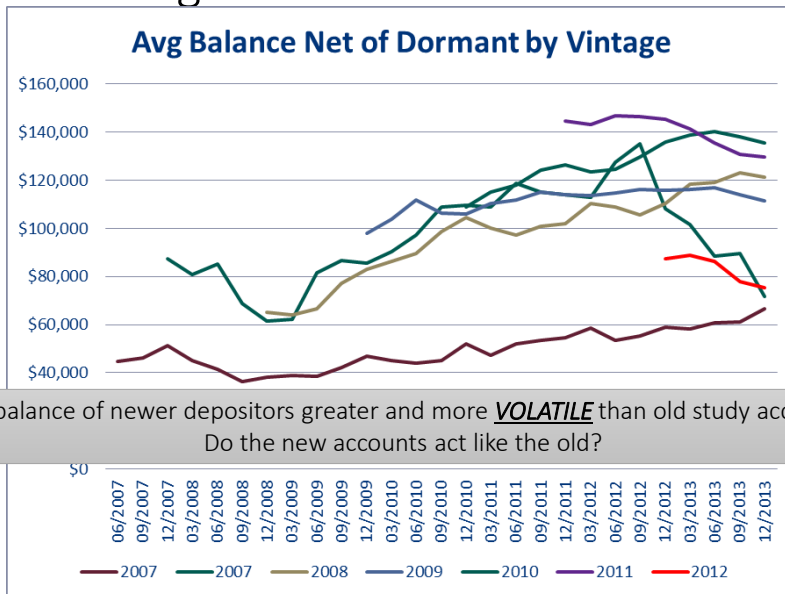
# Surge-Adjusted Decays



What happens when the remaining balances from study group represent an insignificant amount compared to total balances?



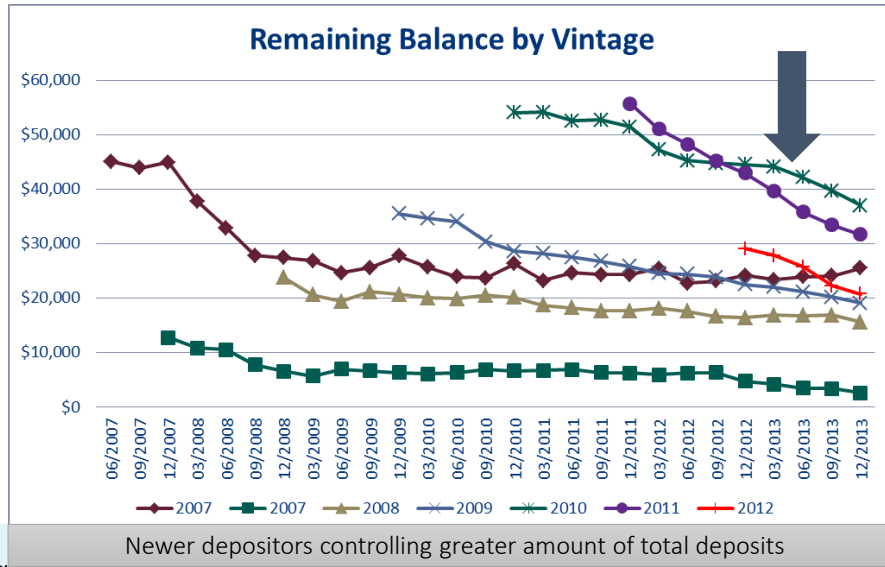
# MMDA – Net Avg Balance



Avg balance of newer depositors greater and more **VOLATILE** than old study accounts. Do the new accounts act like the old?



