

# Advanced Asset/Liability Management

## *WBA BOLT Summer Leadership Summit*

**June 14, 2018**



Presented by:

Marc Gall, Vice President  
mgall@bokf.com

1

## **Agenda**

---

- › Asset/Liability Management Summary
- › Developing Assumptions for Model
- › Liquidity Stress Testing
- › Investment Portfolio Management
- › ALM Strategies



2

## ALM Components



3

## Information to Review and Discuss

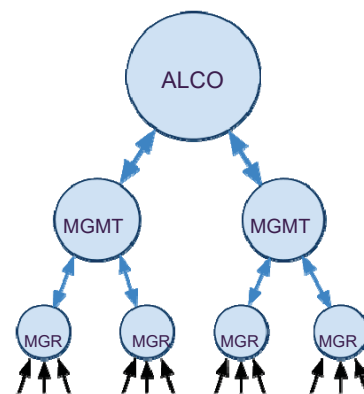
### Objective of Meeting

*Primary: Identify risks and opportunities to maximize earnings*

*Secondary: Satisfy regulatory requirements*

### Minimum Information to Discuss

- › Economic Outlook
- › Current Interest Rate Risk Position
- › Loan Production and Pipeline
- › Deposit Threats and Opportunities
- › Liquidity Position (current and forecasted)
- › Investment Portfolio
- › Examination / Audit Issues



**Inputs**

Front Line Staff



4

## Agenda

---

- › Asset/Liability Management Summary
- › ***Developing Assumptions for Model***
- › Liquidity Stress Testing
- › Investment Portfolio Management
- › ALM Strategies



## Developing Pricing Assumptions

---

Pricing Model

**Model Selection**

Manual

Quick Model

New Model

Savings

Driver: Fed Funds

May Rate: 0.40 %

Time Lag: 3 Months

Current Price: 0.10 %

Calc: Spread

Edit: Spread/Factor

Beta Create A Promotion

Seg.	Driver	Spread	Rate
	0.00	0.00	0.00
A	0.00	0.10	0.10
B	0.50	-0.40	0.10
C	5.50	-4.50	1.00
D			
E			
F			

Add Insert Delete Clear

- › Compare pricing historically vs. a benchmark.
- › Benchmark should be closely aligned with the pricing practice of the bank.
  - › Question: when would the bank change its rate on Savings account? If the answer is when Fed Funds changes, then Fed Funds would be the driver rate or "key rate tie".
- › Pricing beta reflects the amount of price change relative to the driver rate.



## Pricing Assumptions - Example

Figure 1 – Example Rate Data

	2003 Q4	2004 Q1	2004 Q2	2004 Q3	2004 Q4	2005 Q1	2005 Q2	2005 Q3	2005 Q4	2006 Q1	2006 Q2	2006 Q3
<b>Periodic Quarterly Average Deposit Cost</b>												
NOW	0.62%	0.61%	0.61%	0.67%	0.75%	0.87%	1.00%	1.16%	1.32%	1.47%	1.61%	1.74%
Savings/MMDA Cost of Funds	1.53%	1.50%	1.48%	1.49%	1.49%	1.50%	2.00%	2.33%	2.55%	2.68%	3.10%	3.30%
<b>Periodic Market Rate Indexes</b>												
Federal Funds Rate	0.94%	1.05%	1.38%	1.94%	1.97%	2.96%	3.35%	3.93%	4.09%	5.00%	5.05%	5.34%
3-Month US Treasury Bill Yield	0.92%	0.94%	1.27%	1.71%	2.22%	2.77%	3.06%	3.53%	4.20%	4.62%	5.02%	4.95%

Analysis of the data in Figure 1 might produce results such as those displayed in Figure 2. In this example, the results indicate that interest rates on the bank's NOW and Savings/MMDA accounts are driven by changes in the federal funds rate and 3-month Treasury bill rate, with deposit betas in the range of 25 percent to 42 percent.

Figure 2 – Example Estimates of Deposit Betas

Regression Analysis	Federal Funds Rate		3-Month US T-Bill		Average Beta
	Beta	R-squared	Beta	R-squared	
NOW	0.251	95.04%	0.264	95.39%	0.257
Savings/MMDA	0.396	86.47%	0.415	86.42%	0.405

Source: FDIC



7

## Developing Pricing Assumptions

- › Loan pricing and CD assumptions require more data
- › Review of historical loan production vs. index can be helpful
  - › Loans may not be as uniform in pricing due to credit, collateral, amortization characteristics
- › Review CD production or CD rate sheets relative to Treasury rates over time. How much does your CD rate change?



