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Financial Ratios for the Commercial Banking Industry: Do They Measure What You Think?

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ABSTRACT

Financial ratios play a central role in the quantitative analysis of commercial banks. Bank administrators, shareholders, and financial analysts use financial ratios to evaluate the financial characteristics of bank activity such as solvency and performance. The challenge is not in computing a specific ratio but in selecting the ratios that capture the primary financial characteristics of bank activity. The purpose of this study is to (1) explore the financial characteristics of commercial bank activity captured in ratios and, (2) examine the stability of the financial characteristics over time. Results indicate financial ratios presently used by bank rating agencies and industry financial analysts may not be measuring bank characteristics as once assumed. Caution must be exercised when evaluating bank performance with financial ratios.

INTRODUCTION

Financial ratios are an acceptable tool for analyzing a firm and its performance over time. Financial analysts and researchers combine key financial ratios over time and across industries with qualitative measures to gain insight regarding a firm (Barnes, 1987). Ratios are used to represent outcomes of decisions made by the firm and results of outside conditions surrounding the firm (Benishay, 1971).

Financial reporting in the banking industry is significantly different than most other industries. The central objective of a bank is to attract funds at an acceptable cost and reinvest them earning a higher return. Therefore, measures of liquidity, asset management, capital maintenance, profitability and risk exposure requires industry specific financial ratios. Bank financial ratio analysis arose in response to this need.

Selecting key financial ratios from a significant number of possibilities however, presents a challenge to the analyst, researcher or bank administrator. The large number of ratios derived from published reports can be a source of confusion rather than clarification (Gombola and Ketz, 1983). The analytical skill lies not in computing the specific ratio but in determining the primary financial characteristics of the firm captured in ratios (Barnes, 1987 and Benishay, 1971). Furthermore, management experiences difficulty in determining which ratio to employ in the decision making process (Altman and Eisenbeis, 1978). The purpose of this study is to develop a taxonomy of financial ratios to guide the decision-maker when assessing a commercial bank's performance. The thrust of this

research is to determine whether new ratios (in addition to those that comprise CAMEL) group along one or more old factors (Capital Adequacy, Asset Quality, Earnings, Liquidity) or whether they form (a) new classification group(s).

THE BANK INDUSTRY

According to the Federal Reserve Bank of Chicago (1992), the past and present political and economic environment has been and remains uncertain and unstable. First, the U.S. banking industry experienced significant challenges over the past five years due to well publicized problems associated with LDC (lesser developed countries) debt, commercial real estate, highly leveraged transactions and, in some instances, significant real estate downturns. These events, in conjunction with the thrift crisis and the diminished resources of the bank insurance fund, created havoc for the banking industry in the public eye and in the investment community. Second, according to Tannenbaum (1989), inflation and interest rate volatility, technological advances, and changes in the regulatory environment have made bank liability structures much more vulnerable to economic change or a crisis of confidence. As a result changes have taken place in commercial bank balance sheets and earnings over the past five years (FRBC, 1992). For example, major components of bank balance sheets have changed with a shift in the asset composition. Banks have begun (1) to substitute securities for loans or to securitize many of their loans to move them off their balance sheet, thus improving capital ratios and (2) generating non-interest income in the form of service revenue.

The significant changes to services and the industry's recent financial volatility directs greater attention toward understanding and evaluating the financial health of commercial banks. This study challenges how traditional financial ratios for commercial banks are used in the decision-making process. The wide array of financial ratios presently being applied by bank rating and regulatory agencies may not be measuring the financial characteristics once assumed.

LITERATURE REVIEW

Prior research of commercial bank financial ratios has been directed at failure prediction models and distributional properties of ratios. Bank insolvency studies provided the conceptual framework models utilized by many federal financial institution surveillance systems. Stuhr and Van Wicklen (1974), Sinkey (1975), and Hanweck and Simon (1980) identified ratios that presently comprise the CAMEL Rating System. CAMEL is an acronym for capital adequacy, asset quality, management, earnings, and liquidity. Financial regulatory agencies concluded that an institution's financial condition can be judged based on these criteria. Banks are rated on a numerical system of 1 (excellent) through 5 (poor) in each of the five areas. Basically, all five criteria receive the same weights, although examiners are free to give more weight to some variables than others. The CAMEL Rating System was adopted by the regulatory agencies on November 21, 1979.