# MMDA – Remaining Balance



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# Market Value Sensitivity

**Figure 1-7**  
**Market Values by Rate Shock**

	Summary Market Value							
	Balances	-200bp	-100bp	Base Case	+100bp	+200bp	+300bp	+400bp
Premium Business Checking	8,749	8,235	7,659	7,178	7,347	7,326	7,279	7,222
Regular Business Checking	8,749	8,234	7,659	7,134	7,042	6,809	6,582	6,365
Premium Consumer Checking	77,342	72,164	66,079	60,980	60,076	58,079	56,174	54,392
Regular Consumer Checking	77,342	72,143	66,058	60,671	58,112	54,676	51,499	48,579
Premium MMDA	165,001	157,193	147,235	140,108	140,202	138,609	136,818	134,995
Regular MMDA	165,001	157,010	147,052	137,820	134,692	130,339	126,129	122,141
Savings	88,222	81,366	74,355	68,227	68,067	65,303	62,648	60,154

Today's market values are well below book.

What will happen if rates go up on accounts with high betas and high surge percentages?



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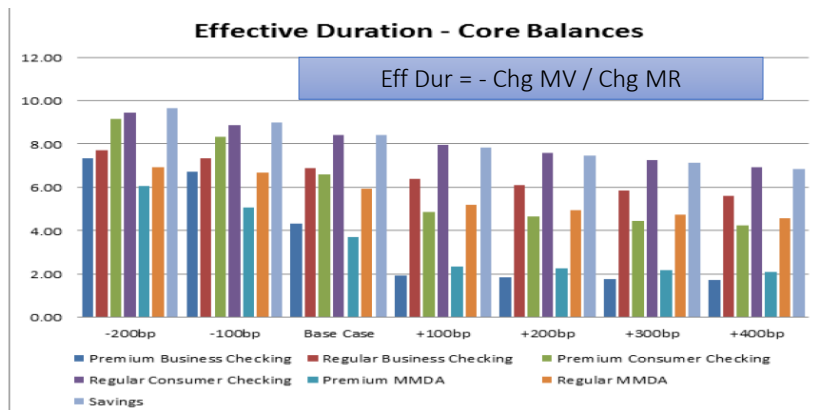
# Weighted Average Life Argument

	Summary Average Life							
	Balances	-200bp	-100bp	Base Case	+100bp	+200bp	+300bp	+400bp
Premium Business Checking	8,749	8.03	8.03	8.03	6.90	6.52	6.28	6.12
Regular Business Checking	8,749	8.03	8.03	8.03	6.90	6.52	6.28	6.12
Premium Consumer Checking	77,342	9.18	9.18	9.18	8.38	8.19	8.06	7.98
Regular Consumer Checking	77,342	9.18	9.18	9.18	8.38	8.19	8.06	7.98
Premium MMDA	165,001	7.51	7.51	7.51	6.81	6.54	6.38	6.26
Regular MMDA	165,001	7.51	7.51	7.51	6.81	6.54	6.38	6.26
Savings	88,222	9.32	9.32	9.32	7.75	7.36	7.12	6.97

WALs only look at principal life & drop when rates rise as surges run off. Since WALs fail to consider betas (interest expense cash flows), they aren't a very good measure of hedging power of NMDs.



