CHAPTER 5
MEASURING AND EVALUATING THE PERFORMANCE OF BANKS AND THEIR PRINCIPAL COMPETITORS

Goal of This Chapter: The purpose of this chapter is to discover what analytical tools can be applied to a bank’s financial statements so that management and the public can identify the most critical problems inside each bank and develop ways to deal with those problems

Key Topics in This Chapter
- Stock Values and Profitability Ratios
- Measuring Credit, Liquidity, and Other Risks
- Measuring Operating Efficiency
- Performance of Competing Financial Firms
- Size and Location Effects
- The UBPR and Comparing Performance

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      2. Interpreting Profitability Ratios
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VII. Summary of the Chapter

Appendix to the Chapter - Improving the Performance of Banks and Other Financial Firms Through Knowledge: Sources of Information on the Banking and Financial-Services Industry

Concept Checks

5-1. Why should banks and other corporate financial firms be concerned about their level of profitability and exposure to risk?

Banks in the U.S. and most other countries are private businesses that must attract capital from the public to fund their operations. If profits are inadequate or if risk is excessive, they will have greater difficulty in obtaining capital and their funding costs will grow, eroding profitability. Bank stockholders, depositors, and bank examiners representing the regulatory community are all interested in the quality of bank performance. The stockholders are primarily concerned with profitability as a key factor in determining their total return from holding bank stock, while depositors (especially large corporate depositors) and examiners typically focus on bank risk exposure.

5-2. What individuals or groups are likely to be interested in these dimensions of performance for a bank or other financial institution?

The individuals or groups likely to be interested in bank profitability and risk include other banks lending to a particular bank, borrowers, large depositors, holders of long-term debt capital issued by banks, bank stockholders, and the regulatory community.

5-3. What factors influence the stock price of a bank or other financial corporation?

A bank's stock price is affected by all those factors affecting its profitability and risk exposure, particularly its rate of return on equity capital and risk to shareholder earnings. A bank can raise its stock price by creating an expectation in the minds of investors of greater earnings in the future, by lowering the bank's perceived risk exposure, or by a combination of increases in expected earnings and reduced risk.

5-4. Suppose that a bank is expected to pay an annual dividend of $4 per share on its stock in the current period and dividends are expected to grow 5 percent a year every year, and the minimum required return to equity capital based on the bank's perceived level of risk is 10 percent. Can you estimate the current value of the bank's stock?

In this constant dividend growth rate problem the current value of the bank's stock would be:

\[ P_o = \frac{D_1}{k - g} = \frac{4}{0.10 - 0.05} = 80. \]
5-5. What is return on equity capital and what aspect of bank performance is it supposed to measure? Can you see how this performance measure might be useful to the managers of nonbank financial firms?

Return on equity capital is the ratio of Net Income After Taxes/Total Equity Capital. It represents the rate of return earned on the funds invested in the bank by its stockholders. Most nonbank financial firms have stockholders, too who are interested in the return on the funds that they invested.

5-6 Suppose a bank reports that its net after-tax income for the current year is $51 million, its assets total $1,144 million, and its liabilities amount to $926 million. What is its return on equity capital? Is the ROE you have calculated good or bad? What information do you need to answer this last question?

The bank's return on equity capital should be:

\[
\text{ROE} = \frac{\text{Net After Tax Income}}{\text{Equity Capital}} = \frac{$51 \text{ million}}{\$1,144 \text{ mill.} - $926 \text{ mill.}} = 0.098 \text{ or 9.8 percent}
\]

In order to evaluate the performance of the bank, you have to compare the ROE to the ROE of some major competitors or some industry average.

5-7 What is the return on assets (ROA), and why is it important in banking? Might the ROA measure be important to banking’s key competitors?

Return on assets is the ratio of Net Income After Taxes/Total Assets. The rate of return secured on a bank's total assets indicates the efficiency of its management in generating net income from all of the resources (assets) committed to the institution.

5-8. A bank estimates that its total revenues from all sources will amount to $155 million and its total expenses (including taxes) will equal $107 million this year. Its liabilities total $4,960 million while its equity capital amounts to $52 million. What is the bank's return on assets? Is this ROA high or low? How could you find out?

The bank's return on assets would be:

\[
\text{ROA} = \frac{\text{Net After Tax Income}}{\text{Total Assets}} = \frac{$155 \text{ mill.} - $107 \text{ mill.}}{\$4,960 \text{ mill.} + $52 \text{ mill.}} = 0.0096 \text{ or 0.96 percent}
\]

The size of this bank's ROA should be compared with the ROA's of other banks similar in size and location to determine if this bank's ROA is high or low relative to the average for comparable banks.
5-9. Why do bankers and the managers of competing financial firms often pay close attention today to the net interest margin and noninterest margin? To the earnings spread?

The net interest margin (NIM) indicates how successful the bank has been in borrowing funds from the cheapest sources and in maintaining an adequate spread between its returns on loans and security investments and the cost of its borrowed funds. If the NIM rises, loan and security income must be rising or the average cost of funds must be falling or both. A declining NIM is undesirable because the bank's interest spread is being squeezed, usually because of rising interest costs on deposits and other borrowings.

In contrast, the noninterest margin reflects the bank's spread between its noninterest income (such as service fees on deposits) and its noninterest expenses (especially salaries and wages and overhead expenses). For most banks the noninterest margin is negative. Management will usually attempt to expand fee income, while controlling closely the growth of noninterest expenses in order to make a negative noninterest margin as least negative as possible.

The earnings base indicates the proportion of the bank's earning assets (loans, leases, and investments) relative to its total assets. As competition increases, greater pressure is placed on the bank's management to maintain the quality and quantity of these earning assets. Additionally, the bank's managers typically will shift some of their emphasis to increasing noninterest income generated by fees.

