

## Teaching bank profit decomposition using real-world data

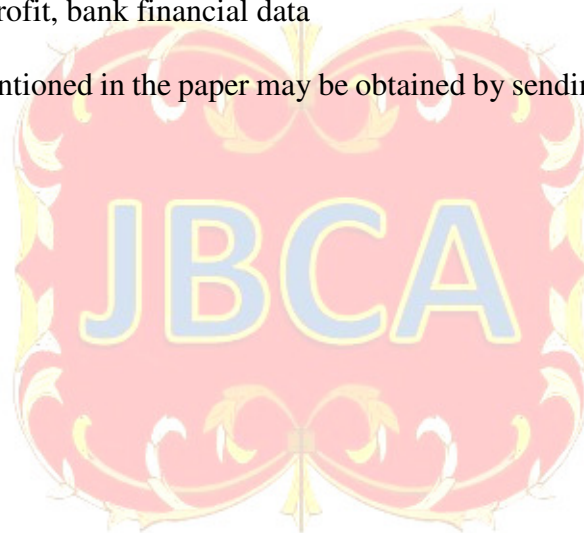
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### ABSTRACT

Exercises that require students to calculate and interpret financial ratios are common in financial textbooks. However, the amount of data necessary for such problems usually results in inclusion of only a few examples. To supplement provided exercises, instructors often turn to projects using real-world data. In the case of banks, a tremendous amount of data is publicly available, but much of it is cumbersome to use. This case shows how to teach the decomposition of a bank's profit stream using bank financial information available through the FDIC's Statistics on Depository Institutions database.

Keywords: ratios, bank profit, bank financial data

The sample Excel file mentioned in the paper may be obtained by sending an email to Ronald Best (rbest@westga.edu).



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## INTRODUCTION

Most bank management textbooks provide some form of case study exercise related to financial ratio calculation and interpretation. Unfortunately, the amount of the data necessary for such exercises usually limits the offerings to one or two problems (see, Koch and MacDonald, 2015 and Kolari and Gup, 2017). Further, the time required to complete this type of assignment is typically large, so instructors often require students to complete the task outside of class. The result is an increased likelihood that students will work together. Also, the lack of multiple versions of the problems makes it more probable that answers will be passed along from one class to another.

Instructors may turn to outside case studies to increase the number of different problems. However, if the exercises are static, the assignment answers may still be shared among students. One solution is to develop projects that require students to use real-world data. The difficulty with such projects is that access to financial data is sometimes expensive or cumbersome. In the case of banks, a vast amount of financial data is easily obtainable since banks are highly regulated and required to report large volumes of information about themselves. Uniform Bank Performance Reports (UBPRs) and Call Reports are a couple of the readily available sources of bank financial data. However, gathering information from these reports can be cumbersome since both are lengthy and require users to become familiar with their layout.

This case provides a simple alternative by using the FDIC's Statistics on Depository Institutions (SDI) as the data source for a bank profit decomposition exercise. SDI allows the user to view and download detailed financial reports concerning FDIC-insured institutions. The financial information of individual banks and predefined and custom peer groups can be easily downloaded in spreadsheet format. The downloaded data can then be used to calculate financial ratios and analyze bank performance. This means that even though project requirements remain static, solutions differ when students examine different banks and/or time periods.

The difficulty level of the project can also be varied. If the focus of the project is basic interpretation of the bank data, a sample Excel file is available for distribution to students. The Excel file calculates all required ratios when a student enters the downloaded SDI data for their bank. The student then answers questions or writes a paper that discusses the results. If an instructor instead wants students to produce their own ratios, she/he may require students to calculate ratios by hand or develop their own Excel file. Also, the set of questions and requirements associated with the project may be easily changed.

## BANK PROFIT DECOMPOSITION PROJECT

Financial ratios are used to facilitate comparison. A common area of focus is firm profit. Understanding how ratios fit together allows comparisons to be made over time and across firms and peer groups to highlight differences and provide a framework for more detailed analysis. In the case of banks, many of the profit-related ratios are industry specific. This project discusses the decomposition of bank bottom-line profit measures into their basic component ratios, and then shows how to use FDIC data to calculate the various ratios.