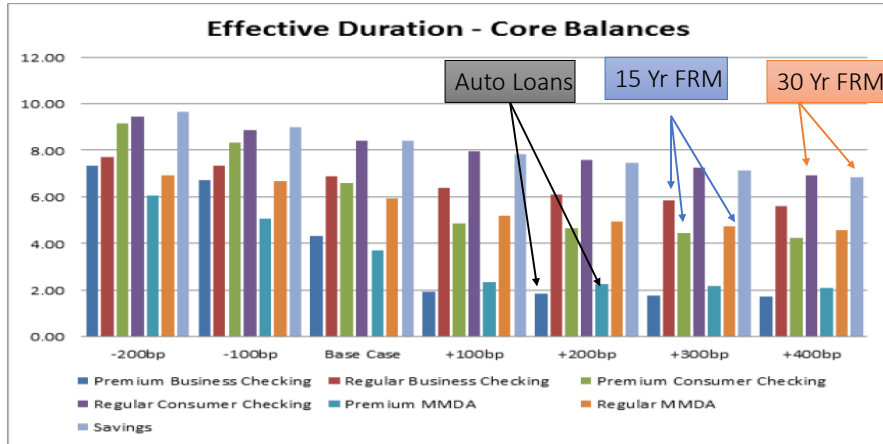
# Effective Duration - Core



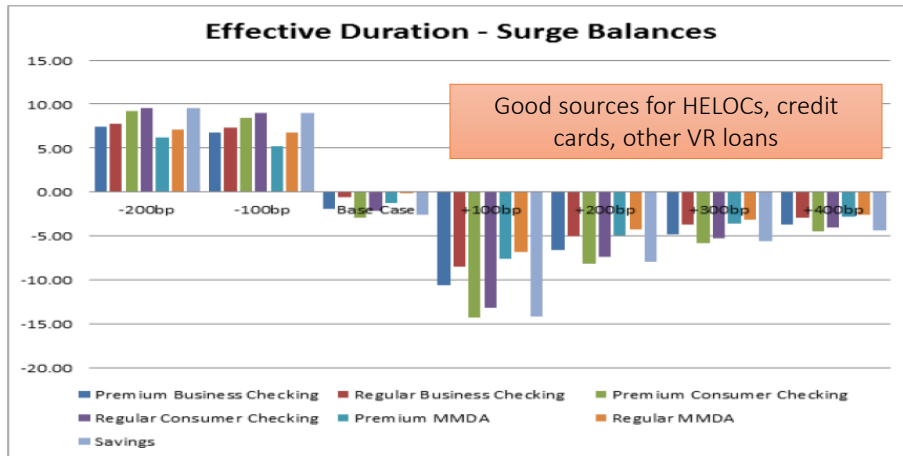
Effective Duration looks at how principal and interest cash flows are impacted by changes in rates. It considers decay rates, surge balances, truncation, and pricing betas. These are effective durations of non-surge (core) balances



# Effective Duration - Core



# Effective Duration - Surge



Note as surge balances run off they are likely to move into CDs – 1 yr, 2 yr, 3 yr, etc.





## Median NMD Decay Rates Comparison

Median Decay Rate by size						
	<\$100 mil	\$100-250	\$250-500	\$500-\$1B	\$1-10B	>\$10B
MMDA	22%	20%	17%	19%	17%	26%
HY MMDA	20%	14%	20%	20%	18%	20%
Int Check	13%	14%	13%	12%	13%	16%
Savings	13%	13%	13%	14%	14%	21%
NIB	13%	13%	13%	13%	13%	17%
Other	13%	18%	16%	20%	11%	24%

- Note larger banks have faster decay rates on more rate sensitive accounts.
  - Shorter life
  - + Faster repricing beta
  - = Less “long term” funding
- More SWAPs & hedging in larger banks than small



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## External rate Forecasts

What Rate Projections Do I Use?



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## FFIEC IRR Guidance

### • *What Interest Rates To Measure?*

- Traditional measures have been shocks
  - +/- 100, 200, & 300 basis points
  - Not enough stress, implied a 400 bp test
- **Rate movements must be both severe and plausible**
  - Must recognize current cycle and possibility for scenario
  - Should consider changes in slope, & twists in curve
  - Who defines plausible?
  - Are parallel shocks plausible?



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## Common Rate Projections in ALCO

- Immediate & Parallel (I&P) shocks
  - All market interest rates move immediately by the same amount
  - Least likely of all rate projections
- Gradual ramps
  - All market interest rates move over time by the same amount
  - Ramps usually 12 months
  - Less likely but better than shocks
- Non-parallel
  - All market interest rates move independently from one another, creating a change in the shape of the yield curve
  - Most likely of all rate projections
  - Most difficult to project and plan for