8

## Decay Rates – Developing Assumptions

- Significant regulatory focus as this assumption is critical in market value of equity calculation
  - › Ideally review over a 10 year period (rising and falling rate cycle)
  - › Measure number of accounts closing in comparison to total at beginning of period
  - › Measure balance of closed accounts vs. total balance for that account type
  - › Need to take “surge” balances into account (assign shorter decay to these balances)
  - › What if your core processor does not allow you to access needed history?
- Analysis is completed for non-maturing deposit accounts
  - › Money Market Accounts
  - › Savings Accounts
  - › NOW Accounts
  - › Checking Accounts



## Sample Format for Decay Analysis

NOW Accounts	June 2005 - June 2006	June 2006 - June 2007	June 2007 - June 2008	June 2008 - June 2009	June 2009 - June 2010	June 2010 - June 2011	June 2011 - June 2012	June 2012 - June 2013			
	Balance - Beginning of Period (select new static sample)	10,000	11,000	12,000	16,000	17,000	18,000	19,000	20,000		
Beginning balance of accounts closed during sample period	500	1,500	500	500	500	500	500	500			
Period Decay Percentage	5.00%	13.64%	4.17%	3.13%	2.94%	2.78%	2.63%	2.50%			
Decay Rate (months)	240	88	288	384	408	432	456	480			
Lessor of Decay Rate or Max Decay Rate (240)	240	88	240	240	240	240	240	240	240 Max is an assumption made by bank		
Number of Accounts - Beginning of Period (select new static sample)	100	100	105	110	115	120	125	130			
Number of Remaining Accounts From Static Sample	90	90	90	100	113	118	120	122			
Change in Number of Accounts (for static account sample)	-10	-10	-15	-10	-2	-2	-5	-8			
Period Decay Percentage	10%	10%	14%	9%	2%	2%	4%	6%			
Decay Rate (months)	120	120	84	132	690	720	300	195			
Lessor of Decay Rate or Max Decay Rate (240)	120	120	84	132	240	240	240	195	240 Max is an assumption made by bank		
Average Balance per Account	100	110	114	145	148	150	152	154			
Pre-Crisis Balance per Account		110									
Estimated 'Hot Money' Balance per Account		Estimate or average						44			
Estimated 'Hot Money' Total Balance								5,700			
Decay Term for 'Hot Money'								12	Assumption made by bank		
Core' Balance								14,300			
Decay Term (Balance)								221			
Decay Term (Number of Accounts)								171			
Decay Term Assigned to 'Core' Balance								190	Estimate based on J21 and J22		
Weighted Average Decay Rate (months)								139			



## Loan Prepayments

- How can your institution collect prepayment detail?
  - Some IRR models capture loan level data and can aggregate prepayment detail
  - Review of that information still needed – how does the model determine a prepayment?
    - Would you consider a loan that matures in 2 months, but is refinanced in the current month a prepayment?
    - Do you have a mix of lines of credit and fixed term loans in the same account category?
    - Is your bank actively looking to “push” out loans? While the loan may “pre-pay”, it may not be indicative of a true prepayment

- Once data is collected and scrubbed, build a model.
- Do you use a static prepayment speed?
  - Prepayments stable in all rate environments
- Estimate for falling/rising rate environments

The screenshot shows a software window titled 'Model | History | Instruments'. It features a 'Model Selection' section with radio buttons for 'No Model', 'New Detailed Model', and 'Quick Model', and a dropdown menu set to 'CRE Fixed'. Below this is a table with columns 'Seg.', 'Spread', and 'Prepayment Percent'. The table contains data for segments A through H. To the right of the table are buttons for 'Save', 'Save As', 'Delete', and 'Chart'. At the bottom are buttons for 'Add', 'Insert', 'Delete', and 'Clear'.

Seg.	Spread	Prepayment Percent
A	-4.00	0.86
B	0.00	1.14
C	4.00	1.43
D		
E		
F		
G		
H		



## How Much Can Assumptions Change Perceived Risk?

- Scenario 1: Reduce beta for MMKT to 0.5 and Savings to 0.25
- Scenario 2: Extend decay rate for MMKT to 60 and Savings to 85
- Decay rates do not impact net interest income rate shocks
- Combination of lower beta and longer decay rates will improve MVE by greatest amount

Account	Base Case	Stress Test #1	Base Case	Stress Test #2
	Beta	Beta	Decay	Decay
Money Market	0.77	0.50	48	60
Savings	0.40	0.25	48	85

Change in Rates	Net Interest Income - 1 year Projected Change			Risk Guidance
	Base Case	Stress #1	Stress #2	
1%	-5.01%	-1.78%	-5.01%	-5%
2%	-11.46%	-3.85%	-11.46%	-10%
3%	-17.57%	-5.96%	-17.57%	-15%
4%	-22.88%	-8.29%	-22.88%	-20%

Change in Rates	Market Value of Equity Projected Change			Risk Guidance
	Base Case	Stress #1	Stress #2	
1%	-4.92%	-3.92%	-3.47%	-10%
2%	-11.20%	-8.86%	-8.45%	-15%
3%	-18.12%	-14.60%	-14.10%	-20%
4%	-23.80%	-19.44%	-18.58%	-25%



## Agenda

---

- › Asset/Liability Management Summary
- › Developing Assumptions for Model
- › **Liquidity Stress Testing**
- › Investment Portfolio Management
- › ALM Strategies