Additional studies in the banking literature examined the distribution of commercial bank financial ratios. Their purpose was to determine if bank financial ratios are normally distributed and, if not, determine the distribution's shape. Kolari, McInish, and Saniga (1989) and Bedingfield, Reckers and Stagliano (1985) have shown that selected financial ratios are not normally distributed. They conclude that a non-normal distribution limits the comparability of these ratios from one bank to another. This information has important implications for bank regulatory agencies whose purpose is to evaluate bank safety and soundness based upon the CAMEL rating system. Lacking in this literature is empirical evidence regarding the financial characteristics of commercial bank ratios in general.

Several studies have investigated the financial characteristics of ratios and their importance to performance evaluation, future profit estimation, competitor analysis, and credit worthiness for other

industries. These studies have focused on the analysis of financial ratios for industrial firms (Pinches, Mingo and Caruthers, 1973), retail firms (Gombola and Ketz, 1983), and electronic, food, steel, and textile firms (Ketz, Dooger and Jensen [KDJ], 1990). Additional studies have examined financial ratios for combined industry groups such as automobile and aerospace; and chemical, rubber and oil (KDJ, 1990). The findings, however, do not benefit the commercial banking industry because of its unique financial characteristics. For example, traditional ratios that relate to sales, inventory, and cost of goods sold can not be used to evaluate commercial banks.

This literature reveals the efficacy of studying classification patterns of financial ratios. These inquiries expose the interrelationships among many accounting ratios and also help a user select a small number of variables to measure bank performance. Therefore, extending the research may improve commercial bank financial ratio analysis.

RESEARCH METHODOLOGY

Reports from Standard & Poors, Duff and Phelps Credit Rating Company, Sheshunoff Information Services, Inc., Fitch Investor Services, Inc., and the Uniform Bank Performance Report (UBPR) provide the basis for the financial ratios selected in this study. It would have been preferable to have selected the financial ratios based upon some theoretical framework but no general theory exists to explain which financial ratios should be part of a decision model. Previous research on financial ratio stability and ratio patterns pertained to non-banking industries and provided minimal benefit to this study.

Forty-five (45) financial ratios were extracted from the bank rating and regulatory reports (see Table 1). As shown in Table 1, each ratio is classified according to the type of information it appears or is assumed to measure. Based upon agency reports, the ratios are labeled capital adequacy (C), asset quality (A), earnings (E), or liquidity (L). Additional ratios were included in the analyses, categorized as other (O). These ratios were extracted from the Uniform Bank Performance Report (UBPR).

Financial ratios were obtained for all nationally chartered banks with the necessary data included on COMPUSTAT annual data files for the banking industry (Standard Industrial Classification Code 6021). Ratios were factor analyzed for the years 1983 to 1991. This time frame enables (1) a general analysis regarding the financial characteristics of the firm provided in recent financial reports, and (2) a specific identification of the key financial ratios capturing the information. Although the factor analysis does not solve all the problems and answer all the questions associated with grouping of ratios, it is more defensible than ad hoc groupings of ratios.

Factor analysis, with a promax rotation, was used to identify the primary information captured in recent financial reports. Factor analysis is a statistical technique used to identify a relatively small number of factors that can be used to represent relationships among sets of many interrelated variables (Norusis, 1990). Factor analysis groups ratios that move together and does not combine those ratios that do not. For example, a capital adequacy ratio defined by total equity/total assets (TE/TA) should group with another capital adequacy ratio defined by total debt/total assets (TD/TA). The correlation should be highly negative based upon the balance sheet equation.

The output from factor analysis is a statistical-based taxonomy of financial ratios. A statistical-based taxonomy is defined as a grouping of an entire ratio set into several subsets, labeled common factors. Each subset is based on the common variability (correlation) among the ratios in the subset. The condition driving the common variability of each ratio subgroup is labeled a financial characteristic of firm activity (Gombola and Ketz 1983a, 1983b). Benishay (1971) and Barnes (1987) refer to each financial characteristic of firm activity as either fully-independent or semi-independent financial information.

