

Interest Rate Risk Monitor: Introduction and Overview



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Interest Rate Risk Management requires proper analysis of balance sheet data in a dynamic context, and a good reporting system is necessary for that analysis. The **Interest Rate Risk Monitor (IRRM)** has been designed to satisfy the fundamental needs of a sound reporting system. The data is thorough and detailed, but the reports are readable and useful for risk assessment and strategy development. Separate reports are designed for the three primary constituencies who will make use of them: bank management, bank directors, and regulatory authorities. Key reports are accompanied by descriptive text and explanation to assist in interpretation and analysis.

Summary ALCO: This is the executive summary for an IRRM report. It provides the essential information necessary for analysis. This includes the following reports:

- A/L Mix:** A snapshot of the balance sheet as of report date. This report shows broad categories of assets and liabilities, and essential measures of those items across the columns. Key liquidity measures are also shown on this page along with pie charts of the asset / liability mix. This page provides a starting point for understanding the interest rate risk position of the bank. Among other things, the balances of various asset and liability categories are listed along with the percentage of each balance that is rate sensitive (re-priceable) in the next 12 months. Existing book yields and rates are shown alongside the new reinvestment rates for each category so users can get an idea of rate differentials for repricing balances and the expected impact on interest income and expense.

Summary ALCO - Asset/Liability Mix													
ABC Bank - Anywhere, US													
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Balances (\$000's)	Book Value	% of Book TA	Total is % of Segment			Rate Sensitive < 1 Year	*Book Yield/Rate	*Reinv. Rate	Full Indx. Rate	**12 Mo. Proj. Yield/Rate	Avg. Life	Effective Duration	Effective Convexity
Cash & Due	\$2,523	2.04			100.00						0.00	0.00	0.00
Investments	\$20,627	16.66	97.32	0.21	2.47	35.14	4.58	2.77 / 2.92	3.96	3.55	2.71	(0.57)	
Funds Sold	\$5,653	4.57		100.00		100.00	0.38	0.38 / 0.38	0.38	0.04	0.02	(0.01)	
Loans	\$88,147	71.19	88.74	12.63	(1.38)	36.04	6.19	5.96 / 3.92	6.05	2.73	1.71	(0.53)	
Other Earning Non-Earning	\$6,874	5.55			100.00								
Total Assets	\$123,824	100.00	79.39	13.60	7.02	36.07	5.62	5.13 / 2.73	5.41	2.54	1.67	(0.48)	
Non-Maturing Deposits	\$48,550	39.21	75.21	24.79		75.21	0.90	0.93 / 0.93	0.93	3.40	1.97	(0.39)	
CD's Under 100M	\$28,479	23.00	100.02	(0.02)		73.55	2.86	2.00 / 0.00	2.18	1.02	0.87	(0.05)	
CD's Over 100M	\$16,718	13.50	100.00			87.50	2.99	1.86 / 0.00	2.04	0.52	0.43	(0.05)	
Borrowed Funds	\$16,809	13.57	98.91		1.09	23.80	3.66	3.66 / 0.00	3.81	3.29	2.95	0.21	
Other Paying Non-Paying	\$618	0.50			100.00								
Total Liabilities	\$111,174	89.78	55.62	32.64	11.54	68.44	2.29	1.86 / 0.93	1.97	2.32	1.60	(0.16)	
Total Equity Capital	\$12,650	10.22									0.24	(0.33)	
Total Liab & Capital	\$123,824	100.00											

Liquidity Ratios		
	Constant	ALCO Benchmark
Investments / Deposits	22.00	< 40.00%
Loans / Deposits	94.03 ✓	< 90.00%
Loans / Assets	71.19	< 90.00%
Loans / Capital	696.81	< 850.00%
Net Borrowed Funds / Capital	88.19	< 200.00%
Reliance on Wholesale Funding	15.20 ✓	< 15.00%
Dependency Ratio	20.37	< 30.00%
Liquid Assets / TA	12.43	> 10.00%
Over \$100m Deposits / TA	13.50	< 20.00%
Available Line of Credit	\$10,119	
✓ Ratio is outside benchmark.		

Asset Mix

Liability Mix

Note: Values are rounded before printing, but full precision values are used in all calculations. * Investments using Accounting yield. * Yields/Rates are reported on EA & PL.

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Liquidity Ratios - The IRRM report lists certain key liquidity ratios on the Asset / Liability Mix page. These measures and definitions are listed below.

Liquidity Ratios	Constant	ALCO Benchmark
Investments / Deposits	22.00	< 40.00%
Loans / Deposits	94.03 ✓	< 90.00%
Loans / Assets	71.19	< 90.00%
Loans / Capital	696.81	< 850.00%
Net Borrowed Funds / Capital	88.19	< 200.00%
Reliance on Wholesale Funding	15.20 ✓	< 15.00%
Dependency Ratio	20.37	< 30.00%
Liquid Assets / TA	12.43	> 10.00%
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▪ **Investments / Deposits**

The investment to deposit ratio displays the percentage of deposits used to fund investments. Since there is an actively traded investment market, a high percentage of investments to deposits could display a very liquid balance sheet if these securities book value was equal or close to market value.

- $\text{Investments / Deposits} = \text{Total Securities} / \text{Total Deposits}$

▪ **Loan / Deposits**

Many banks and bank analysts monitor loan / deposit ratios as a measure of liquidity. Loans are presumably the least liquid of assets, while deposits are the primary source of funds. A high ratio indicates illiquidity because a bank is fully loaned up relative to its stable funding. Implicitly, new loans or other asset purchases must be financed with large purchased liabilities, which can be very expensive. A low ratio suggests that a bank has additional liquidity because it can grant new loans financed with stable, low cost deposits.

- $\text{Loans Category} / (\text{Non-Maturing Demand} + \text{CD} > \$100,000 + \text{CD} < \$100,000) 100$

▪ **Loans / Capital**

Loans / capital displays the amount of loans versus the amount of primary capital for a particular institution. History has shown that institutions with loan amounts equivalent to eight times tier 1 capital are testing the limits of prudence. Ratios much lower than eight times capital could be considered the norm for most institutions. Loans / capital is derived by:

- $\text{Total Loans} / \text{Net Tier 1 Capital}$

▪ **Net Funds Borrowed / Capital**

Net funds borrowed / capital is monitored by analysts and bank managers to display the extent to which bank managers are forced to utilize purchased funds to maintain steady growth.

