THE IMPACT OF NONFINANCIAL PERFORMANCE ON THE FINANCIAL PERFORMANCE OF THE UNITED STATES INVESTOR-OWNED MULTIHOSPITAL SYSTEMS

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By

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ABSTRACT

A review of relevant healthcare literature suggests that the financial performance of a hospital may be influenced by nonfinancial data. The focus of this dissertation is the financial performance of more than 1,000 U.S. hospitals members of the for-profit sector known as investor-owned multihospital systems. We examined the impact of eight nonfinancial performance measures representing outputs, efficiency, productivity and quality on their financial performance from 1999 to 2004. Our main objective is to validate the relevance of nonfinancial performance measures in determining hospital profitability which is measured by total margin, net operating margin and cash flow margin. Also, we identified some of the best financial performance models by combining the nonfinancial performance variables under study. Finally, we examined the long term impact of nonfinancial performance measures on financial performance in order to determine whether their long-term impact is greater than their short-term impact.

Simple and multiple regressions results for total margin, net operating margin and cash flow margin support hypotheses that measures representing output, operational efficiency and quality are relevant in determining profitability. Moreover, our findings suggest that nonfinancial measures have a lasting impact on hospital profitability and may play an important role in the evaluation of the achievement of their objectives not only in the short-term but also in the long-term. Output measures, number of patients discharged adjusted by the case-mix-index and patient days adjusted by the case-mix-index, are closely linked to financial performance and contribute to explain profit margins as well as the cash flow of the hospitals under study. One of the main sources of earnings is the number of patients discharged however, in order to be profitable, hospitals need to keep under control their length of stay. Efficiency ratios provide some insight of the costs at which a given hospital provides services. Simple regressions results demonstrate that both, the number of full-time-equivalent employees per occupied bed, and the number of work hours per adjusted patient day may impact negatively hospital profitability. In models where both variables are combined, their tendency is to impact financial performance differently. This suggests that a highly labor intensity may reduce earnings or cash flow while an adequate staffing pattern tend to enhance hospital financial performance. Occupancy rate is positively related to total margin and to net operating margin. Neither productivity measures, the number of case-mix-adjusted discharges per bed in service and the number of case mix adjusted discharges per full-time-equivalent employee, are significant. All results demonstrate that the quality measure, JCAHO, is significant. It is positively related to each dependent variable under study. Our findings suggest that nonfinancial measures have a lasting impact on hospital profitability. However, based on tests results, we can not affirm that the long-term impact of the explanatory variables is greater than the short-term impact.

DEDICATION

To my parents

Aurea Luz and Héctor Enrique

For their love and inspiration.

I am convinced that if they were alive, they would feel very proud of me and very happy with my achievements and my successes.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 Background

The healthcare industry is one of the world's largest and fastest growing industries. This industry is consuming over 10% of Gross Domestic Product (GDP) of most developed nations. In 2003, healthcare costs paid to hospitals, doctors, nursing homes, diagnostic laboratories, pharmacies, medical device manufacturers and other components of the healthcare system, consumed 15.3% of the United States' GDP; the largest of any country in the world. In 1990, the average for the Organization for Economic Cooperation and Development (OECD) countries was 7.3% and the United States consumed 11.9% of the GDP. Ten years later, in 2000, the average for the OECD was 8.1% and the United States consumed 13.1% of the GDP. In 2001, the average for the OECD was 8.4% with the United States, 13.9 %; Switzerland, 10.9 %; and Germany, 10.7 %, being the top three[1]. Most recently, in year 2004, the healthcare industry consumed 16%, approximately one sixth, of United States' GDP. From 1991 to 2004, the national healthcare spending has been increasing at an average rate of 7.1%. Since 2001 to 2004, the spending has been increasing at an average rate of 8.4%.

Besides governmental and not-for-profit agencies, the healthcare system consists of the following four major participants: (1) patients, (2) physicians, hospitals, and

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[1] OECD Health Data 2003

medical service companies, (3) pharmaceuticals, medical supplies, and other healthcare-related products, and (4) third-party payers (Ewing, et al., 2002).

When investors, policymakers, and the public think about industries that promote economic stability and growth, most do not think about hospitals. Hospitals are the largest single component of healthcare expenditures however, in general, the facts remain that hospitals are strong contributors to the US economy (American Hospital Association, 2008) because:

1. Hospitals contribute to the economy viability of local and regional communities by serving as the mainstay of healthcare community networks and stimulating demand for goods and services produced by local businesses that support over \$1.9 trillion of economic activity.
2. Hospitals support one of every nine jobs in the US. They continue to provide job opportunities during recessions and create a steady source of employment even in economic downturns.
3. Hospitals are the second largest employers in the private sector. They offer high pay relative to other service sectors and jobs across a wide spectrum of skill levels.
4. Hospitals support their community in many additional ways. They offer an array of community services (e.g., health screenings, health fairs and fee clinics, patient education and health information center, clinical research and health professional

training programs). They provide charity care and other care for which no payment is received.

5. During 2006 hospitals treated 118 million people in their Emergency Departments, provide care for 600 millions outpatients, performed 27 millions of surgeries and delivered 4 millions of babies.

1.2 Purpose

The focus of this dissertation is the hospital sector of the healthcare industry in the United States, specifically, the investor-owned multihospital systems' sector. The main purpose is to examine the impact of eight nonfinancial performance measures on their financial performance from 1999 to 2004 in order to: (1) validate the relevance of the nonfinancial performance measures in determining hospital profitability, (2) identify which is the best combination of nonfinancial performance measures in order to explain their financial performance, and (3) examine the long term impact of nonfinancial performance measures on financial performance.

1.3 Summary of Results and Research Methods

The time period for the analysis is from 1999 to 2004. The principal data sources for the analysis include: (1) the AHA Annual Survey; (2) Medicare cost reports; (3) Centers for Medicare and Medicaid Services; and (4) JCAHO performance scores.

The explanatory variables (nonfinancial performance) are classified into four categories: (1) quality; (2) output; (3) operational efficiency; and (4) productivity. Quality measure category includes Joint Commission hospital performance scores for the seven areas with stable content and generally consistent scoring procedures for the period. Output measures include: (1) case-mix-adjusted discharges (CMAD); and (2) case-mix-adjusted patient days (CMAPD). Operational efficiency measures include: (1) full-time-equivalent employees per number of occupied bed (FTE/BED); (2) work hours per adjusted patient day (WH/APD); and (3) percentage of occupancy (OCCP). Productivity measures include: (1) case-mix-adjusted discharges per bed in service (CMAD/BED); and (2) case-mix-adjusted discharges per full-time-equivalent employee (CMAD/FTE). Financial performance is measured by the following ratios: total margin, net operating margin and cash flow margin.

Our analytical databases consist of data of hospitals of different types. Tests results to measure the effect of hospital type on total margin, net operating margin and cash flow margin, suggest that the type of hospital could make a difference in the average profitability.

Descriptive statistics for each dependent and explanatory variable were calculated to know their characteristics.

In order to compare and select the models that best fit to the data, we are using the following selection criteria: (1) the R-squared; (2) the adjusted R-squared; (3) the Mallows Cp statistic and, (4) the Akaike's information criteria.

We examined the relevance of nonfinancial measures representing output, operational efficiency, productivity and quality in determining hospital financial performance which is measured by total margin, net operating margin and cash flow margin. The main statistical technique used to test the hypotheses is the ordinary least squares regression (OLS). All OLS regressions to examine impact of nonfinancial measures on the financial performance of the hospitals are performed for the current year, the short-term (one year after) and the long-term (three years later). One common problem of panel data is the statistical dependence among multiple observations from the same individual (e.g., hospital). Repeated observations on the same individual are likely to be positively correlated. In order to correct for dependence, we are using the robust standard errors' method. Robust standard errors are standard error estimates that correct for dependence among repeated observations. This method is also known as Huber-White standard errors (Allison, 2009; Greene, 2008).

Appendix C shows the summary of the results of all simple regressions for the short-term and for the long-term. Based on these results, almost all explanatory variables are significant. There are few exceptions such as the productivity variable, case-mix-adjusted discharges per full-time-equivalent employee, which is not significant. Two operational efficiency variables, full-time-equivalent employee per occupied bed and the occupancy rate, are not significantly related to the cash flow margin. Also, the operational efficiency measure, work hours per adjusted patient day is not significantly related to the long-term net operating margin. Finally, the productivity measure, case-mix-adjusted discharges per bed, is not significantly related to the long-term net operating margin.

Both output measures, the number of patients discharged adjusted by the case-mix-index and the number of patient days adjusted by the case-mix-index, are closely linked to hospital financial performance. Based on the results, both measures contribute to explain profit margins as well as the cash flow. Moreover, they have a lasting impact on total margin, net operating margin and cash flow margin. These findings suggest that, both nonfinancial measures may play an important role in the evaluation of the achievement of the organizational objectives not only in the short-term but also in the long-term. Also, our results suggest that one of the main sources of earnings or profitability is the number of patients discharged. However, in order to be profitable, hospitals needs to keep under control the length of stay of these patients.

Efficiency ratios provide some insight of the costs at which a given hospital provides services. Our simple regressions results have demonstrated that both, the number of full-time-equivalent employees per occupied beds and, the number of work hours per adjusted patient day impact negatively the financial performance of the hospitals. Both measures are negatively correlated with the earnings and with the cash flow of the hospitals. In models where both variables are combined, their tendency is to impact financial performance differently. Multiple regression results demonstrate that the number of full-time-equivalent employees per occupied bed is positively related to hospital financial performance, while the number of work hours per adjusted patient day is negatively related. This opposite relationship suggests that a highly labor intensity may reduce earnings or cash flow while an adequate staffing pattern tend to enhance a hospital financial performance. A third measure of operational efficiency used in this study is the occupancy rate. Based on the results, the occupancy rate is significant. Also, it is positively correlated with total margin and, with net operating margin.

Productivity measures, number of case-mix-adjusted discharges per bed in service and number of case mix adjusted discharges per full-time-equivalent employee are not significant. Therefore, these measures are not relevant in determining total margin, net operating margin or cash flow margin in hospitals members of the United States investor-owned multihospital systems' sector.

This study attempts to present evidence in favor of the relevance of quality measures to determine hospital profitability. Based on simple and multiple regressions results, JCAHO is significant. It is positively related to each profitability measure under study. Also, it is positively correlated with each financial performance measure under study.

In general, simple and multiple regressions results for total margin, net operating margin and cash flow margin support hypotheses that measures representing output, operational efficiency and quality are relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems' sector.

The final part of this dissertation attempted to provide some evidence of the magnitude of the impact of nonfinancial performance measures on long-term financial performance. We hypothesized that long term impact is greater than short-term impact Results of the multiple regressions analysis for total margin, net operating margin and cash flow margin suggest that nonfinancial variables may explain variations in hospitals financial performance not only one year after but also, three years later. Although our findings suggest that nonfinancial measures have a lasting impact on hospital profitability, neither Z-tests for differences between the regression coefficients are significant ($p > .05$). Therefore, based on these results, we could not affirm that the long-term impact of the explanatory variables is greater than the short-term impact.

1.4 Present Contribution

This study contributes with empirical evidence that confirm the impact of nonfinancial measures on financial performance of hospitals members of the U.S. investor-owned multihospital systems' sector. Results validated the links between nonfinancial performance measures and hospital's financial performance.

This study presents evidence in favor of the relevance of quality measures to determine hospitals' financial performance.

Results suggest that nonfinancial variables have a lasting impact on hospitals' financial performance and may explain variations in the long-term.

1.5 Organization of the Rest of the Dissertation

The second chapter summarized the literature reviewed in relation to nonfinancial measures: (1) reasons for their use, (2) how they are used, (3) advantages and disadvantages, (4) the importance of the selection of adequate measures, (5) their role in strategic performance measurement systems (SPMS), and (6) their use in the healthcare industry.

Chapter three provides some insight about the nonfinancial performance measures pertinent to this study.

Chapter four covers the theoretical framework for the development of the hypothesis and the design of the research.

Chapter five presents the empirical results of the statistical analysis performed and a discussion of the findings including the following: (1) summary of the descriptive statistics of the most relevant accounts of the statement of revenues and expenses for the hospitals under study, (2) descriptive statistics for each variable under study, (3) the repeated measures ANOVA performed to measure the effect of the year and the type of hospital on the financial performance, (4) the regression models, and (5) the comparison between the long-term and the short-term impact of nonfinancial performance measures on hospitals' financial performance.

Finally, chapter six discusses our findings and their implications. Also, discusses the limitations with the databases and suggests some areas for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In 1991 Eccles proclaimed a revolution when he states that: "*Within the next five years, every company will have to redesign how it measures its business performance"* (p. 131). At the heart of this revolution lies a radical decision to shift from treating financial figures as a foundation for performance measurement to treating them among a broader set of measures.

Performance measurement systems play a key role in the development of the company strategy and in the evaluation of the achievement of the organizational objectives. Traditionally, accounting data have been played a major role in measuring an organization's success. However, the use of financial data may have limitations as a measure of company performance. The accounting-based financial measurement systems are no longer adequate to measure the performance of a company (Eccles, 1991; Eccles and Pybum, 1992; Fisher, 1992; Kaplan and Norton, 1992, 2001a; Brancato, 1995; Ittner and Larker 1998a, 1998b, 2003; Stivers et al., 1998; Knowledge@Wharton, 2000; Watkins, 2000, 2003; Larrán-Jorge and García-Meca, 2004; Chow and VanDerStede, 2006; Jusoh et al., 2006; Pangarkar and Kirkwood, 2006; Kocakülâh and Austill, 2007 and Ferreira, 2008). Therefore, many companies have adopted new approaches that combine financial and nonfinancial measures to assess their performance.

This literature review covers the following aspects in relation to nonfinancial measures: (1) reasons for their use, (2) how they are used, (3) advantages and disadvantages, (4) the importance of the selection of adequate measures, (5) their role in strategic performance measurement systems (SPMS), and (6) their use in the healthcare industry.

2.2 Reasons for the Use of Nonfinancial Performance Measures

Fisher (1992) compares the conventional reports about the financial performance of a business with the scoreboard at a baseball game because a scoreboard tells a player whether he is winning or losing the game, but it tells him little about what he is doing right or wrong in terms of the fundamentals of baseball. The role of accounting reports has generally been limited to providing periodic historical statements of financial performance, with little expectation that they can provide insights into the factors that cause that performance. As competition in the industry has intensified managers have looked for new sources of information about the key factors that contribute to success and how they are measured. The rise of operational (nonfinancial) performance measures represents an attempt to reassert the primacy of operations over financial measures. By using nonfinancial measures, managers attempt to track progress on the actionable steps that lead to a company's success in the market.

Case studies by Fisher (1992) and Brancato (1995) have identified three principal reasons why firms are adopting nonfinancial measures. First, companies perceived limitations in traditional accounting-based measures. For example, relative to key nonfinancial measures, traditional financial indicators only reflect historical performance, are highly aggregated, and may lead to short-term bias. By incorporating nonfinancial indicators into their measurement systems, firms are seeking to create a wider set of measures that capture not only firm value, but also the factors leading to the creation of value in the business. Second, the substantial changes in the nature and intensity of competition forced firms to determine and measure the nonfinancial "value drivers" leading to success in the new competitive environment. Finally, other firms have adopted nonfinancial measures as an outgrowth of improvement initiatives that required new performance indicators.

The performance measurement revolution begins several years ago. Senior executives in a broad range of industries have been rethinking how to measure the performance of their business and have recognized that new strategies and competitive realities demand new measurement systems. Eccles (1992) alleges that dissatisfaction with the use of financial measures to evaluate business performance is not new. What is new is the intensity and nature of the criticism directed at traditional accounting systems. Academics and practitioners have demonstrated that accrual-based performance measures are obsolete and more often harmful. These do not take into account the diversity in products, markets, and businesses. This system fails to support the investments in new technologies and markets that are essential for successful performance in global markets.

Another criticism is the pernicious effects of short-term thinking on the competitiveness of U.S. companies. Under this system, managers focus on reported quarterly earning reinforcing the investment community's short-term perspective and expectations. Also, they have a strong incentive to manipulate the figures they report. For this reason, many managers, analysts, and financial economists are focusing on cash flow in the belief that it reflects a company's economic condition more accurately than its reported earnings do. Finally, income-based financial figures are better at measuring the consequences of yesterday's decisions than they are at indicating tomorrow's performance. This general discontent with the traditional accounting system led to the development of new performance measurement systems with special emphasis in process improvements. Examples of this new vision are the growth of the quality movement during the 1980s, the customer's satisfaction and retention movement during the 1990s and, the development of the competitive benchmarking and its transforming effects on managerial mind-sets and perspectives. For Eccles: "*Quality measures represent the most positive step taken to date in broadening the basis of business performance measurement*" (p.133).

The Ernst & Young's 1991 International Quality Study which includes 584 businesses in Canada, Germany, Japan and the United States in four industries (automobile, banking, computer and healthcare), indicates that customer satisfaction measures become increasingly important for strategic planning. Nonfinancial measures such as reductions in customer complaints and process variability played a greater role in assessing process improvements.

Using customer and business-unit data, Ittner and Larker (1998b) find modest support for claims that the customer satisfaction measures are leading indicators of customer purchase behavior (retention, revenue, and revenue growth), growth in the number of customers, and accounting performance (business-unit revenues, profit margins, and return on sales). They find evidence that firm-level customer satisfaction can be economically relevant to the stock market but are not completely reflected in contemporaneous accounting book values. They also find that the public release of this measure is statistically associated with excess stock market returns over a ten-day announcement period, providing some evidence that the disclosure of customer satisfaction measures provides information to the stock market on expected future cash flows.

It is recognized that a big part of a company's true value depends upon intangible factors such as organizational knowledge, customer satisfaction, product innovation and employee morale, rather than on physical assets like machinery or real estate (Knowledge@Wharton, 1999). The Wharton Research Program on Value Creation in Organizations has been conducting a series of studies on the key drivers of value creation jointly with Ernst & Young's Center for Business Innovation and Ittner and Larcker, co-directors of the Wharton program. The first of this series of studies asked corporate executives about key drivers of future economic value in their industries. Despite the importance of financial performance, executives ranked four other areas as being more important for future value generation: (1) employee satisfaction, (2) supplier performance, (3) product innovation and, (4) customer satisfaction.

The primary reason for the use of nonfinancial performance measures is that some of them are leading indicators of financial performance (Kaplan and Norton, 2001a).

Many firms are trying to overcome perceived limitations in traditional accounting-based performance measures by using nonfinancial measures for decision-making and performance evaluation, such as the balanced scorecard. In addition to the financial perspective, the balanced scorecard focuses on nonfinancial measures such as customers, internal business processes, and learning and growth (Kaplan and Norton 1992, 1996).

The perceived inadequacies in traditional performance systems have lead many organizations to place greater emphasis not only in nonfinancial measures, but also on the need to improve the existing financial measures to overcome some of their limitations.

2.3 How Nonfinancial Performance Measures are Used

Stivers et al. (1998) provide a comprehensive picture of the process of nonfinancial measurement by a survey to top executives in Fortune 500 firms in the U.S. and Post 300 firms in Canada. Their study examines: (1) the degree to which these executives identify particular nonfinancial performance factors as important, (2) whether firms are measuring important nonfinancial factors and, (3) whether or not companies actually are using nonfinancial performance factors information in their planning processes. Their results show that U.S. and Canadian firms have similar challenges and highlight three red flags. First, measures of innovation and employee involvement (i.e., human and intellectual capital) were not perceived to be as important as customer service and market standing. Second, although top executives believe that certain nonfinancial factors are highly important, a large number of firms are not capturing data on these measures. Third, a large number of companies are collecting data that are not being used by managers in the planning process.

Ittner and Larker (2003) allege that although an increasing number of companies have been using nonfinancial performance measurements in areas such as customer loyalty and employee satisfaction, few have realized the potential benefits of these relatively new measurement systems. This is because these companies fail to correctly identify, analyze and act on the right measurements. They identify four common mistakes companies make when trying to measure nonfinancial performance based on survey responses from 297 executives of over sixty service and manufacturing companies. First, companies do not link measures to strategy. Fewer than 30% of the companies surveyed have developed causal models. Second, companies do not validate the links. Even those companies that create causal models rarely go on to prove that actual improvements in nonfinancial performance measures affect future financial results. Of the companies surveyed, only 21% did so. Third, companies do not set the right performance targets. Outstanding nonfinancial performance is not always beneficial. Indeed, it often produces diminishing or even negative economic returns. Most companies have no idea when they have achieved too much of a good thing. Finally, companies do not measure correctly. Even companies that build a valid causal model and track the right elements can fall down when determining how to measure them. At least 70% of companies employ metrics that lack statistical validity and reliability. Another problem mentioned is that many companies do not attempt to measure hard to measure qualitative areas of performance. This may save them from relying on misleading results, but also prevents them from developing a comprehensive picture of performance.

Chow and Van Der Stede (2006) examine the extent to which manufacturing managers of 128 firms combine financial, quantitative nonfinancial and, subjective (e.g. loyalty toward a firm, employee spirit/morale, etc.) performance measures. Both, the relative use of measure types and the specific measures within each type vary with the companies' manufacturing strategies. Therefore, the three types of measures play different roles in supporting a firm's operations. Firms that place relatively greater emphasis on quality in manufacturing used more nonfinancial measures (especially ones relating to internal operations and employees) and subjective measures. One interesting finding is that nonfinancial measures are not substitutes for financial measures, as these firms also used more of the latter.

2.4 Advantages and Disadvantages of Nonfinancial Performance Measures

The firm needed to focus and align every area of the business with the strategy, including executive teams, business units, personnel, information systems, and finances. Financial measurement tools existed to document a financial plan, but they seemed to lack framework for describing strategy (Kocakülâh and Austill, 2007). Nonfinancial measures are gaining prominence within the business environment over financial measures because these measures provide a direct correlation to strategic objectives

(Pangarkar and Kirkwood, 2006). When dealing with organizational strategy, a long-term approach is required. Many nonfinancial factors have demonstrated that they contribute to and have a lasting impact on a company's market value. Since these nonfinancial measures are more forward-looking and are linked to operational activities, they help to focus a manager's efforts and better evaluate employee performance. The value of nonfinancial performance measures for decision making and control purposes lies, to a significant degree, in the ability of such measures to serve as leading indicators of future financial performance (Dikolli and Sedatole, 2007).

Fisher (1992) identifies some strengths and weaknesses of the nonfinancial measures at several high technology manufacturing plants. First, let us examine the strengths. Nonfinancial measures are more directly traceable to strategies of the firm therefore, management feel that progress on these measures directly affect the success of firm strategy. Another perceived benefit is that these measures are actionable. This means that an operational problem can be detected more quickly by using nonfinancial measures, so remedial steps could quickly be taken to solve it. In addition to these, most firms argue that a nonfinancial measure could be calculated and return to interested parties could be passed on faster than a financial measure.

Ittner and Larker summarize the advantages and disadvantages of nonfinancial performance measures and offer their suggestions for implementation (Knowledge@Wharton, 2000). According to them, nonfinancial measures offer four clear advantages over measurement systems based on financial data. First, nonfinancial performance measures are linked to long-term organizational strategies and, financial evaluation systems generally focus on annual or short-term performance. Nonfinancial measures deal with progress relative to customer requirements or competitors and other nonfinancial objectives that may be important in achieving profitability such as competitive strength and longer-term strategic goals. Second, critics of traditional measures argue that drivers of success in many industries are intangible assets such as intellectual capital and customer loyalty and, nonfinancial data can provide indirect, quantitative indicators of a firm's intangible assets. One study that examined the ability of nonfinancial indicators of intangible assets to explain differences in the United States companies' stock market values find that measures related to innovation, quality, brand value, management capability, and employee relations explained a significant proportion of a company's value, even allowing for accounting assets and liabilities. In the past decade, an increasing numbers of companies have been measuring customer loyalty, employee satisfaction, and other performance areas considered leading indicators. These companies are convinced that these performance areas have an effect on their profitability (Ittner and Larcker, 2003). Third, nonfinancial measures can be better indicators of future financial performance. One of the most important limitations of accounting measures is that they are the result of management action and organizational performance. They tell managers the consequences of decisions that already have been made but do little to predict future performance. Even when the ultimate goal is to maximize financial performance, current financial measures may not capture long-term benefits from decisions made now such as investments in research and development or customer satisfaction programs. Research and development expenditures and marketing costs must be charged for in the period they are incurred (to reduce profits) but, successful research may improve future profits. Similarly, investments in customer satisfaction can improve subsequent economic performance by increasing revenues and loyalty of existing customers, attracting new customers and reducing transaction costs. These authors suggest that nonfinancial data can provide the missing link between these beneficial activities and financial results by providing forward-looking information on accounting or stock performance. Finally, the choice of measures should be based on providing information about managerial actions and the level of "noise"[2] in the measures. Managers must be aware of how much success is due to their actions or they will not have the signals they need to maximize their effect on performance. Many nonfinancial measures are less susceptible to external noise than accounting measures. Therefore, their use may improve managers' performance by providing a more precise evaluation of their actions.

Paul Sharman (1992), a well-known conference speaker on strategic cost management and activity-based costing, state that: "*Cost and financial performance is the consequence of the decisions made by managers*" (p. 18). Consistent with this point, Epstein et al. (2000), affirm that nonfinancial measures are designed to capture the operating effects of managerial decisions that will, eventually, influence financial results. Nonfinancial measures such as the levels of quality, customer satisfaction or employee retention have a role in business success or profitability. The objective for managing an

[2] The term noise refers to changes in the performance measure that are beyond the control of the manager or organization, ranging from changes in the economy to luck (good or bad).

enterprise should not be to increase these levels; it should be to manage all the identifiable drivers of profitability with regard to their effects on revenues and costs, so as to maximize the value of the firm to its stakeholders.

Ittner and Larker's paper (1998b) is one of the first to empirically examine the relation between customer satisfaction measures and economic variables like customer retention, future sales and stock price. They find what they call "modest support" for claims that customer satisfaction measures are leading indicators of customer purchase behavior (retention, revenue, and revenue growth), growth in the number of customers, and accounting performance (business-unit revenues, profit margins, and return on sales). They also find some evidence that firm-level customer satisfaction measures can be economically relevant to the stock market.

