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Hospital financial ratio classification patterns revisited: Upon considering nonfinancial information

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Abstract

My paper first considers the relationship between nonaccounting information and traditional hospital financial ratios. I found that nonaccounting information represents separate characteristics of hospital financial performance. Second, the link between factors produced in the first stage of the analysis and one dimension of hospital financial performance, creditworthiness, is assessed. Bond ratings are used as a proxy for creditworthiness. I found that nonaccounting information is highly significant in explaining bond ratings. © 2000 Elsevier Science Ltd. All rights reserved.

1. Introduction

Traditionally hospital financial analysis has relied primarily on financial accounting information. Early work in this area employed the same financial ratios used for retail and manufacturing firms even though the market structure and service delivery system of the hospital industry differed substantially from these industries (Choate, 1974; Choate and Tanaka, 1979). Hospital financial performance analysis has progressed in the past 20 years, and special financial ratios reflecting the unique characteristics of the hospital industry have been developed and employed in analysis (Cleverley and Nilsen, 1980; Cleverley and Rohleder, 1985; Zeller et al., 1996).

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However, there is evidence that information in addition to financial accounting ratios might be relevant to evaluating the financial performance of hospitals (Cleverley and Nutt, 1984; Sloan et al., 1987; McCue et al., 1990; Craycraft, 1994; Lawrence and Kurtenbach, 1995; Gardiner et al., 1996). For example, Cleverley and Nutt (1984, p. 626) examined eight nonfinancial measures and found that the number of beginning beds,¹ expense per patient day, and percentage of Medicaid revenue were significantly correlated with hospital bond ratings.² Also, for example, Lawrence and Kurtenbach (1995, pp. 175–176) found 10 nonfinancial measures significantly correlated with several measures of market risk, and Gardiner et al. (1996, p. 454) found that two nonfinancial variables, county market share and length of stay, were significant in predicting failure in both not-for-profit and proprietary hospitals.

The purpose of my study was twofold: (1) to extend previous research which has investigated the common characteristics of hospital performance (Cleverley and Rohleder, 1985; Counte et al., 1988; Chu et al., 1991; Zeller et al., 1996) by including nonfinancial information in the analysis; and, (2) to test the relationship between the various characteristics of hospital performance produced in the first stage of the analysis and one measure of hospital financial performance – creditworthiness.

In the first phase of my study a factor analysis was performed including a set of hospital financial ratios which have been examined in previous studies (Cleverley and Rohleder, 1985, Zeller et al., 1996) and a set of nonfinancial information which has not yet been examined. The findings with respect to financial ratios are similar to prior studies (e.g., Zeller et al., 1996, pp. 171–176; Chu et al., 1991, pp. 47–52). The analysis of nonfinancial information suggests that there are information effects related to characteristics of hospital performance that are different from the effects of financial information. The second stage of my study assesses the relationship between factors produced in the first stage of the analysis and hospital bond ratings. Results suggest that nonfinancial information represents characteristics of hospital performance not depicted by traditional financial ratios and that several nonfinancial variables are significant in explaining bond ratings.

¹ Cleverley and Nutt (1984) do not elaborate on the definition of this measure. It was used as a proxy for hospital size.

² The study (Cleverley and Nutt, 1984, p. 618) sample was taken over a four-year period prior to the implementation of Medicare's prospective payment system (1973–1977) and reflects incentives provided by the retrospective payment system. For example, expense per patient day was positively correlated with bond ratings (Cleverley and Nutt, 1984, p. 628). Under the retrospective payment system higher expense per patient day represented higher revenues generated by the hospital (e.g., Morgan and Kappel, 1985, p. 1).

2. Background

A review of the relevant health care literature indicates that initial studies focussing on hospital financial ratios developed out of a need to reduce the volume of information that hospital administrators and managers encountered when monitoring the operations, financial strengths, and potential problems of their organizations (see, e.g., Glandon et al., 1987, p. 440). In the late 1970s the use of ratio analysis among hospital administrators was still novel (Choate, 1974, p. 50). Cleverley and Nilsen (1980, p. 30) offered two reasons why financial ratios were not as widely used in the hospital industry as in other industries. First, it is possible that financial pressures in the hospital industry were not as pervasive during the late 1970s as they were in other industries (Cleverley and Nilsen, 1980, p. 30). Thus managers had little incentive to produce, analyze, and interpret financial ratios. Second, lack of availability of comparable financial statement information may have slowed the development of meaningful industry ratio averages (Cleverley and Nilsen, 1980, p. 30).

This lack of information availability was somewhat overcome when, in 1979, a national data base of hospital ratios was produced. This data base, the Financial Analysis Service (FAS), produces ratio averages from relevant information collected from participating hospitals.³ While many of the ratios provided by the FAS data base are similar to those used in other industries, several are designed to reflect the unique characteristics of the hospital industry.

Because analyzing such a large number of financial ratios can be a source of confusion rather than clarification, later research studies concentrated on reducing the number of significant ratios necessary to evaluate hospital financial performance (Cleverley and Rohleder, 1985, p. 84). A comprehensive review of this literature can be found in Zeller et al. (1996, pp. 164–166), the most recent study to examine the various financial characteristics of hospital performance. Their (1996) study improved on previous research in that it analyzed financial ratio patterns over time and across different ownership type, mission and location. The objective of the Zeller et al. (1996, p. 162) study, like other previous studies, was to identify the consistent characteristics of hospital financial performance through the use of factor analysis. Their study identified seven financial characteristics: (1) “profitability” (p. 173); (2) “fixed asset efficiency” (p. 174); (3) “capital structure” (p. 175); (4) “fixed asset age” (p. 175); (5) “working capital efficiency” (p. 175); (6) “liquidity” (p. 175), and (7) “debt coverage” (p. 176). Particular ratios included in the Zeller et al. (1996, p. 167)

³ The FAS was developed by the Healthcare Financial Management Association in cooperation with Ohio State University (Cleverley and Nilsen, 1980, p. 30).

study were selected because they were ratios typically used by hospital managers and administrators.