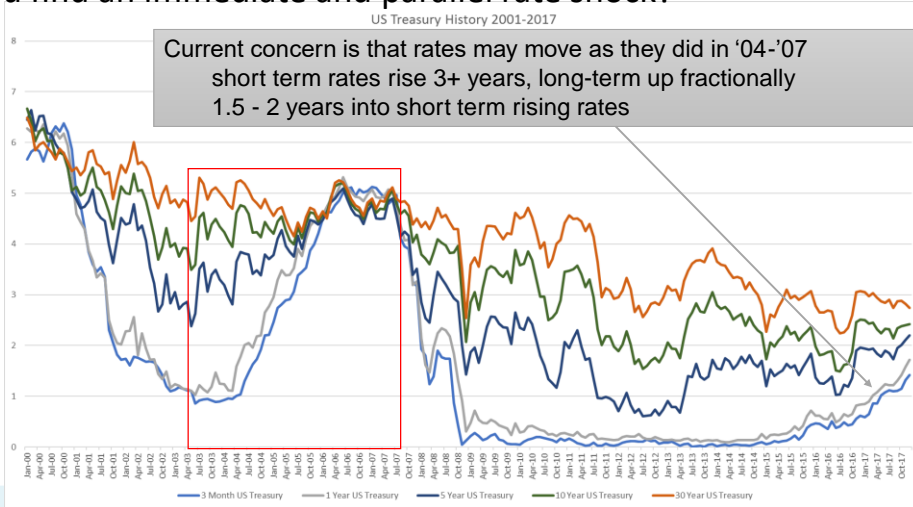


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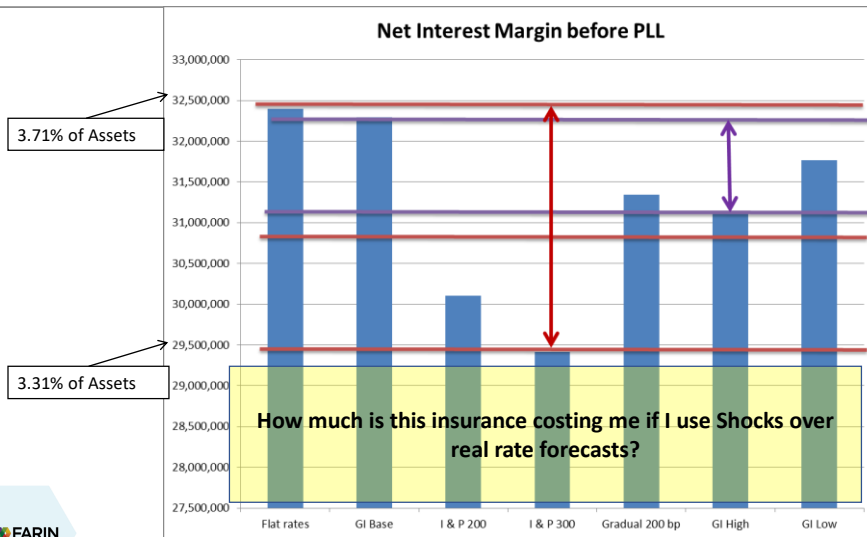
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# Historical Rate Comparison

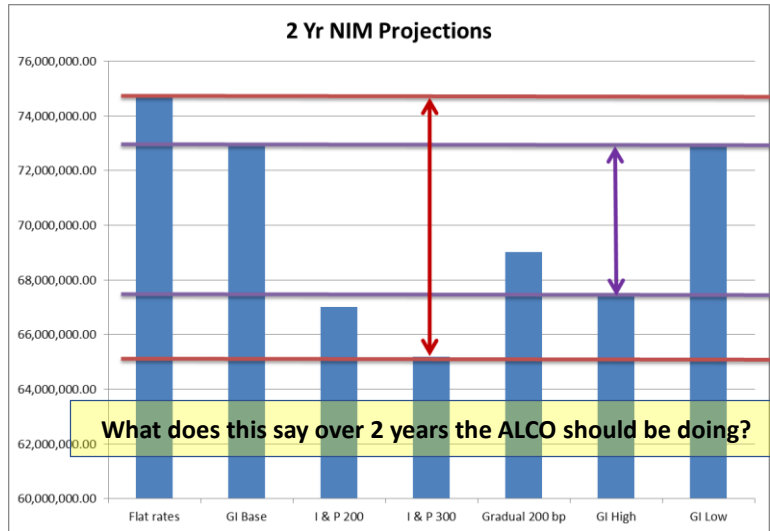
- Can you find an immediate and parallel rate shock?