The earnings spread measures the effectiveness of the bank's intermediation function of borrowing and lending money, which, of course, is the bank's primary way of generating earnings. As competition increases, the spread between the average yields on assets and the average cost of liabilities will be squeezed, forcing the bank's management to search for alternative sources of income, such as fees from various services the bank offers.

5-10. Suppose a banker tells you that his bank in the year just completed had total interest expenses on all borrowings of $12 million and noninterest expense of $5 million, while interest income from earning assets totaled $16 million and noninterest revenues added to a total of $2 million. Suppose further that assets amounted to $480 million of which earning assets represented 85 percent of total assets, while total interest-bearing liabilities amounted to 75 percent of the bank's total assets. See if you can determine this bank's net interest and noninterest margins and its earnings base and earnings spread for the most recent year.

The bank's net interest and noninterest margins must be:

\[
\text{Net Interest Margin} = \frac{\text{Interest Income}}{\text{Total Assets}} = \frac{16 \text{ mill.} - 12 \text{ mill.}}{480 \text{ mill.}} = .00833
\]

\[
\text{Noninterest Margin} = \frac{\text{Noninterest Income}}{\text{Total Assets}} = \frac{2 \text{ mill.} - 5 \text{ mill.}}{480 \text{ mill.}} = -.00625
\]

The bank's earnings spread and earnings base are:

\[
\text{Earnings Spread} = \frac{\text{Earnings}}{\text{Total Assets}} = \frac{16 \text{ mill.}}{480 \text{ mill.} * 0.85} - \frac{12 \text{ mill.}}{480 \text{ mill.} * 0.75}
\]
Earnings Base = \frac{\$480 \text{ mill.} - \$480 \text{ mill.} \times 0.15}{\$480 \text{ mill.}} = 0.85 \text{ or } 85 \text{ percent}

5-11. What are the principal components of ROE and what do each of these components measure?

The principal components of ROE are:

a. The net profit margin or net after-tax income to operating revenues which reflects the effectiveness of a bank's expense control program;

b. The degree of asset utilization or ratio of operating revenues to total assets which measures the effectiveness of managing the bank's assets, especially the loan portfolio; and,

c. The equity multiplier or ratio of total assets to total equity capital which measures a bank's use of leverage in funding its operations.

5-12. Suppose a bank has an ROA of 0.80 percent and an equity multiplier of 12x what is its ROE? Suppose this bank's ROA falls to 0.60 percent. What size equity multiplier must it have to hold its ROE unchanged?

The bank's ROE is:

\[ \text{ROE} = 0.80 \text{ percent} \times 12 = 9.60 \text{ percent}. \]

If ROA falls to 0.60 percent, the bank's ROE and equity multiplier can be determined from:

\[ \text{ROE} = 9.60\% = 0.60 \text{ percent} \times \text{Equity Multiplier} \]

\[ \text{Equity Multiplier} = \frac{9.60 \text{ percent}}{0.60 \text{ percent}} = 16x. \]


The bank's ROE must be:

\[ \text{ROE} = \frac{\$12}{\$50} = 0.24 \text{ or } 24 \text{ percent} \]
Its tax-management, expense control, asset management, and funds management efficiency indicators are:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
<th>Efficiency Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tax Management</td>
<td>$12</td>
<td>$15</td>
</tr>
<tr>
<td>Expense Control</td>
<td>$15</td>
<td>$100</td>
</tr>
<tr>
<td>Asset Management</td>
<td>$100</td>
<td>$600</td>
</tr>
<tr>
<td>Funds Management</td>
<td>$600</td>
<td>$50</td>
</tr>
</tbody>
</table>

= .8 or 80 percent = .15 or 15 percent

5-14. What are the most important components of ROA and what aspects of a financial institution’s performance do they reflect?

The principal components of ROA are:

a. Total Interest Income Less Total Interest Expense divided by Total Assets, measuring a bank's success at intermediating funds between borrowers and lenders;

b. Provision for Loan Losses divided by Total Assets which measures management's ability to control loan losses and manage a bank's tax exposure;

c. Noninterest Income less Noninterest Expenses divided by Total Assets, which indicates the ability of management to control salaries and wages and other noninterest costs and generate interest income;

d. Net Income Before Taxes divided by Total Assets, which measures operating efficiency and expense control; and

e. Applicable Taxes divided by Total Assets, which is an index of tax management effectiveness.

5-15. If a bank has a net interest margin of 2.50%, a noninterest margin of -1.85%, and a ratio of provision for loan losses, taxes, security gains, and extraordinary items of -0.47%, what is its ROA?

The bank's ROA must be:

\[
ROA = 2.50\% - 1.85\% - 0.47\% = 0.18\%
\]

5-16. To what different kinds of risk are banks and their financial-service competitors subjected today?

a. Earnings Risk -- the probability that a bank's earnings (net income) will fall, subjecting its stockholders to actual losses or to lower rates of return.
b. Credit Risk -- the probability that loans and securities the bank holds will not pay out as promised.

c. Solvency Risk -- the possibility or probability the bank will fail.

d. Liquidity Risk -- the probability the bank will not have sufficient cash on hand in the volume needed precisely when cash demands arise.

e. Market Risk -- the probability that the value of assets held by the bank will decline due to falling market prices.

f. Interest-Rate Risk - the possibility or probability interest rates will change, subjecting the bank to losses.

5-17. What items on a bank's balance sheet and income statement can be used to measure its risk exposure? To what other financial institutions do these risk measures apply?

There are several alternative measures of risk in banking and financial services. Capital risk is often measured by bank capital ratios, such as the ratio of total capital to total assets or total capital to risk assets. Credit risk can be tracked by such ratios as net loan losses to total loans or relative to total capital. Liquidity risk can be followed by using such ratios as cash assets to total assets or by total loans to total assets. Interest-rate risk may be indicated by such ratios as interest-sensitive liabilities to interest-sensitive assets or the ratio of money-market borrowings to money-market assets.