3. Motivation for including nonfinancial information

Although nonfinancial information is also extensively used throughout the industry to evaluate hospital performance (GASB Report, 1990, p. 144; Sherman, 1986, pp. 29–31; Anderson, 1991, pp. 33–34; Moody's Investor Services, 1994, p. 27; S&P, 1994c, pp. 68–71), these variables have not been included in prior analysis. Nonfinancial information can consist of a wide array of information. Examples include: utilization information (also referred to as operational information) such as number of admissions, number of full-time equivalent employees, number of beds in service; socioeconomic characteristics of the market area such as the average age or income of the community serviced; and, medical staff characteristics like the concentration of patient admissions with a single physician (GASB Report, 1990, p. 144; Sherman, 1986, pp. 29–31; Anderson, 1991, pp. 33–34; Moody's Investor Services, 1994, p. 27; S&P, 1994c, pp. 68–71). A hospital's financial performance may be influenced by many of these factors which are external to the hospital or otherwise beyond its ability to change in the short run. For example, the financial performance of a hospital may depend significantly on the number of beds it operates, whether it is a teaching or nonteaching hospital, or the socioeconomic make-up of the community it services (McCue et al., 1990, p. 245; Craycraft, 1994, p. 48).

A substantial amount of nonfinancial information is currently produced and utilized within the hospital industry. The American Hospital Association (AHA) has collected utilization data as well as data on a variety of other aspects of health care annually since the mid-1940s (GASB Report, 1990, p. 144). This information is used by hospital managers and administrators to evaluate the performance of their hospital relative to the performance of other hospitals (GASB Report, 1990, p. 144).

Certain resource providers for hospitals – for example, those that make charitable donations, taxpayers, financiers of debt and third party payers – are also interested in assessing various aspects of hospital performance (Lawrence and Kurtenbach, 1995, p. 356; GASB Report, 1990, p. 32). It has been suggested that these particular resource providers require information in addition to traditional financial ratios to enable assessment of relevant dimensions of hospital performance (GASB Report, 1990, p. vi).

Indeed, recognizing this, in 1995 the Government Accounting Standards Board (GASB) adopted and published Concepts Statement No. 2, Service Efforts and Accomplishments Reporting (Harris, 1995, p.18). GASB (1995) establishes the foundation for the subsequent adoption of financial statement disclosure of nonfinancial information or, as the GASB refers to these indi-

cators, “measures of service efforts and accomplishments (SEA)” (GASB Report, 1990, p. iii). The GASB believes that full accountability requires additional information beyond that traditionally supplied in external financial statements (GASB Report, 1990, p. v).

Similar suggestions have come from others. For example, in their commentary on the AICPA Special Committee on Financial Reporting (Jenkins Committee), Ansari and Euske (1995, p. 40) summarize 10 elements as the essence of the Jenkins Committee’s proposed financial reporting model. Element two states “high-level operating data and performance measurements that management uses to manage business” (Ansari and Euske, 1995, p. 40). For hospitals this translates into utilization information. While including nonfinancial data in audited external reports may raise concerns about the difficulty of verifying certain nonfinancial measures, Ansari and Euske (1995, p. 41) note that the Jenkins Committee report seems to be moving away from the emphasis on verifiability in favor of relevance.

Several professional organizations have encouraged the reporting of nonfinancial information by health care organizations who raise capital in the tax-exempt revenue bond market. An advisory committee of the National Association of State Auditors, Controllers and Treasurers (NASACT) has produced draft guidelines on the types of information that tax-exempt health care issuers should annually disclose to owners of their bonds (Pallarito, 1994, p. 73). These guidelines suggested that, in addition to traditional audited financial statements, certain nonfinancial data should also be provided to users of financial reports (Pallarito, 1994, p. 73). Additionally, the National Federation of Municipal Analysts (NFMA), an association representing municipal analysts and investors, is requesting quarterly reports, including utilization statistics and management reports (Nemes, 1992, p. 33). In an attempt to strengthen voluntary disclosure the Healthcare Financial Management Association’s (HFMA) Principles and Practices Board drafted a position statement released in 1993 which established guidelines that define the types of financial and nonfinancial data that health care providers should disclose (Pallarito, 1993, p. 66).

Finally, Mensah (1996, p. 375) raises an important question concerning the adequacy of FASB information requirements for hospitals and other health care institutions in this “emerging highly competitive environment” (p. 375). Should “hospitals and other health care” organizations provide “additional information beyond those required by [the FASB]”? The results of my study might provide evidence as to whether some hospital statement users might benefit from additional information.

The foregoing suggests that the nature and extent of information disclosure by hospitals is a relevant and timely policy issue. At a minimum, given that disclosure is costly such information should provide *incremental* value over and above the financial information that is already disclosed.

My study is a first step in providing empirical information on this issue. The first stage of my study uses factor analysis to provide some insight into whether or not financial and nonfinancial information seem to capture different characteristics of hospital performance. If financial ratios share sufficient information with nonfinancial numbers than these variables should load on common factors. If the financial and nonfinancial variables load on different factors then this provides some evidence that nonfinancial information may capture characteristics of hospital performance which are not captured by financial ratios. The second part of my study places the results of the factor analysis in the context of the relative value of financial and nonfinancial information in judging the creditworthiness of hospitals.

4. Methodology

4.1. Data base

The sample for this study is taken from the Merritt System[®] data base, a private data base compiled by Van Kampen Management Inc.⁴ Types of information included in the data base range from financial accounting information, to socioeconomic data, to utilization statistics, to bond rating information. The data base included 2145 nonprofit US hospitals which at the time represented approximately one-third of the nongovernmental hospitals in the US (see Williams, 1994, p. 55). Approximately 25% of the hospitals were teaching hospitals, and none were government-owned. The Merritt System[®] updates credit ratings monthly, utilization data at varying intervals depending on particular hospitals, and audited financial statements annually. (see Prince and Ramanan, 1994, p. 34).

4.2. Variables analyzed

With respect to financial information, 21 of the 34 ratios collected by the FAS were included in my analysis. These ratios are listed in Table 1. The remaining 13 ratios could not be computed either because they were unavailable

⁴ The Merritt System[®] is a municipal market data base developed in 1986 and maintained by Van Kampen Management Inc. (formerly Van Kampen Merritt Investment Advisory Corporation). Data and terms were taken from the manual *The Merritt System* published by Van Kampen Merritt Investment Advisory Corporation, 1990. Since 1997 the Merritt System has been renamed Merritt Millennium and is currently owned by Van Kampen Management Inc., a Morgan Stanley Dean Witter Company. The web site of the data base is www.merrittmillennium.net. This database has been used in several health care financial management studies (Lawrence and Kurtenbach, 1995, p. 364; Prince and Ramanan, 1994, p. 59).