Unfortunately, nonfinancial performance measures are not free of limitations or as Fisher (1992) states: "*…the nonfinancial system was not problem-free*" (p.37). He finds that the tie between improvements in the nonfinancial measures and profits was unclear. Managers were not sure that their efforts were being rewarded with improvements in the bottom line. Although the performance measurement literature claims that predictive ability is one of the primary benefits of nonfinancial measures, studies indicate that firms experience considerable difficulty linking these measures to future accounting or stock price performance. One survey of vice presidents of quality for major United States firms conducted by Ittner and Larcker (1998a) identify similar problems relating quality and customer satisfaction measures to accounting and stock returns. Seventy five percent of the senior quality executives felt pressure to demonstrate the financial consequences of their quality initiatives, but fewer than 55% could directly relate their quality measures to operational, productivity, or revenue improvements, only 29% to accounting returns, and just 12% to stock returns. Similarly, only 28% could link customer satisfaction measures to accounting returns and 27% to stock returns. As a result, 52% of the executives considered it difficult to identify the quality improvement opportunities offering the highest economic returns, and none of them felt that this was an easy task.

There are some common limitations or disadvantages of nonfinancial measures identified by researchers such as Brancato (1995), Stivers, et al. (1998), Epstein, et al. (2000), Ittner and Larcker (2000, 2003), Chow and Van Der Stede (2006), and Dikolli and Sedatole (2007). First, the time consumed in development, collection, evaluation, reporting preparation, presentation and discussion of outcomes. Also, a greater number of diverse performance measures frequently require significant investment in information systems to track or draw information from multiple (and often incompatible) databases. Second, unlike accounting measures, nonfinancial data are measured in many ways, there is no common denominator. Some are denominated in time, some in quantities or percentages and some in arbitrary ways. Third, the lack of causal links between financial performance and nonfinancial measures. If companies adopt nonfinancial measures without articulating the relations among them or verifying causal links two problems will emerge when evaluating performance: (1) incorrect measures focus attention on the wrong objectives, and (2) improvements cannot be linked to later outcomes. This lack of causal links also contributes to difficulties in evaluating their relative importance. Without knowing the size and timing of associations among measures, companies found it difficult to make decisions or measure success based on them. Fourth, the lack of statistical reliability from nonfinancial data. Many nonfinancial data such as satisfaction measures are based on surveys with few respondents and few questions. These measures generally exhibit poor statistical reliability, reducing their ability to discriminate superior performance or predict future financial results. Finally, implementing an evaluation system with too many measures can lead to "measurement disintegration" [3] achieving little gain in the main drivers of success.

From the accounting procedures perspective, it may be difficult for accountants to understand how nonfinancial performance measurements integrate with financial information. Some call for accountants to make an organization's intangible assets more visible to managers and investors by placing them on a company's balance sheet. But several factors prevent valid valuation of intangible assets on balance sheets (Kaplan and Norton, 2001a). First, the value from intangible assets is indirect because it affects financial outcomes through chains of cause-and-effect relationships. For example, investments in employee training lead to improvements in service quality; better service quality leads to higher customer satisfaction; higher customer satisfaction leads to increased customer loyalty; and, increased customer loyalty generates increased revenues and margins. Second, the value from intangible assets depends on organizational context and strategy. This value cannot be separated from the organizational processes that transform intangibles into customer and financial outcomes. The balance sheet records each class of asset separately and calculates the total by adding up each asset's recorded

[3] Means that overabundance of measures dilutes the effect of the measurement process.

value. The value created from investing in individual intangible assets, however, is neither linear nor additive. The value does not reside in any individual intangible asset. It arises from creating the entire set of assets along with a strategy that links them together. As they state: "*The value-creation process is multiplicative, not additive*" (p. 89).

2.5 Importance of the Selection of Adequate Nonfinancial Performance Measures

Though, for many companies, the benefits derived from the use of nonfinancial performance measures can outweigh their costs it may be a challenge to select from all of the nonfinancial performance measures available, those which are leading indicators of the financial performance. The choice of nonfinancial performance measures, their optimal combination with financial measures to obtain the optimal mix of measures, as well as the task to measure their role in value creation seems to be the great challenge.

Managers need a more systematic understanding of the advantages/benefits and the disadvantages/costs of the new approaches to performance measurement systems compared to traditional accounting-based systems (Chow and Van Der Stede, 2006). These authors conclude that nonfinancial measures are not superior to financial measures. Using survey data from managers of 128 manufacturing firms, they examined empirically the relative and the specific use of three types of measures: (1) financial, (2) quantitative nonfinancial, and (3) "subjective"[4]. Both, the relative use of measure types and the

[4] Refer to nonfinancial measures such as employee morale or loyalty toward a firm which are derived from subjective judgment.

specific measures within each type vary with the companies' manufacturing strategies. Different measure types are seen as having different strengths and weaknesses. Based on this finding the authors infer the following:

> *"Taken as a whole, a rather clear implication of the findings is the need to be cautious about popular claims that nonfinancial measures are "superior" to traditional financial measures across the board. Rather than being an either/or choice, the challenge is to select the optimal combination of measures across the different types"* (p. 7).

Ittner and Larker (2000) described the process to select and implement appropriate measures as a dynamic process that must be linked to factors such as corporate strategy, value drivers, organizational objectives and competitive environment. This process can be summarized in three steps: (1) understand companies value drivers and then translate corporate objectives into measures that guide managers' actions; (2) assessing the extent to which current measures are aligned with the company's strategies and value drivers (i.e. review consistencies); and (3) integrate measures to become an integral part of reporting and performance evaluation.

Eccless and Pybum (1992) recognize the limitations of most systems that emphasize financial measures and proposed the creation of a comprehensive system to measure performance based on a five step process. The first step requires selecting the nonfinancial measures that will be used to supplement the financial ones and deciding on the relationships that exist among them. Once this is done, methodologies have to be developed for taking the new measures. The next step is deciding on format and frequency of performance measurements reports, including who receives which measures. The fourth step is to make changes in personnel evaluation and compensation process to reinforce behaviors that improve performance on relevant activities. Finally, recognize that a performance measurement system evolve over time as conditions change and as managers develop a better understanding of how various measures are related to each other.

Frigo (2002) discusses some findings of the survey of the Institute of Management Accountants (IMA) and one study of the American Institute of Certified Public Accountants (AICPA) which examine the role of nonfinancial measures. The IMA survey provides some insight about the importance and limitations of nonfinancial performance measures. According to Frigo, one of the most relevant findings is that the vast majority of financial professionals surveyed said that nonfinancial performance measures should be used more extensively within their company because these are more closely aligned to strategic initiatives and have more calls to action. According to the results of the AICPA study, customer service/satisfaction and quality and process-related measures are used most frequently, while time/agility, innovation, demographics, and supplier measures are the least used nonfinancial measures.

The traditional performance measurement tools designed for the industrial-age economy, which emphasize financial measures and tangible assets, are no longer able to capture the changing nature of today's business environment (Jusoh et al., 2006). As companies around the world transform themselves for competition that is based on information, their ability to exploit intangible assets has become far more decisive than their ability to invest in and manage physical assets (Kaplan and Norton, 1996). The new scenario requires a good performance measurement system. However, it is a challenge for organizations to deemphasize the use of simple, aggregate, short-term financial measures and to develop indicators that are more consistent with long-term competitiveness and profitability (Kaplan, 1983).

When Kaplan and Norton introduced their balanced scorecard framework in 1992, they began with the premise that an exclusive reliance on financial measures in a management system is not sufficient. The balanced scorecard approach retains measures of financial performance but supplements these with measures on the drivers, the leading indicators, of future performance (Kaplan and Norton, 2001a). As they explain, they introduced the balanced scorecard to provide a new framework for describing value-creating strategies that link intangible and tangible assets. The balanced scorecard does not attempt to value an organization's intangible assets, but it does measure these assets in units other than currency. This approach describes how intangible assets get mobilized and combined with intangible and tangible assets to create differentiating customer-value propositions and superior financial outcomes.

The balanced scorecard is a performance measurement tool that integrates both financial and nonfinancial measures by translating an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for a strategic measurement and management system (Kaplan and Norton, 1996). Measures are categorized into four perspectives: (1) financial, (2) customer, (3) internal business process, and (4) learning and growth, which are linked together by the cause-and-effect relationship. To reinforce the idea of balance, the authors also promoted the use of lagging and leading indicators, and performance measures that were external as well as internal. Let's share with the reader an example used by Jusoh, et al. (2006), in which they illustrate this relationship:

> "*For example*, by *training and improving the skills of operating employees (learning and growth perspective), it will lead to shorter cycle times in operating process (internal business processes perspective), and these will in turn lead to improved on-time delivery and higher customer loyalty (customers perspective), thus finally lead to improved return-on-investment (financial perspective)*" (p.52).

While the technique described in professional literature accumulates the wisdom and experience of many people and represents a form of best practice, it should not be copied blindly under the assumption that one size fits all. The balanced scorecard requires substantial time, energy and talent up front to make it work well. In practice, it is a serious challenge to implement correctly (Zimmerman, 2008).

The main challenge of the balanced scorecard is that different business strategies require different configurations of organizational practices to achieve optimal performance. Any application of the balanced scorecard should be tied to the company's strategy. Each area should be tailored to fit the organization because each organization may be substantially different in their mission and vision (Kocakülâh and Austill, 2007).

2.6 Role of Nonfinancial Performance Measures in the Strategic Performance Measurement System

The strategic performance measurement system (SPMS) combines the use of financial and nonfinancial measures to promote the achievement of strategic objectives of the organization. A study conducted by Ittner and Larcker (1997) finds strong evidence suggesting that the choice of performance measures is a function of the firm's competitive strategy. Their findings confirm the alignment between the organizational strategy and the performance measures and indicate that nonfinancial measures have a positive relationship with innovation-oriented strategy, quality oriented strategy, regulatory requirement and competitive pressures.

Recently, Ferreira (2008) studies the use of financial and nonfinancial performance measures to examine their relationship with the outcomes of the SPMS in particular, information quality and effectiveness. Her paper contributes to the literature on the SPMS by lending additional empirical evidence about the positive outcomes from the adoption of both financial and nonfinancial performance measures in the SPMS design. The results suggest that practitioners need to focus attention on a variety of financial and nonfinancial performance measures in order to increase SPMS effectiveness. According to Ferreira:

> "*These findings imply that proper selection of performance measures (especially nonfinancial) and efforts to ensure that the information reported by the SPMS is of high quality are, indeed, important for the organization reap real benefits from SPMS; as such, they should not simply delegated to finance or accounting professionals, but require full participation by the whole management team*" (p.137).

Kaplan and Norton (2001b) show how organizations use their scorecards to align key management processes and systems to the strategy. Although each organization achieved strategic alignment and focus in different ways, at different paces and in different sequences, each eventually used a common set of five principles, which they refer to as the "Principles of a Strategy-Focused Organization". The first principle is to translate the strategy to operational terms to detail the critical elements for their growth strategies in order to create a common and understandable point of reference for all organizational units and employees. The second principle is the aligning of the organization to the strategy. Individual strategies must be linked and integrated. The corporate role defines the linkages expected to create synergy and ensures that the linkages actually occur. The third principle is to make of the strategy the everyday job to everyone. This requires that all employees understand the strategy and conduct their day-to-day business in ways that contribute to the success of that strategy. The fourth principle is to make the strategy a continual process. Finally, the fifth principle is to mobilize leadership for change. Strategy requires teamwork to coordinate these changes. Strategy implementation also requires continual focus on the change initiatives and on the performance against targeted outcomes.

Inamdor and Kaplan (2002) evaluate the potential value of the balanced scorecard as a strategic management tool in healthcare organizations. They surveyed executives in nine healthcare provider organizations that were early adopters of the balanced scorecard about the issues relating to its implementation and effect: (1) the role of it in relation to a well defined vision, mission, and strategy; (2) the motivation for adopting it; (3) the difference between it and other measurement systems; (4) the process to develop and implement it; (5) the challenges and barriers during the development and implementation process; and (6) the benefits gained by the organization from its adoption and use. The executives reported that the balanced scorecard strategy implementation and performance management tool could be successfully applied in the healthcare sector, enabling organizations to improve their competitive market positioning, financial results, and customer satisfaction. The balanced scorecard provides the following potential benefits to healthcare organizations: (1) it aligns the organization around a more market-oriented, customer-focused strategy; (2) it facilitates, monitors, and assesses the implementation of the strategy; (3) it provides a communication and collaboration mechanism; (4) it assigns accountability for performance at all levels of the organization; and (5) it provides continual feedback on the strategy and promotes adjustments to marketplace and regulatory changes.

Zelman et al. (2003) review a stream of articles about the use of the balanced scorecard in healthcare organizations and draw some conclusions about its use. They conclude that: (1) it is relevant, but some modifications to reflect industry and organizational realities are necessary; (2) it is used by a wide range of healthcare organizations; (3) it has been extended to applications beyond that of strategic management; (4) it has been modified to include perspectives, such as quality of care, outcomes, and access; (5) it increases the need for valid, comprehensive, and timely information; and (6) there are key differences between application of the balanced scorecard for a healthcare organization and for a healthcare sector, namely in the units of analysis, purposes, audiences, methods, data, and results.

There are differences between the objective of the management group in a commercial enterprise and the objective of the management group in a hospital (Berman, et al., 1994). In the case of the commercial enterprise, the usefulness of financial management becomes clear because the objective is basically that of maximizing owner's wealth. However, in the case of a hospital, where the guidelines of return on investment and simple "bottom line" profitability are not easily determined and may not be entirely meaningful, the objective of management is somewhat more difficult to define. According to them hospitals are vital community resources and must be managed for the benefit of the community, thus:

> "*The objective of hospital management must be to provide the community with the services it needs, at a clinically acceptable level of quality, a publicly responsive level of amenity, an the least possible cost*" (p.5).

This objective has several implications. First, the long-term objective of hospital management is to perpetuate continued hospital operations by ensuring that the total revenues at least equal total economic operation costs. Second, it recognizes that the hospital is not just in the health or medical services business but rather in the human services business. Third, it applies equally well to not-for-profit and for-profit hospitals. Finally, it both establishes management's responsibility to the community and provides a general set of operating criteria.

2.7 Nonfinancial Performance Measures and the Healthcare Industry

As in many other industries or organizations, the assessment of hospital financial performance has traditionally been based exclusively on the analysis of a concise set of key financial ratios. However, a hospital's financial performance may be influenced by factors which are external to the hospital or otherwise beyond its ability to change in the short run (Watkins, 2000). Factors such as the number of admissions, the number of full-time-equivalent (FTE) employees, and the number of beds in service, which are also referred to as operational information; socioeconomic characteristics of the market area such as average age or income of the community serviced; and, medical staff characteristics like the concentration of patient admissions within a single physician may influence the financial performance of a hospital. Therefore, some users of hospital financial statement might benefit if additional nonfinancial information is disclosed by hospitals.

In the healthcare industry, it is common to see the application of nonfinancial performance measures to improve the quality of patient services or clinical outcomes, attract healthcare professionals, or qualify for accreditation or any other requirement to be a certified healthcare provider. However, there is evidence that suggests the use of nonfinancial performance measures by hospitals can improve their financial performance as well.

Watkins (2000, 2003) presents the results of a five year study of performance data from more than 2,000 hospitals in the United States. Her study suggests that because nonfinancial performance measures provide information that financial ratios do not, they can substantially enhance the quality a of hospital's financial decision-making. Results suggest that nonfinancial information represents characteristics of hospitals performance not depicted by traditional financial ratios and that several nonfinancial variables are significant in explaining bond ratings.

Prince (1998) describes some nonfinancial measures that lenders can use to predict net income and viability of hospitals and health systems. Nonfinancial variables such as the community's perception of medical capabilities in a hospital may have more influence on the short-term financial status of the facility than the actual level of investment in medical technology. Average age of plant and equipment is a statistically significant factor in projecting the return on total patient revenue and the facility's bond rating. Other three components of medical technology: (1) medical school affiliation, (2) membership in the Council of Teaching Hospital, and (3) the case-mix index for Medicare inpatients are often cited in the professional literature. The specific facility and medical services reported for each participating hospital in the AHA annual survey are two additional components. Prince combines these components into a single medical technology index and applies it to a sample of 501 hospitals for which certified financial statements were available for four consecutive years. He finds that the nonfinancial components in the medical technology index explain more than 30% of the variation in hospital bond ratings.

There are other quantitative nonfinancial variables and other nonfinancial variables which describes characteristics, common operations and strategies of hospitals that could be associated with profitability. Some of these variables are: proportion of Medicare and other payer patients, case-mix-index, discharges, length of stay, patient days, daily census, labor intensity, ownership status, mergers, acquisition and, diversification of services.

Using survey data obtained from 49 hospitals in South Carolina in 1997, Kim et al. (2002) study the relationship between bed size and hospital profitability (measured by patient profit proportion and total profit proportion) to find the optimal hospital bed size that assures maximum profit. The study was conducted in two stages; the first stage identifies the factors influencing hospital profitability and estimates the magnitude of the factors' influence on hospital profitability using multiple regression analysis. The second stage addresses the relationship between hospital bed size and profitability using the results of the multiple regression analysis. They identify the line shape of the relationship between hospital bed size and profitability and find bed size at both the maximum and minimum profitability. Both, the regression model of patient profit proportion and total profit proportion are significant and both, the patient profit proportion and the total profit proportion are positively related to hospital bed size. Each regression equation was used to estimate the exact relationship between bed size and hospital profitability. These equations were differentiated for bed size to determine the maximum profit proportion and minimum profit proportion in both patient and total profit proportion. The results show bed size as a turning point, in that, both patient and total profit proportion increased when hospital beds increased. When bed size passed a certain threshold, profit proportion decreased. Profit proportion increased again when bed size passed a certain larger size. For patient profit proportion, the turning points in bed size are 238.22 and 560.08. Therefore, until bed size reaches about 238, patient profit proportion increased. When bed size passed 238, however, patient profit proportion decreased, and when bed size passed 560, patient profit proportion increased again. For total profit proportion, the turning points in bed size are 223.31 and 503.86.

In another study, an analysis based on data collected from 600 hospitals for the twelve months ending September 30, 2006, reveals variation in financial and operational performance by hospital size (Anonymous 2007). Hospitals were classified according to beds in service: 100 and below, 101-200, 201-300, 301-400, 401-600 and, 601 and above. The EBITDA margin percentages per category were 13.53, 15.38, 11.10, 10.29, 11.61 and 16.54, respectively. Interestingly, hospitals in the first two categories and largest hospitals have the greatest EBITDA margin percentages while the other three categories show very similar margin percentages. This article does not mention if any statistical significant test was performed therefore, we can not conclude that these differences are significant.

Sear (1991) reports that type of hospital ownership (for profit multi-hospital system) was significantly related to hospital profit and efficiency. In their study of hospital closure, Williams, et al. (1992) report that hospital profit was significantly related to the proportion of Medicare patients (negatively), hospital size (positively), community population (positively), rural setting (negatively), and high patient case-mix index (positively). Cody, et al. (1995) report that the county general community hospitals of Los Angeles, which have a general strategy and a high case-mix index, are more profitable than the hospitals that do not have a general strategy and a high case-mix index. In addition, hospitals that had high labor costs, long inpatient stays, and more employees were less profitable than the others. Gapenski et al. (1993) report that hospitals that have a high debt-to-asset ratio, a high proportion of Medicare patients, a high proportion of uncompensated care, and a high labor intensity are less profitable than other hospitals.

Nancy Kane (2004) analyzes the financial and nonfinancial characteristics of high, medium and low performing hospitals in Maine[5] during 1993-2003. Hospitals are classified into high, medium and low performing based on their most recent five years of operation and profitability. There are some significant differences in payer mix (Medicare, Medicaid and others) percentages by profitability group. Patient volume, measured by the number of discharges, is a key factor in understanding the differences in profitability among the three groups. Kane suggests that not maintaining acute inpatient volume, regardless of payer mix, may be the biggest problem facing the low-profitability group. Several access, cost, and quality variables are examined to see if there were differences among hospitals in the three financial performance groups. The two variables with statistically significant (only at 10% level) different average values between groups are the case weight (the relative resource intensity of the inpatient case-mix) and the percentage of admissions that are for ambulatory care-sensitive conditions. The low-performing hospitals have a significantly higher proportion of admissions for ambulatory care-sensitive conditions, which is consistent with their relatively low case weight. Several widely available inpatient quality measures for 2001 also were tested, including severity-adjusted mortality, obstetrics complications, adverse events and wound infections. There are no statistically significant differences in these measures among the hospital groups. In other words, the clinical quality of inpatient care, as measured by these variables, appears to be the same regardless of hospital financial performance.

[5] This state's hospital industry has outperformed hospitals in the Northeast and in the country.

2.8 Summary

The performance measurement revolution begins several years ago and the managers in a broad range of industries have been rethinking how to measure the performance of their business and have recognized that new strategies and competitive realities demand new measurement systems. Companies perceived limitations in traditional accounting-based measures because traditional financial indicators only reflect historical performance, are highly aggregated, and may lead to short-term bias. By incorporating nonfinancial indicators into their measurement systems, firms are seeking to create a wider set of measures that capture not only firm value, but also the factors leading to the creation of value in the business.

There are four common mistakes companies make when trying to measure nonfinancial performance: (1) companies do not link measures to strategy, (2) companies do not validate the links, (3) companies do not set the right performance targets, and (4) companies do not measure correctly.

Nonfinancial measures offer four clear advantages over measurement systems based on financial data: (1) they are linked to long-term organizational strategies; (2) the drivers of success in many industries are intangible assets and, nonfinancial data can provide indirect, quantitative indicators of a firm's intangible assets; (3) they can be better indicators of future financial performance; and (4) the choice of measures should be based on providing information about managerial actions and the level of “noise” in the measures. Nonfinancial performance measures are not free of limitations. Although the performance measurement literature claims that predictive ability is one of the primary benefits of nonfinancial measures, studies indicate that firms experience considerable difficulty linking these measures to future accounting or stock price performance. The choice of nonfinancial performance measures, their optimal combination with financial measures to obtain the optimal mix of measures, as well as the task to measure their role in value creation seems to be the great challenge. Studies confirm the alignment between the organizational strategy and the performance measures suggesting that the choice of performance measures is a function of the firm's competitive strategy.

In the healthcare industry, it is common to see the application of nonfinancial performance measures to improve the quality of patient services or clinical outcomes, attract healthcare professionals, or qualify for accreditation or any other requirement to be a certified healthcare provider. However, there is evidence that suggest that the use of nonfinancial performance measures by hospitals can improve their financial performance as well.

CHAPTER 3

VARIABLES UNDER STUDY

3.1 Introduction

A review of the relevant health care literature suggests that a hospital's financial performance may be influenced by nonfinancial aspects such as utilization information (e.g. number of admissions, number of full-time-equivalents employees, and number of beds in service); type of organizational structure; socioeconomic characteristics of the market area such as average age or income of the community serviced. Nonfinancial information may capture characteristics of hospital performance which are not captured by financial ratios (Watkins, 2000). Sections 3.2 and 3.3 of this chapter provide some insight about the nonfinancial performance measures pertinent to this study.

3.2 Quality of Care

The Institute of Medicine (IOM), a component of the National Academy of Science, Washington, DC, developed in 1990 a definition of quality of care that has been widely accepted, according to this:

> "*Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge"* (Chassin, Galvin and National Roundtable on Health Care Quality, 1998, p.1001).

The term *health services* refers to a wide array of services that affect health, including those for physical and mental illnesses. Furthermore, the definition applies to many types of healthcare practitioners and to all settings of care. The phrase *desired health outcomes* refers to health outcomes that patients desire and highlights the crucial link between how care is provided and its effects on health, as well as the need to ensure that patients and their families are well informed about alternative health care interventions and their expected outcomes. This definition emphasizes that high quality care *increases the likelihood* of beneficial outcomes. It reminds us that quality is not identical to positive outcomes; poor outcomes occur despite the best possible health care. Assessing quality thus requires attention to both: processes and outcomes of care. *Current professional knowledge* emphasizes that healthcare professionals must stay abreast of the dynamic knowledge base in their professions and use that knowledge appropriately.

3.2.1 Relationship Between Quality of Health Care and Financial Performance

If we can identify those variables associated with the high cost of health care, we will be able to get a financial benefit from this knowledge because a reduction in the costs of health care may imply an increase in profit margins.

Three powerful forces are converging in United States healthcare to finally cause recognition of the relationship between cost and quality: (1) the increasing cost of care; (2) the occurrence of another malpractice crisis; and (3) the recognitions inside and outside of healthcare that quality is inconsistent and unacceptable (Feazell and Marren, 2003).

Health care quality problems (Chassin et al., 1998) or challenges (Feazell and Marren, 2003) may be classified into three categories: (1) underuse, (2) overuse, and (3) misuse. Underuse is the failure to provide a health care service when it would have produced a favorable outcome for a patient (e.g. delay in treatment). Overuse occurs when a health care service is provided under circumstances in which its potential for harm exceeds the possible benefit (e.g. excess dose of medication). Finally, misuse occurs when an appropriate service has been selected but a preventable complication occurs and the patient does not receive the full potential benefit of the service (e.g. anesthesia-related event). As Chassin et al. stated:

> "*This tripartite classification of quality problems illuminates the relationship between quality and cost. It also helps answer the question of whether improving quality leads to increased or decreased costs*" (p. 1002).

Substantial opportunities exist to increase quality and decrease cost simultaneously by ameliorating problems of overuse and misuse. Reducing overuse improves quality by sparing patients the unnecessary risk that leads to inappropriate health services. Solving misuse problems also improves quality by reducing the number of complications and, decreases costs by eliminating the cost of treating complications. Fixing underuse problems, however, nearly always results in both increased costs and increased quality.

In response to the increasing concerns about quality, a growing number of healthcare institutions are carrying out quality programs and applying standards that require a great amount of investment in resources. Thus, healthcare managers are under pressure to provide evidence that quality interventions expenditures produce tangible benefits to their organizations. Unfortunately, there is little research evidence of the effectiveness of quality interventions and quality standards. One reason for this is the challenge that represents measuring nonfinancial performance measures such as quality of care. Furthermore, the difficulty of encountering a causality relationship between quality of care and the financial performance.