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The criteria for naming the primary factor pattern are (1) eigenvalues greater than one, known as Kaiser's Criterion, (2) an identifiable factor above the level plane on the scree plot, known as Cattell's Scree Criterion, (3) a five-factor solution based upon previous research (CAMEL criteria and bankruptcy studies), and (4) a consistent loading of the same ratio(s) on an interpretable factor. For a factor to be meaningful it must represent the same subset of ratios on a consistent basis. This approach provides a conservative framework to distinguish the financial characteristics of the bank provided by recently published financial reports and an identification of the key financial ratios capturing this information (KDJ, 1990).

EMPIRICAL RESULTS

Prior to factor analyzing the financial ratios distributional characteristics were examined. Calculations of means and standard deviations were evaluated in an attempt to identify outliers in the data. Outlier data points, identified at three standard deviations from the mean, were eliminated to reduce confounding in the data (Ezzamel and Mar-Molinaro, 1990). Distributional information is available upon request. Five ratios were eliminated from the analysis because of limited sample size. These ratios are identified in Table 1 and followed by an asterisk (*). Forty (40) ratios were evaluated for the nine-year period.

A summary of factors that exhibit an eigenvalue greater than 1 is shown below. Based upon this evaluation criteria, forty bank ratios can be classified into ten independent factors. Each factor is supposed to represent a particular dimension of bank activity. An evaluation of the ratios in a ten-factor solution, however, provided little value in attempting to understand the characteristic of firm activity measured by the factor.

Period	# of Factors	N=
1983-85	10	65
1986-88	10	54
1989-91	10	61
All Years	10	206

A summary of factors above the level plane on the scree plot is shown below. Based upon this criteria, six to eight factors reflect the financial dimensions of bank activity over the nine-year period. Again, the inconsistency in the ratios loading to each factor make the factor uninterpretable.

Period	# of Factors	N=
1983-85	8	65
1986-88	6	54
1989-91	6	61
All Years	6	206

Note, the goal of factor analysis is to uncover the underlying financial characteristics captured in commercial bank financial ratios. The last and most important criteria for naming primary factor patterns is a consistent loading of the same ratio(s) on a factor and the ability to interpret the resulting factor based upon CAMEL characteristics. Since the number of identifiable factors varied over the nine year period (based upon criteria 1 and 2) a five-factor rotation structure was used for exploratory analysis. A five-factor solution was selected because of (1) the number of criteria that comprise the CAMEL Rating System and (2) the number of categories found to be important in predicting bank failure (Stuhr and Van Wicklen, 1974; Sinkey, 1975; Hanweck and Simon, 1980). Each group of ratios that represent liquidity, earnings, capital adequacy, and asset quality, should highly correlate to the same factor on a consistent basis because of this common affinity. Previous bankruptcy research indicates that a fifth factor could measure a firm characteristic such as risk or efficiency.

Table 1.

Financial Ratios Employed in this Study

RATIO	ABBREV.	CLASS#
1. Net loan losses/average loans	NLL/AL	A
2. Loss reserves/total loans	LR/TL	A
3. Loss provision/average assets	LP/AA	E
4. Operating inc. - operating exp./loan loss	OIE/LL	A
5. Net income/average assets	NI/AA	E
6. Net income/average equity	NI/AE	E
7. Interest paid on deposits/average deposits	IP/AEA	E
8. Interest expense/average earning assets	IE/AEA	E
9. Interest income/average earning assets	II/AEA	E
10. Net interest income/average earning assets	NII/AEA	E
11. Net interest income/average assets	NII/AA	E
12. Non interest income/average assets	NOII/AA	E
13. Non interest expense /average assets	NOIE/AA	E
14. Assets this year/assets last year	A/ALY	O
15. Equity this year/equity last year	E/ELY	O
16. Cash dividends/average equity	CD/AE	O
17. Cash dividends/Net income	CD/NI	L
18. Employee expense/average assets*	EE/AA	O
19. Employee expense/full time employees*	EE/FTE	O
20. Average assets/full time employees	AA/FTE	O
21. Average deposits/full time employees	AD/FTE	O
22. Non-interest income/salary expense	NII/SE	O
23. Avg. current deposits/avg. deposits last yr	ACD/ADLY	O
24. Avg. current loans/avg. loans last year	ACL/ALLY	A
25. Average loans/average deposits	AL/AD	L
26. Average demand deposits/average deposits	ADD/AD	L
27. Consumer loans/total loans	CSL/TL	A
28. Commercial loans/total loans	CML/TL	A
29. Real estate loans/total loans	REL/TL	A
30. Avg. earning assets/avg. total assets*	AEA/ATA	A
31. Tangible equity/total assets	TE/TA	C
32. Tier 1 capital/risk-adjusted assets	T1C/RAA	C
33. Tier 1 capital + loss reserve/total loans	T1LR/TL	C
34. Common stock price/tangible book value	CSP/TBV	C
35. Preferred stock/invested capital*	PS/IC	O
36. Common stock/invested capital	CS/IC	O
37. Surplus/invested capital	S/IC	C
38. Total debt/total equity	TD/TE	C
39. Net income minus dividends/beginning equity	NID/BE	C
40. Other real estate loans/total assets	OREO/TA	A
41. Goodwill/equity*	G/E	C
42. Net charge-offs/average loans	NCO/AL	A
43. Total loans/total assets	TL/TA	L
44. Liquid assets/total liabilities	LA/TL	L
45. Total equity/total assets	TTE/TA	C