## Components of Bank Profit

The analysis begins with return on equity (ROE) which measures the rate of return on the investment made by the owners of a firm by dividing net income (NI) by total equity (EQ).

$$\text{ROE} = \frac{\text{NI}}{\text{EQ}}$$

A common method of decomposing ROE is the DuPont equation (Rose and Hudgins, 2013). The first step of the DuPont equation shows that ROE can be broken into two components. The first is the return on assets (ROA) which measures the rate of return on the total assets (TA) employed in the firm and the second is the equity multiplier (EM) which measures the degree leverage used in the firm.

$$\text{ROE} = \frac{\text{NI}}{\text{EQ}} = \frac{\text{NI}}{\text{TA}} \times \frac{\text{TA}}{\text{EQ}} = \text{ROA} \times \text{EM}$$

Note that EM is the inverse of the equity ratio (EQR) where  $\text{EQR} = \text{EQ}/\text{TA}$  which is the percentage of assets funded by equity. Using more debt to fund assets results in a lower EQR and a higher EM. In other words, increased financial leverage magnifies the size of the relative return to owners. When ROA is positive, higher leverage leads to bigger profits for owners. However, when ROA is negative, higher leverage increases the relative size of the loss for shareholders. DuPont analysis further shows that ROA can be broken into two components: net profit margin (NPM) and asset utilization (AU).

$$\text{ROA} = \frac{\text{NI}}{\text{TA}} = \frac{\text{NI}}{\text{REV}} \times \frac{\text{REV}}{\text{TA}} = \text{NPM} \times \text{AU}$$

The breakdown shows that ROA is driven by the NPM which is the amount of profit earned per dollar of revenue and AU which is the amount of revenue generated per dollar of assets. Although the above breakdown is commonly used for many industries, an alternative version is more applicable to banks. Banks tend to group income and expense into interest and non-interest components to focus on the contribution of each source to overall profit. Thus, any decomposition of bank profit should preserve this categorization.

To address the unique attributes of bank earnings, start by recognizing that NI equals total revenue (REV) minus total expense (EXP). REV for a bank is determined by three basic income streams: interest income (II); non-interest income (NonII); and gains/losses on asset sales (GL). Some sources include GL in non-interest income, but this paper keeps it separate since it differs substantially from the other primarily fee-based sources of NonII. Also, note that although GL is included as an income item, it can be negative (a loss). Bank expenses are divided into four basic categories: interest expense (IE); non-interest expense (NonIE); provision for loan losses (PLL); and taxes (TAX). Net interest income (NII) is defined as  $\text{II} - \text{IE}$ . On the noninterest side of the bank,  $\text{NonIE} - \text{NonII}$  is often called Burden (BUR). The label burden is applied since NonIE exceeds NonII for the vast majority of banks, so the difference must be covered by income generated elsewhere in the bank. Using these definitions, ROA can be written as below.

$$ROA = \frac{NI}{TA} = \frac{REV - EXP}{TA} = \frac{NII}{TA} - \frac{PLL}{TA} - \frac{BUR}{TA} + \frac{GL}{TA} - \frac{TAX}{TA}$$

Earnings assets (EA) are those assets that earn interest and interest bearing liabilities (IBL) are the liabilities that require interest payments. Thus, NII/TA can be further decomposed as follows.

$$\frac{NII}{TA} = \frac{NII}{EA} \times \frac{EA}{TA}$$

NII/EA is the bank's net interest margin (NIM) which indicates the average return on earning assets after the funding cost is considered. EA/TA is the earnings base and reveals the percentage of TA that earn interest. NIM may be further divided as below.

$$\frac{NII}{EA} = \frac{II}{EA} - \frac{IE}{EA} = \frac{II}{EA} - \left( \frac{IE}{IBL} \times \frac{IBL}{EA} \right)$$

II/EA is the yield on earning assets and indicates the average rate received on earning assets. IE/EA is the cost of funding earning assets which can be broken into two components. IE/IBL is the cost rate on interest bearing liabilities and shows the average cost for liabilities that require interest payments. IBL/EA measures the percentage of earning assets funded by interest bearing liabilities. The ratio adjusts for the fact that banks have some liabilities, such as non-interest-bearing checking accounts, that do not require interest payments.