- $((\text{Borrowed Funds} - \text{Funds Sold}) / \text{Capital}) 100$

▪ **Reliance on Wholesale Funding**

- $\text{Reliance on Wholesale Funding} = (\text{Total Borrowings} + \text{Brokered Deposits}) / (\text{Total Borrowings} + \text{Total Deposits})$

- **Dependency Ratio**

The Dependency Ratio displays the amount to which an institution's long term assets are dependent on short term (volatile) liabilities for funding. The dependency ratio is calculated by:

- $\text{Dependency Ratio} = ((\text{Non-Core Liabilities} - \text{Short Term Investments}) / (\text{Long Term Assets} * 100))$

- **Liquid Assets / Total Assets**

Asset liquidity refers to the ease of converting an asset to cash with a minimum amount of loss. The most liquid assets typically mature in the near term and are highly marketable. The liquidity ratio is expressed as a percentage of total assets. The Liquidity Ratio is calculated by:

- $(\text{Cash \& Due} + \text{ST Investments} - \text{Pledged Investments} + \text{Funds Sold} + \text{Trading Account}) / \text{Total Assets}$
- ST Investments = all investments that mature or paydown within a one year time frame.

- **Over \$100m Dep. / Total Assets**

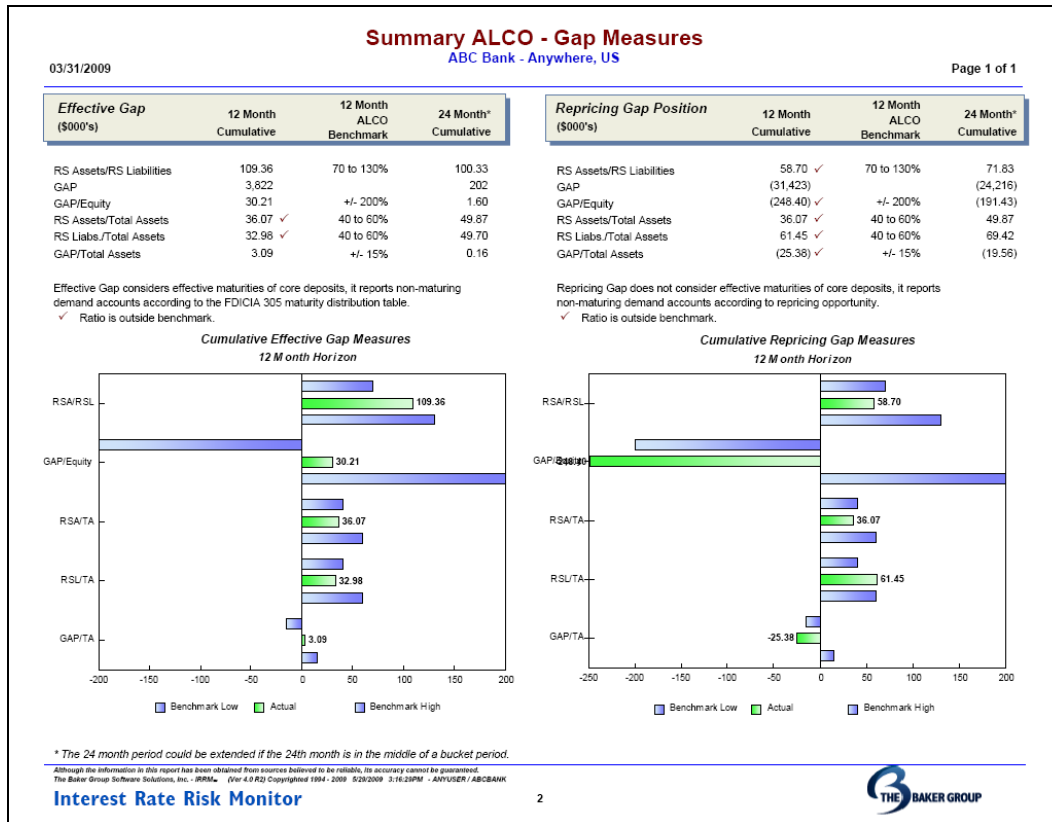
Jumbo CD's, or time deposits over \$100,000, typically tend to be highly volatile in that purchasers of CD's that size tend to pay close attention to interest rates. This close monitoring of the term structure of interest rates allows purchasers to shop around for the highest rate. This shopping around causes this type of liability to be highly volatile money, hot money. It is vital to banks to keep large percentages of deposits from leaving the bank at one time. Therefore, managers and analysts use this ratio to protect against runs on the bank. Over \$100m Dep. / Total Assets is calculated by:

- $(\text{Certificates of deposits of \$100m or more} + \text{Open Account Time Deposits of \$100m}) / \text{Total Assets}$

- **Available Line of Credit**

This includes the amount of any and all borrowing lines that are currently unencumbered and untapped by the bank. Unused lines of credit at the Federal Home Loan Bank, for example, would be listed.

- Gap Measures:** Gap is simply the dollar difference between rate sensitive assets (i.e. assets that re-price or mature) and rate sensitive liabilities for a particular time period, usually 12 months. If more assets re-price than liabilities, the number will be positive which shows that an institution is asset sensitive, or “positively gapped”. Traditional Gap theory says that an asset sensitive institution will generally realize an increase in income if interest rates rise due to the fact that more assets than liabilities will be rolling over and repricing into higher market rates. In this case, all else being equal, earning asset yield will rise faster than the cost of liabilities. The exact opposite takes place if the bank has a negative Gap, where more liabilities than assets re-price during the period. It is important to note that Gap analysis deals only with balances of rate sensitive assets and liabilities, and ignores the rates (yields or costs) associated with those repricing balances. It is therefore only a crude indicator of the potential change in net income.



Effective Gap versus Repricing Gap: One of the problems with Gap measures involves the treatment of non-maturing deposits. These liability accounts (such as Checking, Savings, and MMDA) do not have an identifiable maturity date and contractually the rate may be changed by the bank any time it chooses. So there arises a question as to whether these items should be treated as always and immediately rate sensitive, or if they should be assigned a rate sensitivity that more accurately reflects their true behavior.