Table 1
Definitions of financial ratios analyzed in this study^a

1.	Operating Margin (OMAR)	Total Revenue – (Operating Expense + Taxes Paid)/Total Revenue
2.	Return on Total Assets (ROA)	Excess of Revenue Over Expenses/Total Assets (Year End)
3.	Return on Equity (ROE)	Excess of Revenue Over Expenses/Fund Balance (Year End)
4.	Growth Rate in Equity (GRIE)	Change in Fund Balance/Fund Balance (Year End)
5.	Current Ratio (CR)	Current Assets/Current Liabilities
6.	Average Payment Period (APP)	Current Liabilities/[(Operating Expenses – Depreciation)/365]
7.	Days in Patient Accounts Receivable (DAR)	Net Patient Accounts Receivable/(Patient Revenue/365)
8.	Days Cash on Hand (DCHST)	Cash + Marketable Securities/[(Operating Expense – Depreciation)/365]
9.	Equity Financing Ratio (EF)	Fund Balance/Total Assets
10.	Long-Term Debt to Equity (LTDE)	Long-Term Liabilities/Unrestricted Fund Balance
11.	Fixed Asset Financing Ratio (FAF)	Long-Term Liabilities/Net Fixed Assets
12.	Cash Flow to Total Debt (CFTD)	Excess of Revenue Over Expenses + Depreciation/Current Liabilities + Long-Term Debt
13.	Capital Expense (CE)	Interest + Depreciation/Net Operating Expense
14.	Times Interest Earned (TIE)	Excess of Revenue over Expenses + Interest Expense/Interest Expense
15.	Debt Service Coverage (DSC)	Cash Flow + Interest Expense/Principle payment + Interest Expense
16.	Total Asset Turnover (TATO)	Total Revenue/Total Assets
17.	Fixed Asset Turnover (FATO)	Total Revenue/Net Fixed Assets
18.	Current Asset Turnover (CATO)	Total Operating Revenue/Current Assets
19.	Average Age of Plant (AAP)	Accumulated Depreciation/Depreciation Expense
20.	Depreciation Rate (DEPR)	Depreciation Expense/Gross Fixed Assets
21.	Capital Expenditure Growth Rate (CEGR)	Capital Expenditures/Gross Fixed Assets

^a Financial ratios, ratio definitions, and ratio abbreviations are from Zeller et al. (1996, pp. 169–170) which were taken from Cleverley (1993, pp. 492–495).

in the Merritt System® or because of missing data. In comparison, the Zeller et al. (1996, pp. 169–170) study examined 28 ratios. In my study as well as the Zeller et al. (1996, pp. 169–170), ratios were included which are representative

of the seven conceptual categories noted above: profitability, fixed asset efficiency, capital structure, fixed asset age, working capital efficiency, liquidity and debt coverage.

With respect to nonfinancial information, both limits on data availability and different beliefs about what is and what is not relevant information make the selection of variables more difficult. The nonfinancial variables included in my study were limited to the information collected by the Merritt System® data base. The actual definitions of the 10 nonfinancial variables included in the study were taken from the Merritt System® data base manual (1990, pp. 7.25–7.27) and are provided in Table 2.⁵

4.3. *The sample*

Five samples were drawn from the Merritt System® data base, one representing each sample-year between 1990 and 1994. To be included in the sample a hospital must have provided complete data on all the variables tested in my study. More hospitals provided nonfinancial data to the data base in recent sample-years (1993–1994) than in earlier sample-years (1990–1991). This results in gradually increasing sample sizes between the 1990 (97 hospitals) to 1994 (202) sample-years. This difference in sample size is due primarily to the lack of available nonfinancial data in earlier sample-years, a lack of availability that may help explain why previous studies have not been concerned with nonfinancial information.

The 1990 sample is smaller than the samples in earlier factor-analytic studies (Chu et al., 1991, p. 43; Zeller et al., 1996, p. 168). The larger sample sizes found in previous factor-analytic studies are due to the fact that nonfinancial information was not included in these earlier studies. Studies which have examined nonfinancial information have sample sizes comparable to those in my study.⁶ In my study, even for 1990, the sample is more than adequate to meet the statistical demands of the factor analysis (Kline, 1994, p. 74).⁷

Given the difference in sample sizes for each sample-year of my study, I conducted several statistical analyses to assure sample stability with respect to proportion of teaching to nonteaching hospitals, proportion of rural to

⁵ Variables selected correspond to the description of various SEA categories found in the GASB research report *Service Efforts and Accomplishments Reporting* (1990, p. 151).

⁶ Cleverley and Nutt (1984, p. 627) report sample sizes that range from 104 to 108. Craycraft's (1994, p. 43) sample size was 76.

⁷ Kline (1994, p. 74) suggests that there should be a minimum of twice as many observations as variables being analyzed. The 1990 sample of 97 hospitals provides more than three times the number of observations to variables.

Table 2
Definitions of nonfinancial measures analyzed in the study^a

1.	Case Mix Index (CMI)	Measures the intensity of hospital services based on the acuity of patients treated.
2.	Occupancy Percentage (OCCP)	Patient Days ^b /(Beds in Service×365) Provides an efficiency measure of existing capacity utilization.
3.	CMA Adjusted Admissions (CMAAD)	Case Mix Index×Admissions Provides a measure of total inpatient activity.
4.	Length of Stay (LOS)	Patient Days/Case Mix Adjusted Admissions A longer average stay is indicative of greater intensity or level of care.
5.	Full Time Equivalents per Occupied Beds (FTEs/BED)	Full Time Equivalent Employees/ Occupied Beds Measure of staffing efficiency.
6.	CMA Patient Days (CMAPD)	Case Mix Index×Patient Days The number of adult and pediatric inpatient days registered during the fiscal year adjusted by acuity of patients treated. A measure of hospital volume adjusted for intensity of patient treatment.
7.	CMA Admissions per Bed (CMAAD/ BED)	CMA Admissions/Number of Beds in Service Efficiency measure standardizing inpatient activity produced by each bed.
8.	CMA Admissions per FTEs (CMAAD/ FTEs)	CMA Admissions/Full-Time-Equivalent-Employees Provides a measure of efficiency and a comparison of one hospital relative to another according to FTEs
9.	Number of Births (BIRTHS)	Measure of hospital output.
10.	Total Surgical Operations (SURG)	Measure of hospital output.

^aData and terms were taken from the manual *The Merritt System* published by Van Kampen Merritt Investment Advisory Corporation, 1990. Since 1997 the Merritt System has been renamed Merritt Millennium and is currently owned by Van Kampen Management, a Morgan Stanley Dean Witter Company. The web site of the database is www.merrittmillennium.net.

^bThe number of inpatient days registered during the fiscal year.

urban hospitals, and the distribution of size of hospitals comprising each sample. The results of these tests suggest that though sample size changes considerably from the 1990 sample-year to the 1994 sample-year there is consistency among the five sample-years with respect to the above mentioned attributes (these results can be obtained upon request from the author).