## Liquidity Reporting/Stress Test

---

- Liquidity projections should include both sources and uses of cash
  - › Include expected maturities/payments from investment portfolio, loan portfolio
  - › Expected increases/decreases in deposit accounts
  - › Maturities of borrowings
- Consistent with contingency funding plan
- Include available sources of backup liquidity
- Develop stress test scenario(s) to address the following:
  - › Loss of core deposits (ex. 10%, 20%, 30%)
  - › Loss of key depositors (if concentration by several large depositors or types, simulate the loss of those funds)
  - › Increase in loan demand – loan commitments fund
  - › Loss of contingency funding sources that could be limited – Fed Funds Lines from Correspondent Banks, Brokered CD issuance, Internet deposits (subject to rate caps), increased collateral haircuts at FHLB



# Liquidity Stress Testing

CONTINGENCY FUNDING PLAN												
Sample Bank	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16
<b>Funds from Operations:</b>												
<b>Sources (Uses)</b>												
Loans	(637)	(640)	(643)	(646)	(649)	(652)	(655)	(658)	(662)	(665)	(668)	(671)
Securities	394	(41)	(42)	(42)	(42)	(42)	(42)	(43)	207	(43)	(43)	(43)
Time Deposits	3,115	0	0	0	0	0	0	0	0	0	0	0
Borrowed Funds	0	0	0	0	0	0	0	0	0	0	0	0
DDA/NOW/MMDA/SAV	0	0	0	0	0	0	0	0	0	0	0	0
<b>Net Funding from Operations</b>	<b>2,872</b>	<b>(681)</b>	<b>(685)</b>	<b>(688)</b>	<b>(691)</b>	<b>(694)</b>	<b>(698)</b>	<b>(701)</b>	<b>(454)</b>	<b>(708)</b>	<b>(711)</b>	<b>(714)</b>
<b>Other Funding Requirements (Uses)</b>												
Loan Commitments												
Additional Loan Demand												
Loss of Core Deposits												
<b>Total Other Funding Requirement</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Funding Surplus or (Requirement)</b>	<b>2,872</b>	<b>(681)</b>	<b>(685)</b>	<b>(688)</b>	<b>(691)</b>	<b>(694)</b>	<b>(698)</b>	<b>(701)</b>	<b>(454)</b>	<b>(708)</b>	<b>(711)</b>	<b>(714)</b>
<b>Sources of Funds to Meet Operational Requirement</b>												
Cash and Due From Banks	1,298	1,300	1,302	1,304	1,306	1,309	1,311	1,313	1,315	1,317	1,319	1,321
Fed Funds Sold	8,210	7,801	7,369	6,957	6,529	6,110	5,677	5,253	5,076	4,636	4,204	3,758
Available Fed Funds Purchases	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Fed Funds Purchased	-	-	-	-	-	-	-	-	-	-	-	-
<b>Net Fed Funds Available (Required)</b>	<b>19,508</b>	<b>19,101</b>	<b>18,671</b>	<b>18,261</b>	<b>17,835</b>	<b>17,418</b>	<b>16,988</b>	<b>16,566</b>	<b>16,391</b>	<b>15,953</b>	<b>15,523</b>	<b>15,079</b>
Brokered CDs	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200	11,200
Brokered CD Limit/Remaining (of deposits)	50.0%	72,226	72,226	72,226	72,226	72,226	72,226	72,226	72,226	72,226	72,226	72,226
<b>Brokered Remaining</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>	<b>61,026</b>
FHLB Borrowings	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
<b>Total FHLB Limit</b>	<b>15,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>	<b>10,500</b>
Securities	36,558	36,599	36,641	36,682	36,724	36,767	36,809	36,852	36,644	36,687	36,730	36,773
Pledged Securities	0	0	0	0	0	0	0	0	0	0	0	0
<b>Free Securities Available for Repo</b>	<b>36,558</b>	<b>36,599</b>	<b>36,641</b>	<b>36,682</b>	<b>36,724</b>	<b>36,767</b>	<b>36,809</b>	<b>36,852</b>	<b>36,644</b>	<b>36,687</b>	<b>36,730</b>	<b>36,773</b>
<b>Capacity to Meet Requirement</b>	<b>127,592</b>	<b>127,226</b>	<b>126,838</b>	<b>126,470</b>	<b>126,086</b>	<b>125,711</b>	<b>125,323</b>	<b>124,943</b>	<b>124,562</b>	<b>124,167</b>	<b>123,779</b>	<b>123,378</b>
<b>Other Funding Available (Sources)</b>												
Sale of Participations												
SBA/USDA Guarantee												
Federal Reserve Bank												
<b>Total Other Funding Available</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Surplus Capacity</b>	<b>130,463</b>	<b>126,545</b>	<b>126,154</b>	<b>125,782</b>	<b>125,395</b>	<b>125,017</b>	<b>124,625</b>	<b>124,242</b>	<b>124,108</b>	<b>123,459</b>	<b>123,068</b>	<b>122,664</b>
<b>Assets (End of Month Balance)</b>	<b>180,938</b>	<b>181,215</b>	<b>181,473</b>	<b>181,753</b>	<b>182,022</b>	<b>182,302</b>	<b>182,572</b>	<b>182,854</b>	<b>183,137</b>	<b>183,409</b>	<b>183,693</b>	<b>183,966</b>
<b>Surplus (% of Assets)</b>	<b>72.10%</b>	<b>69.83%</b>	<b>69.52%</b>	<b>69.20%</b>	<b>68.89%</b>	<b>68.58%</b>	<b>68.26%</b>	<b>67.95%</b>	<b>67.77%</b>	<b>67.31%</b>	<b>67.00%</b>	<b>66.68%</b>