5-18. A bank reports that the total amount of its net loans and leases outstanding is $936 million, its assets total $1,342 million, its equity capital amounts to $110 million, and it holds $1,150 million in deposits, all expressed in book value. The estimated market values of the bank's total assets and equity capital are $1,443 million and $130 million, respectively. The bank's stock is currently valued at $60 per share with annual per-share earnings of $2.50. Uninsured deposits amount to $243 million and money market borrowings total $132 million, while nonperforming loans currently amount to $43 million and the bank just charged off $21 million in loans. Calculate as many of the bank's risk measures as you can from the foregoing data.

\[
\begin{align*}
\text{Net Loans and Leases} & = \frac{\$936 \text{ mill.}}{\$1,324 \text{ mill.}} \\
\text{Uninsured Deposits} & = \frac{\$243 \text{ mill.}}{\$1,150 \text{ mill.}} \\
\text{Equity Capital} & = \frac{\$130 \text{ mill.}}{\$1,443 \text{ mill.}} \\
\text{Stock Price} & = \frac{\$60}{\text{Earnings Per Share}} = \frac{\$2.50}{\text{Earnings Per Share}} \\
\end{align*}
\]

\[
\begin{align*}
0.7069 \text{ or } 70.69 \text{ percent} & \quad 0.2113 \text{ or } 21.13 \text{ percent} \\
\end{align*}
\]
5-1. An investor holds the stock of First National Bank of Inseco and expects to receive a dividend of $12 per share at the end of the year. Stock analysts have recently predicted that the bank’s dividends will grow at approximately 8 percent a year indefinitely into the future. If this is true, and if the appropriate risk-adjusted cost of capital (discount rate) for the bank is 15 percent, what should be the current stock price per share of Inseco’s stock?

\[
P_0 = \frac{D_1}{(k - g)} = \frac{$12}{(.15 - .08)} = $171.43 \text{ per share.}
\]

5-2. Suppose that stockbrokers have projected that Price State Bank and Trust Company will pay a dividend of $3 per share on its common stock at the end of the year; a dividend of $4.50 per share is expected for the next year and $6 per share in the following year. The risk-adjusted cost of capital for banks in Price State’s risk class is 12 percent. If an investor holding Price State’s stock plans to hold that stock for only three years and hopes to sell it at a price of $60 per share, what should the value of the bank’s stock be in today’s market?

\[
P_0 = \frac{$3}{(1+.12)} + \frac{$4.50}{(1+.12)^2} + \frac{$6}{(1+.12)^3} + \frac{$60}{(1+.12)^3} \]

\[
P_0 = $53.24 \text{ per share.}
\]

5.3 Depositors Savings Association has a ratio of equity capital to total assets of 7.5 percent. In contrast, Newton Savings reports an equity capital to asset ratio of 6 percent. What is the value of the equity multiplier for each of these institutions? Suppose that both institutions have an ROA of 0.85 percent. What must each institution’s return on equity capital be? What do your calculations tell you about the benefits of having as little equity capital as regulations or the marketplace will allow?
Depositors Savings Association has an equity-to-asset ratio of 7.5 percent which means its equity multiplier must be:

\[
1/ (\text{Equity Capital} / \text{Assets}) = \frac{\text{Assets}}{\text{Equity Capital}} = 1 / 0.075 = 13.33x
\]

In contrast, Newton Savings has an equity multiplier of:

\[
1/ (\text{Equity Capital} / \text{Assets}) = \frac{1}{0.06} = 16.67x
\]

With an ROA of 0.85 percent Newton Savings would have an ROE of:

\[
\text{ROE} = 0.85 \times 16.67x = 14.17 \text{ percent.}
\]

In this case Newton Savings is making greater use of financial leverage and is generating a higher return on equity capital.

Depositors Savings Association has an ROE of:

\[
\text{ROE} = 0.85 \times 13.33x = 11.33 \text{ percent.}
\]

5-4. The income and expense statement for Gilcrest Merchants National Bank, when arranged in proper order, would appear as follows:

<table>
<thead>
<tr>
<th>Gilcrest Merchants National Bank Income and Expense Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Fees on Loans</td>
</tr>
<tr>
<td>Interest Dividends on Securities</td>
</tr>
<tr>
<td><strong>Total Interest Income</strong></td>
</tr>
<tr>
<td>Interest Paid on Deposits</td>
</tr>
<tr>
<td>Interest on Nondeposit Borrowings</td>
</tr>
<tr>
<td><strong>Total Interest Expense</strong></td>
</tr>
<tr>
<td>Net Interest Income</td>
</tr>
<tr>
<td>Provision for Loan Losses</td>
</tr>
<tr>
<td>Noninterest Income and Fees</td>
</tr>
<tr>
<td><strong>Noninterest Expenses:</strong></td>
</tr>
<tr>
<td>Salaries and Employee Benefits</td>
</tr>
<tr>
<td>Overhead Expenses</td>
</tr>
<tr>
<td>Other Noninterest Expenses</td>
</tr>
<tr>
<td><strong>Total Noninterest Expenses</strong></td>
</tr>
<tr>
<td><strong>Net Income Before Taxes and Security</strong></td>
</tr>
</tbody>
</table>
Gains or Losses 5
Taxes 1
Securities Gains (or Losses), Net of Taxes 1
Net Income After Taxes $5