- Repricing Gap** is defined as a gap measure that utilizes contractual repricing dates in the allocation of assets and liabilities across predefined time periods. A repricing gap treats non-maturing deposits as though they will immediately and instantly re-price each time market rates move. Repricing Gap does not consider the actual behavior of non-maturing deposits in terms of how they affect the balance sheet.

- **Effective Gap** is a more useful measure for rate sensitivity analysis. Effective gap uses behavioral assumptions that more accurately model the rate sensitivity of non-maturing deposits. Effective Gap is considered to be the more meaningful measure for analysis since it looks at the true behavior of non-maturing deposits rather than the contractual ability to re-price. The IRRM uses FDICIA 305 guidelines as a default treatment of non-maturing deposits in order to arrive at the Effective GAP.

Treatment of Non-Maturity Deposits: Most banks have a large percentage of their liabilities in core deposits or non-maturity deposits (DDA, NOW, and MMDA). These liabilities are difficult to model with respect to rate sensitivity and repricing behavior. The rates paid on Core deposits are generally considered to be “administered” rates in the sense that they set or changed at anytime at the discretion of bank management. Often, core deposit rates are barely moved for lengthy periods of time, but to some degree bank managers will move these rates according to changes in the general interest rate environment. Every bank is different in this respect. In order to model these deposits appropriately, we must use some sort of guidelines for estimating how rate sensitive these accounts are likely to be. As a base case default, the **IRRM** uses the guidelines originally proposed in section 305 of the FDIC Improvement Act of 1991 (FDICIA). These guidelines provide for a percentage of the balance in different non-maturing deposit accounts to be treated as re-priceable or rate sensitive across a range of maturity buckets. This scheme of maturity distribution is shown in the table below.

FDICIA 305: Maturity Distribution Limits for Non-Maturity Deposits

	0-3 mos (pct)	3-12 mos (pct)	1-3 yrs (pct)	3-5 yrs (pct)	5-10 yrs (pct)
Commercial DDA....	50	0	30	20
Retail DDA.....	0	0	60	20	20
MMDA.....	0	50	50
Savings.....	0	0	60	20	20
NOW.....	0	0	60	20	20

This treatment of non-maturity deposits will result in average life and duration measures that are greater than zero, but still fall within reasonable ranges for analysis of economic value. It is important to note that the FDICIA guidelines are a default and are not intended to replace the need for banks to evaluate and consider the unique characteristics of their individual deposit bases when determining their rate sensitivity.

An alternative to the FDICIA maturity distribution guidelines for core deposits is the set of assumptions used by the OTS standard model. The OTS (Office of Thrift Supervision) guidelines spread the maturity distribution out more evenly and generally produce estimated average lives that are longer. The OTS guidelines are designed to be used by thrifts under \$1 billion in assets.

OTS Standard Model: Maturity Distribution Limits for Non-Maturity Deposits

	0-3 mos (pct)	3-12 mos (pct)	1-3 yrs (pct)	3-5 yrs (pct)	5-10 yrs (pct)	>10 yrs (pct)
DDA.....	0	18	27	18	23	14
MMDA.....	0	32	37	17	12	2
Savings.....	0	14	22	17	25	22
NOW.....	0	32	36	17	13	2

Newer banks and those in competitive markets may find that their core deposits are fairly rate sensitive. For those banks, the FDICIA 305 distribution may serve as a useful benchmark or default. The OTS distribution often makes sense for many smaller community banks, older institutions, or those in rural areas for example, that can demonstrate very little rate sensitivity of their non-maturity deposits.

Earning Power & Earnings Simulation – Establishing a Baseline (Base Case): In order to conduct a dynamic analysis of a bank’s interest rate risk, we must first establish a baseline or benchmark against which to measure changes. We use two different methods for deriving this base case.

- **YTD Annualized** – One method for determining the base case is to simply look at actual year-to-date annualized performance and assume that the bank continues on the same trajectory for the next twelve months. We are using the performance of the recent past to project the base case for the coming year. The potential problem with this method is that often there may have been one-time or non-recurring income or expense events that skew the year-to-date performance. Also, many banks experience seasonality or calendar-year patterns of performance that can introduce distortions. For banks such as these, we use an alternative method for deriving the base case called the Constant Balance Sheet method.
- **Constant Balance Sheet** – This method for calculating the base case simply takes the balances of assets and liabilities that existed on report date, applies the actual rates associated with those balances and then does the multiplication. This method takes a snapshot of existing (not historical) balances and rates, and extrapolates a baseline for earnings. The base case net-interest income is just (Earning Assets Balance x Asset Yield – Paying Liabilities Balance x Liability Cost). Non-interest income and expense are plugged in or assumed to be the actual year-to-date numbers annualized.

Summary ALCO - Earning Power Measures

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Earning Power	YTD Annualized	Constant Balance Sheet *		YTD Annualized	Constant Balance Sheet	ALCO Benchmark
Interest Income:	\$6,366	\$6,471	Efficiency Ratio	58.01	56.99	< 65.00%
Tax Adjusted Interest Income: [Ⓞ]	\$6,366	\$6,471	Earning Assets/Paying Liab.		117.07	> 115.00%
Interest Expense:	\$2,320	\$2,253	Yield on Earning Assets (EA)		5.62	
Net Interest Income before Provision:	\$4,047	\$4,217	Rate on Paying Liabilities (PL)		2.29	
Provisions for Loan Loss:	\$(480)	\$(480)	Earning Interest Spread (difference)		3.33	> 3.25%
Net Interest Income:	\$3,567	\$3,737	Cost of Funds	1.90	1.82	
Non Interest Income:	\$2,100	\$2,100	Net Interest Margin	3.65 ✓	3.66 ✓	> 3.75%
Non Interest Expense:	\$3,600	\$3,600	To break even the bank needs a margin of	1.35	1.30	
Operating Income before G/L, Tax & Extra Items:	\$2,067	\$2,237	To achieve a target of 1.00 ROA, the bank needs a Margin of	3.05	2.96	
Realized Gain/Loss + Extra Items: [Ⓞ]	\$0	\$0	To achieve a target of 10.00 ROE, the bank needs a Margin of	3.14	3.03	
Taxes:	\$(580)	\$(783)				
Net Income(Loss):	\$1,487	\$1,454				