* Indicates this ratio was dropped due to small sample size or measurement
  redundancy.

\# C = Capital Adequacy Ratio
  A = Asset Quality Ratio
  E = Earnings or Profitability Ratio
  L = Liquidity Ratio
  O = Ratio identified by Uniform Bank Performance Report

Table 2.

Factor Pattern and Specific Ratio Loading

Promax Rotation

1983-85 n = 65			1986-88 n = 54			1989-91 n =61			All Years		
Factor 1			**Factor 1**			**Factor 1**			**Factor 1**		
LP/AA	.94	E	NOIE/AA	.89	E	NOIE/AA	.94	E	NOIE/AA	.81	E
NLL/AL	.93	A	LP/AA	.89	E	NII/SE	.81	O	LP/AA	.87	E
LR/TL	.65	A	NLL/AL	.81	A	LP/AA	.85	E	NLL/AL	.86	A
NII/SE	.81	O	NII/SE	.75	O	NLL/AL	.89	A	NII/SE	.79	O
OIE/LL	-.67	A	OREO/TA	.53	A	OREO/TA	.80	A	LR/TL	.73	A
NI/AA	-.75	E	LR/TL	.71	A	LR/TL	.74	A	OREO/TA	.59	A
NI/AE	-.73	E	CD/NI	-.23	L	CD/NI	-.22	L	NID/BE	-.77	C
NID/BE	-.78	C	OIE/LL	-.72	A	OIE/LL	-.84	A	NI/AE	-.78	E
NCO/AL	-.78	A	NCO/AL	-.81	A	NCO/AL	-.89	A	OIE/LL	-.78	A
						NID/BE	-.83	C	NI/AA	-.81	E
						NI/AA	-.93	E	NCO/AL	-.86	A
						NI/AE	-.87	E			

1983-85			1986-88			1989-91			All Years		
Factor 2			**Factor 2**			**Factor 2**			**Factor 2**		
NII/AEA	.85	E	NII/AEA	.79	E	II/AEA	.73	E	IP/AEA	.80	E
NII/AA	.78	E	NII/AA	.82	E	TL/TA	.79	L	IE/AEA	.79	E
NOIA/AA	.53	E	ADD/AD	.63	L	IE/AEA	.70	E	II/AEA	.61	E
CSL/TL	.66	A	NI/AA	.69	E	AL/AD	.76	L	LA/TL	.66	L
CSP/TBV	.56	C	NI/AE	.63	E	IP/AEA	.68	E	TD/TE	.70	C
REL/TL	.46	A	NID/BE	.61	C	CD/AE	.53	O	NOII/AA	.57	E
OREO/TA	.25	A	IP/AEA	-.54	E	S/IC	-.26	C	CML/TL	.37	A
LA/TL	-.52	L	IE/AEA	-.76	E	CSP/TBV	-.67	C	REL/TL	-.47	A
AD/FTE	-.84	O	AD/FTE	-.78	O				TTE/TA	-.70	C
AA/FTE	-.88	O	AA/FTE	-.90	O						