## Liquidity Reporting/Stress Testing Considerations

- Does your institution pledge securities for municipal deposits?
  - › If those deposits leave in a stress scenario, collateral would be free to use for another secured borrowing or sale
- Loan Portfolio Runoff
  - › Are you planning for reductions in the loan portfolio? Bank could generally expect ~2% runoff from principal repayments, but may not want to include any prepayments or additional portfolio runoff
- Worst case scenarios
  - › Some examiners have asked for "worst" case scenarios where the bank runs out of liquidity. How much in deposits would need to leave before the bank ran out of contingent sources of funding?





## Liquidity Concerns From FDIC

- Seeing increase in use of non-core and wholesale funding sources and a decrease in liquid assets
- Seeing cases of banks with “insufficient level of unencumbered liquid assets”
- Concerns in municipal allocations to investment portfolios
  - Prior to Great Recession, only 10% of insured financial institutions had muni holdings greater than 100% of tier 1 capital; 25% of these institutions do now
  - Less liquidity given “long-term ‘buy and hold’ view of retail and institutional investors (like banks)”
- “Generally borrowings are not a substitute for core deposits”

<https://www.fdic.gov/regulations/examinations/supervisory/insights/sisum17/si-summer-2017.pdf>



Chart 2: Liquid Assets Rebound then Retreat Post-Crisis

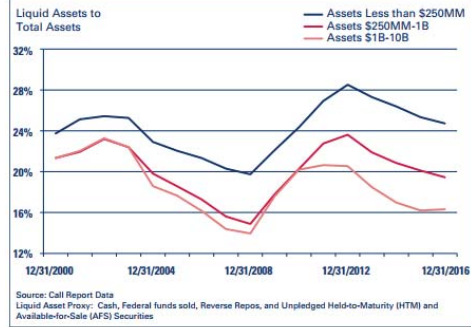
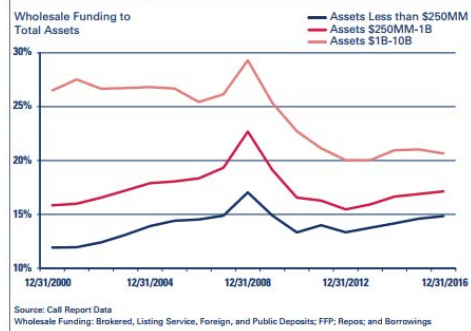


Chart 3: Wholesale Funding to Total Assets



17

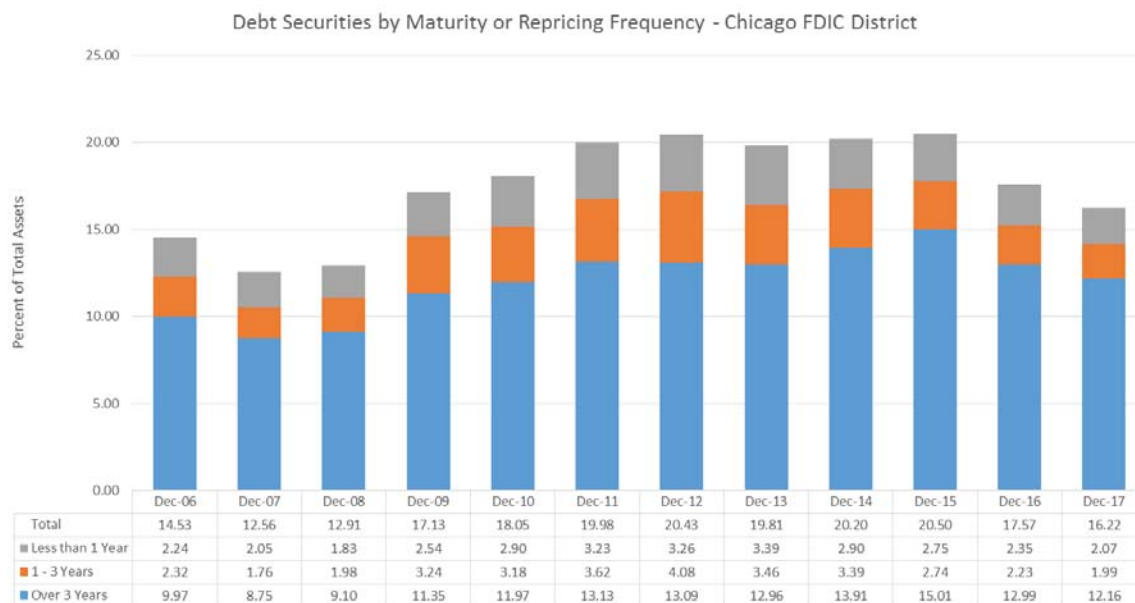
## Agenda

- › Asset/Liability Management Summary
- › Developing Assumptions for Model
- › Liquidity Stress Testing
- › **Investment Portfolio Management**
- › ALM Strategies