Available Line of Credit:	\$10,119
Risk Weighted Assets:	\$80,442
Avg. Earning Assets:	\$110,826
Avg. Total Assets:	\$122,313
Equity/Total Assets:	10.22
Desired After Tax ROA:	1.00
Desired After Tax ROE:	10.00
Effective Tax Rate:	35.00%
Marginal Tax Rate:	35.00%
Taxable this year?	Yes
OREO:	\$538

Net Interest Margin per Rate Shift
12 Month Horizon

Rate Shift	Net Interest Margin	Benchmark	Base
-300/-300	3.66	3.73	3.66
-200/-200	3.66	3.73	3.66
-100/-100	3.73	3.73	3.66
Constant	3.73	3.73	3.66
+100/+100	3.78	3.73	3.66
+200/+200	3.80	3.73	3.66
+300/+300	3.82	3.73	3.66

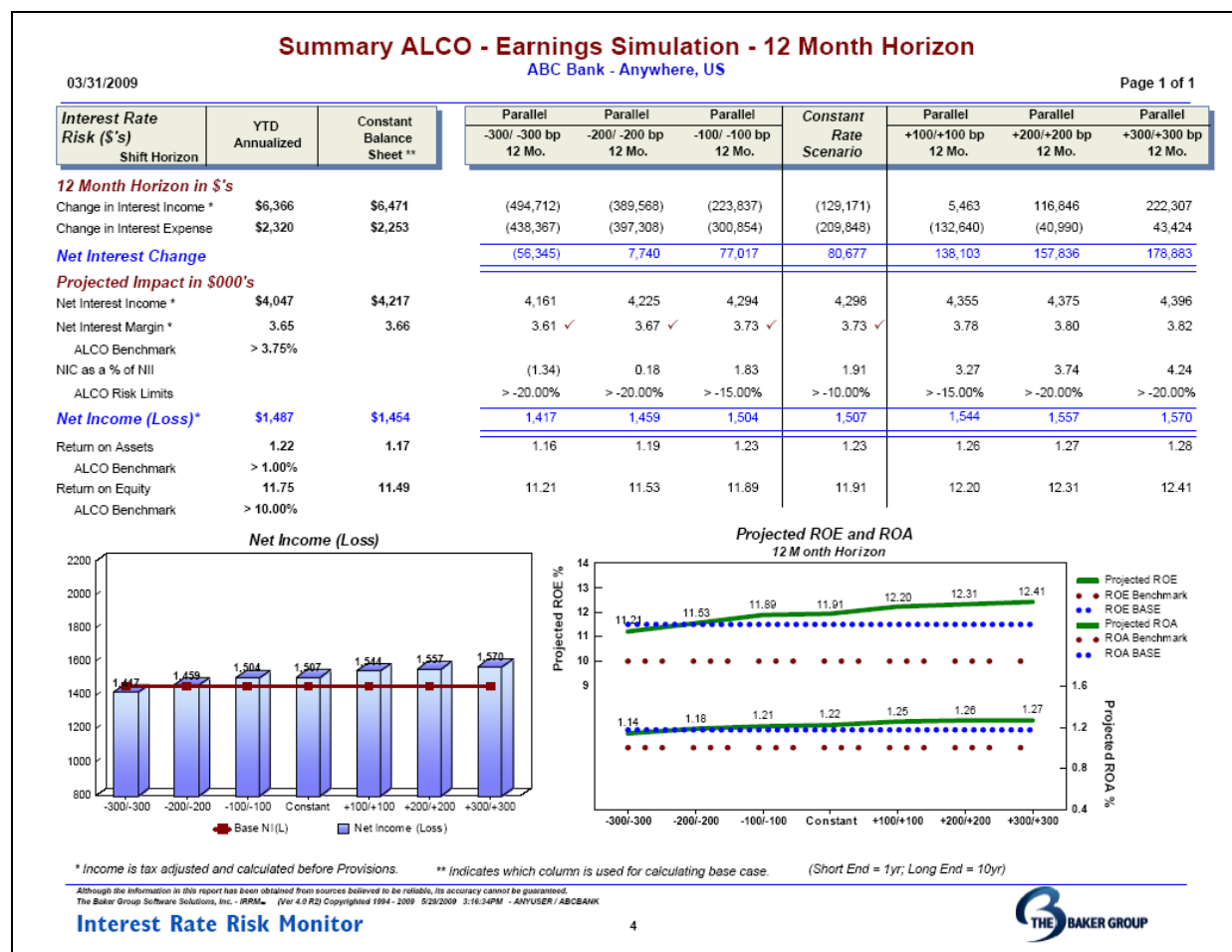
Ⓞ Adjusted Interest Income is calculated using the Interest Income, Tax Exempt Income, and Marginal Tax Rate.
Ⓞ Realized Gain & Extra Items are non-recurring events. * Indicates which column is used for calculating base case.

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- **Earning Power Measures:** Bank Earnings arise ultimately from income exceeding expenses. Various metrics exist which allow us to track the earning potential or earning power of a bank at a point in time. For example:
 - **Efficiency Ratio:** The efficiency ratio displays how well bank managers are utilizing the bank's resources to produce healthy returns for the shareholders. The efficiency ratio can be thought of as total overhead expense (i.e. non-interest expense) divided by total operating income less interest expense. The efficiency ratio is calculated by: $\text{Total Overhead Expense} / (\text{Total Operating Income} - \text{Interest Expense})$.
 - **Earning Assets / Paying Liabilities:** This ratio is an earning power measure that displays the amount of earning assets that an institution possesses for every dollar of paying liabilities. Equilibrium is achieved when a measure of 100 is achieved, however for an institution to profit from business a spread should exist. In historical terms banks have been able to maintain a level of \$1.17 of earning assets for every \$1.00 of paying liabilities.
 - **Net Interest Margin:** The net interest margin is the dollar difference between interest income and interest expense expressed as a percentage of average assets.
 - **Breakeven Margin:** The breakeven margin is the level of net interest margin that an institution must earn on its average earning assets in order to pay all of its expenses. It is the level of net interest margin that produces no net income.
 - **Target Margin:** The target margin is the level of net interest margin that an institution must earn on its average earning assets in order to reach its desired return goals.