Among the key ratios that can be calculated are the following:

\[
\text{ROE} = \frac{\text{Net Income After Taxes}}{\text{Equity Capital}} = \frac{5}{80} = 0.0625 \text{ or } 6.25 \text{ percent}
\]

\[
\text{ROA} = \frac{\text{Net Income After Taxes}}{\text{Total Assets}} = \frac{5}{1000} = 0.005 \text{ or } .5 \text{ percent}
\]

\[
\text{Net Interest Margin} = \frac{\text{Total Interest Income} - \left[ \left( \frac{61 + 12}{830} \right) \right]}{\text{Total Interest Expenses} - \left[ \left( \frac{49 + 6}{710} \right) \right]} = 0.0180 \text{ or } 1.8 \text{ percent}
\]

\[
\text{Net Noninterest Margin} = \frac{7 - 18}{1000} = -0.011 \text{ or } -1.1 \text{ percent}
\]

\[
\text{Net operating margin} = \left( \frac{\text{Total Operating Revenues} - \text{Total Operating Expenses}}{\text{Total Assets}} \right) = \frac{1000}{70} = 0.08 \text{ or } 8.0 \text{ percent}
\]

\[
\text{Earnings spread} = \frac{\text{Total Interest Income}}{\text{Total Earning Assets}} - \frac{\text{Total Interest Expenses}}{\text{Total Interest Bearing Liabilities}} = \frac{61 + 12}{830} - \frac{49 + 6}{710} = 0.0880 - 0.0775 = 0.0105 \text{ or } 1.05 \text{ percent}
\]

\[
\text{Earnings base in assets} = \frac{\text{Total Assets} - \text{Nonearning Assets}}{\text{Total Assets}} = \frac{830}{1000} = 0.83 \text{ or } 83 \text{ percent}
\]

\[
\text{Profit Margin} = \frac{\text{Net income after taxes}}{\text{Total operating revenue}} = \frac{5}{80} = 0.0625 \text{ or } 6.25 \text{ percent}
\]

\[
\text{Asset Utilization} = \frac{\text{Total operating revenue}}{\text{Total Assets}} = \frac{80}{1000} = 0.08 \text{ or } 8.0 \text{ percent}
\]

\[
\text{Equity Multiplier} = \frac{\text{Total Assets}}{\text{Total Equity Capital}} = 12.5x
\]
Net Loans / Total Assets = \( \frac{670}{1000} \) = 0.67 or 67 percent

Cash and Due from Bank = \( \frac{120}{1000} \) = 0.12 or 12 percent

Operating Efficiency Ratio = \( \frac{73}{80} \) = 0.9125 or 91.25 percent

Employee Productivity Ratio = \( \frac{\text{Net Operating Income}}{\text{# of Full Time Employees}} \) = \( \frac{80 - 73}{40} \) = $175,000 per employee

5-5. The rates of return requested for Shadowwood National Bank are as follows:

ROE = \( \frac{105}{15,765 - 15,440} \) = 0.3231 or 32.31 percent

ROA = \( \frac{105}{15,765} \) = 0.0067 or .67 percent

Net Interest Margin = \( \frac{1875 - 1210}{12,612} \) = 0.0527 or 5.27 percent

(If total assets are used as the denominator, NIM = 4.22 %.)

Net Noninterest Margin = \( \frac{501 - 685}{12,612} \) = 0.0146 or –1.46 percent.

(If total assets are used as the denominator, the noninterest margin is –1.17%).

Net Operating Margin = \( \frac{(1,875 + 501) - (1,210 + 685 + 381 + 16)}{15,765} \) = \( \frac{100}{15,765} \) = 0.0063 or .63 percent

Net Return Before Special Transaction Costs = \( \frac{(1,875 + 501) - (1,210 + 685 + 381 + 16)}{15,765} \) = \( \frac{84}{15,765} \) = 0.0053 or .53 percent

Earnings per Share = \( \frac{105,000,000}{145,000} \) = $724.14 per share.
A summary table created using excel is as follows:

Notes: All figures except Common Shares in millions.

Equity Capital = Total Assets - Total Liabilities = $15,765 - $15,440 = $325 (millions)

<table>
<thead>
<tr>
<th></th>
<th>original</th>
<th>Alt (1)</th>
<th>Alt (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest Income</td>
<td>1875</td>
<td>1968.75</td>
<td>1781.25</td>
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<tr>
<td>Interest expense</td>
<td>1210</td>
<td>1270.5</td>
<td>1149.5</td>
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<tr>
<td>Net interest income</td>
<td>665</td>
<td>698.25</td>
<td>631.75</td>
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<tr>
<td>non interest income</td>
<td>501</td>
<td>526.05</td>
<td>475.95</td>
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<tr>
<td>noninterest expense</td>
<td>685</td>
<td>719.25</td>
<td>650.75</td>
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<tr>
<td>net noninterest income</td>
<td>-184</td>
<td>-193.2</td>
<td>-174.8</td>
</tr>
<tr>
<td>provision for loan losses</td>
<td>381</td>
<td>381</td>
<td>381</td>
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<tr>
<td>pretax operating income</td>
<td>100</td>
<td>124.05</td>
<td>75.95</td>
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<tr>
<td>taxes paid</td>
<td>16</td>
<td>16</td>
<td>16</td>
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<tr>
<td>security gains or losses</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>net after-tax income</td>
<td>105</td>
<td>129.05</td>
<td>80.95</td>
</tr>
<tr>
<td>Total assets</td>
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<tr>
<td>Earning assets</td>
<td>12612</td>
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<tr>
<td>Total Liabilities</td>
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<td>15440</td>
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<tr>
<td>Total Equity</td>
<td>325</td>
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</tr>
<tr>
<td>Shares of common stock</td>
<td>145000</td>
<td>145000</td>
<td>145000</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>%change(A1)</th>
<th>%change (A2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROE</td>
<td>32.31%</td>
<td>22.90%</td>
</tr>
<tr>
<td>ROA</td>
<td>0.67%</td>
<td>22.90%</td>
</tr>
<tr>
<td>NIM (total assets as denominator)</td>
<td>4.22%</td>
<td>5.00%</td>
</tr>
<tr>
<td>NIM (earning assets as denominator)</td>
<td>5.27%</td>
<td>5.00%</td>
</tr>
<tr>
<td>EPS</td>
<td>$724.14</td>
<td>$22.90%</td>
</tr>
<tr>
<td>NNIM</td>
<td>-1.17%</td>
<td>-5.00%</td>
</tr>
<tr>
<td>NOM</td>
<td>0.63%</td>
<td>-24.05%</td>
</tr>
<tr>
<td>Net Returns before special transactions</td>
<td>0.53%</td>
<td>-28.63%</td>
</tr>
</tbody>
</table>
decrease flows through to net income, then net income will decrease by 5%. This decrease will result in ROE, ROA, and EPS decreasing by 22.90%.