4.4. *Comparison to the methodology of Zeller et al.*

Because my study builds upon the work of Zeller et al. (1996), it is useful to compare the similarities and differences between the two studies. First, my study, unlike Zeller et al. (1996), includes examination of nonfinancial information as well as financial information. Second, one objective of Zeller et al. (1996, p. 167) was to test empirically whether or not financial characteristics differed across three dimensions: hospital ownership structure, hospital mission, and hospital location. Their study (1996, pp. 177–178) found that factor loadings did not differ significantly across these categories. For this reason, my study does not partition the data across these dimensions. Third, there is a slight difference in the time period from which data were taken in the two studies. Zeller et al. (1996) examined the four-year period, 1989 through 1992, and my study considers the five-year period, 1990 through 1994. Fourth, Zeller et al. (1996, see p. 172) averaged factor loadings after conducting separate factor analyses for each year. Such averaging was not used in my study due my concern about possible intertemporal stability of the data. Instead, factor analyses were simply presented for each year in the sample. First identified by Chu et al. (1991, p. 42), such intertemporal instability is caused by the ongoing structural and economic changes within the hospital industry.⁸ Finally, the hospitals included in my study are, on average, larger than those included in Zeller et al. (1996).⁹

4.5. *Factor analyses*

Exploratory factor analysis was chosen over confirmatory factor analysis. This choice is appropriate in settings where theory is insufficiently developed to permit well-defined structures to guide specification of hypotheses (Kline, 1994, pp. 9–11). Factors were initially extracted using the common factor analysis generated by the SAS system PROC FACTOR procedure (SAS Institute, 1990, p. 773). For each of the five years of data, the 31 variables selected for inclusion – 21 financial variables and 10 nonfinancial variables – were included in the analysis. The PROC FACTOR procedure was programmed to retain and rotate factors with eigenvalues greater than one. As discussed in the results

⁸ It should be noted that Chu et al. (1991, p. 52) believed that this instability could have been due to the fact that sample-years in their study were taken during the implementation of Medicare's Prospective Payment System.

⁹ A comparison of the composition of my study's samples was made with that of Zeller et al. (1996, pp. 168 and 177) based on size of hospitals, mission and location. There were substantial differences between the average sample presented in Zeller et al. (1996) and the samples used in my study with respect to hospital size (e.g., there was a greater proportion of large hospitals (net patient revenue > \$100 million) in my study).

section, eight factors met this criterion in each sample year. The eight factors retained and rotated were confirmed by a visual analysis of Cattell's Scree Test.¹⁰ The option Promax was invoked to perform an oblique¹¹ factor rotation on the eight factors retained.¹²

The percentage of the total variance explained by each factor is calculated by dividing the eigenvalue of each factor by the total number of variables in the study. This eight factor solution accounts for 73–81% of the total explained variance over the five-year period. Inter-factor correlation among identified factors was very low to moderate, ranging between 0.002 and 0.36.

5. Results and discussion

Table 3 provides a summary of the results of the factor analysis. Only four financial characteristics emerged consistently over the five-year period. These factors capture profitability, capital structure, working capital efficiency and fixed asset efficiency. Those factors which did not emerge consistently in my study were fixed asset age, liquidity, return on equity, and debt coverage. In my study as in Zeller et al. (1996, pp. 173–175), the ratio return on equity did not load consistently onto the profitability factor. For a discussion of the relevance of the financial factors see Zeller et al. (1996, pp. 179–180).

The nonaccounting information (see Table 2) loaded onto separate factors (see Table 3). This indicates that information contained in these variables represents separate dimensions of hospital performance. Three distinct nonfinancial ratio groupings emerged consistently over the five-year study period. These three factors might be best characterized as capturing measures of outputs, measures of efficiency, and measures of productivity.

5.1. Measures of output

Variables loading onto the first nonfinancial factor were Case Mix Adjusted Admissions (CMAAD), Case Mix Adjusted Patient Days (CMAPD), and number of births (BIRTHS). These variables can best be described as measures

¹⁰ Cattell's Scree test consists of a graph of the relationship between the eigenvalues and the factors produced in the common factor analysis (Kline, 1994, p. 75). The cutoff point for factor rotation is where the line changes slope on the graph (Kline, 1994, p. 75).

¹¹ Following Counte et al. (1988, p. 175) as well as Zeller et al. (1996, p. 170), factors are assumed to be correlated. Under that assumption, an oblique rotation is preferred (Kline, 1994, p. 62).

¹² A principal components analysis was also performed including the 31 variables analyzed in the factor analysis. The results of the two procedures were compared and found to produce similar factor groupings of variables.

Table 3

Summary of results of factor analysis for the five-year study period 1990–1994

Year	1994	1993	1992	1991	1990
Sample size	(202)	(177)	(125)	(113)	(97)
Profitability					
ROA	0.86	0.71	0.94	0.80	0.92
*GRIE	0.88	0.88	0.73	*	0.70
*ROE	0.87	0.84	0.92	*	0.81
*CFTD	*	*	0.79	0.93	0.83
OMAR	*	*	*	0.75	0.86
Capital structure					
EF	0.88	(–)0.68	(–)0.89	(–)0.73	0.80
FAF	(–)0.66	0.81	0.82	0.76	0.85
*CEGR	*	0.83	0.68	0.73	0.78
*LTDE	(–)0.72	0.67	0.86	*	0.37
*CE	*	*	*	0.65	0.81
Working capital efficiency					
CATO	(–)0.83	0.85	(–)0.71	(–)0.71	0.85
DCHST	0.76	(–)0.68	0.71	0.98	(–)0.61
CR	0.70	*	0.78	*	0.62
Fixed asset efficiency					
FATO	0.87	0.89	0.85	0.88	0.78
TATO	0.84	0.88	0.85	0.82	0.65
*CE	(–)0.72	(–)0.72	(–)0.65	*	*
*DEPR	*	*	*	0.79	0.79
Fixed asset age					
*DEPR	0.81	*	0.73	*	*
*CEGR	0.85	*	*	*	*
AAP	(–)0.74	*	(–)0.65	*	*
Liquidity					
*CFTD		0.82			
CR		0.64			(–)0.69
APP		(–)0.64			0.73
Return on equity					
*GRIE				0.98	
*ROE				0.98	
*LTDE				0.96	
Debt coverage					
DSC				0.97	
TIE				0.96	
Measures of output					
CMAAD	0.97	0.98	0.95	0.97	0.98
CMA PD	0.95	0.95	0.91	0.95	0.95
BIRTHS	0.85	0.78	0.85	0.73	0.85