On the other hand, despite the increasing concern about quality and the adoption of continuous quality improvement programs by healthcare organizations the tendency is to use separate evaluative processes for quality of service, clinical effectiveness and financial performance. The focus is mainly on individual indicators, and not on a multidisciplinary and an integrated system which allows identification of how quality of services and clinical effectiveness are able to impact the financial measures of the organization as well as other nonfinancial measures in order to achieve an effective and realistic assessment of financial and nonfinancial performance of the organization.

3.2.2 Quality Measures: Methods and Types

Guth and Kleiner (2005) explore the quality assurance methods commonly used in the healthcare industry. Six of these methods are: (1) independent performance audits; (2) internal audits; (3) outcomes analysis; (4) consumer reports; (5) industry guidelines; and (6) consumer satisfaction surveys.

Hospital audits are the most common and comprehensive types of quality assessment utilized by the healthcare industry. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is an independent organization that sets the standards by which healthcare quality is uniformly measured in the United States. They evaluate healthcare facilities for compliance with performance standards and patient safety following an extensive on-site review. Their audit visits are routinely scheduled every three years and their goal is to continuously improve the safety and quality of care provided in healthcare facilities. Internal audits are used by the healthcare facility to maintain quality standards between external audits such as JCAHO, which requires facilities to show ongoing efforts at maintaining and improving the quality of health care at all times, including the interim between scheduled JCAHO audits.

Measures of hospital quality can be grouped into two categories: process based or outcomes based. Process based measures are related to the amount and the quality of inputs that are used in treating patients. Outcomes based measures are used to measure actual patient outcomes from treatment. For an outcome to be a valid measure, it must be closely related to processes of care that can be modified to affect the outcome. On the other hand, for a process to be a valid measure, it must be closely related to an outcome that we care about. For example, controlling diabetes is a process that is a valid measure of quality because it has been shown to reduce the occurrence of many other health conditions. Outcomes analyses are used by healthcare facilities to monitor outcomes of patient care. The most common measured outcomes are morbidity and mortality rates. All health care facilities monitor morbidity and mortality rates. Other important indicators are rates of infection, fall rates (or patient falls) among patients, and medication errors.

There are a number of initiatives at the national level to utilize evidence-based practice (EBP) to guide standard of practice. National and international standards of care are developed by professional organizations and used as benchmarks to evaluate the quality of care delivered. In July 2002, the JCAHO implemented standardized performance measures that were designed to track the performance of accredited hospitals and encourage improvement in the quality of health care. The results are important because they show that hospitals have improved. They identify opportunities for further improvement, and support continual measurement and reporting. Quality improvement in hospitals contributes to save lives, better health and quality of life for many patients, as well as to lower the costs of health care (The Joint Commission, 2007).

Rubin, et al. (2001b) outline the steps in developing and implementing quality process measures. The steps required to develop a process measure include: (1) define the purpose of and audiences for the measures; (2) choose the clinical area to evaluate; (3) organize the assessment team; (4) choose the component of the process to measure; (5) write the measure specifications, including the unit of analysis, the indicator, the target population, any needed risk adjustment strategy, the data sources, and the data collection specifications; (6) perform preliminary tests including pilot testing of measures and data collection methods and testing the scientific strength (reliability and validity) of the indicator; and (7) develop scoring and analytical specifications. In a separate paper, the same authors (2001a) discuss the advantages and disadvantages of quality process measures. The advantages are: (1) process measures can be used to provide feedback for quality improvement initiatives; (2) most process measures require less risk adjustment (e.g. specify eligible population) for patient illness than do most outcome measures; and (3) process measures can usually be collected more quickly than outcome data. On the other hand, there are several disadvantages: (1) to be valid, there must be a strong relationship between the process and the outcome measures; (2) when evidence linking process and outcomes is absent in order to demonstrate this link may be expensive for the organization; (3) while providers may care about the process measures, the patients and non-clinicians care about outcomes and believe it is the provider's responsibility to perform the appropriate process and to avoid harmful ones; and (4) most feasible process are usually indicators for a very specific element of care process rather than comprehensive measures of how care is delivered.

Mant (2001) reviews the relative strengths and weaknesses of outcome and process measures as performance indicators in health care. Outcome measures are valid as performance indicators in as much as the quality of health services has an impact on health. However, in some circumstances the quality of health services has a relative minor role in determining health outcome, and in other circumstances, a major role. Where health services have major effects on outcome, use of outcome measures as performance indicators is appropriate and efforts should be taken to ensure the correct interpretation of the data. Process measures are direct measures of the quality of health care, provided that a link has been demonstrated between a given process and an outcome. Therefore, where such measures are available and they are relevant and practical then they should be used in preference to outcome measures since they are much easier to interpret and much more sensitive to differences in the quality of care.

Consumer reports are gaining importance as a way to track quality performance in health care. Consumers can use this information when making healthcare decisions and choosing their healthcare facility. The fundamental goal of public reporting is improved quality and outcomes of care but, the publications of a facility outcomes data could represent, depending of whether it is positive or negative information, more or less revenues. Healthcare facilities need to maintain adequate revenue, and quality care (or the perception of it) is critical to maintaining and increasing patient admissions, which translates to revenue. Thus, the publication of a facility's outcomes data could have an impact on their financial performance.

Most healthcare facilities measure quality of care through patient and provider surveys. The limitation is that surveys are subjective and therefore more useful in evaluating the adequacy of comfort of the patient care received instead of actual health care delivery or expected patient care outcomes. However, through satisfaction surveys consumers can play an active role in their health care and contribute to the improvement of healthcare outcomes.

3.2.3 Impact of Hospital Structure and Financial Conditions on Quality of Care and Quality Programs

Bazzoli et al. (2007a), examine the relationship between hospital financial condition (specifically, changes in a hospital's operating margin and its cash flow to total revenues ratio) and selected patient safety and quality of care measures. They measure quality of health care in terms of patient safety as the numbers of adverse patients events (surgical and nursing related) and in-hospital mortality occurring in conditions that typically have low mortality. Their results suggest that there is a relationship between financial performance and quality of care. Overall, their results suggest that deep financial problems that go beyond the patient care side of business may be important to prompting quality problems.

One important characteristic of a quality improvement program in a hospital is the multidisciplinary approach such as the JCAHO accreditation process. Hassan (2005) demonstrates the importance of measuring performance from different stakeholders' perspectives to enable the organization to have a comprehensive overall assessment of its business excellence. It is necessary to apply a holistic performance appraisal approach that would allow for an assessment of the organization's progress from multiple dimensions in order to determine whether the desired performance standards are indeed being achieved on all organizational levels.

Alexander et al. (2006), examine the role of organizational infrastructure in the implementation of quality improvement practices and structures in hospitals. They focus on four elements: (1) integrated data systems; (2) financial support for quality improvement; (3) clinical integration; and (4) information system capability. In general, their findings indicate that several organizational infrastructure and financial support factors are significantly associated with greater scope and intensity of quality improvement implementation. Clinical information system capabilities were found to be particularly important to successful quality improvement implementation. Financial investment in quality improvement was not a major contributor to successful implementation; however, a long-standing commitment to quality improvement over a number of years was positively associated with nearly all measures of implementation scope and intensity.

Bazzoli et al. (2007b) examine how the financial pressure experienced by the hospital industry during the late 1990s affected the quality of their operations in terms of organizational infrastructure and processes that support the delivery of care. Financial pressure was measured based on changes in net patient revenue per adjusted patient day and the ratio of cash flow to total revenues. They examined the effects on hospital investments in plant and equipment and on hospital standards compliance with selected JCAHO performance areas. The results suggest that increasing financial pressures did lead to cutbacks in these areas and may contribute to poor patient outcomes.

An empirical investigation of quality improvement initiatives in two different operational settings, for-profit and not-for-profit hospitals, conducted by Miller and Yasin (2006) suggests that for-profit and not-for-profit hospitals were more similar than different in the utilization of quality improvement initiatives. For both types of hospitals, the implementation of quality improvement initiatives appears to be improving customer service, operational efficiency and strategic effectiveness. This study offers decision-makers in healthcare operational settings empirical evidence of the operational and strategic effectiveness of different quality improvement efforts, thus justifying investments related to the initiation and implementation of such quality improvement efforts.

Jiang et al. (2006) examine the likelihood of attaining high-quality/low-cost performance in relation to organizational and market characteristics. They find that the organizational characteristics show significant relationships with hospital quality-cost performance. Specifically, the likelihood of achieving high-quality/low-cost performance increased for hospitals with for-profit ownership or system membership. One important finding is the positive association of system membership with hospital quality/cost performance. System hospitals may be able to achieve lower costs and better quality through sharing knowledge, skills, and resources with other member hospitals. A recent study reveals that system-affiliated and for-profit hospitals are more likely than their counterparts to adopt managerial information systems in support of financial analysis, strategic planning, resource allocation, and quality improvement operations (Wang et al., 2005).

3.2.4 JCAHO Standards and Scoring System

JCAHO standards are grouped into performance areas, which identify groups of related standards addressing a particular area of hospital operation. Between 1995 and 2000, hospitals seeking JCAHO underwent an on-site survey at least once every 3 years. The JCAHO survey team uses various modalities to assess hospital compliance. Individual standards are scored on a 5-point scale in which values of 1 or 2 imply that the hospital is generally in compliance with a standard and values of 3 to 5 indicate that the hospital is generally not in compliance.

In their study, Bazzoli et al. (2007), identify those that had stable content and scoring procedures throughout 1995 to 2000. The purpose of their study was to investigate how the financial pressures mounted to hospitals affect the quality of their operations in terms of organizational infrastructure and processes that support the delivery of care. Overall, 30 of the 44 performance areas have stable content but only 14 of these have generally consistent scoring procedures during the period. In order to assess whether hospital financial condition was an important factor in explaining this variation, they focused only on 7 performance areas in which variation exist in the extent of hospital compliance. These performance areas are: (1) initial assessment procedures for admitted patients, (2) processes to organize and monitor medication use, (3) processes to organize and monitor anesthesia care, (4) processes to organize and monitor operative procedures, (5) human resources assessment of staff competency, (6) management of patient specific information, and (7) surveillance, prevention, and control of infection. Sections 3.2.4.1 to 3.2.4.7 describe briefly the focus of each performance areas.

3.2.4.1 Assessment of Patients: Initial Assessment

This performance area focuses on hospital practices to undertake and document patient needs when they are admitted to a hospital. The assessment includes not only the reason why the patient is admitted but also a thorough identification of the patient's immediate and emerging needs, including physiological status, psychological needs, social concerns, presence and intensity of pain, potential nutritional problems, diagnostic testing needs, patients for whom discharge planning is critical, and also assessment of potential abuse and neglect. The hospital should have policies and processes to collect these data and to make them available on a timely basis. In addition, the initial assessment should identify patients requiring further assessments during their hospital stay.

3.2.4.2 Care of Patients: Medication Use

This performance area encompasses hospital procedures for documenting and maintaining medications that are routinely used throughout the hospital and processes for ordering and procuring medications not available. In addition, hospital policies and procedures must support safe medication prescription and ordering, including distribution and administration of controlled medications, proper storage, distribution and control of drugs, documentation of orders and times of dose administration and distribution of drugs to patients at discharge. Hospitals must also demonstrate adherence to law, professional licensures, and practice standards governing the safe operation of pharmacy services.

3.2.4.3 Care of Patients: Anesthesia Care

This performance area applies when hospitals provide general, spinal, and other major regional anesthesia, or sedation, which in the manner used, may be reasonably expected to result in the loss of protective reflexes. Hospitals must develop specific, appropriate protocols for the care of patients receiving such sedation, and these policies and protocols must be consistent with professional standards. This performance area focuses on several hospital policies, including the availability of sufficient qualified personnel that are present to perform the procedure and monitor the patient; appropriate equipment for care and resuscitation; and appropriate monitoring, documentation of care, and monitoring of outcomes. Patient and family communication and education also must be addressed.

3.2.4.4 Care of Patients: Operative Procedures

This performance area encompasses hospital policies for operative or other procedures, which may result in a significant physiological effect. Hospital processes should address the selection of appropriate procedures by a thorough review of the patient history; patient physical status; diagnostic data; risks and benefits; and the need to administer blood or blood components. In addition, this performance area addresses the process of preparing the patient for procedures, the actual performance of the procedure, the monitoring during the procedure, and the postoperative care. Patient communication, education and documentation are also addressed.

3.2.4.5 Management of Human Resources: Assessing Staff Competence

This performance area focuses on systems to conduct periodic competence assessment and document these findings for each staff member. Ongoing, periodic competence assessment evaluates staff members' continuing abilities to perform their duties and meet the needs of the patients they serve. The hospital considers special needs and behaviors of specific patient populations when defining the qualifications, duties, and responsibilities of staff that have regular contact with patients. Competency assessments should clearly address the ages of the patient population served and the success with which employees produce expected results.

3.2.4.6 Management of Information: Patient-Specific Data and Information

This performance area addresses the use of patient-specific data and information to facilitate patient care; serve as financial and legal record; aid in clinical research; support decision analysis; and guide professional and organizational performance improvement. This performance area outlines the specific data and information to be maintained for each patient to facilitate consistency and continuity in patient care. The hospital maintains this information via a medical record. The processes by which these medical records are completed and the information that it is contained therein is addressed in this performance area.

3.2.4.7 Surveillance, Prevention, and Control of Infection: Infection Control

This performance area focuses on the processes by which hospitals identify and reduce the risks of acquiring and transmitting infections among patients, employees, physicians, and other licensed independent practitioners, contracted service workers, volunteers, students, and visitors. This performance area encompasses a broad range of activities and processes that should be performed by the hospital to reduce the risk of endemic or epidemic infections. The organization's policies and processes for infection control should be based on sound epidemiologic principles and research on nosocomial infection. In addition, the hospital must connect its program with the local health department or other external agencies to ensure appropriate follow-up and control.

3.3 Output, Operational Efficiency and Productivity Measures

Watkins (2000) conducts a study including 2,145 nonprofit hospitals in the United States from 1989 to 1994 which reveals that certain nonfinancial measures representing output, efficiency, and productivity measurements provide relevant information in evaluating a hospital's financial performance. The purpose of her study is twofold: (1) to extend previous research which has investigated the common characteristics of hospital performance by including nonfinancial information in the analysis to provide some insight into whether or not financial and nonfinancial information seem to capture different characteristics of hospital performance; and, (2) to test the relationship between financial and nonfinancial characteristics identified in the first stage of the study and one measure of hospital financial performance (bond ratings), to know the relative value of financial and nonfinancial information in judging the creditworthiness of hospitals.

Unlike her studies, this dissertation examines the investor-owned multihospital healthcare systems in the United States which is a for-profit sector. Even if these two sectors are different, we based our selection of the nonfinancial variables under study in her findings. Therefore, it is necessary to enter in the presentation of the variables analyzed in her study and her findings to understand the reasons behind the selection of the nonfinancial performance measures under study in this dissertation.

After the first phase of her analysis, only four financial characteristics emerged consistently over the five-year period. These factors capture profitability (return on total assets), capital structure (equity financing ratio), working capital efficiency (current asset turnover) and fixed asset efficiency (fixed asset turnover). Three distinct nonfinancial ratio groupings emerged consistently over the five-year study period. These three factors might be characterized as capturing measures of outputs, measures of operational efficiency and measures of productivity.

3.3.1 Measures of Output

Output measures were shown to be closely linked to hospital financial performance. According to Watkins (2003):

> "*Measures of hospital outputs explained 20 percent of total variation of data set- the highest percentage of the total variance to be explained by any of the seven financial and nonfinancial factors. Therefore, depending on the context, this factor appears to offer a good vantage point for evaluating a hospital's overall financial condition, especially given the intuitive nature of output measures (e.g., a high number of births could be taken as an indicator of solid financial performance*" (p. 77).

The most revealing measure of outputs was case-mix-adjusted admissions (CMAAD). The CMAAD represents total admissions adjusted by the average intensity of each case as reflected in the case-mix-index. This measure facilitates comparison of inpatient activity for hospitals with different case mixes in terms of severity of patient conditions. As some hospitals specialize in treatment of more acute illnesses, this measure gives a more accurate indication of total inpatient activity than admissions alone. It provides some indication of the magnitude of resources utilized by hospitals and the trend in their use.

Other important output measures include case-mix-adjusted patient days (CMAPD), number of births, and number of surgeries.

3.3.2 Measures of Efficiency

Efficiency ratios provide some insight of the costs at which a given hospital provides services. The most sensitive measure of operational efficiency was full-time-equivalent employees per number of occupied beds (FTE/BED). It is a measure of how many workers are employed to provide services for inpatients, measured by the annual average of occupied beds. FTEs are a good indication of total hospital input. The other measure of efficiency used is the occupancy rate (OCCP) which is determined by dividing patient days by the number of beds in service times 365. It represents a measure of hospital's existing capacity utilization.

3.3.3 Measures of Productivity

The case-mix-adjusted admissions per bed in service (CMAAD/BED) and the case mix adjusted equivalent admissions per full-time-equivalents employee (CMAEAD/FTE) represent capacity productivity and manpower productivity, respectively. Capacity productivity is a measure which correlates inpatient activity produced by each bed with productivity across hospitals. The most significant measure reflecting productivity was case-mix-adjusted admissions per beds in service (CMAAD/BED). 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. CMAEAD/FTE is indicative of the number of CMAEADs serviced by each FTE.

3.3.4 Implications of Watkins' Results

To study the extent to which nonfinancial data could be used in an evaluation of hospital's creditworthiness, Watkins uses as a proxy of creditworthiness five S&P bond rating classifications (A+ and above, A, A-, BBB+ and E A BBB and below). Applying regression analysis, a bond rating model using financial ratios only is compared with a model including key financial ratios and the most revealing measure for each nonfinancial factor. The analysis indicates that the nonfinancial measures provided information significant in predicting a hospital's creditworthiness beyond the information provided by financial ratios. Her results suggest that nonfinancial data may captures aspects of hospital performance that financial data may not. This conclusion is based on the empirical finding that a bond rating model utilizing both financial and nonfinancial variables did a better job explaining the cross sectional differences in hospital bond ratings than a model employing financial variables only.

In fact, CMAAD and CMAAD/BED are more correlated with a hospital's creditworthiness than the financial ratios. FTE/BED is not found to be a significant predictor, even though it appears to reflect hospital efficiency information not captured by financial ratios. This provides some evidence that nonfinancial information, which is information, not provided in traditional external accounting reports may be relevant in assessing a hospital's creditworthiness.

3.4 Summary

A review of the relevant health care literature suggests that a hospital's financial performance may be influenced by nonfinancial aspects. This chapter provides some insight about nonfinancial performance measures pertinent to this study.

Hospital audits are the most common and comprehensive types of quality assessment utilized by the healthcare industry. The JCAHO is an independent organization that sets the standards by which healthcare quality is uniformly measured in the United States. They evaluate healthcare facilities for compliance with performance standards and patient safety following an extensive on-site review. Sections 3.2.4.1 to 3.2.4.7 describe briefly the focus of seven performance areas considered to compute our quality measure.

Watkins (2000) study of 2,145 nonprofit hospitals in the United States from 1989 to 1994 reveals that certain nonfinancial measures representing output, efficiency, and productivity measurements provide relevant information in evaluating a hospital's financial performance. The most revealing measure of outputs was case-mix-adjusted admissions. Other important output measures include case-mix-adjusted patient days. The most sensitive measure of operational efficiency was full-time-equivalent employees per number of occupied beds. Other measure of efficiency evaluated is the occupancy rate. The most significant measure reflecting productivity was case-mix-adjusted admissions per beds in service. In general, her results suggest that nonfinancial data may captures aspects of hospital performance that financial data may not.

CHAPTER 4

HYPOTHESES DEVELOPMENT AND RESEARCH DESIGN

4.1 Introduction

The focus of this dissertation is the hospital sector of the healthcare industry in the United States, specifically, the investor-owned multihospital systems. We are tracking the financial performance of hospitals members of the investor-owned multihospital systems in 1999, according to the AHA survey. The main purpose is to examine the impact of nonfinancial performance measures on their financial performance from 1999 to 2004 in order to: (1) validate the relevance of nonfinancial performance measures under study in determining hospital's profitability, (2) identify which is the best combination of nonfinancial performance measures in order to explain the financial performance of these hospitals and, (3) examine the long-term impact of nonfinancial performance measures on financial performance.

This chapter covers the theoretical framework for the development of the hypotheses, the design of the research and, a final summary.

4.2 Theoretical Framework and Development of the Hypotheses

This section covers the theoretical framework and the hypotheses for the first and the third part of this dissertation.

4.2.1 Relationship Between Nonfinancial Performance Measures And Financial Performance

The first two parts of this dissertation examines the relevance of nonfinancial measures representing output, operational efficiency, productivity and quality in determining hospital's profitability. We measured profitability by computing the total margin, the net operating margin and the cash flow margin. Hypotheses were tested using ordinary least squares (OLS) multiple regression.

Watkins (2000, 2003) results of a five-year study of performance data from more than 2,000 US not-for-profit hospitals suggest than one hospital can considerably enhance their financial analysis by routinely measuring certain key nonfinancial measures. This dissertation examines the investor-owned multihospital healthcare systems in the United States which is a for-profit sector. Even though these two sectors are different, her findings served as a base for the selection of the nonfinancial variables under this study. She identified seven factors representing different dimensions of a hospital's performance, four of these factors consisted entirely of financial ratios and the remaining three consisted entirely of nonfinancial variables.

Her study reveals that certain nonfinancial measures representing output, efficiency, and productivity measurements provide relevant information in evaluating a hospital's financial performance. To know the relative value of financial and nonfinancial information in judging the creditworthiness of hospitals, she compares the relationship between the financial ratios and the bond ratings with the relationship between the nonfinancial measures and the bond ratings. Her results demonstrate that nonfinancial measures can provide information relevant in evaluating a hospital's financial performance beyond that provided by financial ratios.

According to Watkins results, output measures were shown to be closely linked to hospital financial performance explaining 20% of total variation of data set. The most revealing measure of outputs was the case-mix-adjusted admissions. This measure represents total admissions adjusted by the average intensity of each case as reflected in the case-mix-index. The other important output measures included is the case-mix-adjusted patient days.

Our study evaluates the impact of two output measures on hospital's profitability. One measure is the case-mix-adjusted discharges (CMAD) and the other measure is the case-mix adjusted patient days (CMAPD). The term *case-mix* refers to the type or mix of patients treated by a hospital or unit. Case mix is a system that measures hospital performance, aiming to reward initiatives that increase efficiency in hospitals. It also serves as an information tool that allows policy makers understand the nature and complexity of healthcare delivery.

This study uses the number of discharges instead of the number of admissions because a hospital computes the case-mix-index based on patient's diagnostic related groups (DRGs) codes. This is a model that classifies inpatient admissions into a number of manageable categories based on clinical condition and resource consumption. The case-mix-index is equal to the average diagnosis-related group weight for all of a hospital's Medicare patients. A DRG can be allocated only after the patient is discharged. Each DRG is allocated a weight, which is dependent on the average cost of inputs (e.g. nursing, diagnostic services, procedures) required to achieve the appropriate patient outcome. The facility is reimbursed by a predetermined amount for each patient admission, according to the DRG code allocated.

From the perspective of the current reimbursement system, a hospital seeks to optimize the utilization of its resources in order to optimize reimbursement. Usually a hospital seeks to achieve this by increasing the number of patients discharged while reducing length of stay. Our first hypothesis states that:

Hypothesis 1. Output measures are relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems.

With the increase in number of patients discharged, the total incomes from patients tend to be higher. However, an increase in patient days can be the result of prolonged patient stays that could impact earnings adversely.

Efficiency ratios provide some insight of the costs at which a given hospital provides services. Investor-owned multihospital systems concentrated a great deal of management energy on controlling these variables (Sear, 1992). According to Watkins results, the most sensitive measure of operational efficiency is the full-time-equivalent employees per number of occupied beds (FTE/OCCBED). The respondents to the Critical Access Hospitals (CAH) Financial Indicators Reports (Flex Monitoring Team, 2005) consider the FTE/OCCBED as one of the most useful cost indicators. It is a measure of how many workers are employed to provide services to inpatients. FTEs are a good indication of total hospital input. Recall that hospitals are the second largest employers in the private sector. Also, they offer high pay relative to other service sectors. Therefore, we expect that this measure impacts the financial performance of a hospital. An adequate staffing pattern may contribute to the efficiency of the operations of a hospital and also may impact earnings favorably.

The second measure of operational efficiency selected is the work hours per adjusted patient day (WH/APD). This is a measure of labor intensity used by Sear (1992) to assess its role in determining operating margin. The third measure of operational efficiency used is the occupancy rate (OCCP). It represents a measure of hospital's existing capacity utilization (the extent to which beds are fully occupied) and it is one of the most used measures by the hospitals to develop their budget and estimate their revenues. It is expected that an increase in the WH/APD impacts negatively the financial performance while an increase in the OCCP contributes to improve the financial performance. The second hypothesis states that:

Hypothesis 2. Operational efficiency measures are relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems.

Watkins results demonstrate that the most significant measure reflecting productivity is the case-mix-adjusted admissions per bed in service. In this study, the case-mix-adjusted discharges per bed in service (CMAD/BED) and the case mix adjusted discharges per full-time-equivalents employee (CMAD/FTE) represent capacity productivity and manpower productivity, respectively. We are measuring capacity productivity by the relationship of case mix adjusted discharges to the number of staffed beds. On the other hand, manpower productivity is measuring by the relationship of case mix adjusted discharges to FTEs. We expect both measures to have a positive impact on financial performance. Our third hypothesis states that:

Hypothesis 3. Productivity measures are relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems.

Epstein et al. (2000), affirm that nonfinancial measures are designed to capture the operating effects of managerial decisions that will, eventually, influence financial results. Nonfinancial measures such as the levels of quality, customer satisfaction or employee retention have a role in business success or profitability. Also, he argues that the objective for managing an enterprise should not be to increase these levels. It should be to manage all the identifiable drivers of profitability with regard to their effects on revenues and costs, so as to maximize the value of the firm to its stakeholders.