18

## Portfolio Trends



- Portfolio as a % of assets has fallen from 20.50% at YE15 to 16.22% at YE17

Source: FDIC



19

## Portfolio Trends

	2006	2008	2010	2012	2013	2014	2015	2016	2017
US Treasuries	2.42%	1.62%	7.04%	6.81%	6.43%	12.58%	12.61%	14.60%	13.13%
US Agencies	0.56%	0.44%	0.45%	0.83%	0.90%	0.93%	1.01%	1.07%	1.05%
Government Sponsored Enterprises	13.53%	8.55%	8.65%	7.11%	6.96%	5.72%	4.77%	3.48%	3.28%
Mortgage Pass-Through Securities	39.63%	41.01%	31.99%	32.15%	32.11%	30.48%	33.57%	35.55%	38.19%
Collateralized Mortgage Obligations	21.30%	22.84%	21.65%	20.13%	18.25%	17.21%	15.41%	13.37%	12.72%
State, County, Municipal Obligations	7.42%	7.47%	6.82%	8.70%	9.73%	9.79%	10.17%	10.19%	10.19%
Asset Backed Securities	4.64%	6.48%	4.87%	5.51%	5.83%	4.97%	4.03%	3.48%	3.14%
Other Debt Securities	9.14%	10.27%	17.79%	18.20%	19.32%	17.89%	18.10%	17.97%	18.03%
Equity Securities	1.36%	1.33%	0.75%	0.56%	0.47%	0.43%	0.33%	0.28%	0.28%
Total Securities	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

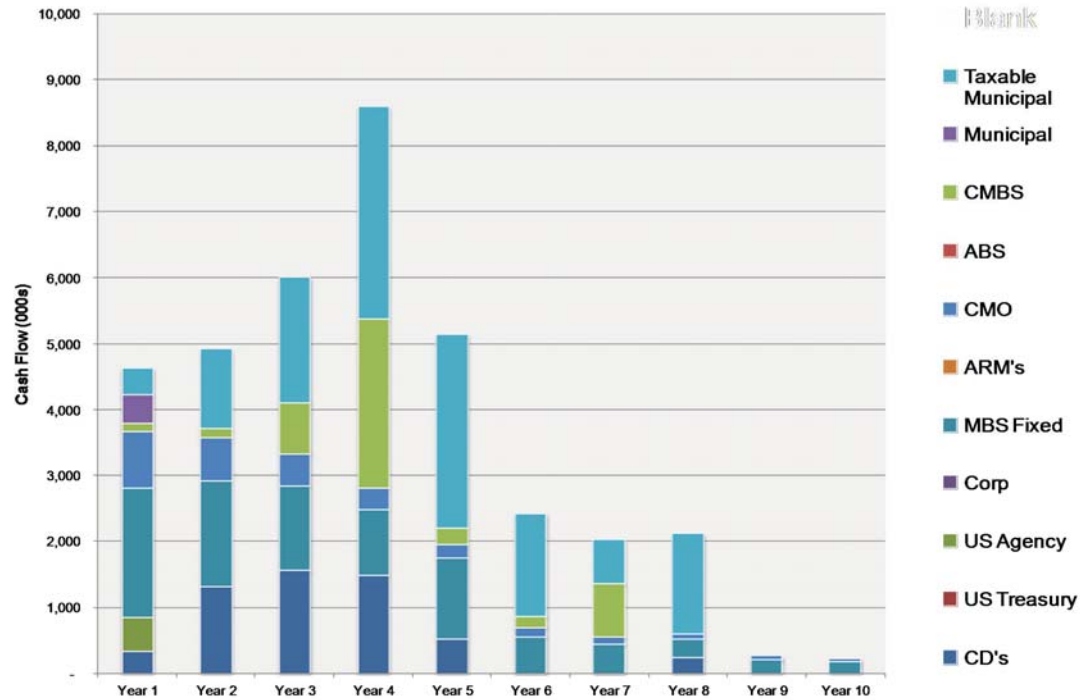
- Liquidity Coverage Ratio Rule effective 1/1/2015. Resulted in largest banks (>\$250 billion) increasing holdings of Treasuries. In 2016, the Fed allowed certain municipal securities to be included in the LCR calculation.
- Other Debt Securities includes:
  - Privately issued residential mortgage backed securities
  - Commercial mortgage backed securities (CMBS)
  - Corporate securities
- Change in tax law impacting holdings of tax exempt munis
  - C-Corp banks subject to a 21% tax rate finding munis less attractive compared to S-Corp banks subject to ~29.6% or higher tax rates (depending on shareholders)