Table 3 (Continued)

SURG	0.79	0.77	*	*	*
*CMI				0.60	0.72
Measures of efficiency					
FTE/BED	0.70	0.74	0.85	0.84	0.82
OCCP	*	(–)0.62	(–)0.73	(–)0.71	(–)0.61
Measures of productivity					
CMAAD/BED	0.83	0.82	0.83	0.81	0.77
CMAAD/FTE	0.70	0.71	0.69	0.73	0.76
*CMI	0.66	0.61	0.64	*	*
LOS	*	*	*	(–)0.70	(–)0.62

* Represents ratios with unstable factor loadings. An unstable ratio is defined as a ratio which did not load onto the same factor for all periods of the study (1990–1994) (Zeller et al., 1996, p.176). For example, CE loaded on Capital Structure in 1990 and Fixed Asset Efficiency in 1994. Similar to Zeller et al. (1996, pp. 176) CE, CEGR, CFTD, and GRIE were unstable ratios. For definitions of ratios see Tables 1 and 2.

of hospital outputs (GASB Report, 1990, p. 150). They provide some indication of the magnitude of resources being used by hospitals and the trend in their use. CMAAD is calculated by weighting admissions by average acuity of each case as reflected in the case mix index (see Table 2). As some hospitals specialize in treatment of more acute illnesses, this measure gives a more accurate indication of total inpatient activity than admissions alone (Van Kampen Merritt Investment Advisory Corporation, 1990, p. 7.25). According to GASB (1990, p. 140):

Output indicators have received widespread use for many years and provide users with information about the utilization of the hospital, the mix of the methods of treatment . . . and the hospital's practice concerning duration of stay.

5.2. *Measures of efficiency*

Efficiency ratios (see Tables 2 and 3) give some insight into the costs at which a given hospital provides services. Staff efficiency measured by full time equivalent employees to number of occupied beds (FTE/BED) is one measure of hospital efficiency. It is a measure of how many workers are employed to provide services for inpatients, measured by the annual average of occupied beds. Occupancy rate is determined by dividing patient days by the number of beds in service times 365. It represents a measure of a hospital's existing capacity utilization. Efficiency indicators can be important to a variety of resource providers, "investors, taxpayers, the county commission, the board of

trustees, and so forth” (GASB Report, 1990, p. 149) as the tightening of public resources causes increased attention to be focussed on waste and abuse (GASB Report, 1990, p. 17).

5.3. *Measures of productivity*

Case Mix Adjusted Admissions per Bed in service (CMAAD/BED) and Case Mix Adjusted Equivalent Admissions per Full-Time-Equivalents (CMAEAD/FTEs) loaded consistently onto a separate factor (Table 3). While these variables do not conform nicely to any one SEA category provided by the GASB, they do seem to fit the general description of service efforts and accomplishments. Perhaps they are more appropriately described as representing “capacity productivity” and “manpower productivity”,¹³ respectively. Capacity productivity is a measure which correlates inpatient activity produced by each bed with productivity across hospitals. The capacity productivity ratio is produced by first determining the relative level of total inpatient activity – CMAAD. This is achieved by multiplying admissions by the case mix index. CMAAD is then divided by the number of beds in service or capacity to yield a measure of bed turnover. Manpower productivity is measured by the relationship of case mix adjusted equivalent admissions to FTEs. CMAEAD is a measure of total hospital output, taking into account inpatient turnover, case mix intensity, and outpatient production. FTEs are a good indication of total hospital input. The ratio is indicative of the number of CMAEADs serviced by each FTE. Because manpower productivity is a combination of total utilization and staffing, the ratio provides a measure of efficiency and a comparison of one hospital relative to another according to FTEs (Van Kampen Merritt Investment Advisory Corporation, 1990, p. 7.26).¹⁴

¹³ The terms “capacity productivity” and “manpower productivity” were taken from the Merritt System manual published by Van Kampen Merritt Investment Advisory Corporation (1990). Data and terms were taken from the manual *The Merritt System* published by Van Kampen Merritt Investment Advisory Corporation (1990). Since 1997 the Merritt System has been renamed Merritt Millennium and is currently owned by Van Kampen Management, a Morgan Stanley Dean Witter Company. The web site of the database is www.merrittmillennium.net. Though these particular variables and the information they represent do not conform precisely to any of the categories developed by GASB (GASB Report, 1990, pp. 12–13), they do fit the general description of service efforts and accomplishments and possibly represent information relevant to users of hospital financial statements.

¹⁴ Data and terms were taken from the manual *The Merritt System* published by Van Kampen Merritt Investment Advisory Corp, 1990. Since 1997 the Merritt System has been renamed Merritt Millennium and is currently owned by Van Kampen Management, a Morgan Stanley Dean Witter Company. The web site of the database is www.merrittmillennium.net.

6. Further analysis – does nonfinancial data provide incremental information beyond that provided by financial data?

Zeller et al. (1996, p. 178) acknowledge that a limitation of their study, and prior studies as well, is that “it does not link an identified factor to decision making value or usefulness.” In a modest way, this section of my paper offers one example of how such limitations might be overcome. I provide some evidence that information contained in nonfinancial data may not be conveyed through financial accounting numbers. Given that hospitals already produce financial information to assess hospital performance this section is concerned with examining whether one dimension of hospital performance – creditworthiness – may be enhanced by utilizing additional nonfinancial data.

There is evidence that a hospital's financial performance may be influenced by factors external to the hospital or otherwise beyond its ability to change in the short run. For example, the number of beds a hospital operates, whether a hospital is a teaching hospital, a hospital's county market share and the socioeconomic background of its surrounding community can influence the financial performance of a hospital (Cleverley and Nutt, 1984, p. 626; McCue et al., 1990, p. 251; Craycraft, 1994, p. 48; Gardiner et al., 1996, p. 457). Rating agencies indicate that nonfinancial ratio trends are examined with the same care as financial trends (S&P, 1994c, p. 70). The severity of illnesses treated, number of outpatient procedures, number of surgeries, patient days, and other general trends in patient volume are examined by analysts to accurately assess demand for a provider's services and competitive position when rendering a bond rating (S&P, 1994c, p. 70).