# Cost of Shock Analysis 1 Year NII Comparisons



Cost of Shock Analysis  
2 Year NII Comparison



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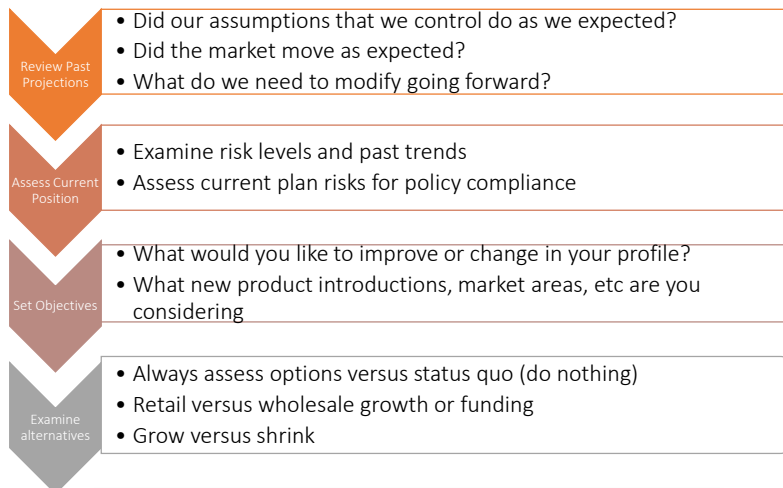
# ALCO Composition and Process



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## Elements of an Effective ALCO Meeting



### Select strategies that:

- Provide earnings to meet objectives
- Manage Risks to acceptable levels
- Better the risk/return profile

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## ALCO Composition

- Head lending officer(s) by area
- Head of retail operations (deposit gathering)
- Chief financial officer
- President/CEO
- Marketing manager
- Board representation
- Any other team member with direct responsibility for managing business plan objectives.



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## ALCO Agenda

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- Review prior minutes
- Review actual performance to projected
- Monitor status of prior actions
- Measure performance relative to
  - Policy limits
  - Peers
- Review trends and costs for recent funding
- Review economic outlook and interest rate forecasts
- Review income simulation results & assumptions



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## ALCO Agenda (continued)

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- Review market value results
  - Current position
  - Projected under various interest rate scenarios
- Review simulation results of any major actions or plans being considered
- Review current and projected liquidity positions
- Review non-earning asset and non-performing loans
- Review investment\borrowing activities
- Set loan & deposit targets for upcoming quarter.



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## Imagine ALCO With Pertinent Information

- Many ALCO meetings considered boring or less valuable
- Time is spent
  - Reviewing 200+ pages of risk reports
  - Having discussions on assumptions
  - Finding fault with analysis framework
- But we met! ✓

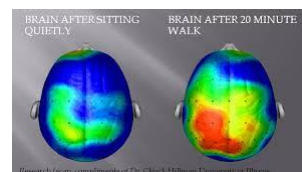


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## Imagine ALCO With Pertinent Information

- Make ALCO more meaningful with a simple 20 minute walk
  - Add in real discussions about where you are really headed
    - Real interest rate path concerns
    - Real projections for balance sheet growth & mix
  - Grow to a 45 minute walk as stamina grows
    - Alternate projections for different rates
    - Discussion about key variables and plans for controlling



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**Don't be upset  
with the results  
you didn't get  
from the work  
you didn't do.**



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## Abrigo\FARIN Resources

- Advisory Services
  - From education to strategy we can recharge your approach to ALCO
- Capital Planning
  - Capital plan development
  - Integrated stress testing
  - Capital buffer calculations
- Asset/Liability Management
  - Institution managed
  - Outsourced
- Core Deposit Analysis
  - Vintage analysis
  - Sensitivity testing
- Credit Services
  - CECL ready ALLL calculation
  - Dual loan grading & migration
  - Credit stress testing
  - Customer management & tracking
- Loan & Deposit Pricing
  - Integrate CFO analytics with needs of the front-line
  - Strategy development



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