Source: FDIC



20

## Portfolio Cash Flows - Annual



21

## Monthly Cash Flows

	US							Taxable					Total	Cumulative
	CD's	Treasury	US Agency	Corp	MBS Fixed	ARM's	CMO	ABS	CMBS	Municipal	Municipal	Other		
Month 1	2	-	-	-	172	-	76	-	11	438	6	-	705	705
Month 2	7	-	503	-	167	-	74	-	11	-	47	4	813	1,518
Month 3	5	-	-	-	167	-	73	-	11	-	-	-	256	1,774
Month 4	10	-	-	-	169	-	74	-	11	-	10	-	274	2,048
Month 5	13	-	-	-	171	-	75	-	11	-	61	4	335	2,383
Month 6	9	-	-	-	171	-	75	-	11	-	77	-	343	2,726
Month 7	2	-	-	-	168	-	73	-	11	-	6	-	260	2,986
Month 8	7	-	-	-	166	-	72	-	11	-	47	4	307	3,293
Month 9	5	-	-	-	160	-	69	-	11	-	-	-	245	3,538
Month 10	260	-	-	-	157	-	68	-	11	-	10	-	506	4,044
Month 11	13	-	-	-	151	-	65	-	11	-	61	4	305	4,349
Month 12	9	-	-	-	147	-	63	-	11	-	77	-	307	4,656
Month 13	2	-	-	-	141	-	60	-	11	-	6	-	220	4,876
Month 14	7	-	-	-	137	-	58	-	11	-	47	4	264	5,140
Month 15	5	-	-	-	136	-	58	-	11	-	-	-	210	5,350
Month 16	9	-	-	-	137	-	56	-	11	-	10	-	223	5,573
Month 17	258	-	-	-	139	-	56	-	11	-	371	4	839	6,412
Month 18	254	-	-	-	138	-	58	-	12	-	77	-	539	6,951
<b>Total</b>	<b>877</b>	<b>-</b>	<b>503</b>	<b>-</b>	<b>2,794</b>	<b>-</b>	<b>1,203</b>	<b>-</b>	<b>199</b>	<b>438</b>	<b>913</b>	<b>24</b>	<b>6,951</b>	



22

## Risk of Asset vs. Liability Sensitivity to Banks

- Down economy, falling rate environment:
  - Asset sensitive
    - (-) Less net interest income
    - (-) Decreased loan growth
    - (-) Loan quality problems (losses)
  - Liability sensitive
    - (+) Higher net interest income
    - (-) Decreased loan growth
    - (-) Loan quality problems (losses)
- Up economy, rising rate environment:
  - Asset sensitive
    - (+) Higher net interest income
    - (+) Increased loan growth
  - Liability sensitive
    - (-) Lower net interest income
    - (+) Increased loan growth
- Higher Loan/Deposit ratio:
  - Generally greater risk to capital
  - Greater liquidity risk – Liquidity risk becomes more of an issue when a bank experiences credit problems
  - Banks that survived last recession the best typically had greater percentage of investments and those investments had a large percentage of positively convex bonds (municipals)
  - CMBS and Municipals give greatest spread to curve with positive convexity or relatively minimal negative convexity
- At what point does your institution begin preparing for falling interest rates?



23

## Agenda

- › Asset/Liability Management Summary
- › Developing Assumptions for Model
- › Liquidity Stress Testing
- › Investment Portfolio
- › **ALM Strategies**



24

## Where Are We in the Cycle?

*“Interest rate changes generally have small effects on bank profits, but changes in economic conditions do matter relatively much more.”*

*The Federal Reserve Bank of Chicago July 2014*



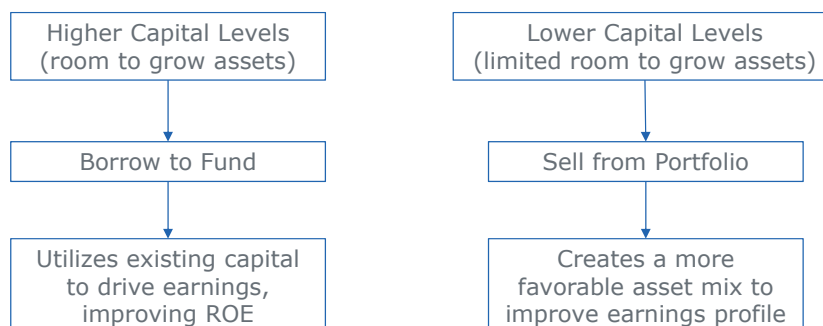
- Many banks have experienced loan credit spread compression over past year
- Has risk profile of deals decreased or increased? Is that perceived or based on the completed credit analysis?
- Thinking back to 2007-2008, could we have identified potential credit risks that impacted the bank loan portfolio in subsequent years? Loosening credit standards, fast loan growth, etc.?



25

## Scenario for Discussion: Funding Loan Demand

- Example: Institution is looking to fund \$5 million in loan growth and does not have excess cash balances to use. What should management do?
- Items to consider:
  - › Current capital levels
  - › Financial targets
  - › Interest rate risk position
  - › Existing asset mix
  - › Portfolio cashflow forecast



26

## Loan Funding, continued

---

### Decision and analysis:

- › Capital ratios are acceptable, but management does not feel as though it has significant "excess capital" to leverage the balance sheet for a longer time frame
- › Interest rate risk position is liability sensitive
- › Institution will borrow \$2 million short term
  - › Review of portfolio cashflow forecast indicates \$2 million coming due within 3 months. Borrowing will be paid off with the portfolio run off. Cost to borrow ~0.50%.
- › Sell \$3 million from investment portfolio
  - › Institution will take opportunity to sell lower yielding callable agencies with call/extension risk to fund loans.