Hospital audits are the most common and comprehensive types of quality assessment utilized by the healthcare industry. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is an independent organization that sets the standards by which healthcare quality is uniformly measured in the United States. Standards are grouped into performance areas, which identified groups of related standards addressing a particular area of hospital operation. They evaluate healthcare facilities for compliance with performance standards and patient safety following an extensive on-site review. Between 1995 and 2000, hospitals seeking JCAHO underwent an on-site survey at least once every 3 years. The JCAHO survey team uses various modalities to assess hospital compliance. Individual standards are score on a 5-point scale in which values of 1 or 2 imply that the hospital is generally in compliance with a standard and values of 3 to 5 indicate that the hospital is generally not in compliance.

Bazolli et al. (2007), identify those standards that had stable content and scoring procedures throughout 1995 to 2000. The purpose of their study was to investigate how the financial pressures mounted to hospitals affected the quality of their operations in terms of organizational infrastructure and processes that support the delivery of care. Overall, 30 of the 44 performance areas have stable content but only 14 of these have generally consistent scoring procedures during the period. In order to assess whether hospital financial condition is an important factor in explaining this variation, they focused on seven performance areas in which variation exist in the extent of hospital compliance. These performance areas are: (1) initial assessment procedures for admitted patients, (2) processes to organize and monitor medication use, (3) processes to organize and monitor anesthesia care, (4) processes to organize and monitor operative procedures, (5) human resources assessment of staff competency, (6) management of patient specific information, and (7) surveillance, prevention, and control of infection. Sections 3.2.4.1 to 3.2.4.7 in Chapter 3 describe briefly the focus of each performance areas.

For the empirical analysis, they recoded the performance area scores so that hospitals in compliance received a one (1) and those out of compliance received a zero (0) value. Then, they aggregate the number of JCAHO performance areas in which a hospital is in compliance by adding the recoded scores. Each hospital has a score that range from zero to seven. We have access to database used by Dr. Gloria Bazolli in her study through a Data Sharing Agreement with the JCAHO. Our quality measure (JCAHO) is equivalent to the aggregate of the recode scores and the fourth hypothesis states that:

> Hypothesis 4. JCAHO quality measure is relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems.

Even though, there is little empirical evidence that links quality measures with the financial performance of the hospitals, it is expected that a high level of compliance with these standards will contribute to increase their profits and the cash flow.

4.2.2 Long Term Impact of Nonfinancial Performance Measures on Hospital's Financial Performance

The rise of operational performance measures represents an attempt to reassert the primacy of operations over financial measures. By using nonfinancial measures, managers attempt to track progress on the actionable steps that lead to a company's success in the market (Fisher, 1992). By incorporating nonfinancial indicators into their measurement systems, firms are seeking to create a wider set of measures that capture not only firm value, but also the factors leading to the creation of value in the business (Brancato, 1995). Ittner and Larker (1998b) find support for claim that customer satisfaction measures are leading indicators of accounting performance (e.g., business-unit revenues, profit margins, and return on sales). They also find some evidence that firm-level customer satisfaction measures can be economically relevant to the stock market because the disclosure of this measure provides information to the stock market on expected future cash flows. The primary reason for the use of nonfinancial performance measures is that some of them are leading indicators of financial performance (Kaplan and Norton, 2001a).

Nonfinancial measures can be better indicators of future financial performance. One of the most important limitations of accounting measures is that they are the result of management action and organizational performance. They tell managers the consequences of decisions that already have been made but do little to predict future performance. Even when the ultimate goal is to maximize financial performance, current financial measures may not capture long-term benefits from decisions made now such as investments in research and development or customer satisfaction programs. Research and development expenditures and marketing costs must be charged for in the period they are incurred (to reduce profits) but, successful research may improve future profits. Similarly, investments in customer satisfaction can improve subsequent economic performance by increasing revenues and loyalty of existing customers, attracting new customers and reducing transaction costs (Knowledge@Wharton, 2000).

Nonfinancial measures are gaining prominence within the business environment over financial measures because these measures provide a direct correlation to strategic objectives (Pangarkar and Kirkwood, 2006). When dealing with organizational strategy, a long-term approach is required. Many nonfinancial factors have demonstrated that they contribute to and have a lasting impact on a company's market value. Since these nonfinancial measures are more forward-looking and are linked to operational activities, they help to focus a manager's efforts and better evaluate employee performance. The value of nonfinancial performance measures for decision making and control purposes lies, to a significant degree, in the ability of such measures to serve as leading indicators of future financial performance (Dikolli and Sedatole, 2007).

This study attempts to provide some evidence of the long-term impact of nonfinancial performance measures on financial performance of hospitals members of the United States investor-owned multihospital systems. The short-term period is defined as one year after the year to which correspond the explanatory variables while the long-term period is defined as three years later. For example, if we want to know the short-term impact of the explanatory variables of 1999, we need to examine how these variables impact the financial performance of year 2000. On the other hand, if we want to know the long-term impact then we need to examine how these variables impact the financial performance of year 2002. We hypothesized that the long-term impact is greater than the short-term impact.

Hypothesis 5. Nonfinancial performance measures impact on profitability of hospitals members of the United States investor-owned multihospital systems are greater in the long-term than in the short-term.

4.3 Design of the Research

This section describes: (1) the population under study and the time period; (2) the data sources and the specific data used; (3) financial and nonfinancial measures and formulas used to compute them; (4) the analytical databases; and (5) procedures applied for the statistical analysis.

4.3.1 Population Under Study and Time Period

The population under study consists of all hospitals of the United States registered in the American Hospital Association (AHA) under the classification known as investor-owned multihospital healthcare systems. According to AHA' statistics, in 1999 there were 39 investor-owned multihospital healthcare systems composed of 1,155 hospitals with 146,646 beds. Six years later, in 2005, the number of investor-owned multihospital healthcare systems rose to 61 with 1,196 hospitals and 144,606 beds. Ermann and Gabel (1984) pooled the data from the 1978, 1979, 1981 and 1982 surveys conducted by *Modern Healthcare* and find that the number of investor-owned multihospital systems was 34, 35, 30 and 34, respectively. Practically a 0% of change thus, this 56% of increase in the number of investor-owned multihospital systems from 1999 to 2005 is significant especially if we compared it with the not-for-profit multihospital sector, which percentage of change for the same period was 19%.

The institutions listed in the 1999-2000 edition of the AHA Guide include all of the institutions registered as of April 1999. According to this guide, there were 39 investor-owned multihospital healthcare systems composed of 1,155 hospitals. These hospitals represent 37% of all system's hospitals and 19% of the total hospitals in the United States during 1998. Our analytical database consists of 1,058 hospitals which represent 92% of the hospitals members of the United States investor-owned multihospital healthcare systems registered in the AHA.

The time period for the analysis of the impact of nonfinancial measures on the financial performance of the hospitals is from 1999 to 2004. Due to the assumption that nonfinancial performance measures are link to future financial performance, the time period of the explanatory variables under study is from 1999 to 2001. This allows examining the short-term impact and the long-term impact of nonfinancial performance measures of more than one period.

4.3.2 Data Sources and Type of Data

The principal data sources for the analysis include: (1) the 1999 AHA's Annual Survey; (2) the Centers for Medicare and Medicaid Services (CMS) Cost Reports; (3) the Research Data Assistance Center (ResDAC) which is a CMS contractor; and (4) the JCAHO performance scores.

4.3.2.1 AHA's Annual Survey

The files in the CD_ROM of the AHA's Annual Survey of hospitals database for fiscal year 1999 contain information on hospital organization and structure. This includes the following data for each facility: demographic, descriptive, facilities, services, utilization, personnel and the non confidential financial fields. Using these files we identify those hospitals which control type is equal to 31, 32 and 33 (individual, partnership and corporation, respectively) which are the hospitals members of the investor-owned multihospital healthcare systems. Table A.1 in the appendix includes a list of variables and the field descriptions of the AHA file named investor-owned.

4.3.2.2 CMS and ResDAC

The case-mix-index data used to compute the adjusted nonfinancial performance measures for each hospital for the period from 1999 to 2001 is public use data and is downloadable from the CMS website[6].

[6] http://www.cms.hhs.gov/AcuteInpatientPPS/FFD/list.asp#TopOfPage

The filling of the Medicare Cost Report is mandatory for each hospital participating in the Medicare program. This report contains financial and nonfinancial data for each facility. The Medicare cost report is public use data, is free and downloadable from the CMS website. The hospital's cost report data are available for Federal Fiscal Years from 1999. Table A.2 in the appendix includes a list of the fields of the Cost Report used to compute the nonfinancial performance measures and the profitability measures included in our analytical databases.

4.3.2.3 JCAHO

Through a Data Sharing Agreement signed with the JCAHO, we have access to the analytical database used by Dr. Gloria Bazolli in her study. This database includes all hospitals accredited by the JCAHO during 1996 and 1999. The hospitals were identified by the AHA identification number. We limit our hospitals to those facilities members of the investor-owned multihospital healthcare systems accredited by the JCAHO in 1999. Our quality measure labeled *JCAHO* is equivalent to the aggregate of recoded scores used by Dr. Bazolli in her research. Table A.3 in the appendix includes a list of variables and field descriptions of the file.

4.3.3 Measures

This section describes formulas used to compute nonfinancial and financial performance measures.

4.3.3.1 Nonfinancial Performance Measures

Nonfinancial Measures are classified into four main categories: (1) output measures; (2) operational efficiency measures; (3) productivity measures; and (4) quality measures. Except for the quality measure, which measure corresponds only to the 1999 JCAHO survey, each nonfinancial measure was computed for each year: 1999, 2000 and 2001.

4.3.3.1.1 Output

The case-mix-adjusted discharge (CMAD) for each hospital is computed by multiplying the total patient discharged by the case-mix-index. CMAD provides information on the volume of patients treated and discharged annually. Also, provides some information on the possible levels of revenues generated by these patients.

The case-mix-adjusted patient days (CMAPD) for each hospital is computed by multiplying the adjusted patient days[7] by the case-mix-index. The number of patient days is the aggregate of the length of stay (measure in days) of each patient. Usually, the length of stay of a patient depends on the degree of the severity of his health condition or of the kind of treatment required.

Since the case-mix-index reflects the average intensity of inpatient's conditions treated in a hospital both measures, CMAD and CMAPD, are adjusted to reflect this

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[7] Adjusted Patient Days = (Patient Days) x [1+ (Total Outpatient Revenue ÷ Total Inpatient Revenue)]

intensity. The adjustment facilitates comparison of inpatient activity for hospitals with different case mixes in terms of severity of inpatient's conditions (Watkins, 2000).

4.3.3.1.2 Operational Efficiency

The following two measures are ratios of inputs to outputs used to measure hospital operations.

The staff per occupied bed (FTE/OCCBED) for each hospital is computed by dividing the total full-time-equivalent employees by the adjusted occupied beds[8]. FTE/OCCBED provides information on how many workers are employed to provide services to inpatients.

The work hours per adjusted patient day (WH/APD) for each hospital are computed by dividing the total work hours[9] by the adjusted patient days. WH/APD provides information of how many man hours are employed per day to provide services to inpatients.

The third measure of operational efficiency is the occupancy rate (OCCP). This is computed by dividing total patient days by the total bed days.

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[8] Adjusted Occupied Beds = Total Beds x [((Total Patient Days ÷ Days in Period)÷Total Beds) x (Total Patient Revenue ÷ Total Inpatient Revenue)] = [(Total Patient Days ÷ Days in Period) x (Total Patient Revenue ÷ Total Inpatient Revenue)] = [Average Daily Census x (Total Patient Revenue ÷ Total Inpatient Revenue)]

[9] Work Hours = Total FTE x 2080 hours

4.3.3.1.3 Productivity

The following productivity measures are ratios of outputs to inputs.

The case-mix-adjusted discharges per bed in service (CMAD/BED) for each hospital is computed by dividing the case-mix-adjusted discharges by the total beds. CMAD/BED provides a more accurate measure of total inpatient activity than discharges alone because is taking into account the beds capacity. As the CMAD/BED increases, the inpatient activity or bed turnover is greater. Thus, the expected consequence is a positive impact on the level of revenue.

The case-mix-adjusted discharges per full-time-equivalent employee (CMAD/FTE) for each hospital is computed by dividing the case-mix-adjusted discharges by the total full-time-equivalent employees.

4.3.3.1.4 Quality

The quality measure (JCAHO) consists of the aggregate of the compliance codes for the seven areas under study. The hospital receives a compliance code equal to one for each performance area in which it is found in compliance with the standards by the Joint Commission Accreditation of Healthcare Organizations. If the hospital is not in compliance with the standards the code is equal to zero. The performance areas under study are: (1) initial patient assessment procedures, (2) anesthesia care, (3) medication use, (4) operative procedures, (5) assessing staff competence, (6) availability of patient-specific information, and (7) infection control.

4.3.3.2 Financial Performance Measures

The financial performance measures consist of the following profitability margins: (1) total margin, (2) net operating margin, and (3) cash flow margin. These financial measures are calculated for each hospital in each of the six years of this study.

The total margin (TM) is computed by dividing the net income[10] by the sum of the net patient revenues[11] and the total other income[12]. The total margin ratio defines the percentage of total revenue that has been realized in the form of net income, or excess revenues over expenses. This measure puts income from all sources in perspective with all revenues received by a hospital. It is used by many analysts as a primary measure of total hospital profitability. It is considered one of the most useful profitability indicators by the respondents to the CAH Financial Indicators Reports (Flex Monitoring Team, 2005).

The net operating margin (NOM) is computed by dividing the net income from services to patients by the net patient revenues[13]. The net operating margin is a ratio of operating income to total operating revenue. This measure places operating income in

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[10] Net Income = Total Income – Total Other Expenses

[11] Net Patient Revenues = Total Patient Revenues – Contractual Allowances and Discounts on Patients' Accounts

[12] Other revenues include: revenues from telephone and telegraph service; revenues from television and radio service; purchase discounts; rebates and refunds of expenses; parking lot receipts; revenue from laundry and linen service; revenue from meals sold to employees and guests; revenue from rental of living quarters; revenue from sale of medical and surgical supplies to other than patients; revenue from sale of drugs to other than patients; revenue from sale of medical records and abstracts; tuition (fees, sale of textbooks, uniforms, etc); revenue from gifts, flowers, coffee shops, and canteen; rental of vending machines; rental of hospital space; and other.

[13] Net Income from Services to Patients = Net Patient Revenues – Total Operating Expenses

perspective with the volume of business realized by a hospital. It assesses the generation of a profit or a loss from the primary line of business of a hospital.

The cash flow margin (CFM) is computed by dividing the sum of the net income, the contractual allowances and discounts on patients' accounts and the depreciation by the total patient revenues[14]. The cash flow margin is a broader measure of profitability because a hospital can generate substantial revenues from non-operating sources and non-patient care business activities such as investment income, donations, and non-patient care activities.

4.3.4 Analytical Database

The analytical database for this study consists of three different cross-sectional databases in which the financial performance of the same group of hospitals are observed during each of the three years after each *base year*. The *base year* is the year corresponding to the nonfinancial performance measures under study which are the following: 1999, 2000, and 2001. In some sense the resulting observations can be described as forming a panel or longitudinal data set but it is not exactly a panel database. Repeated measures data arise when time sequences of observations of the same dependent variable are made on each of a number of experimental units (Everitt, 1995). When the same characteristic for all members of a random sample is measure under a number of different conditions we refer to it as *repeated measures* (SAS Library, 1997).

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[14]Total Patient Revenues = Total General Inpatient Care Services + Total Intensive Care Type Inpatient Hospital Services + Total Outpatient Services

Our databases follow a repeated measures design because the profitability measure for each hospital under study (e.g., total margin, net operating margin and cash flow margin) is measured at different periods or years so that, the condition that changes is the year.

The first step in the creation of the analytical databases for this study consists in identifying the hospitals members of the investor-owned multihospital healthcare systems by creating the 1999 investor-owned database. This database is created using the files in the AHA Annual Survey CD-ROM. Then, we collect the data that eventually will be used to compute financial and nonfinancial measures under study by extracting from the Medicare Cost Reports (FY- 1999 to 2004) all of the variables of interest. After this, we merge both files to create two different types of files, the files of the financial accounts and the files of the nonfinancial accounts for each year. The next step is the application of the corresponding formulas to compute all financial and nonfinancial measures. Finally, these files are merging to create three analytical databases, one for each year from 1999 to 2001. Each analytical database consists of the nonfinancial measures for the base year and the financial measures for the base year and the next three years. Table 4.1 describes the content of these three analytical databases.

Table 4.1. Description of the Content of the Analytical Databases

Base Year	*Nonfinancial Measures*	*Financial Measures*
1999	CMAD1999 CMAPD1999 FTE/OCCBED1999 WH/APD1999 OCCP1999 CMAD/BED1999 CMAD/FTE1999 JCAHO	TM: 1999 2000 2001 2002 NOM: 1999 2000 2001 2002 CFM: 1999 2000 2001 2002
2000	CMAD2000 CMAPD2000 FTE/OCCBED2000 WH/APD2000 OCCP2000 CMAD/BED2000 CMAD/FTE2000	TM: 2000 2001 2002 2003 NOM: 2000 2001 2002 2003 CFM: 2000 2001 2002 2003
2001	CMAD2001 CMAPD2001 FTE/OCCBED2001 WH/APD2001 OCCP2001 CMAD/BED2001 CMAD/FTE2001	TM: 2001 2002 2003 2004 NOM: 2001 2002 2003 2004 CFM: 2001 2002 2003 2004

The Medicare cost report form[15] classified the hospitals into nine different categories according to the type of services they provide. These are: (1) general short-

[15] FORM CMS-2552-96

term; (2) general long-term[16] ; (3) cancer; (4) psychiatric; (5) rehabilitation; (6) religious non-medical health care institution; (7) children; (8) alcohol and drug; and (9) other.

Our analytical databases consist of hospitals of different types. Table 4.2 summarizes the number of hospitals under each category:

Table 4.2. Number of Hospitals by Types

Type of Hospital	*1999**	*2000***	*2001****
1. General Short-term	644	629	613
2. General Long-term	54	59	55
3. Cancer	2	1	1
4. Psychiatric	139	130	113
5. Rehabilitation	90	91	88
6. Religious Non-medical Health Care	0	0	0
7. Children	0	1	1
8. Alcohol and Drug	3	4	3
9. Other	2	3	2

Missing information about classification: * = 124 ** = 140 *** = 182

Based on these numbers, the four main categories represented in our analytical databases are: (1) general short-term, (2) psychiatric, (3) rehabilitation, and (4) general long-term.

[16] Long term care hospitals are hospitals organized to provide long term treatment programs with lengths of stay greater than 25 days. These hospitals may be identified in two ways: (1) those hospitals properly identified by a distinct type of facility code in the third digit of the Medicare provider number; or (2) those hospitals that are certified as other than long term care hospitals, but which have lengths or stay greater than 25 days.

Before entering in the details about the design of the methodology, it is necessary to point out three key aspects of these databases which determine the availability of the data for each variable and help to understand better the way in which they were processed and analyzed.

First, Medicare does not require to all types of hospitals to report the case-mix-index. For example, those hospitals under the psychiatric and the rehabilitation classification group are excluding from this requirement. This means, that those hospitals that do not need to submit the case-mix-index to Medicare are reflecting a missing value in those explanatory variables computed using the case-mix-index to adjust the measure. These measures are: CMAD, CMAPD, CMAD/BED, and CMAD/FTE. Therefore, only those hospitals considered as community hospitals (e.g., general short-term) count with these explanatory variables in the analytical databases.

Second, the nonfinancial measure representing quality is available only in the analytical database corresponding to year 1999. This is because, for the period under study, the JCAHO's visits were scheduled routinely every three years. Therefore, a hospital accredited by JCAHO in 1999 would have their next visit in year 2002. Recall that our nonfinancial measures cover the period from 1999 to 2001.

Third, those nonfinancial measures representing operational efficiency (e.g., FTE/OCCBED, WH/APD and OCCP) are the only measures available to all types of hospitals in these three analytical databases.

4.3.5 Statistical Analysis

The first two parts of this study consists to provide some evidence as to whether hospitals nonfinancial data may contribute to explain its profitability. The third part has the purpose to provide some evidence of the long-term impact of nonfinancial variables under study on hospitals' profitability.

4.3.5.1 Descriptive Statistics

The first step in the analysis is to produce the descriptive statistics for each dependent and explanatory variable to know the characteristics of the variables under study. Also, the descriptive statistics for each financial data used to calculate the profitability measures are produced.

4.3.5.2 ANOVA

In order to know the effect of the type of hospital on the financial performance, we are performing an analysis of variance (ANOVA).

In general, the purpose of analysis of variance (ANOVA) is to test for significant differences between means. As with the ANOVA, *repeated measures* ANOVA test the equality of means. However, a *repeated measures* ANOVA is used when the same characteristic for all members of a random sample are measures under a number of different conditions. Our databases follow a repeated measures design because the measures of profitability for each hospital under study (e.g., total margin, net operating margin and cash flow margin) are measure at different periods or years so that, the condition that changes is the year. If any repeated factor is present, then *repeated measure s* ANOVA should be used (Everitt, 1995; SAS Library, 1997).

Three different effects are tested: (1) the within-subjects main effect, (2) the between-subjects main effects, and (3) the within-subjects by between-subjects interaction effect. When a dependent variable is measured repeatedly for all sample members over a set of conditions (e.g., year), this set of conditions is called a within-subjects factor. When a dependent variable is measured on independent groups of sample members, where each group (e.g., type of hospital) is exposed to a different condition, the set of conditions is called a between-subjects factor. The conditions that constitute this factor type are called groups. When an analysis has both within-subjects factors and between subjects factors (e.g., year and type of hospital), it is called a *repeated measures* ANOVA with between-subjects factors. The specific questions are the following:

1. Within-subjects main effect: Does the year influence the financial performance?
    a. Is there a difference in the mean total margin because of the year?
    b. Is there a difference in the mean net operating margin because of the year?
    c. Is there a difference in the mean cash flow margin because of the year?
2. Between-subjects main effect: Does type of hospital influence the financial performance?

a. Do any type of hospital have different mean total margin than the other?

b. Do any type of hospital have different mean net operating margin than the other?

c. Do any type of hospital have different mean cash flow margin than the other?

3. Within-subjects by between–subjects interaction effect: Does the influence of the year on financial performance depend upon the type of hospital?

   a. Does the pattern of differences between mean total margins for a particular year of the period under study changes due to the type of hospital?

   b. Does the pattern of differences between mean net operating margins for a particular year of the period under study changes due to the type of hospital?

   c. Does the pattern of differences between mean cash flow margins for a particular year of the period under study changes due to the type of hospital?

For each of these questions, the null hypothesis tested is the hypothesis of no differences between population means. If the null hypothesis is rejected then, we can conclude that a difference between populations means exist due to the effect under testing.

4.3.5.3 Econometric Model

The main statistical technique used to test the hypotheses is the ordinary least squares regression. The dependent variables consist of the profitability margins as measured by total margin, the net operating margin and, the cash flow margin. The explanatory variables are the nonfinancial measures representing output, operational efficiency, productivity and quality of care. Our basic general econometric model is expressed as:

$$HP_{it} = \beta_1 + \beta_2 O_{it} + \beta_3 E_{it} + \beta_4 P_{it} + \beta_5 Q_{it} + \varepsilon_{it}$$

Where HP_{it} represents hospital profitability as measured by the total margin, the net operating margin and, the cash flow margin for hospital *i* in time period *t*. O_{it} represents output as measured by the CMAD and the CMAPD for hospital *i* in time period *t*. E_{it} represents operational efficiency as measured by the FTE/OCCBED, the WH/APD and, the OCCP for hospital *i* in time period *t*. P_{it} represents productivity as measured by the CMAD/BED and the CMAD/FTE for hospital *i* in time period *t*. Q_{it} represents quality as measured by the compliance with the JCAHO performance standards for hospital *i* in time period *t*. Finally, ε_{it} represents the random error. The time period for our analysis is from 1999 to 2004.

One common problem of panel data is the statistical dependence among multiple observations from the same individual (e.g., hospital). Repeated observations on the same individual are likely to be positively correlated. In order to correct for dependence, we are using the robust standard errors' method. Robust standard errors are standard error estimates that correct for dependence among repeated observations. This method is also known as Huber-White standard errors (Allison, 2009; Greene, 2008).

4.3.5.4 Model Selection Criteria

We have three dependent variables: total margin, net operating margin and, cash flow margin, related to eight explanatory variables corresponding to output, operational efficiency, productivity and, quality measures. In order to compare and select those models that best fit the data, we are using the following selection criteria: (1) the R-squared; (2) the adjusted R-squared; (3) the Mallows Cp statistic, and (4) the Akaike's information criteria.

The coefficient of determination R-squared is the percentage of the variability of the dependent variable that is explained by the variation of the independent variables. The closer the model fits the data, the larger the R-squared will be. R-squared is a function of the total sum of squares (*SST*) and the errors sum of squares (*SSE*) and is shown in the following equation:

$$R^2 = 1 - \frac{SSE}{SST}$$

Due to the way in which the R-squared is defined, the full model that is, the model containing all the explanatory variables which could possibly be present in the final model, will always have the largest R^2, whether the extra variables provide any important information about the response variable or not (Larsen, 2008). R^2 cannot fall when variables are added to a model, so there is a built-in tendency to overfit the model. This criterion may point us away from the best forecasting model, because adding variables to the model may increase the variance of the forecast error despite the improved fit to the data (Greene, 2008). Because the adjusted R-squared does not necessarily increase when the number of explanatory variables increases, a common way to avoid this problem is to use an adjusted version of the R^2 instead of R-squared itself. According to the adjusted R-squared criteria, one should choose the model which has the largest adjusted R-squared. The adjusted R-squared statistic, for a model with *k* explanatory variables, is given by:

$$R_a^2 = 1 - \frac{n-1}{n-k-1}(1-R^2)$$

Where *(n-1)* represents the total degrees of freedom, *(n-k-1)* represents the error degrees of freedom and the R^2 represents the coefficient of determination.