My study used hospital bond ratings as a proxy for creditworthiness. First, a bond rating model utilizing only financial information is employed to explain a hospital's bond rating. Next, nonfinancial variables are added to the initial model to create a combined model. The explanatory ability of the second model, with the increase in variables taken into account, is then compared to that of the model utilizing financial variables only. If the second model utilizing both financial and nonfinancial data demonstrates greater explanatory ability than the first model then this provides some evidence that nonfinancial data conveys incremental information beyond that provided by financial ratios. Additionally, this provides some empirical evidence that nonfinancial data may be relevant in assessing the creditworthiness of hospitals.

Ideally a bond rating model utilizing financial information would be chosen from the extant literature. Unfortunately, though many studies have assessed the predictive ability of various variables with respect to hospital bond ratings (Cleverley and Nutt, 1984; Sloan et al., 1987; McCue et al., 1990; Craycraft, 1994; Gardiner et al., 1996), to my knowledge no *consistent* financial model has emerged from the literature. Therefore, I constructed a financial model using variables analyzed in the first stage of my study. The fact that information on

these particular ratios is collected by the FAS provides some evidence of their importance in assessing the financial performance of hospitals.

There are several ways the financial model might be constructed. Using logistic regression all 21 financial variables defined in this study could be considered for inclusion in a bond rating model. The problem with this approach is that the presence of multicollinearity among the various financial variables precludes the simultaneous inclusion of many of these variables in the same model. A second approach would overcome this limitation by utilizing the results of the factor analysis performed in the first phase of this study. Because the factors produced in factor analysis represent groups of variables with shared variance, if financial variables are taken from different factors then the variables chosen will be less likely to be highly correlated with each other (see Johnson and Wichern, 1992, pp. 396–397).

I selected one financial variable from each consistent factor representing financial dimensions produced in the factor analysis (nonfinancial variables to be used in the combined model are chosen in the same fashion). For some factors the variable coefficients varied from year to year; therefore, I chose the variable with the highest average loading over the five-year study period for each factor. The resulting financial model is composed of the following variables: Return on Assets, Equity Financing, Current Asset Turnover, and Fixed Asset Turnover. These ratios represent profitability, capital structure, working capital efficiency and fixed asset efficiency respectively. Nonfinancial variables used to create the combined model can be found in Table 2 and include CMAAD, FTE/BED, and CMAAD/BED.

Researchers have been cautioned against using factor analysis as a data reduction technique in model building or theory construction (Chen and Shimerda 1981, p. 59).¹⁵ It could be argued, for example, that financial ratios which proxy the information conveyed in nonfinancial data were simply excluded from the financial model (Moore and McCabe, 1989, p. 692). The first phase of my study, however, provides evidence that, indeed, this is not the case. Financial ratios and nonfinancial data did not load onto the same factors indicating that they are not highly correlated. Also, the concern here is not with constructing the *best* hospital bond rating model but is simply to provide some evidence as to whether nonfinancial data may contribute incremental information beyond that provided by financial data when explaining hospital bond ratings.

To conduct the logistic regression a sample of hospitals was selected from the Merritt System® data base. To be included in the sample hospitals must have issued bonds between 1990–1994 and must have provided information on all variables examined. Bond issues with credit enhancements were excluded

¹⁵ Cited in Zeller et al. (1996, p. 164).

from the sample.¹⁶ 263 hospitals met the above criteria. The dependent variable, hospital revenue bond ratings, is classified into six Standard and Poor's bond rating categories (Van Kampen Merritt Investment Advisory Corporation, 1990, p. 7.3). The proportion of hospitals represented in each category is presented in Table 4.

The SAS LOGISTIC (SAS Institute, 1990, pp. 1077–1078) procedure is used to fit linear logistic regression models for ordinal response data by the method of maximum likelihood. Logit regression provides both a global test for the significance of a given predictor controlling for all other predictors in the model, and a test for the significance of a set of predictors, controlling for other effects (SAS Institute, 1995, p. 65). Wald's χ^2 is used to test the significance of the estimated model parameters.

The LOGISTIC procedure provides several statistics which aid in the analysis and evaluation of logistic models. The Akaike Information Criterion (AIC) (SAS Institute, 1995, p. 21) and the Schwarz Criterion (SAS Institute, 1995, p. 21) both adjust for the number of explanatory variables in the model¹⁷ as well as the number of observations. For a given set of data, the AIC and SC are goodness-of-fit measures that can be used to compare one model to another, with lower values indicating a more desirable model (SAS Institute, 1995, p. 21).

Even when the number of explanatory variables used are taken into consideration, the financial model with an AIC measure of 925.857 and a SC measure of 958.142 does not appear to provide as much explanatory information as the combined model with an AIC score of 853.928 and a SC score of 896.975. Additional evidence of the combined model's superiority is provided by the log likelihood statistic which has a χ^2 distribution under the null hypothesis that all regression coefficients of the model are zero. The financial model exhibits a χ^2 statistic of 12.466 with 4 degrees of freedom (p -value = 0.0142, two-tailed test of significance) while the χ^2 statistic for the combined model is 90.395 with 7 degrees of freedom (p -value 0.0001, two-tailed test of significance). Complete results of the logistic regression are presented in Table 5.

¹⁶ Credit enhancements are measures an organization takes to enhance their credit rating for a particular debt instrument. An example of an enhancement is when a hospital insures a bond issue against default. The insurer guarantees payment if the hospital defaults on the bond. As a result the rating assigned to the issue reflects the creditworthiness of the insuring organization and not the hospital (Carpenter, 1991, p. 68).

¹⁷ It is not unusual for the predictive ability of a model to increase as variables are added (Johnson and Wichern, 1992, pp. 312–313). When comparing the predictive ability of models, therefore, it is important to compensate for differing numbers of variables (Johnson and Wichern, 1992, pp. 312–313).

Table 4

S&P bond rating classification for hospitals used in the logistic regression analysis^a

S&P rating category	Number	Sample (%)
A+ and above	65	24.3
A	69	25.8
A–	40	15.0
BBB+	26	9.8
BBB	29	10.9
BBB– and below	38	14.2
Total	267	100.0

^aThe plus minus signs show the relative standings with major ratings categories. *Data Source.* Van Kampen Merritt Investment Advisory Corporation (1990). Data and terms were taken from the manual *The Merritt System* published by Van Kampen Merritt Investment Advisory Corporation, 1990. Since 1997 the Merritt System has been renamed Merritt Millennium and is currently owned by Van Kampen Management, a Morgan Stanley Dean Witter Company. The web site of the database is www.merrittmillennium.net.