1983-85			1986-88			1989-91			All Years		
Factor 3			**Capital Adeq.**			**Factor 3**			**Factor 3**		
CD/AE	.72	O	T1C/RAA	.86	C	LA/TL	.77	L	NII/AEA	.75	E
ACD/ADLY	.54	O	T1LR/TL	.87	C	ADD/AD	.63	L	NII/AA	.76	E
A/ALY	.50	O	TE/TA	.83	C	NOII/AA	.65	E	ADD/AD	.59	L
ACL/ALLY	.50	A	E/ELY	.56	O	CSL/TL	.42	A	CSP/TBV	.42	C
ADD/AD	.52	L	CSP/TBV	-.53	C	CS/IC	-.33	O	CSL/TL	.36	A
IE/AEA	-.71	E	S/IC	-.56	C	REL/TL	-.69	A	AD/FTE	-.80	O
NOII/AA	-.69	E	A/ALY	-.64	O				AA/FTE	-.85	O
			ACL/ALLY	-.74	A						
			ACD/ADLY	-.70	O						
			CS/IC	-.56	O						

1983-85			1986-88			1989-91			All Years		
Capital Adeq.			**Factor 4**			**Capital Adeq.**			**Capital Adeq.**		
T1LR/TL	.86	C	TL/TA	.74	L	TE/TA	.92	C	T1C/RAA	.78	C
T1C/RAA	.90	C	II/AEA	.75	E	T1C/RAA	.88	C	TE/TA	.77	C
TE/TA	.78	C	CML/TL	.54	A	T1LR/TL	.77	C	T1LR/TL	.74	C
TTE/TA	.66	C	AL/AD	.64	L	TTE/TA	.61	C	CS/IC	-.32	O
CML/TL	-.24	A	NOII/AA	-.67	E	TD/TE	-.60	C	S/IC	-.39	C
S/IC	-.33	C							ACL/ALLY	-.55	A
TD/TE	-.61	C							A/ALY	-.60	O
CS/IC	-.51	O							ACD/ADLY	-.60	O

1983-85			1986-88			1989-91			All Years		
Factor 5			**Factor 5**			**Factor 5**			**Factor 5**		
TL/TA	.84	L	CSL/TL	.72	A	ACL/ALLY	.69	A	AL/AD	.69	L
AL/AD	.83	L	TD/TE	.74	C	ACD/ADLY	.63	O	CD/AE	.66	O
II/AEA	.62	E	CD/AE	.56	O	A/ALY	.65	O	TL/TA	.61	L
CD/NI	.60	L	LA/TA	.44	L	NII/AA	.66	E	E/ELY	.38	O
E/ELY	.65	O	REL/TL	-.62	A	NII/AEA	.52	E	CD/NI	.26	L
IP/AEA	.54	E	TTE/TA	-.75	C	CML/TL	.28	A			
						E/ELY	-.47	O			
						AD/FTE	-.59	O			
						AA/FTE	-.59	O			

Table 2 identifies the ratios, their respective loadings, and the ratio's categorical classification according to published reports. An inspection of the factors indicates that each factor is not defined by the same group of ratios from one period to the next. Based upon the CAMEL classification scheme and previous bankruptcy prediction studies, five factors should appear when factor analyzing the data:

Asset Quality (A)   - Ratio # 1,2,4,24,27-29,40,42
Earnings (E)   - Ratio # 3,5-13
Liquidity (L)   - Ratio # 17,25,26,43,44
Capital (C)   - Ratio # 31-34,37-39,45
Other (O)*   - Ratio # 14-16,20-23,36

*Could relate to an efficiency or risk characteristic based upon previous bankruptcy studies.