## Selling Bonds from the Portfolio – What to Choose?

---

<u>Investments Sold</u>	<u>Maturity</u>	<u>Book Yield</u>	<u>Book Price</u>	<u>Sale Price</u>	<u>Loss</u>
\$3 Million Callable Agencies	5 year	1.65%	\$100.00	\$ 97.65	\$ (70,395)
<u>Reinvestment</u>					
Commercial Loans	5 year	4.50%			
Incremental Yield		2.85%			
Incremental Annual Income		\$ 85,500			
Time to Recover Loss (years)		0.82			

<u>Compare the "costs"</u>	<u>Cost</u>	<u>Duration/Term</u>
Investment Portfolio	2.15%	5-year callables
FHLB Advance	2.08%	5-year maturity
Brokered CD	2.15%	5-year bullet

Other considerations: purchase of FHLB stock, collateral requirements, current Brokered allocation



## Funding Strategy – In Market vs. Wholesale?

- Your bank needs funding. Traditionally, the bank has only run CD specials, but hasn't had much success increasing deposits. The bank is targeting \$10 million of new money. What options would the bank have to increase deposits?
  - Run another CD special
  - Increase rates on money market account
  - Use wholesale funding

	<u>Existing MMKT Balance</u>	<u>Current Rate</u>		<u>Current Annual Cost</u>	
	\$ 100,000,000	0.50%		\$ 500,000	
<b>Scenario 1</b>	<b>New Funds</b>	<b>New Rate</b>	<b>Total Funding</b>	<b>Total Cost</b>	<b>Increase in Expense</b>
Raise MMKT rate by 25 bps	\$ 10,000,000	0.75%	\$ 110,000,000	\$ 825,000	\$ 325,000
<b>Scenario 2 and 3</b>					
Add Wholesale Funding					
All Short Term	\$ 10,000,000	1.83%	\$ 110,000,000	\$ 683,000	\$ 183,000
All Fixed Rate (3 YR)	\$ 10,000,000	2.69%	\$ 110,000,000	\$ 769,000	\$ 269,000

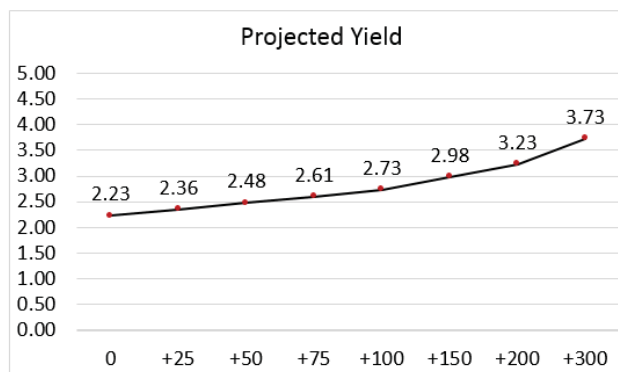


29

## Investment Strategy - CMBS Barbell Opportunity

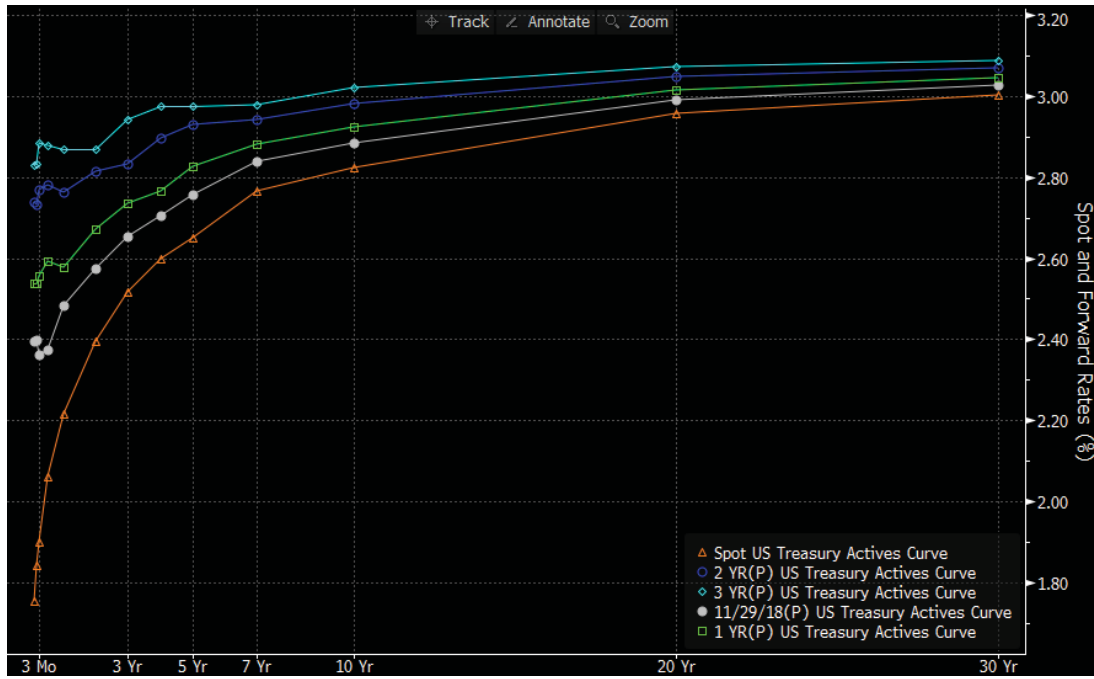
- Balance risks of a rising rate environment with floating rate exposure, while capturing the yield of a longer security without extension risk.
- Blue Chip Rate Forecast® predicts further curve flattening through 4Q 2019
- Barbell with 1 month LIBOR floater & longer term (8-10yr) fixed rated CMBS
  - Capless floater with long average life of cashflow
  - Adjust maturity of fixed rate CMBS to meet duration target
- Compare this strategy to a 4 year CMO
  - 2.24% yield, 4.3 base case average life
  - 5.8 year +300
  - Barbell provides equivalent yield today, with upside in the future, without convexity (duration shift) risk.