5-6. Selected balance sheet and income statement data for Farmers and Merchants National Bank are given as follows:

Given: ROA = 0.0076 (i.e., 0.76%)
Total Assets = $1.69 billion ($1,690 million)
Equity Capital = $139 million

Solution:

\[
\text{ROE} = \text{ROA} \times \frac{\text{Total Assets}}{\text{Equity Capital}} = 0.0076 \times \frac{1,690}{139} = 0.0924 \text{ or } 9.24\%
\]

Alternative Scenario 1:

ROA increases by 50%, with no change in assets or equity capital.
Therefore, the new ROA = 0.0076 * 1.5 = 0.0114 or 1.14%.

New ROE = 1.14% * 12.16 = 13.86%

This represents a 50% increase in ROE. With no changes in assets or equity, the investors' funds are more effectively utilized, generating additional income and making the bank more profitable.

Alternative Scenario 2:

ROA decreases by 50%, with no change in equity or assets.
Therefore, the new ROA = 0.0076 * 0.5 = 0.0038 or 0.38%.

New ROE = 0.38% * 12.16 = 4.62%

This represents a 50% decrease in ROE. The bank's management has been less efficient, in this case, in managing their lending and/or investing functions or their operating costs.

Alternative Scenario 3:

ROA = 0.0076 or 0.76% (as in the original problem)

Total assets double in size to $3.38 billion and equity capital doubles in size to $278 million. Therefore, the equity multiplier (i.e. total assets/equity capital) remains the same (E.M. = $3,380/$278 = 12.16). As a result, there is no change in ROE from the original situation (i.e.), 0.76% * 12.16 = 9.24%.

Alternative Scenario 4:
This, of course, is just the reverse of scenario 3. Since the changes in both assets and equity capital are the same, the ratio of the two (i.e., the equity multiplier) remains constant. As a result, there is again no change in ROE.

E.M. = Total Assets/Equity Capital = $845/$69.5 = 12.16.

Therefore, ROE = 0.76% * 12.16 = 9.24%.

5-7. The following chart provides a summary of Granite Dells State Bank reports and their responses to alternative scenarios:

<table>
<thead>
<tr>
<th>Problem 7</th>
<th>Original</th>
<th>alt1</th>
<th>alt2</th>
<th>alt3</th>
<th>alt4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Revenues</td>
<td>135</td>
<td>148.5</td>
<td>135</td>
<td>121.5</td>
<td>135</td>
</tr>
<tr>
<td>Operating Expenses</td>
<td>121</td>
<td>133.1</td>
<td>121</td>
<td>108.9</td>
<td>121</td>
</tr>
<tr>
<td>Net Operating Expenses</td>
<td>14</td>
<td>15.4</td>
<td>14</td>
<td>12.6</td>
<td>14</td>
</tr>
<tr>
<td>Taxes</td>
<td>2</td>
<td>2.2</td>
<td>2</td>
<td>1.8</td>
<td>2</td>
</tr>
<tr>
<td>Net Income</td>
<td>12</td>
<td>13.2</td>
<td>12</td>
<td>10.8</td>
<td>12</td>
</tr>
<tr>
<td>Total Assets</td>
<td>1170</td>
<td>1170</td>
<td>1287</td>
<td>1170</td>
<td>1053</td>
</tr>
<tr>
<td>Total Liabilities</td>
<td>989</td>
<td>989</td>
<td>1087.9</td>
<td>989</td>
<td>890.1</td>
</tr>
<tr>
<td>Equity</td>
<td>181</td>
<td>181</td>
<td>199.1</td>
<td>181</td>
<td>162.9</td>
</tr>
<tr>
<td>ROE</td>
<td>6.63%</td>
<td>7.29%</td>
<td>6.03%</td>
<td>5.97%</td>
<td>7.37%</td>
</tr>
<tr>
<td>% change in ROE</td>
<td></td>
<td>10.00%</td>
<td>-9.09%</td>
<td>-10.00%</td>
<td>11.11%</td>
</tr>
</tbody>
</table>

Solution:

Net Income after Taxes = $135 million - $121 million - $2 million = $12 million
Equity Capital = $1.17 billion - $989 million = $181 million

\[\text{ROE} = \frac{\text{Net Income after Taxes}}{\text{Equity Capital}} = \frac{$12 million}{\$181 million} = 0.0663 \text{ or } 6.63\%.

Alternative Scenario 1:

Given: Total operating revenues, total operating expenses, and taxes each grow by 10%, but assets and liabilities remain fixed.

Solution:

Total revenues = $135 million * 1.10 = $148.5 million
Total expenses = $121 million * 1.10 = $133.1 million
Tax liability = $2 million * 1.10 = $2.2 million

Net Income after Taxes = $148.5 - $133.1 - $2.2 = $13.2 million
ROE = $13.2 million/$181 million = 0.0729 or 7.29%

Change in ROE = \( \frac{7.29\% - 6.63\%}{6.63\%} = 10\% \) (ROE increases by 10%)

Alternative Scenario 2:

Given: Total assets increase by 10% (Total assets = \( \$1.17 \times 1.10 = \$1.287 \) billion)
Total liabilities increase by 10% (Total liabilities = \$989 million \times 1.10 = \$1.0879 billion)
Revenues and expenses (including taxes) remain unchanged.