As mentioned earlier, BUR is calculated as NonIE minus NonII. For most banks, NonIE is composed primarily of expenses associated with salaries and benefits (Sal) and premises and equipment (Prm). Other noninterest expense items such as utilities, deposit insurance premiums, and amortization are often lumped together and reported as other or additional noninterest expense (AdE). NonII is usually categorized into income from fiduciary activities (Fid), service charges on deposits (Svc), trading account activities (Trd), and all other additional noninterest income (AdI).

$$\frac{BUR}{TA} = \frac{NonIE}{TA} - \frac{NonII}{TA} = \frac{(Sal + Prm + AdE)}{TA} - \frac{(Fid + Svc + Trd + AdI)}{TA}$$

Combining all discussed relationships yields the profit decomposition chart shown in Figure 1 (Appendix). By examining the ratios that comprise bank profit, the major drivers of earnings can be identified.

## Data Collection

Download financial data for a U.S. commercial bank and its peer group. Compute all ratios mentioned in the "Decomposition of Bank Profit" discussion and fulfill all listed submission requirements. Any U.S. commercial bank cleared by the class instructor may be chosen for this study. It may be helpful to view the list of the largest U.S. banks that is available at the following link: <https://www.federalreserve.gov/releases/lbr/current/>.



Retrieve required data from the FDIC's Statistics on Depository Institutions (SDI) database. To access the site, go to <https://www.fdic.gov>. Click on "Industry Analysis," then "Bank Data & Statistics," and then "Statistics on Depository Institutions (SDI)." Ensure that beside "Select type of reports:" the option "Dollars/Percent of Assets" is chosen. Also, check that "Select the number of Columns" is set to "4."

Begin by downloading data for the bank. Click on the drop-down arrow for the first "Select One" box. Choose "Single Institution." If this is the first time accessing data for the bank, choose "Find Institution." Type in the institution's name and, if known, the state where it is headquartered. Click "Find." A list of banks matching the criteria entered should appear. Click the box for the correct bank and then click the "Next" button. The page may return to the original "Create or Modify Reports" search page. If so, skip to the next paragraph. Otherwise, click the "Next" button until the original "Create or Modify Reports" page is shown.

In columns 2 through 4, choose "Single Institution" and enter the "FDIC Certificate #" for the chosen bank in the appropriate boxes. Click on the dropdown arrow for "Report Date" and choose "December 31, 2014," "December 31, 2015," "December 31, 2016," and "December 31, 2017" for the first through fourth columns, respectively.

Click the "Next" button. On the resulting page, ensure that "Report Selection" is set to "Assets and Liabilities," and the button left of "Dollars" is selected. Click "Next." Click "Save to CSV file." Save the file with the name BankBalSheet. Record the total assets for the bank for the most recent time period selected. This is the value that will be used to determine the appropriate peer group for comparison. Note that the values are in thousands, so values taken from the site must be multiplied times 1000 to get the actual total assets for the bank.

Click on the drop-down arrow beside "Assets and Liabilities" near the top of the page. Scroll down and choose "Income and Expense" and then click on "Update Report." Now, Click on "Save to CSV file." Save the file with the name BankIncome in the same folder where the previous file was saved.

Next download data for the appropriate size-based peer group. Return to the initial SDI page following the instructions above. Again, ensure that "Select type of reports:" is set to "Dollars/Percent of Assets" and that "Select the number of Columns" is set to "4." Click on the dropdown arrow for the first column "Select One" box. Choose "Standard Peer Group." Click on the drop-down arrow beside "All Institutions," scroll down under the heading "All Commercial Banks," and choose the appropriate peer group for the bank (based on the bank's total asset size). Make the same choices for columns 2 through 4.