One of the commonly used methods is to perform all possible regressions and to compare the results on the basis of Mallows's C*p*-statistic (Gilmore, 1995). For a particular model with *p* parameters:

$$C_p = \frac{SSE_p}{S^2} - n + 2p ,$$

Where SSE_p is the error sum of squares from the model being considered, S^2 is an estimate of the error variance and n is the number of observations. The mean-squared error (MSE) for the full or the complete model is often used as the estimate of the error variance. This method consists of plotting Cp against p for all possible regressions and choosing an equation with low Cp or with the Cp close to p. This criterion is based on the premise that if the error variance is known, any model which provides unbiased estimates of the regression coefficients or which contains all important regressors, has $E(Cp) = p$.

Akaike introduced the concept of information criteria as a tool for optimal model selection in 1973. AIC is a measure of goodness of fit or uncertainty for the range of values of the data (Beal, 2005). In the context of multiple linear regressions, information criteria measure the difference between a given model and the "true" underlying model. AIC is a function of the number of observations n, the sum of squared errors (SSE) and the number of parameters p, as shown below:

$$AIC = n \cdot ln\left(\frac{SSE}{n}\right) + 2p$$

The first term in the equation is a measure of the model lack of fit while the second term is a penalty term for additional parameters in the model. Therefore, as the number of parameters p included in the model increases, the lack of fit term decreases while the penalty term increases. Conversely, as variables are dropped from the model the lack of fit term increases while the penalty term decreases. The model with the smallest AIC is deemed the best model since it minimizes the difference from the given model to the "true" model.

First of all, we are going to define the full model which is given by:

$$HP_{it} = \beta_0 + \beta_1 CMAD_{it} + \beta_2 CMAPD_{it} + \beta_3 FTE/OCCBED_{it} + \beta_4 WH/APD_{it}$$

$$+\beta_5 OCCP_{it} + \beta_6 CMAD/BED_{it} + \beta_7 CMAD/FTE_{it} + \beta_8 JCAHO_{it} + \varepsilon_{it}$$

Where HP_{it} represents hospital profitability as measured by the total margin, the net operating margin and, the cash flow margin for hospital *i* in time period *t*. $CMAD_{it}$ represents the case-mix-adjusted discharges for hospital *i* in time period *t*. $CMAPD_{it}$ represents the case-mix-adjusted patient days for hospital *i* in period *t*. $FTE/OCCBED_{it}$ represents the full time equivalent employees per occupied bed for hospital *i* in period *t*. WH/APD_{it} represents the work hours per adjusted patient day for hospital *i* in period *t*. $OCCP_{it}$ represents the occupancy rate for hospital *i* in time period *t*. $CMAD/BED_{it}$ represents the case-mix-adjusted discharges per bed for hospital *i* in time period *t*. $CMAD/FTE_{it}$ represents the case-mix-adjusted discharges per full time equivalent employee for hospital *i* in time period *t*. $JCAHO_{it}$ represents quality as measured by the compliance with the JCAHO performance standards for hospital *i* in time period *t*. Finally, ε_{it} represents the random error. The time period for our analysis is from 1999 to 2004.

Then, using the selection criteria, we compare the full model with a reduced model, which is a restriction of the full model. If the reduced model provides as good a fit to the data as the full model, then we prefer the reduced model.

4.3.5.5 Long-term Impact versus Short-term Impact

We hypothesized that the long-term impact of the nonfinancial measures on the financial performance is greater than the short-term impact. After the selection of the model that best fits the data in both periods, the short and the long-term, the next step is to do two different OLS regressions. One OLS regression examines the short-term impact and the other, the long-term impact.

Short-term performance model: $HP_{i,t+1} = \beta_0 + \beta_1 O_{it} + \beta_2 E_{it} + \beta_3 P_{it} + \beta_4 Q_{it} + \varepsilon_{it}$

Long-term performance model: $HP_{i,t+3} = \beta_0 + \beta_1 O_{it} + \beta_2 E_{it} + \beta_3 P_{it} + \beta_4 Q_{it} + \varepsilon_{it}$

Where HP_{it} represents hospital profitability as measured by the total margin, the net operating margin and, the cash flow margin for hospital *i* in time period *t+1* (short-term) or *t+3* (long-term). O_{it} represents output as measured by the CMAD and the CMAPD for hospital *i* in time period *t*. E_{it} represents operational efficiency as measured by the FTE/OCCBED, the WH/APD and, the OCCP for hospital *i* in time period *t*. P_{it} represents productivity as measured by the CMAD/BED and the CMAD/FTE for hospital *i* in time period *t*. Q_{it} represents quality as measured by the compliance with the

JCAHO performance standards for hospital *i* in time period *t*. Finally, ε_{it} represents the random error. The time period for our analysis is from 1999 to 2001.

Using the results of the OLS regressions we can compare the regression coefficients of the short-term model with the regression coefficients of the long-term model to test the null hypothesis of no difference between the parameter estimates.

According to Clogg et al., (1995), in large samples, the significance of the difference between the coefficients can be assessed with the statistic:

$$Z = \frac{\beta_{i,1} - \beta_{i,2}}{\sqrt{(SE of \beta_{i,1})^2 + (SE of \beta_{i,2})^2}}$$

This follows a standard unit normal under the null hypothesis of equality of the two coefficients. The standard error of the difference is the square root of the sum of the two squared standard errors, assuming that the samples are independent.

In our case, $\beta_{i,1}$ and $\beta_{i,2}$ represent the regression coefficients for the short and the long-term period regression, respectively and, *SE of* $\beta i,_1$ and *SE of* $\beta_{i,2}$ represent the standard error of the coefficients.

We reject the null hypothesis of no difference between the coefficients, if the value of *Z* is greater than +1.96 or lesser than -1.96 (p< 5%). If not, it may be reasonable to accept the hypothesis that the coefficients are the same for both periods. Through this test it is possible to detect if there is any difference between the estimates of the parameters which may imply or suggest a greater impact in the long-term.

4.4 Summary

This chapter covers the theoretical framework for the development of the hypothesis and the design of the research. Three analytical databases are created, one for each year from 1999 to 2001, by merging nonfinancial and financial performance measures files. Each analytical database consists of nonfinancial measures and financial performance measures for the *base year* and the next three years after the *base year*. The analytical databases consist of hospitals of different types. In order to know the effect of the type of hospital on the financial performance, we are performing an analysis of variance (ANOVA). Using the repeated measures ANOVA technique we are testing the null hypothesis of no differences between population means.

Descriptive statistics for each dependent and explanatory variable are calculated to know their characteristics. We examine the relevance of nonfinancial measures representing output, operational efficiency, productivity and quality in determining a hospital's financial performance measured by total margin, net operating margin and cash flow margin. The main statistical technique used to test the hypotheses is the ordinary least squares regression. Our basic general econometric model is expressed as:

$$HP_{it} = \beta_1 + \beta_2 O_{it} + \beta_3 E_{it} + \beta_4 P_{it} + \beta_5 Q_{it} + \varepsilon_{it}$$

We are using four selection criteria in order to compare and select the models that best fit the data: (1) the R-squared, (2) the adjusted R-squared, (3) the Mallows Cp statistic, and (4) the Akaike's information criteria.

Finally, we attempt to provide some evidence of the long-term impact of nonfinancial performance measures on financial performance. We hypothesized that the long-term impact is greater than the short-term impact.

CHAPTER 5

EMPIRICAL RESULTS

5.1 Introduction

This chapter presents the empirical results of the statistical analysis performed and a discussion of the findings including the following: (1) summary of the descriptive statistics of the most relevant accounts of the statement of revenues and expenses for the hospitals under study, (2) descriptive statistics for each variable under study, (3) the repeated measures ANOVA performed to measure the effect of the year and the type of hospital on the financial performance, (4) the regression models, and (5) the comparison between the long-term and the short-term impact of nonfinancial performance measures on hospitals' financial performance.

5.2 Descriptive Statistics of the Statement of Revenues and Expenses Accounts

One of the main distinctions between the operation of a hospital and the operation of a commercial business is the source of the revenues to support the institution. Usually, commercial business buys or manufactures goods or provides services at a certain price and sells these products directly to their consumer in a competitive or quasi-competitive market at prices which will return a profit. A hospital's revenue come predominantly from third parties therefore, they play a highly important role in the operation of a hospital. A third party is an agent other than the patient, who contracts to pay all or part of a patient's hospital bill. Among them are the commercial health insurance companies, Medicare, Medicaid and other workers' compensation programs. In this business relationship, the first two parties are constituted by hospitals and patients.

The major portion of third party contracts call for reimbursements based on the reasonable and allowable costs of the hospital. These costs are not necessarily equivalent to the full cost or total cost incurred in operating the hospital. A hospital develops expenses in its operation which can be pointed to as part of the total process of medical and nursing care but not directly. Some of these costs have been rejected by large third party purchasers of care arguing that these costs are not directly related to the care that their clients are receiving or to any nursing, medical or services they were contracted with the hospital.

The next section of this chapter examines the descriptive statistics of the data extracted from the Medicare cost reports' statement of revenues and expenses[17] from 1999 to 2004, for the main accounts including: total patient revenue, contractual allowances and discounts on patients' accounts, operating expenses, and net income. The descriptive statistics' tables containing the remaining accounts are in Table A.10 in the Appendix A.

[17] Worksheet G-3 Form CMS-2552-96

5.2.1 Total Patient Revenue

The total patient revenue account represents the total impatient routine care services composed by the sum of the general impatient care services and the total intensive care type inpatient hospital services plus other outpatient services. Table 5.1 summarizes the descriptive statistics as the result of the analysis.

Table 5.1. Descriptive Statistics for Total Patient Revenue

Year	*n*	*Minimum*	*Maximum*	*Mean*	*Median*	*Standard Deviation*
1999	919	$2,137,178	$1,475,986,722	$108,328,423	$50,425,987	149,466,986
2000	914	409,511	2,143,935,805	127,943,049	57,634,471	182,125,074
2001	872	1,608,862	2,473,872,172	153,746,643	66,824,765	221,678,409
2002	847	721,275	1,987,451,781	182,223,210	76,061,920	253,936,309
2003	826	620,187	2,183,299,653	193,117,046	83,342,751	266,207,001
2004	802	583,511	2,470,165,134	214,146,850	99,979,134	288,221,497

Note: Total hospitals = 1058

The tendency to increase in the total patient revenue mean value is greater from 1999 to 2001. Since then, the mean value tend to increase, but at a lower rate. The average rate of change across the period is equivalent to 14.73%. The standard deviation of the total patient revenue for year 2001 is 144.18% of its mean. This is the highest coefficient of variation then, the relative spread around the mean is greater for year 2001 than for the remaining period. Year 2004 has the lower relative spread around the mean; its coefficient of variation is 134.59%.

5.2.2 Contractual Allowances and Discounts on Patients' Accounts

Due to the influences of the cost-based reimbursement and differing payment levels of third party payers, hospitals have adopted a general ledger account entitled *Allowances for Contractual Deductions*. The purpose of this account is to record the aggregate difference between the hospitals billed charges and the amounts actually received as payment from third party payers. The allowances for contractual provide creditors and management with a readily available measurement of the markup the hospital incorporates in its prices to cover unrecognized expenses. Table 5.2 presents the descriptive statistics of the contractual allowances and discounts on patients' accounts**.**

Table 5.2. Descriptive Statistics for Contractual Allowances and Discounts

Year	*n*	*Minimum*	*Maximum*	*Mean*	*Median*	*Standard Deviation*
1999	906	$6,614	$1,269,963,379	$67,412,793	$26,789,763	104,388,341
2000	904	62,297	1,823,827,657	82,245,002	30,493,359	133,914,067
2001	870	162,988	2,076,655,506	101,618,037	37,989,050	166,144,821
2002	843	182,841	1,281,052,283	124,830,479	43,506,730	192,722,272
2003	822	287,987	1,414,354,780	135,523,003	53,285,247	203,557,112
2004	798	302,584	1,592,087,575	153,952,031	61,821,125	219,910,575

Note: Total hospitals = 1058

The average rate of change of the mean contractual allowances and discounts on patients' accounts is 18.11% across the period. The standard deviation of the contractual allowances and discounts on patients' accounts for year 2001 is 163.20% of its mean. This is the highest coefficient of variation. Year 2004 has the lower relative spread around the mean, with a coefficient of variation of 142.84%.

5.2.3 Operating Expenses

Table 5.3 presents the descriptive statistics of hospitals' total operating expenses during the period.

Table 5. 3. Descriptive Statistics for Total Operating Expenses

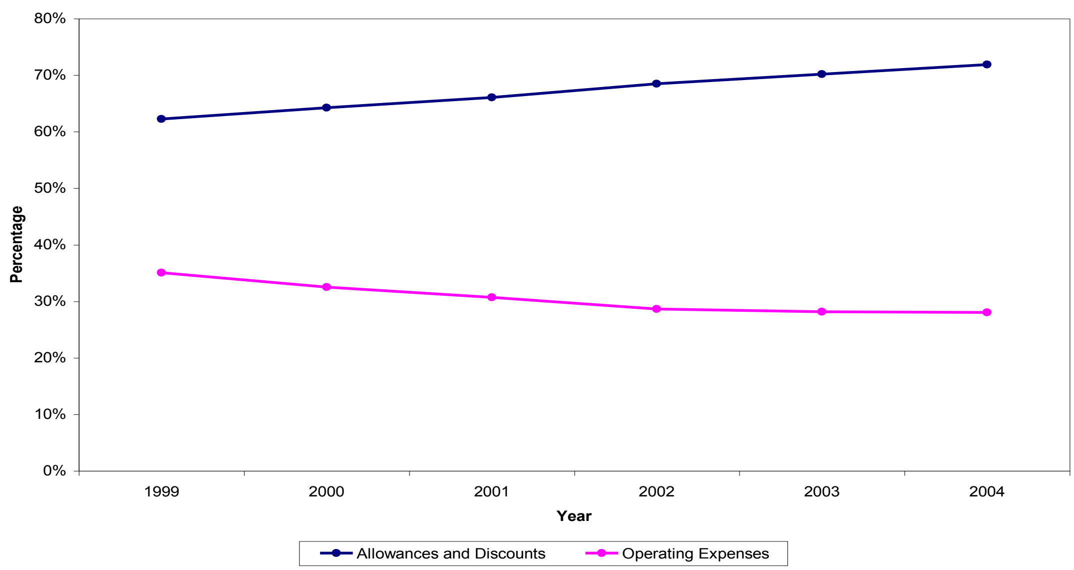
Year	*n*	*Minimum*	*Maximum*	*Mean*	*Median*	*Standard Deviation*
1999	933	$2,009,580	$482,026,305	$37,966,803	$22,442,176	44,628,432
2000	917	310,845	504,361,498	41,614,718	24,346,782	48,856,225
2001	875	1,883,999	563,791,531	47,242,458	27,469,056	55,692,965
2002	850	790,242	637,560,040	52,172,579	30,176,616	62,517,183
2003	827	241,213	684,230,561	54,413,313	30,136,553	64,107,778
2004	804	627,184	706,550,343	60,031,726	34,160,913	70,130,368

Note: Total hospitals = 1058

The average rate of change of the mean of the total operating expenses across the period is equivalent to 9.64%. The standard deviation of the total operating expenses for year 2002 is 119.83% of its mean. This is the highest coefficient of variation. This year, the relative spread around the mean was greater than for the remaining period, which fluctuates around 117%. Year 2004 has the lower relative spread around the mean, with a coefficient of variation of 116.82%.

Note, that the average rate of change of the mean of the contractual allowances and discounts on patients' accounts is higher than the average rate of change of the mean of the total operating expenses. Figure 5.1 shows the percentage that each account's mean value represent of the mean value of the total patient revenue.

Figure 5.1. Mean of Contractual Allowances and Discounts and Mean of Operating Expenses as Percentage of Total Patient Revenues' Mean



The mean of contractual allowance and discounts as a percentage of the mean of the total patient revenues increased while the mean of the operating expenses as percentage of the mean of the total patient revenues, tend to decrease over the years. This suggests an important effect of the contractual allowances and discounts on the profitability of the hospitals under study.

5.2.4 Net Income

Table 5.4 presents the descriptive statistics for the net income. The net income is computed by the difference between the total income[18] and the total other expenses.

Table 5. 4. Descriptive Statistics for Net Income

Year	*n*	*Minimum*	*Maximum*	*Mean*	*Median*	*Standard Deviation*
1999	933	$ (69,905,810)	$ 473,664,180	$3,881,639	$ 562,774	19,782,744
2000	917	(33,338,809)	504,369,682	5,449,314	535,883	22,035,484
2001	875	(134,337,489)	347,046,445	5,502,914	1,028,630	20,731,869
2002	850	(154,593,563)	65,804,779	6,387,666	2,095,377	16,956,439
2003	827	(85,525,416)	88,000,061	4,139,323	1,293,783	13,383,284
2004	804	(56,279,809)	204,308,991	4,193,677	1,418,634	15,887,344

Note: Total hospitals = 1058

This tendency to decrease in the mean operating expenses over the years suggests that hospitals have been more efficient however; unrecognized expenses by third party payers still have a high impact on net income. The average rate of change of the mean of the net income is 4.71% over the period.

[18] Total income=Net Income from services to patients + Total Other Income

5.3 Descriptive Statistics of the Variables Under Study

Table 5.5 shows the mean, standard deviation and coefficient correlation for each independent (explanatory) and dependent variable. They are computed using all the available data for the period under study in each case. The descriptive statistics for the independent variables are computed using the data from 1999 to 2001 while the descriptive statistics for the dependent variables, are computed using the data from 1999 to 2004. Table A.6 in the Appendix A shows the minimum and the maximum value, the mean, the standard deviation and the coefficient of variation for each independent and dependent variable for the four main types of hospitals: general short-term, general long-term, psychiatric, and rehabilitation.

5.3.1 Dependent Variables

Total margin ratio defines the percentage of the total revenue that has been realized in the form of net income, or excess revenues over expenses. This measure puts income from all sources in perspective with all revenues received by a hospital. It is measured by dividing the net income by the sum of the net patient revenues and the total other income. Average total margin is 3.11%; its standard deviation is 0.34.

Net operating margin is a ratio of operating income to total operating revenue. This measure places operating income in perspective with the volume of business realized by the facility. This measure assesses the generation of a profit or loss from hospital's primary line of business. The net operating margin is computed by dividing the

Table 5.5. Descriptive Statistics and Correlations for Dependent and Independent Variables

Dependent Variables	Mean	Standard Deviation	N	1	2	3
1. TM	0.0311	0.3376	5186	1.00		
2. NOM	0.0141	0.4071	5186	0.8299****	1.00	
3. CFM	0.7137	0.2048	4963	0.1701****	0.1691****	1.00

Explanatory Variables	Mean	Standard Deviation	N	1	2	3	4	5	6	7	8
1. CMAD	8492	9043	1898	1.00							
2. CMAPD	58665	61101	1879	0.963****	1.00						
3. FTE/OCCBED	4.3051	2.5485	2687	-0.159****	-0.178****	1.00					
4. WH/APD	25.3296	11.9341	2666	-0.217****	-0.240****	0.858****	1.00				
5. OCCP	0.5239	0.2194	2719	0.562****	0.5443****	-0.378****	-0.440****	1.00			
6. CMAD/BED	53.2967	38.2457	1898	0.432****	0.384****	-0.151****	-0.214****	0.586****	1.00		
7. CMAD/FTE	15.6561	11.2412	1896	0.299****	0.251****	-0.281****	-0.355****	0.326****	0.274****	1.00	
8. JCAHO	5.4048	1.2645	499	0.054	0.078	-0.006	-0.0496	0.105**	0.131***	0.079*	1.00

*Note: *P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.0001; p-values are the result of two-tailed tests of significance* net income from services to patients by the net patient revenues. Average net operating margin is 1.41%; its standard deviation is 0.41.

The standard deviation for net operating margins is 2889.34% of its mean and that for the total margins is 1083.83% of its mean. Since the coefficient of variation for total margin is lower than the coefficient of variation for the net operating margin, the total margin have a lower relative spread than the net operating margin. The median of the total margin is 4.77%, while the median of the net operating margin is 3.86%. There is a strong positive correlation between the total margin and the net operating margin, $R = 0.8299$, $p < 0.0001$.

Cash flow margin is a broader measure of profitability because hospitals can generate substantial revenues from non-operating sources and non-patient care business activities such as investment income, donations, and non-patient care activities. From a financial perspective, strength in the cash flow ratio should facilitate meeting short-term and long-term obligations, and thus, it represents a good all-around measure of hospital financial health (Bazolli et al., 2007b). The cash flow margin is measured by dividing the sum of net income, the contractual allowances and discounts on patients' account and the depreciation by the total patient revenues. Average cash flow margin is 71.37%; the median is 73.39%; and the standard deviation is 0.20. The coefficient of variation is 28.70%; a lower relative spread than the total margin and the net operating margin. Cash flow margin is positively correlated with the total margin, $R = 0.1701$, $p < 0.0001$, and with the net operating margin, $R = 0.1691$, $p < 0.0001$. Although these correlations are significant they are not as strong as the correlation between the total margin and the net operating margin.

5.3.2. Explanatory Variables

5.3.2.1. Output Measures

CMAD provides information on the volume of patients treated and discharged annually. Average CAMD is 8,492 patients per hospital; the median is 8,492 patients; and the standard deviation is 9,043 patients. Its coefficient of variation is 106.48%.

CMAPD provides information on the total length of stay of all patients treated and discharged annually. It is computed by multiplying the adjusted patient days by the case-mix-index. Average CMAPD is 58,665 days per hospital; the median is 38,618 days; and the standard deviation is 61,101 days. Its coefficient of variation is 104.15%.

The relative spread of CMADs is slightly higher than the relative spread of the CMAPDs. Also, their correlation coefficient is significant and close to one, $R = 0.9627$, $p < 0.0001$, then both variables, CMAD and CMAPD, have a strong positive correlation. If the number of patients discharged increases it is expected that the number of patient days will be higher, and vice versa. Both output measures, are positively correlated with each financial performance measure under study; correlation coefficients range from 13.59% to 25.69%. The highest correlation coefficient is the correlation between CMAD and the cash flow margin.

5.3.2.2 Operational Efficiency Measures

These measures are ratios of inputs to outputs used to measure hospital operations. FTE/OCCBED provides information on how many workers are employed to provide services to inpatients. It is computed by dividing the total full-time-equivalent employees by the adjusted occupied beds. Average FTE/OCCBED is 4.31 employees, its median is 3.92 employees; the standard deviation is 2.55 employees. Its coefficient of variation is 59.20%.

WH/APD provides information of how many man hours are employed per patient day to provide services to inpatients. The WH/APD is computed by dividing the total annual work hours (total FTEs x 2080) by the adjusted annual patient days. Average WH/APD is 25.33 hours per patient day; the median is 23.11 hours; the standard deviation is 11.93 hours. Its coefficient of variation is 47.12%.

OCCP represents a measure of hospital existing capacity utilization of beds (occupancy rate). In other words, we refer to the extent to which beds are fully occupied. The OCCP is computed by dividing the total annual patient days by the total annual bed days. Both, average and median value of OCCP are 52%. Its standard deviation is 0.22; the coefficient of variation is 41.88%.

Under the group of variables representing operational efficiency, the measure with the highest relative spread is FTE/OCCBED followed by WH/APD and then, OCCP. FTE/OCCBED and WH/APD have a strong positive correlation, R = 0.8575,

$p < 0.0001$. A change in the proportion of FTEs per occupied bed would produce a change in the same direction in the number of man hours employed per patient day. OCCP is negatively correlated with FTE/OCCBED, R=-0.3776, $p < 0.0001$. Assuming that the number of FTEs were constant or relatively stable, an increase in the occupancy rate would cause a reduction in the proportion of FTEs per occupied bed. As well as with the variable FTEs per occupied bed, OCCP is negatively correlated with WH/APD, R = -0.4401, $p < 0.0001$. Both, FTE/OCCBED and WH/APD, are negatively correlated with total margin, with net operating margin, and with cash flow margin thus, an increase in either of them would impact negatively the earnings as well as the cash flow.

Also, OCCP is positively correlated with CMAD (R = 0.5618, $p < 0.0001$), as well as with CMAPD (R = 0.5443, $p < 0.0001$). But also, OCCP is positively correlated with the total margin (R=8.31%), with the net operating margin (9.32%), and with the cash flow margin (R=3.80%).

5.3.2.3. Productivity Measures

These measures are ratios of outputs to inputs that represent capacity productivity and manpower productivity.

CMAD/BED is computed by dividing the CMAD by the number of beds. CMAD/BED provides a more accurate measure of total inpatient activity than discharges alone because it takes into account the beds capacity. As much as CMAD/BED increases, inpatient activity or turnover is greater. The expected consequence is a highly impact on the level of revenue. Average CMAD/BED is 53.30 patients discharged per bed; the median is 49.69 patients discharged; the standard deviation is 38.25 patients discharged. Its coefficient of variation is 71.76%.

CMAD/FTE is computed by dividing CMAD by full-time-equivalent employees. Average CMAD/FTE is 15.66 patients discharged per employee; the median is 15.55 patients discharged; the standard deviation is 11.24 patients discharged. Its coefficient of variation is 71.80%.

The relative spread of the CMAD/FTEs is almost equal to the relative spread of the CMAD/BEDs. Also, they are positively correlated: $R = 0.2738$, $p < 0.0001$. Both productivity measures are positively correlated with the total margin, the net operating margin, and the cash flow margin thus, any change in either of them would impact earnings as well as the cash flow in the same direction.