Solution:  Equity Capital = \$1.287 billion - \$1.0879 billion = \$199.1 million

\[
\text{ROE} = \frac{\$12 \text{ million}}{\$199.1 \text{ million}} = 0.063 \text{ or } 6.03\%
\]

Therefore, change in ROE = \( \frac{6.03\% - 6.63\%}{6.63\%} = -0.6\% \) (ROE decreases by 9%)

Alternative Scenario 3:

Given: Total revenues decline by 10% (Total revenues = \$135 million \times 0.90 = \$121.5 million)
Total expenses decline by 10% (Total expenses = \$121 million \times 0.9 = \$108.9 million)
Tax liability declines by 10% (Tax liability = \$2 \times 0.9 = \$1.8 million)
Assets and liabilities remain unchanged (Therefore, equity remains unchanged)

Solution:  Net Income after Tax = \$121.5 million - \$108.9 million - \$1.8 million = \$10.8 million

\[
\text{ROE} = \frac{\$10.8 \text{ million}}{\$181 \text{ million}} = 0.0597 = 5.97\%
\]

Therefore, change in ROE = \( \frac{5.97\% - 6.63\%}{6.63\%} = -0.66\% = -10\% \) (ROE decreases by 10%)

Alternative Scenario 4:

Given: Assets and liabilities decrease by 10%; therefore,  
Equity capital decreases by 10%,  
Operating revenues, operating expenses, and taxes remain unchanged.

Solution:  Total assets = \$1.17 billion \times 0.9 = \$1.053 billion
Total liabilities = \$989 million \times 0.9 = \$890.1 million
Equity capital = \$1.053 billion - \$890.1 million = \$162.9 million
5-8. Suppose a stockholder owned nonbank thrift institution is projected to achieve a 1.25 percent ROA during the coming year. What must its ratio of total assets to total equity capital be if it is to achieve a 12-percent ROE goal?

Given: ROA = 1.25% and target ROE = 12%

Solution: \[ \frac{\text{Total Assets}}{\text{Equity Capital}} = \frac{\text{ROE}}{\text{ROA}} = \frac{12\%}{1.25\%} = 9.6 \times \]

If ROA unexpectedly falls to 0.75% and target ROE remains 12%:

Solution: \[ \frac{\text{Total Assets}}{\text{Equity Capital}} = \frac{12\%}{.75\%} = 16 \times \]

5-9. The following information is given for Blythe County National Bank:

- Net Income after Taxes = $16 million
- Total Operating Revenues = $215 million
- Total Assets = $1,250 million
- Total Equity Capital Accounts = $111 million

Solve for the bank's net profit margin, asset utilization ratio, equity multiplier, and ROE.

Solutions:

a. Net Profit Margin = \[ \frac{\text{Income After Taxes}}{\text{Total Operating Revenue}} = \frac{$16 \text{ mill.}}{$215 \text{ mill.}} = 0.0744 \text{ or } 7.44\% \]

b. Asset Utilization = \[ \frac{\text{Total Operating Revenues}}{\text{Total Assets}} = \frac{$215 \text{ mill.}}{$1250 \text{ mill.}} = 0.172 \text{ or } 17.2\% \]

c. Equity Multiplier = \[ \frac{\text{Total Assets}}{\text{Total Equity Capital}} = \frac{$1250 \text{ mill.}}{$111 \text{ mill.}} = 11.26 \text{ times} \]
d. \[ \text{ROE} = \left( \frac{\text{Net Income After Taxes}}{\text{Total Equity Capital}} \right) \times 100 = \frac{16 \text{ mill.}}{111 \text{ mill.}} = 0.1441 \text{ or } 14.41\% \]

5-10. Lochiel Commonwealth Bank and Trust Company has experienced the following trends over the past five years (all figures in millions of dollars):

Given: (Figures in millions of dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Income After-Tax</th>
<th>Total Operating Revenues</th>
<th>Total Assets</th>
<th>Total Equity Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.7</td>
<td>26.5</td>
<td>293</td>
<td>18</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>30.1</td>
<td>382</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4.1</td>
<td>39.8</td>
<td>474</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>4.8</td>
<td>47.5</td>
<td>508</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>5.7</td>
<td>55.9</td>
<td>599</td>
<td>28</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Profit Margin</th>
<th>Asset Utilization</th>
<th>Equity Multiplier</th>
<th>ROA %</th>
<th>ROE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.19%</td>
<td>0.0904</td>
<td>16.28x</td>
<td>0.92%</td>
<td>15.00%</td>
</tr>
<tr>
<td>2</td>
<td>11.63%</td>
<td>0.0788</td>
<td>19.10X</td>
<td>0.92%</td>
<td>17.50%</td>
</tr>
<tr>
<td>3</td>
<td>10.30%</td>
<td>0.0840</td>
<td>21.55X</td>
<td>0.86%</td>
<td>18.64%</td>
</tr>
<tr>
<td>4</td>
<td>10.11%</td>
<td>0.0935</td>
<td>20.32X</td>
<td>0.94%</td>
<td>19.20%</td>
</tr>
<tr>
<td>5</td>
<td>10.20%</td>
<td>0.0933</td>
<td>21.39X</td>
<td>0.95%</td>
<td>20.36%</td>
</tr>
</tbody>
</table>

If we look at the entire 5-year period, Lochiel's profit margin has remained relatively constant. However, from year 2 through year 5, there has been a significant decline (from 11.63% to 10.20%). This can be viewed as troublesome when we note that net income, total operating revenues, and total assets have more than doubled during the five-year period. Two potential areas that management should investigate are (1) the mix of funding sources and (2) non-interest expenses.

Since ROE has grown much more rapidly than ROA (ROE grew at an average annual rate of 8% compared to only a 0.8% average annual growth rate in ROA), we should be concerned that Lochiel is increasing its liability sources of funding, thereby increasing its leverage to keep its ROE growing. This can cause serious problems with its income as interest rates rise, driving up its cost of funds.