Now enter the "Report Dates" for columns 1 through 4 that were used for the bank data download. Click the "Next" button. On the resulting page, ensure that "Report Selection" is set to "Assets and Liabilities," and choose the button left of "Percent of Assets." Click "Next," and then click "Save to CSV file." Save the file with the name PeerBalSheet in the same folder where the previous files were saved.

Next, click on drop-down arrow beside "Assets and Liabilities" near the top of the page. Scroll down and choose "Income and Expense." Click on "Update Report," and then click "Save to CSV file." Save the file with the name PeerIncome in the same folder with the previous files.

### **Submission Requirements**

There are two major requirements for the project. First, create an Excel file that includes the downloaded data from SDI and any items listed below. Second, write a short paper that

highlights the changes in the bank's position over time and its differences relative to its peer group. Both the Excel file and the paper must be submitted to satisfy project requirements.

Begin by creating an Excel file with "yournameProject" as the filename. If provided, the sample Excel file is set to calculate all needed ratios when the bank and peer group data is copied into the appropriate pages. The file format should follow the pattern described below.

The first worksheet in the file should contain the four years of downloaded Balance Sheet data for the bank (in dollars). The second worksheet should contain the four years of downloaded Income Statement data for the bank (in dollars). The third worksheet should contain the four years of downloaded Balance Sheet data for the peer group (in percent of assets). The fourth worksheet should contain the four years of downloaded Income Statement data for the peer group (in percent of assets).

The fifth worksheet should be labeled Project Data and should contain four years of values for the items listed below (see the sample Excel file).

1. For each of the four years examined, list the following items in dollars for the bank and percent of assets for the bank and the peer group: Cash and due from depository institutions, securities, net loans and leases, other assets, total assets, total deposits, total equity capital, other liabilities, total interest income, total interest expense, net interest income, provision for loan and lease losses, total noninterest income, total noninterest expense, burden, securities gains/losses, applicable income taxes, and net income attributable to bank.
2. For each of the four years examined, include all of the decomposition of profit ratios listed in Figure 1 for the bank and the peer group.

On a sixth worksheet, create at least five charts or graphs from the data presented in the fifth worksheet. The charts or graphs should illustrate the most important changes over time and major differences in bank to peer comparisons.

After completing all requirements for the Excel file, write a paper discussing how the bank has changed over time and how it compares to the peer group. The paper should be typed and the written portion of the paper should be at least three but no more than five pages long (standard one inch margins, 12 point font, single-spaced paragraphs with double-spacing between paragraphs). Use headings to organize the paper. Charts and graphs created in the Excel data file should be inserted in the paper to support the discussion (but charts do not count as a part of the page requirement). The paper should address any relevant items, but it must include discussion of the following points: (1) change in the bank's financial statements over time and relative to the peer group; (2) primary determinants of bank profit over time and relative to the peer group; and, (3) potential reasons for changes in performance over time and relative to the peer group.

Project grades will be based on the rubric shown in Table 1 (Appendix). Scores for all categories listed in the rubric will be summed to determine the overall project grade.