Table 5

Results of logistic regression using hospital tax-exempt revenue bonds as the dependent variable

	Model fitting information	
	Financial variables only	Combined model
Akaike Information Criterion	925.857	853.928
Schwarz Criterion	958.142	896.975
Log likelihood chi-square	12.466 (<i>p</i> -value 0.0142) ^H	90.395 (<i>p</i> -value 0.0001) ^H

	Parameter estimates		Financial variables only		Combined model	
	Financial model	Combined model	Wald χ^2	Pr > χ^2	Wald χ^2	Pr > χ^2
ROA	0.0749	0.0291	7.2929	0.0069 ^H	00.9814	0.3218 ^H
EF	0.5596	1.2395	0.6704	0.4129	03.0431	0.0811
FATO	–0.1099	–0.1143	1.2915	0.2558	01.4341	0.2311
CATO	–0.0170	–0.0613	0.0266	0.8705	00.3094	0.5781
CMAAD		0.00004			22.3066	0.0001
CMABED		0.0324			17.3759	0.0001
FTEBED		–0.0309			00.8361	0.3605

^H *p*-values are the result of two-tailed tests of significance.

An analysis of the Wald χ^2 values of variables in the combined model indicate that two nonfinancial variables, CMAAD and CMABED, were important in explaining hospital bond ratings (*p*-values = 0.0001, two-tailed tests of significance). While ROA was the only significant variable in the financial model it was not significant in the combined model. EF was the only significant financial variable in the combined model, with a *p*-value of 0.0811 (two-tailed test of significance).

CMAAD and CMAAD/BED are both positively correlated with bond ratings. It is possible that lower admissions indicate that a hospital has limited capacity to generate revenue (Lawrence and Kurtenbach, 1995, p. 374). Also, CMAAD provides some indirect information on the level of revenue the hospital generates. The Case Mix Index used to adjust the number of admissions in formulating CMAAD is created using Diagnostic Related Groups (DRGs). DRGs are used by the government to determine the amount of reimbursement to hospitals for their treatment of Medicare patients¹⁸ (Fetter, 1991, p. 3). There are more than 470 DRGs and each represents a particular procedure or service or groups of related procedures and services provided by the hospital (Fetter, 1991, p. 3). Each DRG has a fixed rate of reimbursement attached to it (Fetter, 1991, p. 3). Many third party payers follow reimbursement guidelines similar to those provided by DRGs (Fetter, 1991, p. 4). Therefore, in addition to providing information on the volume of patients treated, CMAAD also conveys some information on the level of revenue which these patients generate.

CMAAD/BED may provide a more accurate measure of total hospital inpatient activity than admissions alone. This variable makes allowances for the different overall level of patient acuity treated by a particular hospital and makes the comparison of bed utilization across hospitals possible (Van Kampen Merritt Investment Advisory Corporation, 1990, p. 7.26). These results would seem to support Sherman's (1986, p. 543) conclusion that additional data about patient volume and case mix are necessary to analyze hospital performance.

EF is positively correlated with bond ratings. This capital structure ratio indicates the hospital's ability to meet both principal and interest payments on long-term obligations. These measures depict the long-term financial and operating structure of the organization (Lev, 1974, p. 79). In the past 15 years the hospital industry has had a large increase in its proportion of debt financing chiefly through tax-exempt revenue bonds (S&P, 1994a, p. 17). The evaluation of these ratios may ultimately determine the amount of financing available to an organization, thus directly affecting its rate of growth and its ability to deliver services.

Though ROA, CATO, FATO and FTEs/BED were variables which emerged consistently in the factor analysis in all five years of the study period, they are not significant variables in the combine bond rating model. The relationship of some input measures to outputs measures can be complex and even difficult to interpret by the bond market. The fact that FTEs/BED was not

¹⁸ On average hospitals receive about 40% of their revenue from the government in the form of Medicare reimbursements (S&P, 1994b, p. 33).

found to be a significant explanatory variable, for example, may reflect this observation (Lawrence and Kurtenbach, 1995, p. 377).

7. Implications of results and future research

My study expands upon previous research (e.g., Zeller et al., 1996; Craycraft, 1994; Chu et al., 1991; Counte et al., 1988; Cleverley and Rohleder, 1985) which examined factor patterns derived from financial information provided by hospitals by extending the analysis to include nonfinancial information. A further extension of existing research had to do with analyzing the additional information that nonfinancial variables may convey with respect to at least one dimension of hospital financial performance that should be of relevance to users – creditworthiness.

My results suggest that nonfinancial data captures aspects of hospital performance that financial data may not capture and perhaps has informational value in making financial decisions. This suggestion is based on the empirical finding that a bond rating model utilizing both financial and nonfinancial variables did a better job of explaining the cross sectional differences in hospital bond ratings than a model employing financial variables only. In addition two nonfinancial variables – CMAAD and CMAAD/BED – were found to be significant explanatory variables in the combined bond rating model. This provides some evidence that nonfinancial information, information not provided in traditional external accounting reports, may be relevant in assessing a hospital's creditworthiness.

In addition to various participants in the hospital bond market, hospital managers and administrators may find the results of my study of interest. The results may also offer some guidance for those concerned with hospital reporting disclosure and its regulation. As noted earlier, the HFMA, NASACT and NFMA have suggested that hospitals should include nonaccounting information in their external reports. The GASB and several quasi-governmental organizations have proposed that full accountability for hospitals requires additional information beyond that traditionally supplied in external financial statements (Pallarito, 1994, p. 72; GASB Report, 1990, p. iii). To date, there has been little empirical evidence providing support for the above proposals made by the GASB, HFMA, NASACT and NFMA.

Though my study has provided some evidence that nonfinancial information may be relevant in evaluating the financial performance of hospitals, more research is needed before strong claims can be made about, for example, required disclosures. In addition, relying on certain indicators relevant to financial decisions may lead to decisions which are at odds with other goals of health care organizations. For example, the GASB (GASB Report, 1990, p. 140) recognizes that decisions made based on measures like efficiency may

conflict with other dimensions of hospital performance such as quality of care (see for example the discussion in GASB Report, 1990, p. 140).

Theories need to be developed which provide insight into the relationship between financial and nonfinancial data and the economic activity of a hospital. In addition to extending the evidence of financial relevance, future research in this area might focus on nonfinancial information which is relevant to other resource providers – those who provide charitable donations, tax support, third party payers and, perhaps most importantly, the patients themselves. Whatever the case, health care and accounting's relation to it is an area of inquiry which offers promise for accounting academics interested in areas that are quite relevant to public policy.