<u>Yield</u>	<u>WAL</u>	<u>Effective Duration</u>	<u>Yield +300bps</u>	<u>WAL +300bps</u>	<u>Purchase Price</u>
2.78	9.38	8.31	2.78	9.38	99.438
1.68	11.02	0.08	4.68	11.02	100.375
2.23	10.20	4.20	3.73	10.20	



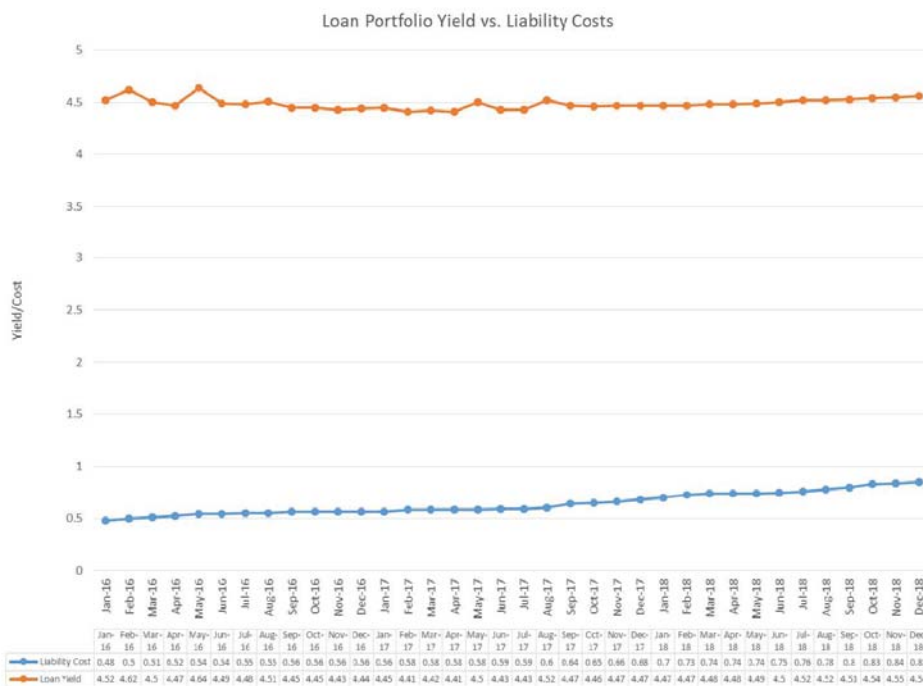
30

## How Could Barbell Pay Off? – Forward Treasury Curves



31

## Example Institution – Yield on Loans vs. Deposit Cost



2016:  
Loan: 4.50%  
Deposit: 0.54%

2017:  
Loan: 4.45%  
Deposit: 0.61%

2018:  
Loan: 4.50%  
Deposit: 0.77%



32



## Disclaimer

---

The views expressed herein are provided for informational purposes only and are subject to change based on market and other conditions. The information is current only as of the date indicated and subsequent developments may affect the accuracy or completeness of such information. BOK Financial Securities, Inc. ("BOKFS") has no duty or obligation to revise this document for any such subsequent developments. BOKFS currently makes a market in the subject offerings. From time to time BOKFS may have a financial interest (ex. long position) in the subject securities. Prices, yields, and availability are time sensitive and subject to change based upon market conditions and other factors. Prices and yields will be recalculated for your review prior to placement of an order. All material has been obtained from sources believed to be reliable, but its accuracy is not guaranteed. Prospective investors should read the Official Statement for each offering carefully and consult with their own legal, financial, and tax advisors prior to making any investment.

Securities, insurance and advisory services offered by BOK Financial Securities, Inc., member FINRA/SIPC and a subsidiary of BOK Financial Corporation. Some services offered through our affiliate, Institutional Investments, Bank of Oklahoma which operates as a separately identifiable trading department of BOKF, NA. **NOT FDIC INSURED | NO BANK GUARANTEE | MAY LOSE VALUE**