## REFERENCES

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**APPENDIX**

Figure 1. Decomposition of Bank Profit

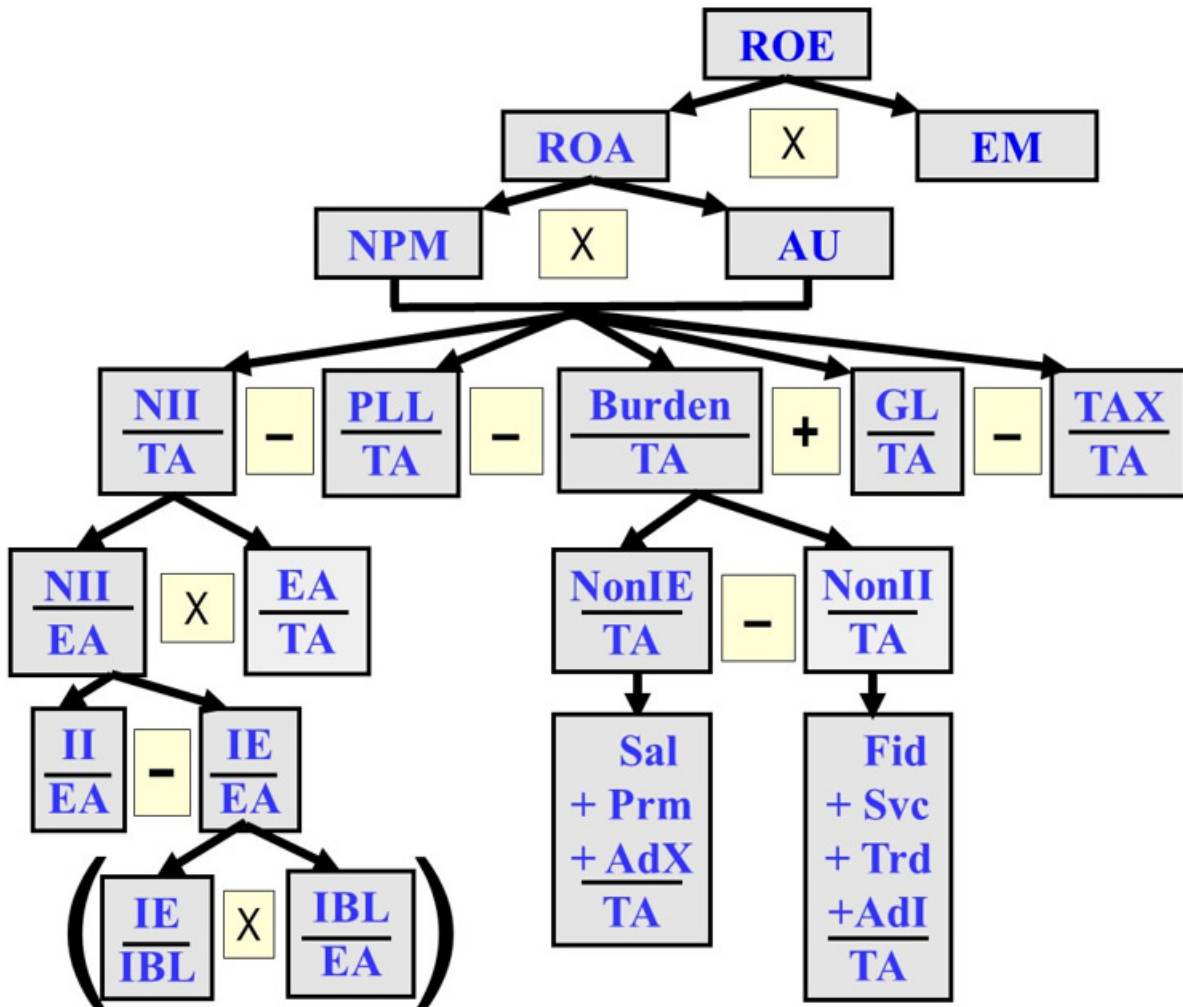


Table 1: Project Grading Rubric

Graded Attribute	Missing	Poor	Fair	Good	Very Good	Excellent
1. Excel file: Inclusion of required data and file format	0	6	12	16	18	20
2. Excel file and Paper: Creation of relevant charts and use in paper	0	6	12	16	18	20
3. Paper: Significant financial statement changes over time and differences relative to peer group	0	4	9	12	13	15
4. Paper: Significant determinants of profit over time and relative to peer group	0	4	9	12	13	15
5. Paper: Logic used in discussion of potential reasons for changes in performance over time and relative to peer group	0	4	9	12	13	15
6. Paper: Organization, clarity, and appearance of paper	0	4	9	12	13	15
TOTAL POINTS						
Note: Attributes may be graded as falling in the middle of the above categories. For example, If the paper were considered to fall between “Very Good” and Excellent” for attribute 6, the assigned points for that area would be 14.						