Earnings Simulation – 12 Month Horizon: The **IRRM** model simulates the dynamics of repricing and maturing balances of assets and liabilities in order to capture the fluctuations in income and expense under different interest rate scenarios. This requires a variety of behavioral assumptions to be built into the model. These assumptions include critical inputs about principal prepayment rates, time lags, and sensitivities of different types of assets and liabilities to changes in market interest rates. The output of the simulation shows the projected changes in a number of performance measures including net interest income, net interest margin, and returns on assets and equity among others. The **IRRM** also allows for non-parallel yield curve shifts to be modeled as well.



- Net Interest Change (NIC)** – Net Interest Change displays how interest income and expense will change over time, as balances of assets and liabilities naturally re-price, mature, and rollover into new rate environments. Net interest change is extremely useful in displaying how changes in market interest rates as well as changes in an institution’s balance sheet will affect the institution’s earnings. The power of net interest change comes through the analysis of several different rate scenarios at one time as well as the ability to adjust prepayment speeds for cash flows and monitor reinvestment assumptions for different interest rate scenarios. Once Net Interest Change is calculated for each rate scenario, the corresponding net income and performance measures (return on assets and return on equity) are easily derived.

Economic Value of Equity (EVE): This is an economic concept that gauges the impact of interest rate changes on fair market values of asset, liabilities, and equity. EVE captures the change in economic value of the bank even though that change may not be reflected in the bank's accounting books and records. Consider the underlying market value of bonds in the investment portfolio. We all know that if interest rates rise, bond prices fall. This is the manifestation of price risk. What is not as clear, however, is the degree to which that change in the economic value of the investment portfolio value will impact the overall value of the balance sheet. Note that loans also have a theoretical economic value just like bonds. If market interest rates rise sharply, then existing fixed-rate loans will be worth less from an economic standpoint. Indeed, any financial asset or liability... anything with a cash flow... will have an underlying value that fluctuates as interest rates move up and down. Whereas the value of assets will move inversely to interest rates, the value of liabilities will move directly with rates. This is because existing fixed rate deposits become more valuable to the institution if market interest rates rise. The **IRRM** uses standard financial discounting methodology to derive fair value of assets and liabilities, then shocks interest rates up and down 100, 200, and 300 basis points, and then recalculates values in order to measure projected changes. The effect of these changes on various equity ratios is reported along with the percentage change in fair market value for equity among other metrics.

Economic Value of Equity (EVE)							
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<i>Book Value</i>	Assets	Risk Weighted Assets	Liabilities	Total Equity Capital	Tier 1 Capital	Tier 2 Capital	Total RBC
Total	123,824 *	80,442	111,174	12,650	12,004	885	12,889
as a % of TA		64.96	89.78	10.22	9.69		
as a % of RWA				15.73	14.92		16.02
Unadjusted BV	123,144						
* Adjusted Book Value includes MTM adjustment of 680							
<i>Fair Value</i>	Fair Value of Assets	Appreciation / (Depreciation)		Fair Value of Liab.	(Appreciation) / Depreciation		Fair Value of Equity
Rate Shock		\$	%		\$	%	
+300/+300 bp	115,678	(7,466)	(6.06)	104,312	(6,862)	(6.17)	11,366
+200/+200 bp	118,894	(4,250)	(3.45)	106,229	(4,945)	(4.45)	12,665
+100/+100 bp	121,959	(1,185)	(0.96)	108,140	(3,034)	(2.73)	13,819
Constant	124,732	1,588	1.29	110,349	(825)	(0.74)	14,383
-100/-100 bp	126,806	3,662	2.97	112,661	1,487	1.34	14,145
-200/-200 bp	127,184	4,040	3.28	114,224	3,050	2.74	12,960
-300/-300 bp	128,321	5,177	4.20	114,829	3,655	3.29	13,492
<i>Fair Value of Equity Ratios</i>				Change in FV of Equity			
Rate Shock	FV of Equity / FV of TA	FV of Equity / FV of RWA		\$ Change	%	ALCO Benchmark %	
+300/+300 bp	9.83	15.12		(3,017)	(20.98)	>(40.00%)	
+200/+200 bp	10.65	16.40		(1,718)	(11.94)	>(30.00%)	
+100/+100 bp	11.33	17.44		(564)	(3.92)	>(20.00%)	
Constant	11.53	17.75					
-100/-100 bp	11.15	17.17		(238)	(1.65)	>(20.00%)	
-200/-200 bp	10.19	15.69		(1,423)	(9.89)	>(30.00%)	
-300/-300 bp	10.51	16.18		(891)	(6.19)	>(40.00%)	
Note: Values are rounded before printing, but full precision values are used in all calculations.				(Short End = 1yr; Long End = 10yr)			
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Important to Note -

Benchmarks: The **IRRM** reports include benchmark or target ranges and ratios for key measures. These benchmarks are entirely flexible and may be adjusted at management's discretion. The benchmark targets may serve as policy limits if management so desires, or they may simply serve as strategic targets separate and distinct from policy parameters.

Assumptions: Interest rate risk modeling involves projecting (or estimating) behavioral characteristics which cannot be known with complete precision or certainty. The response and behavior of depositors or borrowers to a given change in interest rates will vary from one to another and from institution to institution. For a given bank, we can use historical experience and statistical probabilities to arrive at reasonable assumptions, but always with the knowledge that these are assumptions about unknowns and they should be monitored, tested, and adjusted if deemed appropriate. These assumptions include: Reinvestment rates, prepayment rates, sensitivities (or betas) associated with market rate changes, time lags, direction (or redirection) of maturing balances, and growth rates among others. IRRM includes default assumptions for all of these but users will need to assess these assumptions and adjust them if appropriate in order to capture the unique characteristics of the institution.