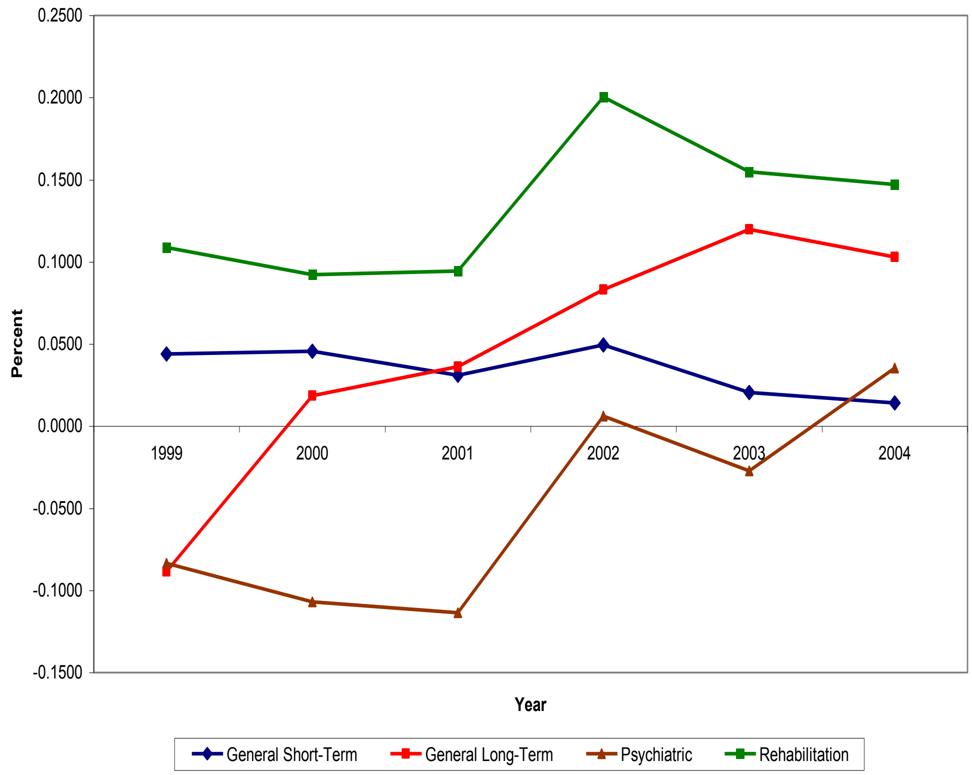
5.3.2.4 Quality Measure

Recall that our quality measure (JCAHO) summarized in one single index the results of the compliance of the hospitals under study with the following performance areas are: (1) initial assessment procedures for admitted patients, (2) processes to organize and monitor medication use, (3) processes to organize and monitor anesthesia care, (4) processes to organize and monitor operative procedures, (5) human resources assessment of staff competency, (6) management of patient specific information, and (7) surveillance, prevention, and control of infection. Hospitals in compliance received a one (1), while those out of compliance received a zero (0) value. Each hospital has an index that range from zero to seven. A hospital which is in compliance with these seven performance areas has a maximum index value of seven. Our analytical database includes only those investor-owned multihospital systems' hospitals accredited by JCAHO in 1999. This is 499 hospitals, which represent 47% of the total hospitals under study. Forty one hospitals have an index equal or less than three (8.22%); 205 hospitals have an index equal to four or five (41.08%); and the remaining 253 hospitals have an index equal or greater than six (50.70%). The average JCAHO index is 5.40 per hospital and its standard deviation is 1.26. Variable JCAHO is positively correlated with other three explanatory variables: CMAD/BED, $R = 0.1314$, $p < 0.01$; CMAD/FTE, $R = 0.0792$, $p < 0.10$; and OCCP, $R = 0.1051$, $p < 0.05$. Also, JCAHO is positively correlated with the total margin, with the net operating margin, and with the cash flow margin.

5.4 Analysis of Variance (ANOVA)

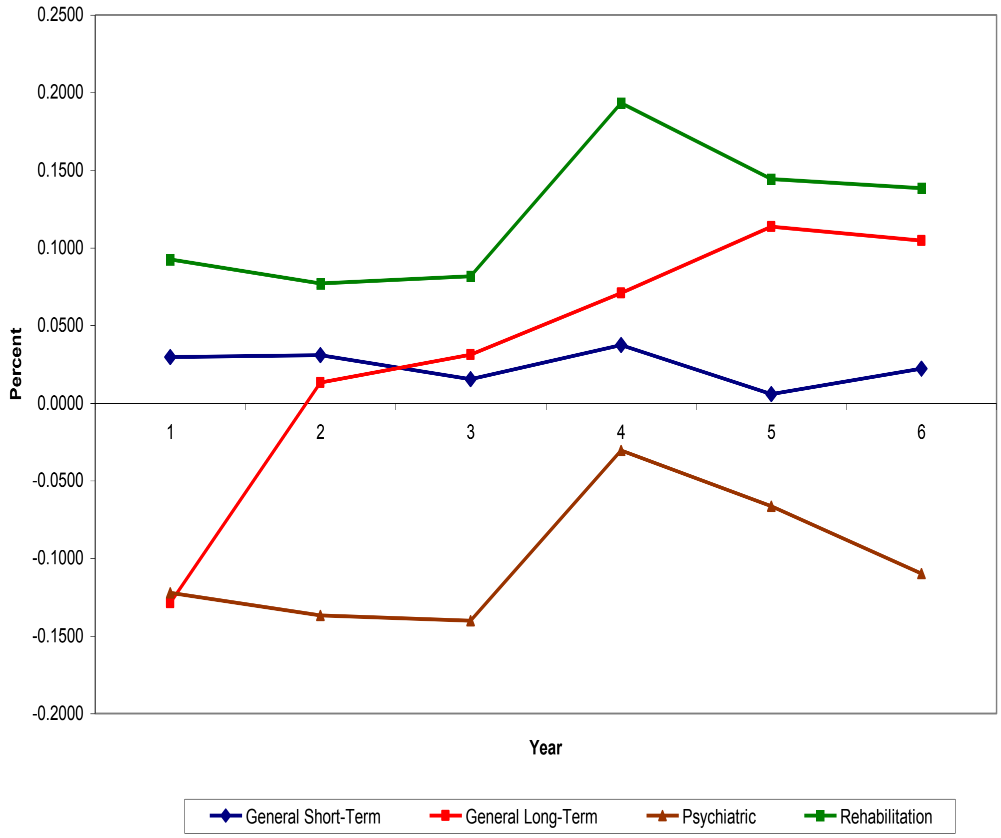
Recall that our analytical databases consist of hospitals of different types. The four main categories are: general short-term, general long-term, psychiatric, and rehabilitation. In order to examine if the type of hospital may influence the value of the dependent variables first, we plotted the means of the financial performance measures by type of hospital for every year. Figures 5.2 to 5.4 show the graphs of the means corresponding to the total margin, the net operating margin and the cash flow margin during the period under study. Each graph compares the four main types of hospitals over the years. Note the difference in the mean values of each financial performance measure between the main types of hospitals over the years.

Figure 5.2. Means of Total Margin over the Years for the Main Types of Hospitals



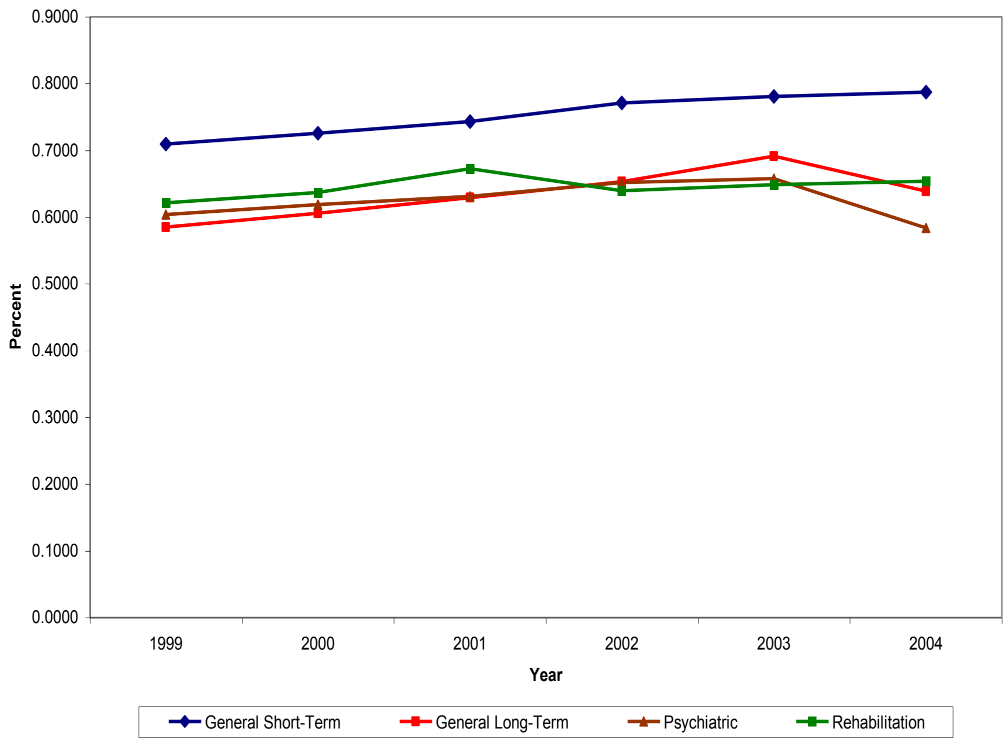
The group of rehabilitation hospitals exhibits means total margin over the years that are higher than the means total margin of the remaining groups for the same period.

Figure 5.3. Means of Net Operating Margin over the Years for the Main Types of Hospitals



In the case of the net operating margin, the main types of hospitals follow a similar pattern to that exhibited by the means total margin. The group of rehabilitation hospitals exhibits higher averages net operating margin over the years.

Figure 5.4. Means of Cash Flow Margin over the Years for the Main Types of Hospitals



Unlike the total margin and the net operating margin, the group of general short-term hospitals shows averages cash flow margin over the years greater than those exhibited by the remaining groups.

Using the *repeated measures* ANOVA we compare the effect of the year and the type of hospital on the total margin, the net operating margin and the cash flow margin. The null hypothesis tested is the hypothesis of no differences between population means because of the year or due to the hospital type. Three different effects are tested: (1) the within-subjects main effect, (2) the between-subjects main effects, and (3) the within-subjects by between-subjects interaction effect.

Repeated measures ANOVA carries a standard set of assumptions associated with the ordinary analysis of variance extended to the matrix case, these are: multivariate normality, homogeneity of covariance matrices, and independence. Violations of independence produce a nonnormal distribution of the residuals, which results in invalid F- ratios. In addition to these assumptions, the univariate approach to tests the within-subjects effects requires the assumption of sphericity. Mauchly's sphericity test examines the form of the common variance matrix. A spherical matrix has equal variances and covariances equal to zero (Greene, 2008). If the Chi-square approximation has an associated p-value less than the *Type I error* (alpha level selected), the sphericity assumption has been violated. If the sphericity does not hold, the univariate F-tests may be adapted to non-sphericity by estimating a correction factor that measures the departure from sphericity. Two methods of estimating the correction factor are the Greenhouse and Geisser, and the Huynh-Feldt. An alternative to the use of correction factors when the sphericity assumption does not hold is to adopt a multivariate approach to the repeated measures. The main advantage of this method is that no assumptions are made about the form of the covariance matrix of the repeated measures (Everitt, 1995).

Appendix B contains the *repeated measures* ANOVA output for the data. Our acceptable level of *Type I error* is $\alpha = 0.05$ (two-tailed test). According to the Mauchly's criterion, the sphericity assumption does not hold, because all of the Chi-square approximation has an associated p-value: $p < 0.0001$, which is less than $\alpha = 0.05$. Therefore, we are adopting the multivariate approach to test our hypotheses of no differences between the population means.

The first effect tested is the within subject main effects by examining the year effect on hospitals' financial performance. The specific questions are:

- Is there a difference in the mean total margin because of the year?
- Is there a difference in the mean net operating margin because of the year?
- Is there a difference in the mean cash flow margin because of the year?

Table 5.6 shows the result of the multivariate analysis of variance which reports the Wilks' Lambda statistic for each profitability measure.

Table 5.6. Analysis of Variance: Year Effect

	Wilks' Lambda Statistic				
	Value	*F-Value*	*Df*	*Den Df*	*P*
Total Margin	0.99615232	0.58	5	757	0.7117
Net Operating Margin	0.99478253	0.79	5	757	0.5541
Cash Flow Margin	0.99189622	1.08	5	664	0.3674

Repeated measures ANOVA are conducted to compare the effect of the year on each profitability measure. The effect of the year on total margin is not significant, Wilks' Lambda = 0.9962, $F(5,757) = 0.58$, $p = 0.7117$. Also, the effect of the year on net operating margin is not significant, Wilks' Lambda = 0.9948, $F(5,757) = 0.79$, p = 0.5541. Finally, the effect of the year on cash flow margin is not significant, Wilks' Lambda = 0.9919, F(5,664) = 1.08, p = 0.3674.

These results suggest that the year itself does not have an effect on the total margin, the net operating margin and the cash flow margin. Any difference between the means does not depend on the year.

The second effect tested is the between-subjects main effect to examine whether the type of hospital influences profitability. The specific questions are:

- Do any type of hospital have different mean total margin than the other?
- Do any type of hospital have different mean net operating margin than the other?
- Do any type of hospital have different mean cash flow margin than the other?

Table 5.7 shows the output of the analysis of variance which reports the sources, the sum of the squares, the degrees of freedom, the mean square, and the associated F and P values for each financial performance measure.

Table 5.7. Analysis of Variance: Hospital Type Effect

	Repeated Measures Analysis of Variance				
	Sum of Squares	*Df*	*Mean Square*	*F value*	*P*
Total Margin					
Hospital Type	5.9666	7	0.8524	6.53	< 0.0001
Error	99.3132	761	0.1305		
Net Operating Margin					
Hospital Type	7.1948	7	1.0278	6.07	< 0.0001
Error	128.7543	761	0.1692		
Cash Flow Margin					
Hospital Type	12.8959	6	2.1493	23.37	< 0.0001
Error	61.4261	668	0.0920		

The *repeated measures* ANOVA conducted to compare the effect of the type of hospital on the total margin, the net operating margin and the cash flow margin demonstrates that there is a significant effect of the type of hospital on total margin, $F = 6.53$, $p < 0.0001$; on the net operating margin, $F = 6.07$, $p < 0.0001$; and on the cash flow margin, $F = 23.37$, $p < 0.0001$.

These results suggest that the type of hospital really does have an effect on the total margin, the net operating margin and the cash flow margin.

The third effect tested is the within-subjects by between–subjects interaction effect to determine the interaction effect between year and hospital type on hospitals' financial performance. The specific questions are:

- Does the pattern of differences between mean total margins for a particular year of the period under study changes due to the type of hospital?
- Does the pattern of differences between mean net operating margins for a particular year of the period under study changes due to the type of hospital?
- Does the pattern of differences between mean cash flow margins for a particular year of the period under study changes due to the type of hospital?

Table 5.8 shows the result of the multivariate analysis of variance which reports the Wilks' Lambda statistic for each profitability measure for the effect of the interaction between the year and the type of hospital.

Table 5.8. Analysis of Variance: Year*Hospital Type Effect

	Wilks' Lambda Statistic				
	Value	*F-Value*	*Df*	*Den Df*	*P*
Total Margin	0.90777601	2.12	35	3186	0.0001
Net Operating Margin	0.91548748	1.93	35	3186	0.0008
Cash Flow Margin	0.87797931	2.93	30	2658	< 0.0001

The *repeated measures* ANOVA conducted to compare the effect of the interaction between the year and the type of hospital on the total margin, the net operating margin and the cash flow margin demonstrates that there is a significant effect on the total margin, Wilks' Lambda = 0.9078, $F(35,3186) = 2.12$, $p = 0.0001$; on the net operating margin, Wilks' Lambda = 0.9155, $F(35,3186) = 1.93$, $p = 0.0008$; and on the cash flow margin, Wilks' Lambda = 0.8779, $F(30,2658) = 2.93$, $p < 0.0001$.

The tests results to measure the effect of hospital type on total margin, net operating margin and cash flow margin, suggest that the group effect is significant. In other words, differences can be found in the average profitability (e.g., total margin, net operating margin, cash flow margin) due to the type of hospital. Unlike the group effect, the test results to compare the effect of the year on financial performance measures are not significant. This suggests that the year does not have an effect on hospitals' financial performance. However, when the year interacts with the type of hospital, the results suggest that we can find differences across the years due to the type of hospital.

5.5 Regression Analyses

One common problem of panel data is the statistical dependence among multiple observations from the same individual (e.g., hospital) because repeated observations on the same individual are likely to be positively correlated. To correct for dependence, we are using the robust standard errors' method. Robust standard errors are standard error estimates that correct for dependence among repeated hospitals. This method is also known as Huber-White standard errors (Allison, 2009; Greene, 2008).

All OLS regressions are performed for the current year, the short-term (one year after) and the long-term (three years later). The regression for the current year is a regression performed with data of the same year for both variables: dependent and independent. To model the short-term financial performance (examine the impact of the explanatory variables on the financial performance of one year after), we are using lags of one year in the explanatory variables. On the other hand, to model the long-term financial performance (examine the impact of the explanatory variables on the financial performance three years later), we are using lags of three years in the explanatory variables.

Also, all regressions are performed including and excluding the quality measure. Those regressions performed including the quality measure are using the 1999 analytical database, which is the only database that contains the measure of quality (JCAHO). The regressions performed excluding the quality measure are using all databases created but, we are excluding from the explanatory variables the JCAHO measure. It is important to note that, the number of hospitals used in the OLS regressions performed using the quality measure is lesser than the number of hospitals used in the OLS regressions performed after excluding the JCAHO measure.

Our basic general econometric model (full) is expressed as:

$$HP_{it+l} = \beta_0 + \beta_1 CMAD_{it} + \beta_2 CMAPD_{it} + \beta_3 FTE/OCCBED_{it} + \beta_4 WH/APD_{it}$$

$$+ \beta_5 OCCP_{it} + \beta_6 CMAD/BED_{it} + \beta_7 CMAD/FTE_{it} + \beta_8 JCAHO_{it} + \varepsilon_{it}$$

Where HP_{it+l} represents hospital profitability as measured by the total margin, the net operating margin and, the cash flow margin for hospital i in time period $t+l$. $CMAD_{it}$ represents the case-mix-adjusted discharges for hospital i in time period t. $CMAPD_{it}$ represents the case-mix-adjusted patient days for hospital i in period t. $FTE/OCCBED_{it}$ represents the full time equivalent employee per occupied bed for hospital i in period t. WH/APD_{it} represents the work hours per adjusted patient day for hospital i in period t. $OCCP_{it}$ represents the occupancy rate for hospital i in time period t. $CMAD/BED_{it}$ represents the case-mix-adjusted discharges per bed for hospital i in time period t. $CMAD/FTE_{it}$ represents the case-mix-adjusted discharges per full time equivalent employee for hospital i in time period t. $JCAHO_{it}$ represents quality as measured by the compliance to the JCAHO performance standards for hospital i in time period t. Finally,

ε_{it} represents the random error. The time period (t) for our explanatory variables is from 1999 to 2001. The lags (l), expressed in years, are equal to zero for the current year, one for the short-term period, and three for the long-term period.

In the econometric model including the quality measure, the value of t is equal to year 1999 only and, it is expressed as:

$$HP_{i,t+l} = \beta_0 + \beta_1 CMAD_{it} + \beta_2 CMAPD_{it} + \beta_3 FTE/OCCBED_{it} + \beta_4 WH/APD_{it}$$
$$+ \beta_5 OCCP_{it} + \beta_6 CMAD/BED_{it} + \beta_7 CMAD/FTE_{it} + \beta_8 JCAHO_{it} + \varepsilon_{it}$$

The econometric model excluding quality is expressed as:

$$HP_{i,t+l} = \beta_0 + \beta_1 CMAD_{it} + \beta_2 CMAPD_{it} + \beta_3 FTE/OCCBED_{it} + \beta_4 WH/APD_{it}$$
$$+ \beta_5 OCCP_{it} + \beta_6 CMAD/BED_{it} + \beta_7 CMAD/FTE_{it} + \varepsilon_{it}$$

Note that the JCAHO explanatory variable is excluded from the general econometric model.

Tables 5.9 to 5.11 in section 5.5.1 show the multiple regression results including the quality measure. Multiple regression results excluding the quality measure are shown on Tables 5.12 to 5.14 in section 5.5.2.

5.5.1. Multiple Regressions Including Quality

Table 5.9 shows the multiple regression results for the total margin.

Table 5.9. Results for Multiple Regression Analysis Including Quality for Total Margin

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
Intercept	-0.04449	-0.14291**	-0.06172
	(0.0657)	(0.07264)	(0.06127)
CMAD	5.60E-6**	-1.00E-7	2.00E-6
	(2.55E-6)	(2.05E-6)	(1.61E-6)
CMAPD	-6.00E-7*	2.00E-7	-1.00E-8
	(3.40E-7)	(2.80E-7)	(1.90E-7)
FTE/OCCBED	-0.00491	-0.00648	0.00186
	(0.00598)	(0.00768)	(0.00979)
WH/APD	-0.00133	-0.00043	-0.00268*
	(0.00097)	(0.00104)	(0.00158)
OCCP	0.18006***	0.27541**	0.18651***
	(0.0663)	(0.09465)	(0.06697)
CMAD/BED	0.00018	-0.00065	-0.00022
	(0.00053)	(0.00090)	(0.00044)
CMAD/FTE	0.00034	0.00288	0.00149
	(0.00265)	(0.00191)	(0.00158)
JCAHO	0.01028*	0.01858***	0.01460**
	(0.00536)	(0.00705)	(0.00589)
Y 1999	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.0000)
Hospitals	473	468	460
R-Square	0.1495	0.1125	0.1667
Adjusted R-square	0.1348	0.097	0.1519
F-Value	10.23*****	8.31*****	9.08*****

Regression coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

The data fitted the models well for the current year, F-Value = 10.23, $p < 0.0001$; the short-term, F-Value = 8.31, $p < 0.0001$; and the long-term, F-Value = 9.08, $p < 0.0001$.

Based on the results for the current year, approximately, 15% of the variation in total margin is explained by the model, as indicated by $R^2 = 0.1495$. There is support for hypothesis 1; both output measures, CMAD and CMAPD, are relevant in determining total margin in hospitals members of the US investor-owned multihospital systems. CMAD is positively related ($p < 0.05$) while CMAPD is negatively related ($p < 0.10$). Similarly, there is support for hypothesis 2 because OCCP is relevant in determining total margin in hospitals members of the US investor-owned multihospital systems. It is positively related to total margin ($p < 0.01$). Neither FTE/OCCBED nor WH/APD is significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.10$).

Based on the results for the short-term, 11% of the variation in total margin is explained by the model, as indicated by $R^2 = 0.1125$. However, unlike the result of the multiple regression analysis for the current year, there is no support for hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because OCCP is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$). Neither FTE/OCCBED nor WH/APD is significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.01$).

Finally, based on the results for the long-term, 17% of the variation in the total margin is explained by the model as indicated by $R^2 = 0.1667$. The proportion of the variance explained by this model three years later is higher than the proportion of the variance explained by the previous two models. There is no support of hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because operational efficiency measures WH/APD and OCCP are relevant in determining total margin in hospitals members of the US investor-owned multihospital systems. WH/APD is negatively related ($p < 0.10$) while OCCP is positively related ($p < 0.01$). However, FTE/OCCBED is not significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$).

Table 5.10 shows the multiple regressions results for the net operating margin.

Table 5.10. Results for Multiple Regression Analysis Including Quality for Net Operating Margin

Explanatory Variable	Parameter Estimates		
	Current Year	*Short-term*	*Long-term*
Intercept	-0.02542	-0.12818	-0.07536
	(0.07109)	(0.0815)	(0.06723)
CMAD	7.00E-6***	8.00E-7	2.00E-6
	(2.61E-6)	(2.10E-6)	(1.58E-6)
CMAPD	-8.00E-7**	1.00E-7	1.00E-8
	(3.40E-7)	(2.80E-7)	(1.80E-7)
FTE/OCCBED	-0.00816	-0.01155	0.00503
	(0.00711)	(0.00865)	(0.01203)
WH/APD	-0.00218*	-0.00067	-0.00385**
	(0.00118)	(0.00117)	(0.00191)
OCCP	0.18274**	0.27628**	0.20817***
	(0.07112)	(0.11148)	(0.07940)
CMAD/BED	0.00025	-0.00043	-0.00020
	(0.00058)	(0.00091)	(0.00058)
CMAD/FTE	0.00016	0.00163	0.00099
	(0.00281)	(0.00260)	(0.00151)
JCAHO	0.01096*	0.02128***	0.01824***
	(0.00578)	(.00737)	(0.00652)
Y 1999	0.000000	0.000000	0.000000
	(0.00000)	(0.00000)	(0.00000)
Hospitals	473	468	460
R-Square	0.1702	0.1229	0.1846
Adjusted R-Square	0.1559	0.1076	0.1701
F-Value	11.41*****	8.80*****	10.11*****

Regression coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

The data fitted the models well for the current year, F-Value = 11.41, $p < 0.0001$; the short-term, F-Value = 8.80, $p < 0.0001$; and the long-term, F-Value = 10.11, $p < 0.0001$.

Based on the results for the current year, 17% of the variation in the net operating margin is explained by the model, as indicated by $R^2 = 0.1702$. There is support for hypothesis 1; both output measures, CMAD and CMAPD, are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. CMAD is positively related ($p < 0.01$) while CMAPD is negatively related ($p < 0.05$). There is support for hypothesis 2 because operational efficiency measures WH/APD and OCCP are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. WH/APD is negatively related ($p < 0.10$) while OCCP is positively related ($p < 0.05$). However, FTE/OCCBED is not significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining net operating margin in hospitals members of the US investor-owned multihospital systems ($p < 0.10$).

Based on the results for the short-term, 12% of the variation in the net operating margin is explained by the model, as indicated by $R^2 = 0.1229$. Unlike the result of the multiple regression analysis for the current year, there is no support for hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because OCCP is relevant (positively related) in determining net operating margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$). However, neither FTE/OCCBED nor WH/APD is significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining net operating margin in hospitals members of the US investor-owned multihospital systems ($p < 0.01$).

Based on the results for the long-term, 18% of the variation in the net operating margin is explained by the model, as indicated by $R^2 = 0.1846$. Similarly to the total margin, the proportion of the variance explained by this model three years later is higher than the proportion of the variance explained by the previous two models. There is no support of hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because operational efficiency measures WH/APD and OCCP are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. WH/APD is negatively related ($p < 0.05$) while OCCP is positively related ($p < 0.01$). However, FTE/OCCBED is not significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining net operating margin in hospitals members of the US investor-owned multihospital systems ($p < 0.01$).