With regard to its noninterest expenses, if these are growing faster than the bank's noninterest income, then there is greater pressure on the bank's net interest margin to offset the increasing negative spread between noninterest income and noninterest expenses.
Since bank regulators place a great deal of emphasis on capital adequacy, these two areas, leverage and noninterest margin, could be moving Lochiel to a precarious capital adequacy position.


Taxes = $6 million  
Total Operating Revenues = $780 million  
Total Assets = $2,100 million  
Equity Capital = $125 million

Solution:

a. Tax Management Efficiency Ratio = Net Income After Taxes / Net Income Before Taxes and Securities Transactions

= ($27 million - $6 million) / $27 million = $21 million / $27 million

= 0.7778 or 77.78 percent.

b. Expense Control = Net Income Before Taxes and Securities Gains / Total Operating Revenues

= $27 million / $780 million

= 0.0346 or 3.46 percent.

c. Asset Management Efficiency Ratio (Asset Utilization) = Total Operating Revenues / Total Assets

= $780 million / $2,100 million

= 0.3714 or 37.14 percent.

d. Funds Management Efficiency Ratio = Total Assets / Equity Capital

= $2,100 million / $125 million

= 16.80 x.

e. ROE = Net Income after Taxes / Equity Capital

= $21 million / $125 million

= 0.168 or 16.8%

Alternative Scenario 1:
Given: Net Before-Tax Income increases by 20% and everything else remains unchanged.

Solution:

\[
\text{ROE} = \frac{\text{ROA} \times \text{Total Assets}}{\text{Total Equity}} = \frac{\text{Net Income After Taxes} \times \text{Total Assets}}{\text{Total Equity}}
\]

\[
= \frac{[(27 \times 1.20) - 6] \times 2,100}{125} = \frac{32.4 - 6 \times 2,100}{125}
\]

\[
= 0.0126 \times 16.8 = 0.2112 \text{ or } 21.12\%
\]

This represents a 26% increase in ROE, from 16.8% to 21.12%. Since the equity multiplier did not change, this increase in ROE is due to the increase in ROA, from 1% to 1.26%.

Alternative Scenario 2:

Given: Total Assets increase by 20%

Solutions:

Asset Management Efficiency Ratio = \[
\frac{2.1 \times 2100}{780} = \frac{2520}{780} = 0.31
\]

This represents a decrease of 16.4%.

Funds Management Efficiency Ratio = \[
\frac{125}{2520} = 20.16 \text{ times}
\]

This represents an increase of 20%.

ROE would not change since the decrease in the asset management efficiency ratio is offset by the increase in the funds management efficiency ratio.

Alternative Scenario 3:

Given: Equity Capital increases by 20%

Solution:

\[
\text{Funds Management Efficiency Ratio} = \frac{\text{Total Assets}}{\text{Equity Capital}} = \frac{2,100}{125 \times 1.20} = 14 \text{ times}
\]

\[
\text{ROE} = \frac{\text{Tax Management Efficiency Ratio} \times \text{Expense Control Efficiency Ratio} \times \text{Asset Management Efficiency Ratio} \times \text{Funds Management Efficiency Ratio}}{\text{Total Equity}}
\]

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\[ \text{ROE} = 0.7778 \times 0.0346 \times 0.3714 \times 14 = 0.14 \text{ or 14%} \]

\[ \text{Change in ROE} = \frac{14\% - 16.8\%}{16.8\%} = -0.1667 \text{ or a 16.67\% decrease} \]

5-12. Using the following information for Laredo International Bank and Trust Company (all figures in millions); calculate the bank's net interest margin, noninterest margin, and ROA.

Given:
- Interest Income = $55
- Interest Expense = $38
- Special Income and Expense = $1
- Noninterest Income = $5
- Provisions for loan losses = $3
- Total Assets = $986
- Security gains (or losses) = $2

Solutions:

a. Net Interest Margin = \( \frac{\text{Interest Income} - \text{Interest Expense}}{\text{Total Assets}} \)
   \[ = \frac{55 - 38}{986} = \frac{17}{986} = 0.0172 \text{ or 1.72\%} \]

b. Noninterest Margin = \( \frac{\text{Noninterest Income} - \text{Noninterest Expense}}{\text{Total Assets}} \)
   \[ = \frac{5 - 8}{986} = \frac{-3}{986} = -0.0030 \text{ or -.3\%} \]

c. ROA = \( \frac{\text{Net Income}}{\text{Total Assets}} \)
   \[ = \frac{55 - 38 + 5 - 8 - 3 + 1 + 2}{986} = \frac{12}{986} = 0.0122 \text{ or 1.22\%} \]

Note: Net Income = Interest Income – Interest Expense + Noninterest Income – Noninterest Expense – Provision for loan losses + Special Income and Expense – Security gains

5-13. Valley Savings reported the following figures on its income statement for the past five years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Current Year</th>
<th>One Year Ago</th>
<th>Two Years Ago</th>
<th>Three Years Ago</th>
<th>Four Years Ago</th>
</tr>
</thead>
</table>