Back-Testing: Each bank's **IRRM** is back-tested annually to assess modeling efficiency and see how close the estimates were to actual performance. Actual versus projected changes are compared for different categories of assets and liabilities. From this, we can determine the accuracy of assumptions. Back-testing is a critical component of the Asset / Liability Management process as it often results in adjustments or changes to assumptions in order to improve the process going forward.

Note: *"Back-Testing" is separate and distinct from "Validation". Back-testing involves comparing actual results versus the model's projections. Validation involves a detailed analysis of the integrity of calculations and methodology of the model itself. The IRRM model has been validated by an outside auditor and a certification letter of that validation is available to all users.*

Other Useful Definitions:

Fully Indexed Yield: This is the yield that would exist on a floating-rate loan or security if the adjustment were to occur today given the current level of index plus margin and taking into account any caps or floors. For example, if a floating rate bond has a contractual adjustment of 150 basis points over the one-year T-Bill, and the one-year T-Bill today is trading at 1%, then the fully indexed yield would be 2.50%. The fully-indexed yield provides helpful information even for floating rate assets that may not actually adjust for some time.

Reinvestment Rate (Cap or Floor): Market interest rates are changing daily and banks are constantly adjusting their loan and deposit rates for new business. The reinvestment rate is simply the newest rate or yield that would be applied to any given asset or liability if it were to be originated or priced today. The reinvestment rate cap or floor is the cap or floor that would apply to newly originated assets or liabilities.

Reset Rate (Cap or Floor): This is the rate on floating- or adjustable-rate assets or liabilities that is calculated by the contractual formula (index plus margin). The reset rate cap or floor is the cap or floor that is applied to that principal amount which is resetting.

Note: It is important to recognize the distinction between the cap or floor on re-investing balances on the one hand, and the cap or floor on resetting principal balances on the other hand. For example, a floating rate loan may have some portion of principal which is paying down (actual maturing or amortizing dollars) and another portion which is resetting (dollars of principal which are having their coupon reset or adjusted). The cap or floor for each of these may be different.

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Data Input and Assumptions for Interest Rate Risk Monitor (IRRM)

Computer simulations are used to project the performance of complex systems under varying conditions. In banking, an asset / liability management model is used to capture the dynamics of a bank's balance sheet and to project financial performance under different interest rate environments. As with any model, the input and assumptions that are built into the framework are critical to the integrity of the resulting output. From the standpoint of management efficiency, a good model should produce reports that detail the key inputs and assumptions.

The IRRM model produces three important reports containing information about data input and assumptions. These reports are designed for management's use as well as for regulatory compliance. Below is a list of those key reports:

- Reinvestment Rates Detail Report** – this report lists every category of asset and liability. Information for each item includes:
 - the current balance (book value)
 - the current book yield (or rate)
 - the fully indexed yield (FIY) for adjustable, variable or floating rate instruments

Reinvestment Rates (Detail)											
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Balances (\$000's)	Balance	Yield	FIY	Var Cap/ Floor	Reinv. Cap/ Floor	Wtd Avg. Reinvest.	First Reinvest.	Second Reinvest.	Third Reinvest.	Roll To Account	
Cash & Due											
Total Cash & Due from Banks						Non Earning/Paying					
Investments											
Total Stock	\$1,650	3.00				3.00	3.00 (100% for 15 Yrs.)	0.00 (0% for 24 Mo.)			
Credit Life Insurance						Non Earning/Paying					
Investment Balancing						Non Earning/Paying					
Mark-To-Market Adjustment						Non Earning/Paying					
Trading Account	\$0	0.00				0.00	0.00 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
Agency	\$7,963	4.11				1.65	1.65 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
Munis	\$1,178	5.77				4.43	4.43 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
BA/CD	\$198	3.63				3.63	3.63 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
MBS FX	\$9,118	5.26				3.50	3.50 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
FNMAFHLMCANL-1YRCMT-An	\$36	5.09	2.76	11.03/0.00		2.76	2.76 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
FNMAFHLMCANL-11thDistCOF	\$8	4.05	3.63	11.61/1.18		3.63	3.63 (100% for 24 Mo.)	0.00 (0% for 24 Mo.)			
Funds Sold											
Fed Funds Sold	\$5,653	0.38	0.38			0.38	0.38 (100% for 1 Mo.)	0.00 (0% for 24 Mo.)			
Loans											
Ag - Fixed	\$1,063	6.67				6.50	6.50 (100% for 3 Yrs.)	0.00 (0% for 24 Mo.)			
Comm'l - Fixed	\$30,655	6.53				6.50	6.50 (100% for 3 Yrs.)	0.00 (0% for 24 Mo.)			
Comm'l - M - Prime	\$9,387	4.78	4.06	0.00/2.20		6.50	6.50 (100% for 3 Yrs.)	0.00 (0% for 24 Mo.)			
Comm'l - Q - Prime	\$822	3.25	3.25			6.50	6.50 (100% for 3 Yrs.)	0.00 (0% for 24 Mo.)			
Comm'l - Q - Other	\$0	0.00				0.00	0.00 (100% for 10 Yrs.)	0.00 (0% for 24 Mo.)			
Comm'l - S - Prime	\$431	3.38	3.38			6.50	6.50 (100% for 3 Yrs.)	0.00 (0% for 24 Mo.)			
Comm'l - A - Prime	\$450	3.94	2.56			6.50	6.50 (100% for 10 Yrs.)	0.00 (0% for 24 Mo.)			
✓ Tax Exempt - Fixed	\$998	4.18				4.19	4.19 (100% for 5 Yrs.)	0.00 (0% for 24 Mo.)			
R/E Mort - Fixed	\$40,637	6.26				5.25	5.25 (100% for 5 Yrs.)	0.00 (0% for 24 Mo.)			
R/E Mort - 3 Yrs - Other	\$47	6.45	5.00	0.00/1.61		5.00	5.00 (100% for 5 Yrs.)	0.00 (0% for 24 Mo.)			
Installment - Fixed	\$2,907	7.60				7.50	7.50 (100% for 3 Yrs.)	0.00 (0% for 24 Mo.)			
Installment R/E - Fixed	\$1,965	7.01				7.70	7.70 (100% for 5 Yrs.)	0.00 (0% for 24 Mo.)			
SBA Comm'l - Fixed	\$0	0.00				0.00	0.00 (100% for 10 Yrs.)	0.00 (0% for 24 Mo.)			