Table 5.11 shows the multiple regressions results for the cash flow margin.

Table 5.11. Results for Multiple Regression Analysis Including Quality for Cash Flow Margin

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
Intercept	0.61823*****	0.6107*****	0.6531*****
	(0.07317)	(0.06853)	(0.06736)
CMAD	2.40E-6	8.00E-7	3.01E-6
	(1.82E-6)	(1.61E-6)	(2.14E-6)
CMAPD	-1.00E-7	1.00E-7	-3.00E-7
	(2.10E-7)	(1.90E-7)	(2.90E-7)
FTE/OCCBED	-0.01601**	0.00373	0.00933
	(0.01006)	(0.00683)	(0.00695)
WH/APD	0.00126	-0.00264**	-0.00318***
	(0.00161)	(0.00117)	(0.00111)
OCCP	0.10889	0.12518*	0.14796*
	(0.08074)	(0.07569)	(0.08175)
CMAD/BED	-0.00057	-0.00048	-0.00065
	(0.00072)	(0.00067)	(0.00067)
CMAD/FTE	0.00434	0.00428	0.00309
	(0.00322)	(0.00276)	(0.00238)
JCAHO	0.00929*	0.01455***	0.01489**
	(0.00522)	(0.00521)	(0.00579)
Y 1999	0.000000	0.000000	0.000000
	(0.00000)	(0.00000)	(0.00000)
Hospitals	459	456	448
R-Square	0.1401	0.1883	0.1304
Adjusted R-Square	0.1248	0.1737	0.1146
F-Value	7.48*****	9.54*****	7.95*****

Regression coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

The data fitted the models well for the current year, F-Value = 7.48, $p < 0.0001$; the short-term, F-Value = 9.54, $p < 0.0001$; and the long-term, F-Value = 7.95, $p < 0.0001$.

Based on the results for the current year, 14% of the variation in the cash flow margin is explained by the model, as indicated by $R^2 = 0.1401$. There is no support for hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because FTE/OCCBED is relevant (negatively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p<0.05$). However, neither WH/APD nor OCCP is significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p < 0.10$).

Based on the results for the short-term, almost 19% of the variation in the cash flow margin is explained by the model, as indicated by $R^2 = 0.1883$. There is no support for hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because operational efficiency measures, WH/APD and OCCP, are relevant in determining cash flow margin in hospitals members of the US investor-owned multihospital systems. WH/APD is negatively related ($p < 0.05$) while OCCP is positively related ($p < 0.10$). However, FTE/OCCBED is not significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p < 0.01$).

Based on the results for the long-term, 13% of the variation in the cash flow margin is explained by the model, as indicated by $R^2 = 0.1304$. There is no support for hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because operational efficiency measures, WH/APD and OCCP, are relevant in determining cash flow margin in hospitals members of the US investor-owned multihospital systems. WH/APD is negatively related ($p < 0.01$) while OCCP is positively related ($p < 0.10$). However, variable FTE/OCCBED is not significant. There is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is relevant (positively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$).

In summary, the data including the quality measure fitted all models well for total margin, net operating margin and cash flow margin. Based on the results for total margin and net operating margin, the percent of variation explained by the model is slightly higher three years later. There is support for hypothesis 1 for the current year only because both output measures are significant. CMAD is positively related while CMAPD is negatively related. There is no support for hypothesis 1, neither in the short-term nor in the long term. There is support for hypothesis 2 for all periods. WH/APD is negatively related while OCCP is positively related. However FTE/OCCBED is not significant. Based on the results for the cash flow margin, there is no support for hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because operational efficiency measures are significant. WH/APD and OCCP are significant for both periods, short-term and long-term. FTE/OCCBED is significant for the current year only. FTE/OCCBED and WH/APD are negatively related while OCCP is positively related.

Based on the results for all periods, there is no support for hypothesis 3 because neither productivity measures are significant. There is support for hypothesis 4 because the quality measure is significant and positively related to all profitability measures.

5.5.2. Multiple Regressions Excluding Quality

Table 5.12 shows the multiple regressions results excluding the quality measure for the dependent variable total margin.

Table 5.12. Results for Multiple Regression Analysis Excluding Quality for Total Margin

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
Intercept	-0.0147926	0.0304729	-0.08879**
	(0.02828)	(0.03876)	(0.04070)
CMAD	1.56E-5*	6.66E-6***	4.30E-6**
	(8.03E-6)	(2.28E-6)	(1.97E-6)

Table 5.12. (continued)

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
CMAPD	-1.74E-6	-4.45E-7	-3.00E-7
	(1.14E-6)	(2.90E-7)	(2.80E-7)
FTE/OCCBED	1.52E-2**	-7.34E-3	5.26E-3
	(0.00770)	(0.00502)	(0.00664)
WH/APD	-4.02E-3****	-1.50E-3**	-1.29E-3
	(0.00116)	(0.00065)	(0.00945)
OCCP	0.09491*	0.1051**	0.17278****
	(0.05125)	(0.05290)	(0.05094)
CMAD/BED	9.35E-4	1.37E-4	2.35E-4
	(0.00022)	(0.00016)	(0.00026)
CMAD/FTE	-2.35E-4	2.59E-5	-4.28E-4
	(0.00038)	(0.00071)	(0.00028)
Y 1999	0.02225	0.0043756	0.050766*****
	(0.01961)	(0.01125)	(0.010318)
Y 2000	0.017127	-0.01243	0.0078210
	(0.018262)	(0.02051)	(0.014286)
Y 2001	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)
Hospitals (clusters)	650	638	597
R-Square	0.0431	0.0394	0.04496
Adjusted R-Square	0.0384	0.0346	0.03987
F-Value	13.42*****	11.93*****	9.50*****

Regression coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

The data fitted the models well for the current year, F-Value = 13.42, $p < 0.0001$; the short-term, F-Value = 11.93, $p < 0.0001$; and the long-term, F-Value = 9.50, $p < 0.0001$.

Based on the results for the current year, 4% of the variation in total margin is explained by the model, as indicated by $R^2 = 0.0431$. There is support for hypothesis 1 because CMAD is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.10$). However, CMAPD is not significant. Similarly, there is support for hypothesis 2 because FTE/OCCBED, WH/APD and OCCP are significant: $p < 0.05$; $p < 0.001$; and $p < 0.10$, respectively. FTE/OCCBED and OCCP are positively related while WH/APD is negatively related. There is no support for hypothesis 3 because neither productivity measures are significant.

Based on the results for the short-term, almost 4% of the variation in total margin is explained by the model, as indicated by $R^2 = 0.0394$. There is support for hypothesis 1 because CMAD is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.01$). However, CMAPD is not significant. Similarly, there is support for hypothesis 2 because WH/APD and OCCP are significant ($p < 0.05$). OCCP is positively related while WH/APD is negatively related. However, FTE/OCCPD is not significant. There is no support for hypothesis 3 because neither productivity measures are significant

Based on the results for the long-term, 4% of the variation in the total margin is explained by the model as indicated by $R^2 = 0.04496$. The proportion of the variance explained by this model three years later is slightly higher than the proportion of the variance explained by the previous two models. There is support for hypothesis 1 because

CMAD is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$). However, CMAPD is not significant. There is support for hypothesis 2 because OCCP is relevant (positively related) in determining total margin in hospitals members of the US investor-owned multihospital systems ($p < 0.0001$). Neither FTE/OCCBED nor WH/APD is significant. There is no support for hypothesis 3 because neither productivity measures are significant.

Table 5.13 shows the multiple regressions results excluding the quality measure for the net operating margin.

Table 5.13. Results for Multiple Regression Analysis Excluding Quality for Net Operating Margin

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
Intercept	0.0024048	0.039359	-0.01269
	(0.031408)	(0.042837)	(0.06820)
CMAD	1.70E-5**	7.6E-6***	1.45E-5
	(7.85E-6)	(2.46E-6)	(9.24E-6)
CMAPD	-1.91E-06*	-5.00E-7*	-1.78E-6
	(1.12E-6)	(3.1E-7)	(1.41E-6)
FTE/OCCBED	0.01464*	-0.01294**	0.00329
	(0.008054)	(0.00583)	(0.01026)
WH/APD	-0.00491*****	-0.00148**	-0.00224*
	(0.00114)	(0.00071)	(0.00121)
OCCP	0.06816	0.08933	0.13592*
	(0.05873)	(0.060213)	(0.07397)

Table 5.13. (continued)

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
CMAD/BED	2.25E-4	2.55E-4	3.08E-5
	(0.00028)	(0.00023)	(0.00029)
CMAD/FTE	-1.14E-4	9.45E-5	-6.67E-4
	(0.00043)	(0.00073)	(0.000416)
Y 1999	0.02284	0.001097	0.029555
	(0.01941)	(0.01188)	(0.02178)
Y 2000	0.01707	-0.015180	-0.01566
	(0.01824)	(0.01205)	(0.02326)
Y 2001	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)
Hospitals (clusters)	650	638	597
R-Square	0.05546	0.05077	0.02838
Adjusted R-Square	0.05086	0.04601	0.0232
F-Value	14.38*****	12.07*****	5.94*****

Regression coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

The data fitted the models well for the current year, F-Value = 14.38, $p < 0.0001$; the short-term, F-Value = 12.07, $p < 0.0001$; and the long-term, F-Value = 5.94, $p < 0.0001$.

Based on the results for the current year, approximately 6% of the variation in the net operating margin is explained by the model, as indicated by $R^2 = 0.05546$. There is support for hypothesis 1; both output measures, CMAD and CMAPD, are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. CMAD is positively related ($p < 0.05$) while CMAPD is negatively related ($p < 0.10$). There is support for hypothesis 2 because operational efficiency measures FTE/OCCBED and WH/APD are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. FTE/OCCBED is positively related ($p < 0.10$) while WH/APD is negatively related ($p < 0.0001$). However, OCCP is not significant. There is no support for hypothesis 3 because neither productivity measures are significant.

Based on the results for the short-term, 5% of the variation in the net operating margin is explained by the model, as indicated by $R^2 = 0.05077$. There is support for hypothesis 1 because both output measures, CMAD and CMAPD, are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. CMAD is positively related ($p < 0.01$) while CMAPD is negatively related ($p < 0.10$). There is support for hypothesis 2 because operational efficiency measures FTE/OCCBED and WH/APD are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. FTE/OCCBED is positively related ($p < 0.05$) while WH/APD is negatively related ($p < 0.05$). However, OCCP is not significant. There is no support for hypothesis 3 because neither productivity measures are significant.

Based on the results for the long-term, almost 3% of the variation in the net operating margin is explained by the model, as indicated by $R^2 = 0.02838$. There is no support of hypothesis 1 because neither output measures are significant. There is support for hypothesis 2 because operational efficiency measures WH/APD and OCCP are relevant in determining net operating margin in hospitals members of the US investor-owned multihospital systems. WH/APD is negatively related ($p < 0.10$) while OCCP is positively related ($p < 0.10$). However, FTE/OCCBED is not significant. There is no support for hypothesis 3 because neither productivity measures are significant.

Table 5.14 shows the multiple regressions results excluding the quality measure for the dependent variable cash flow margin.

Table 5.14. Results for Multiple Regression Analysis Excluding Quality for Cash Flow Margin

	Parameter Estimates		
Explanatory Variable	*Current Year*	*Short-term*	*Long-term*
Intercept	0.73328*****	0.78008*****	0.78968*****
	(0.03149)	(0.03957)	(0.034392)
CMAD	4.80E-6***	3.50E-6**	4.0E-6**
	(1.71E-6)	(1.59E-6)	(1.68E-6)
CMAPD	-1.00E-7	-1.00E-8	-3.00E-7
	(2.10E-7)	(2.00E-7)	(2.30E-7)
FTE/OCCBED	-0.00658	0.01473***	0.01251**
	(0.00694)	(0.00517)	(0.00569)
WH/APD	-0.00059	-0.00452*****	-0.00408*****
	(0.00111)	(0.00081)	(0.000959)
OCCP	0.00534	0.00630	0.03089
	(0.04265)	(0.04525)	(0.04436)
CMAD/BED	1.15E-5	2.04E-5	-2.68E-5
	(0.00011)	(0.00010)	(0.000085)
CMAD/FTE	0.00111	0.00093	0.00075
	(0.00081)	(0.00075)	(0.00054)

Table 5.14.(continued)

Explanatory Variable	*Parameter Estimates* Current Year	*Short-term*	*Long-term*
Y 1999	-0.02900*****	-0.03323**	-0.00517
	(0.00623)	(0.01295)	(0.01259)
Y 2000	-0.014994***	-0.01887*	-0.00175
	(0.00491)	(0.01103)	(0.00555)
Y 2001	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)
Hospitals (clusters)	643	628	584
R-Square	0.1014	0.06641	0.04690
Adjusted R-Square	0.09683	0.06155	0.04154
F-Value	12.20*****	13.71*****	8.32*****

Regression coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

The data fitted the models well for the current year, F-Value = 12.20, $p < 0.0001$; the short-term, F-Value = 13.71, $p < 0.0001$; and the long-term, F-Value = 8.32, $p < 0.0001$.

Based on the results for the current year, 10% of the variation in the cash flow margin is explained by the model, as indicated by $R^2 = 0.1014$. There is support for hypothesis 1 because CMAD is relevant (positively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p < 0.01$). However, CMAPD is not significant. There is no support for hypothesis 2 because neither operational efficiency measures are significant. Also, there is no support for hypothesis 3 because neither productivity measures are significant.

Based on the results for the short-term, almost 7% of the variation in the cash flow margin is explained by the model, as indicated by $R^2 = 0.06641$. There is support for hypothesis 1 because CMAD is relevant (positively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$). However, CMAPD is not significant. There is support for hypothesis 2 because operational efficiency measures FTE/OCCBED and WH/APD are relevant in determining cash flow margin in hospitals members of the US investor-owned multihospital systems. FTE/OCCBED is positively related ($p < 0.01$) while WH/APD is negatively related ($p < 0.0001$). However, OCCP is not significant. There is no support for hypothesis 3 because neither productivity measures are significant.

Based on the results for the long-term, almost 5% of the variation in the cash flow margin is explained by the model, as indicated by $R^2 = 0.04690$. There is support for hypothesis 1 because CMAD is relevant (positively related) in determining cash flow margin in hospitals members of the US investor-owned multihospital systems ($p < 0.05$). However, CMAPD is not significant. There is support for hypothesis 2 because operational efficiency measures, FTE/OCCBED and WH/APD, are relevant in determining cash flow margin in hospitals members of the US investor-owned multihospital systems. FTE/OCCBED is positively related ($p < 0.05$) while WH/APD is negatively related ($p < 0.0001$). However, OCCP is not significant. There is no support for hypothesis 3 because neither productivity measures are significant.

In summary, the data excluding the quality measure fitted all models well for total margin, net operating margin and cash flow margin. Based on the results for the total margin and the net operating margin, there is support for hypothesis 1 because CMAD is positively related while CMAPD is negatively related. There is support for hypothesis 2 because FTE/OCCBED and WH/APD are negatively related while OCCP is positively related. Based on the results for the cash flow margin, there is support for hypothesis 1 because CMAD is relevant (positively related). However, CMAPD is not significant. There is support for hypothesis 2 for both periods, short-term and long-term, because operational efficiency measures FTE/OCCBED and WH/APD are significant. FTE/OCCBED is positively related while WH/APD is negatively related. However, OCCP is not significant. Based on the results for all periods, there is no support for hypothesis 3 because neither productivity measures are significant.

5.6 Models Selection

Four selection criteria are using to compare and select the models that best fit to the data, these are: (1) the R-squared, (2) the adjusted R-squared, (3) the Mallows Cp statistic, and (4) the Akaike's information criteria. Different selection criteria can result in different best model therefore, we select those reduced model that best meet all or at least, the majority of the criteria applied.

The first step in the selection of the best model consists in identifying all possible models fitted to the data. The number of all possible models for each dependent variable is 254, including the quality measure and, 127 without it. As we are examining the impact of nonfinancial variables on financial performance at short-term and at long-term it is necessary to identify the best models for the short-term and for the long-term. Also, we identify the best models for the current year. Next, using the selection criteria, we sorted the results for all reduced models based on the criterions and compared them with the full model, which is the model containing all the explanatory variables. The reduced model is a restriction of the full model. If the reduced model provides as good a fit to the data as the full model, then we preferred the reduced model. For example, the full model including the quality measure for the total margin for the current year has an $R^2 = 0.1495$ and, an Adjusted $R^2 = 0.1348$. The model that best fit to the data is a model that contains five of the eight explanatory variables with $R^2 = 0.1482$, which is almost the same as the R^2 for the full model. It has an Adjusted-$R^2 = 0.1390$, which is greater than the Adjusted-R^2 of the full model. Also, it has a Mallows C (p) statistics = 3.71, which is less than the number of explanatory variables including in the reduced model and finally, it has the smallest Akaike's information criterion, AIC= -1816. 37.

Tables 5.15 to 5.17 show the selection of best models including the quality measure for total margin, net operating margin and cash flow margin for the current year, the short-term, and the long-term. The best selections of models excluding the quality measure are shown on tables 5.18 to 5.20.

Table 5.15 shows the best models including the quality measure for total margin. Each model fits the data well as indicating by their F-values and their p-values ($p < 0.0001$). The proportion of the variance explained by these reduced models range from 10% to 16%, as indicated by their coefficient of determination (R^2). The best model for the current year combines both output measures, two of the three operational efficiency measures and the quality measure. Neither FTE/OCCBED nor the productivity measures are significant. As the time elapsed, the number of variables included in the models decreased and the combination of variables changed. However, some of the variables prevail such as, the operational efficiency measures, WH/APD and OCCP, and the quality measure. We identified more than one best model for the short-term and for the long-term. Model 1 for the short-term coincides with model 2 for the long-term. Similarly, model 2 for the short-term coincides with model 1 for the long-term. Note that three years later (long-term), the same models explain more of the proportion of the variance in the total margin than one year after (short-term) , as indicated by their R-squares values, $R^2_{1,l=1} = 0.1018$ vs. $R^2_{2,l=3} = 0.1373$; and $R^2_{2,l=1} = 0.1011$ vs. $R^2_{1,l=3} = 0.1517$. Models 1 and 2 for the short-term combine the same variables except for the fact that model 1 is including FTE/OCCBED while model 2 is including WH/APD. Both variables are representing operational efficiency. Also, both models are explaining almost the same proportion of the variance of the total margin. Recall that FTE/OCCBED is highly correlated to WH/APD ($R = 0.8575$).

Table 5. 15. Best Models Including Quality for Total Margin

	Current Year	Short-term		Long-term		
Explanatory Variable	*Model 1*	*Model 1*	*Model 2*	*Model 1*	*Model 2*	*Model 3*
Intercept	-4.56E-2	-1.02E-1*	-1.05E-1*	-4.64E-2	-7.86E-2*	-3.40E-2
	(0.0434)	(0.05711)	(0.05873)	(0.04784)	(0.04756)	(0.04825)
CMAD	5.94E-6***					2.20E-6***
	(2.09E-6)					(7.70E-7)
CMAPD	-6.00E-7**					
	(3.00E-7)					
FTE/OCCBED		-1.34E-2**			-1.26E-2**	
		(0.00526)			(0.00532)	
WH/APD	-2.00E-3***		-1.96E-3***	-2.73E-3****		-2.79E-3***
	(7.17E-4)		(7.36E-4)	(8.17E-4)		(8.54E-4)
OCCP	2.04E-1*****	2.77E-1*****	2.75E-1*****	2.35E-1*****	2.55E-1*****	1.72E-1****
	(0.04551)	(0.04974)	(0.051340)	(0.04234)	(0.04092)	(0.05046)
CMAD/BED						
CMAD/FTE						
JCAHO	1.03E-2*	1.93E-2***	1.85E-2***	1.51E-2**	1.61E-2***	1.46E-2**
	(0.00541)	(0.00693)	(0.00699)	(0.00593)	(0.00587)	(0.00593)
Hospitals (clusters)	473	474	475	467	466	461
R-Square	0.1482	0.1018	0.1011	0.1517	0.1373	0.1627
Adjusted R-Square	0.139	0.0961	0.0954	0.1462	0.1317	0.1553
F-Value	16.06*****	18.87*****	20.95*****	21.51*****	20.20*****	17.86*****

*Coefficients are reported with standard errors in parentheses.*P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

Models in table 5.16 fitted the data well ($p < 0.0001$) for the net operating margin. Similarly to the total margin, the model for current year combines both output measures, two of the three operational efficiency measures and the quality variable. Neither FTE/OCCBED nor productivity measures are significant. This model explains 16.79 % of the variation in the net operating margin. Similarly to the total margin models, as the time elapsed, the number of variables included in the models decreased and the combination of variables changed. Some variables prevail such as, the operational efficiency measures, WH/APD and OCCP, and the quality measure, JCAHO. Models 1and 2 for the short-term coincide with models 1 and 2 for the long-term. Three years later, the same models explain more of the proportion of the variance in the net operating margin than one year after, as indicated by their R-squares values, $R^2_{1,l=1} = 0.1133$ vs. $R^2_{1,l=3} = 0.1719$; and $R^2_{2,l=1} = 0.1156$ vs. $R^2_{2,l=3} = 0.1487$.

Table 5. 16. Best Models Including Quality for Net Operating Margin

	Current Year	*Short-term*		*Long-term*		
Explanatory Variable	*Model 1*	*Model 1*	*Model 2*	*Model 1*	*Model 2*	*Model 3*
Intercept	-3.49E-2	-1.13E-1**	-1.12E-1*	-6.29E-2	-1.13E-1**	-4.99E-2
	(0.04781)	(0.06136)	(0.06008)	(0.05266)	(0.05366)	(0.0532)
CMAD	7.25E-6****					2.30E-6***
	(2.15E-6)					(8.20E-7)
CMAPD	-7.90E-7***					
	(3.00E-7)					
FTE/OCCBED			-1.71E-3***		-1.43E-2***	
			(5.66E-4)		(0.00607)	
WH/APD	-3.17E-3****	-2.37E-3***		-3.44E-3****		-3.53E-3****
	(8.83E-4)	(7.82E-4)		(9.29E-4)		(9.71E-4)
OCCP	2.16E-1*****	2.91E-1*****	2.91E-1*****	2.56E-1*****	2.87E-1*****	1.90E-1****
	(0.04899)	(0.05354)	(0.05182)	(0.04534)	(0.04438)	(0.05412)
CMAD/BED						
CMAD/FTE						
JCAHO	1.09E-2*	2.07E-2***	2.17E-2***	1.89E-2***	1.99E-2***	1.84E-2***
	(0.00580)	(0.00729)	(0.00722)	(0.00652)	(0.00647)	(0.00653)
Hospitals (clusters)	473	475	474	467	466	461
R-Square	0.1679	0.1133	0.1156	0.1719	0.1487	0.1829
Adjusted R-Square	0.1589	0.1077	0.1099	0.1666	0.1432	0.1757
F-Value	17.87*****	22.33*****	20.48*****	24.15*****	22.53*****	19.71*****

*Coefficients are reported with standard errors in parentheses.*P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

Table 5.17 shows the best models including the quality measure for the cash flow margin.

Table 5. 17. Best Models Including Quality for Cash Flow Margin

Explanatory Variable	*Current Year* Model 1	*Short-term* Model 1	*Long-term* Model 1
Intercept	7.37E-2*****	6.91E-1*****	7.10E-1*****
	(0.04103)	(0.04734)	(0.04889)
CMAD	3.02E-6*****		
	(5.90E-7)		
CMAPD			
FTE/OCCBED	-0.01881****		
	(0.00504)		
WH/APD		-3.40E-3*****	-2.61E-3****
		(7.00E-4)	(7.07E-4)
OCCP		1.54E-1****	1.28E-2***
		(0.04228)	(0.04377)
CMAD/BED			
CMAD/FTE			
JCAHO	1.02E-3*	1.44E-2***	1.49E-2**
	(0.00543)	(0.00532)	(0.00582)
Hospitals (clusters)	459	462	454
R-Square	0.1086	0.1494	0.09949
Adjusted R-Square	0.1027	0.1438	0.09349
F-Value	17.59*****	20.46*****	14.18*****

Coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

All models fitted the data well for the cash flow margin (p < 0.0001). The model that best fit the data for the current year combines one of the output measure, CMAD, the operational efficiency measure, FTE/OCCBED, and the quality measure, JCAHO. This model is explaining 10.86% of the variation in the cash flow margin. The models for the short-term and for the long-term combine the operational efficiency measures, WH/APD and OCCP, and the quality measure, JCAHO. Their R-squares values are: $R^2_{1,l=1}$ = 14.94% and $R^2_{1,l=3}$ = 9.95%, respectively.

Table 5.18 shows the best models excluding the quality measure for total margin.

Table 5. 18. Best Models Excluding Quality for Total Margin

	Current Year	*Short-term*	*Long-term*
Explanatory Variable	*Model 1*	*Model 1*	*Model 1*
Intercept	-3.85E-3	-7.14E-2***	-1.07E-2*****
	(0.0336)	(0.02667)	(0.02528)
CMAD	4.2E-6*****	3.70E-6*****	2.10E-6****
	(1.01E-6)	(8.70E-7)	(6.40E-7)
CMAPD			
FTE/OCCBED	0.01685**		
	(0.00776)		
WH/APD	-3.77E-3***		
	(0.001155)		
OCCP	1.09E-1**	1.73E-1****	1.98E-2*****
	(0.05167)	(0.05199)	(0.04584)
CMAD/BED			
CMAD/FTE			
Hospitals (clusters)	650	640	598
R-Square	0.0355	0.03294	0.04304
Adjusted R-Square	0.03237	0.03083	0.04081
F-Value	18.71*****	24.33*****	17.43*****

Coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

Even though these regressions used almost four times the number of observations used in the models including the quality measure, all these models explain less of the variation in the total margin than the models including quality. Recall that multiple regressions including the quality measure were performed using the 1999 analytical database only and, that the number of hospitals accredited by JCAHO in this database is 499. For the total margin, all models fitted the data well ($p < 0.0001$).Neither productivity measures are significant. Variables CAMD and OCCP prevailed in all models. Recall that their correlation with the total margin is highly significant ($p < 0.01$). CMAD and OCCP are both positively correlated with the short-term total margin: $R = 0.1592$, $p < 0.0001$; $R = 0.1123$, $p < 0.0001$. Also, they are both positively correlated with the long-term total margin: $R = 0.1535$, $p < 0.0001$; $R = 0.1975$, $p < 0.0001$. Note that the correlation coefficient between OCCP and the long-term total margin is higher than the correlation between OCCP and the short-term total margin.