In the analysis, however, only one financial characteristic emerges during the nine-year period (Table 2). A capital adequacy factor consistently develops. A second financial characteristic, earnings/asset quality (E/AQ), appears to evolve through Factor #1 in all periods. Interesting however, earnings and asset quality has been traditionally defined as separate financial characteristics by bank regulatory agencies. This could be an indication of the complexity of the ratio's firm characteristic. For example, loss provision/average assets (LP/AA), an earnings measure, and net loan loss/average loans (NLL/AL), an asset quality measure, load highly to Factor #1. Also, Factor #1 is composed of additional variables that measure not only earnings (E) and asset quality (A), but capital adequacy (C). Net income less dividends/beginning equity (NID/BE) consistently correlates to an earnings/asset quality factor. This indicates that the measurement classification of these financial ratios is suspect. There is no discernable "earnings" or "asset quality" financial characteristic in the findings.

Another problem arises in that no pattern of stability among the remaining ratios is apparent. The same ratios do not group with a single factor in subsequent periods. This eliminates the opportunity to theorize what financial characteristic of bank activity is being measured by the ratios. Further data analyses including more or less than five-factor structures were attempted, with no improvement in factor interpretation and stability.

Closer analysis of the ratio-to-factor correlations helped to identify ratios that were not significantly correlated with the five factors. Below are the ratios that loaded to a given factor with a correlation of less than .50:

RATIO	#15	17	24	27	28	29	34	36	37	40	44
PERIOD											
1983-85			x		x	x			x	x	
1986-88		x									x
1989-91	x	x		x	x			x	x		
ALL YEARS		x		x	x	x	x	x	x		
Total	1	3	1	2	3	2	1	2	3	1	1

This indicates that CD/NI (#17), CSL/TL (#27), CML/TL (#28), REL/TL (#29), CS/IC (#36), and S/IC (#37) are not correlated to any one factor for at least two periods. For example, consumer loans/total loans (CSL/TL), commercial loans/total loans (CML/TL), and real estate loans/total loans (REL/TL), though appear to be related, failed to collectively load to a given factor. These ratios may be

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measuring a unique factor rather than a common factor supported by a group of related ratios. A unique factor is difficult to interpret because of its limited relationship with other variables.

DISCUSSION AND CONCLUSION

The banking industry is significantly different than other industries. Bank financial statements contain an abundance of information and require excessive time to evaluate. Financial ratio analysis arose partially in response to this problem. The purpose of this study was to develop a taxonomy of financial ratios to provide easier assessment of financial performance.

The conclusions of this study should assist in the improvement of bank financial analysis and research inquiry. First, there appears to be evidence that fewer ratios better measure performance in the banking industry. This supports previous findings by Jocobe (1983). The tradition of providing management and other users of bank information with massive amounts of data is not efficient nor effective for decision-makers in todays complex financial environment.

Second, a large number of financial ratios may be measuring constructs which are significantly different than users presume. A consistent significant correlation with the same identifiable factor (beyond capital adequacy) would have existed had the ratios been measuring the traditional classification. This research does not support the classification schemes developed by bank regulatory agencies. Lack of awareness can lead management to improper operational decisions, thus potentially severe financial consequences for investors, creditors, and taxpayers.

Third, this study suggests that firm evaluation and industry analysis by financial service firms and regulatory agencies may be improper because the ratios are not measuring the same construct from one firm to the next. The lack of consistent factors limits the meaning of firm performance appraisals over time.

Fourth, the research raises additional questions about the computerized surveillance system of the federal agencies. Though the CAMEL Rating System was adopted in 1979, it is supported by few financial ratios. Recognizing the instability of bank financial ratios (as indicated by this study), can regulatory agencies be confident that the selected ratios are measuring liquidity, asset quality, capital adequacy, and earnings in the 1990's?

Last, regulatory agencies may be providing too much information to commercial banks. The Uniform Bank Performance Report, comprised of multiple pages of detailed data items and financial ratios, is provided quarterly to federally-insured commercial banks. While many of the ratios from the report were included in this study, a statistical relationship among these ratios appears to be lacking.

Users of bank financial ratios must recognize the inherent weakness of this information when measuring bank activity. Volatility in the 1970's changed the structural components of commercial bank balance sheets (Jahera and Sinkey, 1984). Today, the commercial bank industry continues to undergo structural changes (Federal Reserve Bank of Chicago, 1992). Therefore, it is not surprising to see that CAMEL or other framework designed to measure commercial bank activity in the past no longer holds. Research is necessary to identify and clarify, on theoretical grounds, the financial ratios that capture significant characteristics of commercial bank activity under current structural conditions.

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