✓ Reinvestment assumptions not changed in the past year. * Notional Balance. (Short End = 1yr; Long End = 10yr)

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Interest Rate Risk Monitor

- the cap or floor for adjustable, variable, or floating rate instruments

- the cap or floor for reinvested principal or new money
 - the weighted average reinvestment rate (this is the bank's average current offering rate for new money)
 - columns for three alternative re-investment options which show any re-allocation of re-investing balances within the same account
 - a column showing any balances that may roll into another asset or liability category
- **Rate Shift Assumptions Report** – this report shows various behavioral assumptions across different interest rate environments for each category of asset and liability. The rate environments are user-defined and flexible. They may include instantaneous rate shocks, rate shifts over a time horizon, parallel shifts or non-parallel shifts. (a bias for rates may also be set as a starting point when banks know that a pricing change is imminent). Normally, the base case is simply for no change over a 12 month horizon. The other assumptions that vary include:
 - CPR Projection – this is the assumption for speed of principal return that is assigned to amortizing assets and liabilities
 - Shift Sensitivity – this is the category-specific sensitivity (or beta) that corresponds to each rate scenario
 - Time Lag – this is the category-specific time lag applied to the pricing change for each rate scenario

Rate Shift Assumptions
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Shift Horizon	Parallel	Parallel	Parallel	Constant Rate Scenario	Parallel	Parallel	Parallel
	-300/-300 bp 12 Mo.	-200/-200 bp 12 Mo.	-100/-100 bp 12 Mo.		+100/+100 bp 12 Mo.	+200/+200 bp 12 Mo.	+300/+300 bp 12 Mo.

Loans-(con't)

Comm ¹ - M - Prime							
	Bias(bp) = 0	Horizon = 12 Mo.	Lag = 0 Mo.				
Bias/Horizon/Lag	60.00	40.00	10.00	5.00	5.00	5.00	5.00
CPR Projection	100%	100%	100%		100%	100%	100%
Shift Sensitivity	0 Mo.	0 Mo.	0 Mo.		0 Mo.	0 Mo.	0 Mo.
Time Lag	3.50	4.50	5.50	6.50	7.50	8.50	9.50
Reinvest Rate (1yr)	2.20	2.20	3.06	4.06	5.06	6.06	7.06
Repricing Rate (1yr)	0.33	0.42	0.63	0.68	0.68	0.68	0.68
Average Life	Cap/Floor			100% @ 6.50 for 36 Mo.,	0% @ 0.00 for 24 Mo.,	0% @ 0.00 for 24 Mo.,	
Reinvestment	100% X Prime (3.25) + 80.5785 Margin/Eff. 81 / 80				Reset Monthly	0.00 collar	0.00 cap 2.20 floor.
Fully Indexed Yield	4.06			Term = 495.0	FDICIA 305 Category = Other amortizing loans		
Additional	Book Value = 9,387						
Comm ¹ - Q - Prime							
	Bias(bp) = 0	Horizon = 12 Mo.	Lag = 0 Mo.				
Bias/Horizon/Lag	60.00	40.00	10.00	5.00	5.00	5.00	5.00
CPR Projection	100%	100%	100%		100%	100%	100%
Shift Sensitivity	0 Mo.	0 Mo.	0 Mo.		0 Mo.	0 Mo.	0 Mo.
Time Lag	3.50	4.50	5.50	6.50	7.50	8.50	9.50
Reinvest Rate (1yr)	0.25	1.25	2.25	3.25	4.25	5.25	6.25
Repricing Rate (1yr)	0.57	0.65	0.76	0.78	0.78	0.78	0.78
Average Life	Cap/Floor			100% @ 6.50 for 36 Mo.,	0% @ 0.00 for 24 Mo.,	0% @ 0.00 for 24 Mo.,	
Reinvestment	100% X Prime (3.25) + 0 Margin/Eff. 0 / 0				Reset Quarterly	0.00 collar	0.00 cap 0.00 floor.
Fully Indexed Yield	3.25			Term = 11.0	FDICIA 305 Category = Other amortizing loans		
Additional	Book Value = 822						
Comm ¹ - Q - Other							
	Bias(bp) = 0	Horizon = 12 Mo.	Lag = 0 Mo.				
Bias/Horizon/Lag	60.00	40.00	10.00	5.00	5.00	5.00	5.00
CPR Projection	90%	90%	90%		100%	100%	100%
Shift Sensitivity	1 Mo.	1 Mo.	1 Mo.		0 Mo.	0 Mo.	0 Mo.
Time Lag	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Reinvest Rate (1yr)	0.00	0.00	0.00	0.00	1.00	2.00	3.00
Repricing Rate (1yr)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Life	Cap/Floor			100% @ 0.00 for 10 Yrs.,	0% @ 0.00 for 24 Mo.,	0% @ 0.00 for 24 Mo.,	
Reinvestment	Effective Formula Not Applicable.				Reset Quarterly	0.00 collar	0.00 cap 0.00 floor.
Fully Indexed Yield	0.00			Term = 8.0	FDICIA 305 Category = Other amortizing loans		
Additional	Book Value = 0						

(Short End = 1yr; Long End = 10yr)

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Interest Rate Risk Monitor 

- Reinvestment Rate (1yr) – this is the reinvestment rate for the account that will exist after one year given the time lags and shift sensitivities
- Average Life – this is the average length of time that each dollar of principal is outstanding

- There are also rows for additional information about reinvestment of principal (three options)
- **Balance and Rate Entry Report** – this report details cash flows and associated yields or rates month-over-month (or per defined period) for each category of asset and liability. It breaks down cash flows into maturing dollars versus principal paydowns as well as variable or floating rate adjustments to principal dollars. Each cash flow balance has the appropriate yield or rate associated with it in each time period. There is also information on this report regarding caps and floors associated with the account, the current fair market value, the discount rate used for EVE calculations, average life, modified and effective durations, and the effective convexity among other things.