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References

- Anderson, H.J., 1991. Multihospital systems earn high marks from bond rating agencies. *Hospitals* 65 (20), 33–34.
- Ansari, S., Euske, K.J., 1995. Commentary: Breaking down the barriers between financial and managerial accounting: a comment on the Jenkins committee report. *Accounting Horizons* 9 (2), 40–43.
- Carpenter, C.E., 1991. The marginal effect of bond insurance on hospital tax-exempt bond yields. *Inquiry* 28 (1), 67–73.
- Chen, K.H., Shimerda, T.A., 1981. An empirical analysis of useful financial ratios. *Financial Management* 10 (1), 51–60.
- Choate, G.M., 1974. Financial ratio analysis. *Hospital Progress* 55 (1), 50–67.
- Choate, G.M., Tanaka, K., 1979. Using financial ratio analysis to compare hospitals' performance. *Hospital Progress* 60 (4), 43–58.
- Chu, K.W., Zollinger, T.W., Kelly, A.S., Saywell Jr., R.M., 1991. An empirical analysis of cash flow, working capital, and the stability of financial ratio groups in the hospital industry. *Journal of Accounting and Public Policy* 10 (1), 39–58.
- Cleverley, W.O., 1993. The 1993 Almanac of Hospital Financial & Operating Indicators. The Center for Healthcare Industry Performance Studies (CHIPS), Columbus, OH.
- Cleverley, W.O., Nilsen, K., 1980. Assessing financial position with 29 key ratios. *Healthcare Financial Management* 34 (1), 30–36.
- Cleverley, W.O., Nutt, P.C., 1984. The decision process used for hospital bond rating – and its implications. *Health Services Research* 19 (5), 615–637.
- Cleverley, W.O., Rohleder, H., 1985. Unique dimensions of financial analysis service ratios. *Topics in Health Care Financing* 11 (4), 81–88.

- Counte, M., Glandon, G., Holloman, K., Kowalczyk, J., 1988. Using ratios to measure hospital financial performance: can the process be simplified?. *Health Services Management Research* 1 (3), 173–180.
- Craycraft, C., 1994. The incremental information content of socioeconomic data in evaluating hospital performance. *Journal of Management Systems Special Series: Research in Healthcare Financial Management* 6 (3), 39–52.
- Fetter, R., 1991. Background. In: R. Fetter (Ed.), *DRGs*. Health Administration Press, Ann Arbor, MI, pp. 1–19.
- Gardiner, L.R., Oswald, S.L., Jahera, J.S. Jr., 1996. Prediction of hospital failure. *Hospital and Health Services Administration* 41 (4), 441–460.
- Glandon, G.L., Counte, M., Holloman, K., Kowalczyk, J., 1987. An analytical review of hospital financial performance measures. *Hospital and Health Services Administration* 32 (4), 439–455.
- Governmental Accounting Standards Board (GASB), 1990. Research Report: Service Efforts and Accomplishments Reporting (GASB Report). Governmental Accounting Standards Board, Norwalk, CT.
- Governmental Accounting Standards Board (GASB), 1995. Concepts Statement No. 2, Service Efforts and Accomplishment Reporting. Governmental Accounting Standards Board, Norwalk, CT.
- Harris, J., 1995. Service efforts and accomplishments standards: Fundamental questions of an emerging concept. *Public Budgeting & Finance* 15 (4), 18–37.
- Johnson, R.A., Wichern, D.W., 1992. *Applied Multivariate Analysis*. Prentice-Hall, Englewood Cliffs, NJ.
- Kline, P., 1994. *An Easy Guide to Factor Analysis*. Routledge, London.
- Lawrence, C.M., Kurtenbach, J.M., 1995. Medicare reimbursement debt financing and measures of service efforts and accomplishments in the healthcare industry. *International Journal of Public Administration* 18 (2&3), 355–381.
- Lev, B., 1974. *Financial Statement Analysis: A New Approach*. Prentice-Hall, Englewood Cliffs, NJ.
- McCue, M.J., Renn, S.C., Pillari, G.D., 1990. Factors affecting credit rating downgrades of hospital revenue bonds. *Inquiry* 27 (3), 242–254.
- Mensah, Y.M., 1996. A call for papers: accounting issues in health care. *Journal of Accounting and Public Policy* 15 (4), 373–377.
- Moody's Investor Services, 1994. *An issuer's guide to the rating process*. Moody's Investor Services, New York.
- Moore, D.S., McCabe, G.P., 1989. *Introduction to the Practice of Statistics*. Freeman, New York.
- Morgan, L.B., Kappel, C.A., 1985. An overview of DRG regulation – the impact of changing reimbursement patterns. *Topics in Health Care Finance* 11 (3), 1–9.
- Nemes, J., 1992. Some bond authorities fight disclosure rules. *Modern Healthcare* 22 (24), 33–34.
- Pallarito, K., 1994. Bond issuers face tougher disclosure rules. *Modern Healthcare* 24 (18), 72–76.
- Pallarito, K., 1993. New financial rules likely to increase burden, costs. *Modern Healthcare* 23 (51), 65–68.
- Prince, T., Ramanan, R., 1994. Bond ratings, debt insurance, and hospital operating performance. *Topics in Health Care Financing* 21 (1), 36–50.
- SAS Institute, 1995. *Logistic Regression Using the SAS System*, Version 6, first ed. SAS Institute, Cary, NC.
- SAS Institute, 1990. *SAS/STAT User's Guide*, Version 6, fourth ed. SAS Institute, Cary, NC.
- Sherman, H.D., 1986. Financial reporting: Interpreting hospital performance with financial statement analysis. *The Accounting Review* 61 (3), 526–550.
- Sloan, F.A., Morrissey, M.A., Valvona, J., 1987. Capital markets and the growth of multihospital systems. In: Scheffler, R.M., Rossiter L.F. (Eds.), *Advances in Health Economics and Health Services*. JAI Press, CT, Greenwich 7(1) 83–109.

- Standard & Poor's (S&P), 1994a. Creditweek: Health-care Reform: 2. Standard & Poor's. McGraw-Hill, New York.
- Standard & Poor's (S&P). 1994b. Industry survey. Standard & Poor's. McGraw-Hill, New York.
- Standard & Poor's, 1944c. Municipal Finance Criteria. Standard & Poor's. McGraw Hill, New York.
- Van Kampen Merritt Investment Advisory Corporation, 1990. The Merritt System. Van Kampen Merritt Investment Advisory Corporation, Oakbrook Terrace, IL.
- Williams, F., 1994. New tonic for hospitals. *Pensions & Investments* 22 (13), 55.
- Zeller, T.L., Stanko, B.B., Cleverley, W.O., 1996. A revised classification pattern of hospital financial ratios. *Journal of Accounting and Public Policy* 15 (2), 161–182.