66
<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Interest Income</td>
<td>$40</td>
<td>$41</td>
<td>$38</td>
<td>$35</td>
<td>$33</td>
</tr>
<tr>
<td>Interest Expenses</td>
<td>24</td>
<td>23</td>
<td>20</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>Net Interest Income</td>
<td>16</td>
<td>18</td>
<td>18</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Provision for Loan Losses</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Net Interest Income after</td>
<td>14</td>
<td>17</td>
<td>17</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>Loan Loss Provision</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noninterest Income</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Noninterest Expense</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Net Noninterest Income</td>
<td>(4)</td>
<td>(3)</td>
<td>(4)</td>
<td>(4)</td>
<td>(4)</td>
</tr>
<tr>
<td>Income before Taxes</td>
<td>10</td>
<td>14</td>
<td>13</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Income Taxes</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Net Income after Taxes</td>
<td>9</td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>14</td>
</tr>
<tr>
<td>but Before Gains (Losses)</td>
<td>(2)</td>
<td>(1)</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Net Securities Gains (Losses)</td>
<td>7</td>
<td>12</td>
<td>13</td>
<td>13</td>
<td>16</td>
</tr>
<tr>
<td>Total Assets</td>
<td>385</td>
<td>360</td>
<td>331</td>
<td>319</td>
<td>293</td>
</tr>
<tr>
<td>ROA</td>
<td>1.82%</td>
<td>3.33%</td>
<td>3.93%</td>
<td>4.08%</td>
<td>5.46%</td>
</tr>
</tbody>
</table>

Valley's ROA has gone from an exceptional level, at almost 5.5%, progressively down to a reasonably good level, at 1.82%, over the last four years.

Growth in interest and noninterest income has been outstripped by the growth in interest and noninterest expense, as well as the increase in the allowance for loan losses, resulting in a significant decline in net income from operations. Needless to say, the shift from gains in securities trading to losses has not been helpful either.

5-14. Calculate as many possible risk measures for NCB, the bank whose UBPR is detailed in the last section of Chapter 5, as you can. Discuss how the bank's risk exposure appears to be changing over time. What steps would you recommend to management in order to deal with any risk exposure problems you observe?

Note to instructors: The Uniform Bank Performance Report (UBPR) is provided to each bank by the Federal Financial Institutions Examination Council. The UBPR is prepared from the call reports of condition and income that are filed quarterly by all banks. It (the UBPR) is for the use of regulators and management to assess how well the bank is performing relative to its internal goals and its peer group.

The user's guide to the UBPR is available from the FFIEC for a nominal fee and details the various ratios and comparative data contained in the UBPR. The actual UBPR is much more detailed than the example provided in the text as Tables 5-5 through 5-9. These exhibits are for illustrative purposes and do not contain all the information that is necessary to calculate all the risk measures described in the text. The instructor may find it helpful to use UBPRs provided by a few local banks in class discussions. Those actual UBPRs allow the students to calculate the full range of risk and return measures and expand discussion of the concepts and ratios considerably.
For those instructors who do not want this much detail, this problem can be reduced to a smaller number of ratios that can be readily calculated from the simple UBPR provided. The following ratios can be calculated for National City Bank:

Capital Risk Measures:

Equity Capital to Total Assets (Current Year) = $2,890,801/$43,721,511 = 0.0661 or 6.61%
Equity Capital to Total Assets (Past Year) = $2,614,682/$39,214,168 = 0.0667 or 6.67%

Ratio of purchased funds to total liabilities (current year) = $13,613,005/$39,463,881 = 0.3449 or 34.49%
Ratio of purchased funds to total liabilities (past year) = $13,865,329/$35,347,599 = 0.3923 or 39.23%

(Purchased Funds = Large Time Deposits + Deposits Held in Foreign Offices + Federal Funds Purchased and repossessions + Other borrowings with maturities less than 1 year)

Ratio of equity capital to risk assets (current year) = $2,890,801/$36,435,405 = 0.079 or 7.93%
Ratio of equity capital to risk assets (past year) = $2,614,682/$34,625,503 = 0.0755 or 7.55%

(Risk Assets = Total Assets - Cash and Due From Banks - U.S. Treasury Securities - Premises, Fixed Assets, and Capital Leases - Other Assets)

Ratio of primary capital to total assets (current year) = $4,794,764/$43,721,511 = 0.1097 or 10.9%
Ratio of primary capital to total assets (past year) = $4,405,975/$39,214,168 = 0.1124 or 11.24%

(Primary Capital = Equity Capital + Allowance for Loan Losses + Minority Interests in Subsidiaries + Subordinated Debentures - Intangible Assets)

Liquidity Risk Measures:

Ratio of purchased funds to total assets (current year) = $13,613,005/$43,721,511 = 0.3114 or 31.14%
Ratio of purchased funds to total assets (past year) = $13,865,329/$39,214,168 = 0.3535 or 35.35%

Ratio of net loans to total assets (current year) = $33,389,128/$43,721,511 = 0.7637 or 76.37%
Ratio of net loans to total assets (past year) = $31,175,957/$39,214,168 = 0.7950 or 79.50%

Ratio of cash and due from to total assets (current year) = $1,642,543/$43,721,511 = 0.0376 or 3.76%
Ratio of cash and due from to total assets (past year) = $1,707,449/$39,214,168 = 0.0435 or 4.35%
Ratio of cash, due from, and Treasury securities to total assets (current year)
\[ \frac{3,415,471}{43,721,511} = 0.0781 \text{ or } 7.81\% \]
Ratio of cash, due from, and Treasury securities to total assets (past year)
\[ \frac{3,937,336}{39,214,168} = 0.1004 \text{ or } 10.04\% \]

Interest-Rate Risk Measures:

Note: In order to calculate the Gap ratios, that is, interest-sensitive assets/interest-sensitive liabilities, we must classify the asset and liability accounts as rate sensitive or non-rate sensitive. Since banks are no longer required to provide this specific information in their call reports, the classification based on the UBPR may be somewhat arbitrary.

Although we do not have complete information for National City Bank and realizing that two years do not really provide a reliable estimate of a trend, there are some changes in the risk measures that can serve as indicators of potential problems.

The relatively heavy dependence on purchased funds to total liabilities and total assets places the bank at some risk if interest rates increase dramatically. Additionally, the dollar volume of rate-sensitive liabilities subjects the bank to additional costs if rates rise dramatically.

Furthermore, National City Bank decreased its capital adequacy and its liquidity positions during the past year. Additionally, it also decreased its proportion of net loans relative to total assets which lowered its earnings during the past year.