Balance & Rate Entry														
ABC Bank - Anywhere, US														
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Balances (\$000's)	Total	Apr 09	May 09	Jun 09	Jul 09	Aug 09	Sep 09	Oct 09	Nov 09	Dec 09	Jan 10	Feb 10	Mar 10	Apr 10 Mar 11
Loans-(con't)														
413	Comm'l - M - Prime													
Principal (Mature)	\$9,387	3,562	340	192	551	814	6	527	0	295	239	0	0	1,571
GAP Cashflow	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387	9,387
Projected Static Yield	4.78	4.99	4.59	6.00	6.75	3.50	5.46	5.27	0.00	3.25	4.29	0.00	0.00	4.29
Adjusted Yield	0.00	4.65	4.06	4.06	4.06	4.06	4.06	4.06	0.00	4.06	4.06	0.00	0.00	4.06
Principal (Paydown)	39	25	23	23	20	16	16	14	14	13	10	12	96	
Yield (Paydown)	4.78	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	
Principal (Reprice)	5,786	5,421	5,206	4,632	3,798	3,776	3,233	3,219	2,910	2,659	2,649	2,637	1,726	
Yield (Reprice)	4.65	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.06	
Reinvest at	6.50	100% @ 6.50 for 3 Yrs.												
Fully Indexed Yield	4.06	100% X Prime (3.25) + 80.5785 Margin/Eff. 81 / 80									Reset Monthly	0.00 collar	0.00 cap	2.20 floor.
Fair Value	\$9,241	Discount Rate = 6.50												
Price Volatility		Average Life = 0.68			Modified Duration = 0.58			Effective Duration = 0.38			Effective Convexity = 0.08			
CPR	5.00	Prepay into Comm'l - M - Prime												
Base Income (Annual \$'s)	\$448,699													
415	Comm'l - Q - Prime													
Principal (Mature)	\$822	0	0	0	0	0	0	0	0	0	787	0	0	0
GAP Cashflow	822	822	822	822	822	822	822	822	822	822	822	822	822	822
Projected Static Yield	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.00	0.00	0.00
Adjusted Yield	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.00	0.00	0.00
Principal (Paydown)	3	4	3	4	4	3	3	3	3	3	0	0	0	
Yield (Paydown)	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	0.00	0.00	0.00	
Principal (Reprice)	819	0	0	808	0	0	798	0	0	0	0	0	0	
Yield (Reprice)	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	0.00	0.00	0.00	
Reinvest at	6.50	100% @ 6.50 for 3 Yrs.												
Fully Indexed Yield	3.25	100% X Prime (3.25) + 0 Margin/Eff. 0 / 0									Reset Quarterly	0.00 collar	0.00 cap	0.00 floor.
Fair Value	\$802	Discount Rate = 6.50												
Price Volatility		Average Life = 0.78			Modified Duration = 0.69			Effective Duration = 0.62			Effective Convexity = 0.03			
CPR	5.00	Prepay into Comm'l - Q - Prime												
Base Income (Annual \$'s)	\$26,715													

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Supplemental Information Report

In order for projected changes in interest income and expense to translate into bottom-line performance, we need to have some idea of what the bank is expecting in terms of non-interest income and expense as well as provision for loan losses and taxes. This data must be provided by the bank as supplemental input in order for the IRRM to establish a baseline measure of performance. Once this

baseline is established, changes in interest income and expense can be applied to arrive at projected performance over the different interest rate environments.

There are two methods for establishing the baseline (base case) net income. One method is simply to annualize the year-to-date performance. Another is to calculate projected interest income and expense based on actual balances and rates that exist on the balance sheet as of report date. In this latter case, we still need projections or estimates (from bank management) for the non-interest items, provision for loan loss, and taxes. Unless we tell the model otherwise, it will simply default to the actual year-to-date numbers for those projections. This report also includes information on the rate of dividend payout (where applicable) and OREO.

Supplemental Information			
ABC Bank - Anywhere, US			
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Balances (\$000's)	Entered Value YTD	Entered Value Annualized	Constant Balance Sheet
Interest Income:	\$1,573 [Y]	\$6,366	
Cash & Due:	0	0	
Investments:	235	940	
Funds Sold:	0	0	
Loans:	1,338	5,426	
Other Interest Earning:	0	0	
Tax Adjusted Interest Income: [Ⓞ]	\$1,573	\$6,366	\$6,471
Interest Expense:	\$572 [Y]	\$2,320	\$2,253
Non-Maturing Demand:	75	304	
Under 100M Time Deposits:	219	888	
Over 100M Time Deposits:	118	479	
Borrowed Funds:	160	649	
Other Interest Paying:	0	0	
Net Interest Income before Provision:	\$1,001	\$4,047	\$4,217
Provisions for Loan Loss:	\$(120) [Y]	\$(480)	\$(480)
Net Interest Income:	\$881	\$3,567	\$3,737
Non Interest Income:	\$525 [Y]	\$2,100	\$2,100
Non Interest Expense:	\$900 [Y]	\$3,600	\$3,600
Operating Income before G/L, Tax & Extra Items:	\$506	\$2,067	\$2,237
Realized Gain/Loss + Extra Items: [Ⓞ]	\$0	\$0	\$0
Taxes:	\$(145) [Y]	\$(580)	\$(783)
Net Income(Loss):	\$361	\$1,487	\$1,454
Dividend:			\$(1,454)
Retained Earnings:			\$0

Available Line of Credit:	\$10,119
Risk Weighted Assets:	\$80,442
Avg. Earning Assets:	\$110,826
Avg. Total Assets:	\$122,313
Equity/Total Assets:	10.22
Desired After Tax ROA:	1.00
Desired After Tax ROE:	10.00
Effective Tax Rate:	35.00%
Marginal Tax Rate:	35.00%
Taxable this year?	Yes
OREO:	\$538
Dividend Pay Out:	100%

[M] Original amount was entered using month-to-date values.
[Y] Original amount was entered using year-to-date values.
[A] Original amount was entered using annualized values.

[Ⓞ] Adjusted Interest Income is calculated using the Interest Income, Tax Exempt Income, and Marginal Tax Rate.
[Ⓞ] Realized Gain & Extra Items are non-recurring events.
Note: Values are rounded before printing, but full precision values are used in all calculations.

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Interest Rate Risk Monitor



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