Table 5.19 shows the best model for the net operating margin. Similarly to the total margin, all these models fitted the data well ($p < 0.001$). The R-square values are lesser for these models, which excludes the quality measure. Neither productivity measures are significant. Output measure, CMAD, and operational efficiency measure, OCCP, are significant and as a consequence they prevail in all models. Both measures are positively correlated with the short-term net operating margin: $R = 0.1739$, $p < 0.0001$; and $R = 0.12$, $p < 0.0001$, respectively. Also, both measures are positively correlated with the long-term net operating margin, but unlike the long-term total margin, their correlation coefficients are smaller than those for the short-term models: CMAD, $R = 0.1127$, $p < 0.0001$; and OCCP, $R = 0.0976$, $p < 0.0001$.

Table 5.20 shows the best models for the cash flow margin. All these models fitted the data well ($p < 0.0001$). Similarly to the best models for the total margin and the net operating margin, neither productivity measures are significant. The output measure, CMAD, and the operational efficiency measures, FTE/OCCBED and WH/APD, prevail in all models. Both measures, CMAD and FTE/OCCBED, are positively related while WH/APD is negatively related. These models explained a slightly more of the variation in the cash flow margin than those for the total margin or the net operating margin shown on tables 5.18 and 5.19.

Table 5. 19. Best Models Excluding Quality for Net Operating Margin

	Current Year	*Short-term*		*Long-term*
Explanatory Variable	*Model 1*	*Model 1*	*Model 2*	*Model 1*
Intercept	4.84E-2	-9.53E-1***	-2.62E-2	-8.55E-2*
	(0.03580)	(0.0294)	(0.04267)	(0.05032)
CMAD	1.86E-5***	4.20E-6*****	4.30E-6*****	2.50E-6****
	(7.09E-6	(9.80E-7)	(9.8E-7)	(6.9E-7)
CMAPD	-2.00E-6*****			
	(1.07E-6)			
FTE/OCCBED	0.01426*		-1.07E-2*	
	(0.00819)		(0.00607)	
WH/APD	-5.33E-3*****			
	(0.00112)			
OCCP		1.88E-1***	1.47E-1**	1.63-1**
		(0.05707)	(0.05759)	(0.07320)
CMAD/BED				
CMAD/FTE				
Hospitals (clusters)	650	640	640	598
R-Square	0.05339	0.0390	0.04439	0.02001
Adjusted R-Square	0.05032	0.0369	0.04175	0.01773
F-Value	16.82*****	24.51*****	19.77*****	9.20*****

*Coefficients are reported with standard errors in parentheses.*P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

Table 5. 20. Best Models Excluding Quality for Cash Flow Margin

	Current Year	*Short-term*	*Long-term*
Explanatory Variable	*Model 1*	*Model 1*	*Model 1*
Intercept	7.47E-1*****	7.98E-1*****	8.20E-1*****
	(0.02032)	(0.02196)	(0.02237)
CMAD	4.40E-6*****	3.50E-6*****	2.80E-6*****
	(6.50E-7)	(6.50E-7)	(6.30E-7)
CMAPD			
FTE/OCCBED	-0.00915**	1.43E-2***	1.17E-2**
	(0.00396)	(0.00524)	(0.005818)
WH/APD		-4.74E-3*****	-4.32E-3*****
		(7.82E-4)	(9.50E-4)
OCCP			
CMAD/BED			
CMAD/FTE			
Hospitals (clusters)	647	628	584
R-Square	0.08883	0.06419	0.04397
Adjusted R-Square	0.08681	0.06149	0.04100
F-Value	21.96*****	23.42*****	13.11*****

Coefficients are reported with standard errors in parentheses.
**P < 0.10; **P < 0.05; ***P < 0.01; ****P < 0.001; *****P < 0.0001; two-tailed test*

5.7 Long-term Impact versus Short-term Impact

After the selection of the model that best fits to the data in both periods, the short-term and the long-term, our next step was to do two different OLS regressions. One OLS regression examines the short-term impact and the other, the long-term impact.

Using the results of the OLS regressions we compared the regression coefficients of the short-term model with the regression coefficients of the long-term model in order to test the null hypothesis of no difference between the parameter estimates.

According to Clogg et al., (1995), in large samples, the significance of the difference between the coefficients can be assessed with the statistic:

$$Z = \frac{\beta_{i,1} - \beta_{i,2}}{\sqrt{(SE of \beta_{i,1})^2 + (SE of \beta_{i,2})^2}}$$

This follows a standard unit normal under the null hypothesis of equality of the two coefficients. The standard error of the difference is the square root of the sum of the two squared standard errors, assuming that the samples are independent.

$\beta_{i,1}$ and $\beta_{i,2}$ represent the regression coefficients for the short-term and the long-term period regression, respectively. *SE of* $\beta i,_1$ and *SE of* $\beta_{i,2}$ represent the standard error of these coefficients.

We reject the null hypothesis of no difference between the coefficients, if the value of *Z* is greater than +1.96 or lesser than -1.96. Both Z values correspond to a P value less than 5%. If neither of these conditions is true then, it may be reasonable to accept the hypothesis that the coefficients are the same for both periods. Through this test it is possible to detect if there is any difference between the parameters estimates which may imply or suggests a greater impact in the long-term. We hypothesized that the long-term impact of the nonfinancial measures on the financial performance is greater than the short-term impact. Appendix E includes the Z-tests for differences between regression coefficients for all models evaluated.

Tables 5.21 to 5.23 show the summary of the results for the Z-tests for those models including the quality measure. Summary of the results for the Z-test for those models excluding the quality measure are shown on tables 5.24 to 5.26.

Table 5.21 shows the summary of the results for the Z-tests for Model A: TM=f (FTE/OCCBED, OCCP, JCAHO); and Model B: TM=f (WH/APD, OCCP, JCAHO).

Table 5.21. ***Summary of Z-test Results Including Quality for Dependent Variable: Total Margin***

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
Model A:				
FTE/OCCBED	-0.01344	-0.01264	-0.1059	0.5438
OCCP	0.27676	0.25519	0.3349	0.3707
JCAHO	0.01925	0.01608	0.3493	0.3632
R^2	*(0.1018)*	*(0.1373)*		

Table 5.21. (continued)

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
Model B:				
WH/APD	-0.00196	-0.00273	0.7040	0.2420
OCCP	0.27487	0.23479	0.6023	0.2743
JCAHO	0.0185	0.01508	0.3730	0.3557
R^2	*(0.1011)*	*(0.1517)*		

Both models fitted the data well for the short-term: Model A, F-value = 18.87, p < 0.0001; Model B, F-value = 20.95, p < 0.0001; and for the long term: Model A, F-value = 20.20, p < 0.0001; Model B, F-value = 21.51, p < 0.0001. Both explain a proportion of the variation in the total margin as indicated by their R-square values. Note that long- term R-square values are greater than short-term R-square values. These results suggest that these models explain more of the variation in the long-term total margin than in the short-term total margin. However, Z-tests for differences between the regression coefficients and their p-values are not significant. All p-values are greater than 5% therefore, we can not reject the null hypotheses of no differences between the regression coefficients. Based on these results, we can not affirm that the long-term impact of the explanatory variables on the total margin is greater than the short-term impact.

Table 5.22 shows the summary of the results for the Z-tests for Model A: NOM=f (FTE/OCCBED, OCCP, JCAHO); and Model B: NOM=f (WH/APD, OCCP, JCAHO).

Table 5.22. Summary of Z-test Results Including Quality for Dependent Variable: Net Operating Margin

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
Model A:				
FTE/OCCBED	-0.01714	-0.01434	-0.3369	0.6255
OCCP	0.29067	0.28675	0.0573	0.4761
JCAHO	0.02171	0.01989	0.1880	0.4247
R^2	*(0.1156)*	*(0.1487)*		
Model B:				
WH/APD	-0.00238	-0.00344	0.8754	0.1894
OCCP	0.29067	0.25572	0.4980	0.3121
JCAHO	0.02078	0.01886	0.158	0.4247
R^2	*(0.1133)*	*(0.1666)*		

Similarly to the total margin, both models fitted the data well for the short term: Model A, F-value = 20.48, $p < 0.0001$; Model B, F-value = 22.33, $p < 0.0001$; and for the long term: Model A, F-value = 22.53, $p < 0.0001$; Model B, F-value = 24.15, $p < 0.0001$. Both models explain a proportion of the variation in the net operating margin as indicated by their R-square values. Long-term R-square values are greater than short-term R-square values, which suggest that the same set of variables explain more of the variation of the long term total margin. However, Z-tests for differences between the regression coefficients and their p-values are not significant. All p-values are greater than 5%

therefore, we can not reject the null hypotheses of no differences between the regression coefficients. Based on these results, we can not affirm that the long-term impact of the explanatory variables on the net operating margin is greater than the short-term impact.

Table 5.23 shows the summary of the results for the Z-tests for the model: CFM=f(WH/APD, OCCP, JCAHO).

Table 5.23. Summary of Z-test Results Including Quality for Dependent Variable: Cash Flow Margin

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
WH/APD	-0.0034	-0.0026	-0.7888	0.7852
OCCP	0.1537	0.1284	0.4146	0.3409
JCAHO	0.01425	0.01491	-0.0559	0.5199
R^2	*(0.1494)*	*(0.0995)*		

The model fits the data well for the short-term, F-value = 20.46, $p < 0.0001$ as well as for the long- term, F-value = 14.18, $p < 0.0001$. This model explains a proportion of the variation in the cash flow margin for both periods, as indicated by their R-square values. Unlike the previous models, R-square is lesser for the long-term than for the short-term. Z-tests for differences between the regression coefficients and their p-values are not significant. All p-values are greater than 5% therefore, we can not reject the null hypotheses of no differences between the regression coefficients. Based on these results, we can not affirm that the long-term impact of the explanatory variables on the cash flow margin is greater than the short-term impact.

Table 5.24 shows the summary of the results for the Z-tests for the model: TM=f(CMAD, OCCP), which is excluding the quality measure.

Table 5.24. Summary of Z-test Results Excluding Quality for Dependent Variable: Total Margin

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
CMAD	3.70E-6	2.10E-6	1.1481	0.0694
OCCP	0.17308	0.19847	-0.3661	0.6443
R^2	*(0.0329)*	*(0.0430)*		

The model fits the data well in the short-term, F-value = 24.33, p < 0.0001; and in the long-term, F-value = 17.43, p < 0.0001. This model explains a slightly higher proportion of the variation in the total margin for the long-term, as indicated by their R-square values. The results for the Z-tests for differences between the regression coefficients and their p-values are not significant. All p-values are greater than 5% therefore, we can not reject the null hypothesis of no differences between the regression coefficients. Based on these results, we can not affirm that the long-term impact of the explanatory variables, excluding the quality measure, on the total margin is greater than the short-term impact.

Table 5.25 shows the summary of the results for Z-tests for the model: NOM=f (CMAD, OCCP), which is excluding the quality measure.

Table 5.25. Summary of Z-test Results Excluding Quality for Dependent Variable: Net Operating Margin

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
CMAD	4.20E-6	2.50E-6	1.4184	0.0793
OCCP	0.18876	0.16509	0.2549	0.4013
R^2	*(0.0390)*	*(0.0200)*		

Similarly to the total margin model above, this model fits the data well for the short-term, F-value = 24.51, $p < 0.0001$; and for the long-term, F-value = 9.20, $p < 0.0001$. This model explains more of the variation of the net operating margin for the short-term than for the long-term, as indicated by their R-square values. The results for the Z-tests for differences between the regression coefficients and their p-values are not significant. All p-values are greater than 5% therefore, we can not reject the null hypothesis of no differences between the regression coefficients. Based on these results, we can not affirm that the long-term impact of the explanatory variables, excluding the quality measure, on the net operating margin is greater than the short-term impact.

Finally, table 5.26 shows the summary of the results for the Z-tests for the model: CFM=f (CMAD, FTE/OCCBED, WH/APD), which is excluding the quality measure.

Table 5.26. Summary of Z-test Results Excluding Quality for Dependent Variable: Cash Flow Margin

Explanatory Variables	Short-term Parameter Estimate	Long-term Parameter Estimate	Z-value	P > Z
CMAD	3.50E-6	2.80E-6	0.7330	0.2206
FTE/OCCBED	1.43E-2	1.18E-2	0.32043	0.3745
WH/APD	-4.72E-3	-4.32E-3	-0.32723	0.6293
R^2	*(0.0642)*	*(0.0439)*		

This model fits the data well for the short-term, F-value = 23.42, p < 0.0001; and for the long-term: F-value = 13.11, p < 0.0001. This model explains more of the proportion of the variation in the cash flow margin for the short-term, as indicated by their R-square values. The results for the Z-tests for differences between the regression coefficients and their p-values are not significant. All p-values are greater than 5% therefore, we can not reject the null hypotheses of no differences between the regression coefficients. Based on these results, we can not affirm that the long-term impact of the explanatory variables, excluding the quality measure, on the cash flow margin is greater than the short-term impact.

5.8 Summary

This chapter presents the empirical results of the statistical analysis performed. A summary of the descriptive statistics of the most relevant accounts of the statement of revenues and expenses for hospitals under study are examining for the period from 1999 to 2004. Descriptive statistics for all independent variables were computed using the data from 1999 to 2001, while the descriptive statistics for the dependent variables were computed using the data from 1999 to 2004. Average total margin is 3.11% with a standard deviation of 0.34. On the other hand, average net operating margin is 1.41% and its standard deviation is equal to 0.41. Total margin and the net operating margin have a strong positive correlation. Average cash flow margin is 71.37%, its median is 73.39%, and its standard deviation is 0.20. Financial performance measure, cash flow margin, has a positive correlation with both, the total margin and the net operating margin, but not as strong as the correlation between total margin and net operating margin. The average CAMD is 8,492 patients per hospital, its median is 8,492 patients and, its standard deviation is 9,043 patients. The average CMAPD is 58,665 days per hospital, its median is 38,618 days and its standard deviation is 61,101 days. CMAD and CMAPD, have a strong positive correlation (96.27%). Both output measures, have significant and positive correlations with all of the financial performance measures under study. The average FTE/OCCBED is 4.31 employees, its median is 3.92 employees, and its standard deviation is 2.55 employees. The average WH/APD is 25.33 hours per patient day, its median is 23.11 hours, and its standard deviation is 11.93 hours. Both, the average and the median OCCP are 52%; its standard deviation is 0.22. FTE/OCCBED and WH/APD have a strong positive correlation (0.8575). Both, FTE/OCCBED and WH/APD, are negatively correlated with total margin, with net operating margin, and with cash flow margin. The average CMAD/BED is 53.30 patient discharges per bed, its median is 49.69 discharges and its standard deviation is 38.25 patients. The average CMAD/FTE is 15.66 patient discharges per employee, its median is 15.55 discharges and its standard deviation is 11.24 patients. Both productivity measures are positively correlated with total margin, with net operating margin, and with cash flow margin. The average JCAHO index is 5.40 per hospital and its standard deviation is 1.26. It is positively correlated with all financial performance measures under study.

Our analytical databases consist of hospitals of different types. Tests results to measure the effect of hospital type on total margin, net operating margin and cash flow margin, suggest that the effect of group is significant. Unlike the effect of group, the effect of year is not significant. However, when the year interacts with the type of hospital, the results suggest that we can find differences across the years but mainly due to the type of hospital.

All OLS regressions were performed for the current year, the short-term and the long-term. Data including the quality measure fitted all models well for total margin, net operating margin and cash flow margin. Both output measures are relevant in determining total margin and net operating margin but for the current year only. Operational efficiency measures are relevant in determining both, total margin and net operating margin. Based on results for the cash flow margin, output measures are not significant. Operational efficiency measures are relevant in determining cash flow margin. Quality measure is relevant in determining total margin, net operating margin and cash flow margin. Data excluding the quality measure fitted all models well for total margin, net operating margin and cash flow margin. For lags equal to zero and one year; output measures are relevant in determining total margin. Output measure, CMAD is relevant in determining total margin while CMAD and CMAPD are relevant in determining the net operating margin. Operational efficiency measures are relevant in determining both, total margin and net operating margin. Based on results for all models, neither productivity measures, CMAD/BED and CMAD/FTE, are significant.

Based on results of the Z-tests to compare the regression coefficients of short-term models with the regression coefficients of long-term models, we can not affirm that the long-term impact of the explanatory variables on financial performance is greater than the short-term impact.

CHAPTER 6

CONCLUSIONS

6.1 Introduction

Traditionally, accounting data have been played a major role in measuring an organization's success. As in many other industries or organizations, the assessment of a hospital financial performance has traditionally been based exclusively on the analysis of a concise set of key financial ratios. However, a hospital's financial performance may be influenced by factors which are nonfinancial. There are other quantitative nonfinancial variables and other nonfinancial variables, which describes characteristics, common operations and strategies of hospitals that could be associated with profitability. We refer to factors such as the type of hospital or ownership, the number of patients discharged, patient days, the number of full-time-equivalent employees, beds in service, labor intensity and the occupancy rate, which are also referred to as operational information. Probably, some users of hospitals financial statement might benefit if additional nonfinancial information is disclosed by hospitals. Nonfinancial performance measures provide information that financial ratios do not therefore, they can substantially enhance the quality a of hospital's financial decision-making (Watkins, 2000, 2003). Also, the ownership status could be associated with profitability. Sear (1991) reports that type of hospital ownership (for-profit multihospital system) is significantly related to a hospital profit and efficiency.

The focus of this dissertation is the financial performance of U.S. hospitals members of the for-profit sector known as investor-owned multihospital systems. We examined the impact of nonfinancial performance measures on their financial performance from 1999 to 2004. Our main objective is to validate the relevance of nonfinancial performance measures representing outputs, efficiency, productivity and quality in determining hospital's profitability, which is measured by the following profitability ratios: total margin, net operating margin and cash flow margin. Also, we identified some of the best financial performance models combining nonfinancial performance variables under study. Finally, we examined the long term impact of nonfinancial performance measures on hospitals financial performance in order to determine whether the long-term impact of such variables is greater than the short-term impact. In this chapter we discuss our findings and their implications.

6.2 Contributions and Implications

Appendix C shows the summary of the results of all simple regressions for the short-term and for the long-term for each dependent variable. Based on these results, almost all explanatory variables are significant. There are few exceptions such as the productivity variable, case-mix-adjusted discharges per full-time-equivalent employee, which is not significant. Two operational efficiency variables, full-time-equivalent employee per occupied bed and the occupancy rate, are not significantly related to the cash flow margin. Also, the operational efficiency measure, work hours per adjusted patient day is not significantly related to the long-term net operating margin. Finally, the productivity measure, case-mix-adjusted discharges per bed, is not significantly related to the long-term net operating margin.

This study evaluates the impact of two output measures on hospitals' profitability. One measure is the number of patients discharged adjusted by the case-mix-index and the other is the number of patient days adjusted by the case-mix index. In general, both measures represent the volume of business of a hospital primary line of business, which is patient care. These two variables are positively correlated with total margin, with net operating margin and, with cash flow margin. Based on the simple regression results, these variables are positively related to hospitals' earnings and cash flow. According to this, a hospital is more profitable as the number of patients discharged or the number of patient days, increased.

Total margin ratio defines the percentage of total revenue that has been realized in the form of net income or excess revenues over expenses. This measure puts income from all sources in perspective with all revenues received by the facility, whereas net operating margin places operating income in perspective with the volume of business realized by the facility, its primary line of business. The number of case-mix-adjusted discharges provides information on the volume of patients treated and discharged. Also, it may provide some information on the possible level of revenue that these patients can generate. On the other hand, the number of case-mix-adjusted patient days provides information on total patient days generated by all patients discharged. These quantitative variables, which measure the services rendered by a hospital, are a direct consequence of the primary line of business of a hospital. Therefore, it is expected that they explain more of the variation in the net operating margin. Consistent with this, we observed that model 1 for the current year net operating margin on Table 5.16 has an adjusted R-square value (15.89%) that is greater than the adjusted R-square value corresponding to the current year total margin (13.90%). Note that both models are function of CMAD, CMAPD, WH/APD, OCCP and JCAHO. Similarly, model 3, which is function of CMAD, WH/APD and JCAHO, has an adjusted R-square value for the long-term net operating margin equal to 17.57%, while the same statistic for the long-term total margin model is equal to 15.53%. A similar tendency is observed in the adjusted R-square values corresponding to multiple regressions models' results for net operating margin, after excluding the quality measure.

In spite that both output measures are significant and that both are positively related to hospital's financial performance when we performed simple regressions, this is not necessarily true whenever we combined them in the same multiple regression model. First, the major determinant of total margin or net operating margin is the number of case-mix-adjusted discharges. Second, our results demonstrate that in models where both variables are combined, their tendency is to impact financial performance differently. This means that the variable number of case-mix-adjusted discharges is positively related to financial performance, while the variable number of case-mix-adjusted patient days maintains an inverse relationship. Recall that there is a strong positive correlation between case-mix-adjusted discharges and case-mix-adjusted patient days ($R=0.9627$, $p<0.0001$). Based on our results, the average length of stay is 8.44 days per patient with a standard deviation of 13.79 days, and a median of 6.98 days per patient.

Usually, the average length of stay of a patient depends on the severity of his or her condition. Under the new payment systems, hospitals attempt to control the utilization of services through the implantation of utilization management programs. URAC (formerly the Utilization Review Accreditation Commission), a nonprofit organization promoting healthcare quality by accrediting healthcare organizations, defines utilization management as "*the evaluation of the medical necessity, appropriateness and efficiency of the use of healthcare services, procedures and facilities under the provisions of the applicable health benefits plan*" (Freedman, 2006, p.1). Utilization management describes proactive procedures such as discharge planning, concurrent planning, precertification and clinical case appeals. It also covers proactive processes, such as concurrent clinical reviews and peer reviews, as well as appeals introduced by the provider, payer or patient. Since the implementation of the Medicare prospective payment system (PPS) in 1983, hospitals that minimize the length of stay (within the boundaries of good medical practice) of their Medicare patients tend to achieve higher operating margins than those that do not focus on this issue. Also, since 1983 many other third party payers have implemented their own prospective payment systems, so discharge planning (to optimize length of stay) has become even more important (Sear, 1992).

Hospitals are vital community resources and must be managed for the benefit of the community. "*The objective of hospital management must be to provide the community with the services it needs, at a clinically acceptable level of quality, a publicly responsive level of amenity, at the least possible cost*" (Berman, et al., 1994, p.5). This objective has several implications. First, the long-term objective of hospital management is to perpetuate continued hospital operations by ensuring that the total revenues at least equal total economic operation costs. Second, it recognizes that the hospital is not just in the health or medical services business but rather in the human services business. Third, it applies equally well to not-for-profit and for-profit hospitals. Finally, it both establishes management's responsibility to the community and provides a general set of operating criteria.

The objective behind the implantation of management utilization programs in hospitals is two-fold. First, to help maintain high quality health care and second, to assure an efficient use of hospital's resources in order to optimize their reimbursements for services rendered.

Indeed, numbers of patients discharged as well as length of stay are important and both impact hospitals' profitability. When a hospital analyzes the impact of these two measures on their revenues, they focus on how both factors can be combined in order to optimize their reimbursement and strength their financial performance. Usually, from the perspective of a hospital's financial performance, a high level of patients discharged combined with a short length of stay is considered an adequate balance. Our results suggest that one of the main sources of earnings or profitability is the number of patients discharged. However, in order to be profitable, hospitals need to keep under control the length of stay of these patients.

Cash flow margin is a broader measure of profitability because hospitals can generate substantial revenues from non-operating sources and non-patient care business activities such as investment income, donations and non-patient care activities. Many managers, analysts and financial economists are focusing on cash flow in the belief that it reflects a company's economic condition more accurately than its reported earnings do (Eccles, 1992). From a financial perspective, strength in the cash flow ratio should facilitate meeting short-term and long-term obligations, and thus, it represents a good all-around measure of hospital financial health (Bazolli et al., 2007b). In this study, cash flow margin is computed by dividing the sum of the net income, the contractual allowances and discounts on patients' accounts and the depreciation by the total patient revenues.

Based on the simple regressions results both output measures are significantly related to cash flow margin. The number of case-mix adjusted discharges is positively correlated with the current year cash flow margin, $R = 0.2569$, $p < 0.0001$. Similarly, case-mix-adjusted patient days is positively correlated with the current year cash flow margin, $R = 0.2441$, $p < 0.0001$. For the short-term, both measures are positively correlated ($p < 0.0001$) with the cash flow margin, R = 0.1871 and R = 0.1812, respectively. Moreover, both are positively correlated ($p < 0.0001$) with long-term cash flow-margin, R = 0.1522 and R = 0.1423, respectively. Neither CMAD nor CMAPD is significant for the short-term or the long-term cash flow margin models that include the quality measure. In fact, we observed that neither CMAD nor CMAPD is correlated with the quality measure, JCAHO. Those cash flow margin models in which variables CMAD or CMAPD are not significant also include the operational efficiency measures, occupancy rate (OCCP) and work hours per adjusted patient day (WH/APD). We observed that variable occupancy rate is positively correlated with both output measures, CMAD, R = 0.5618; and CMAPD, R = 0.5443. On the other hand, variable work hours per adjusted patient day is negatively correlated with CMAD, R = -0.2167; and with CMAPD, R = -0.24. Recall that variable OCCP represents the extent to which beds are fully occupied and, that variable number of work hours per adjusted patient day is a measure of labor intensity thus, it is expected that the first impact the revenues positively while the second, which is mainly a cost indicator, impact them negatively.

The major determinants of the cash flow margin models excluding the quality measure (see table 5.20), are the case-mix-adjusted discharges, the full-time-equivalent employees per occupied bed and the work hours per adjusted patient day. The first two variables are positively related to the cash flow margin while the third is negatively related.

Both, the number of case-mix-adjusted discharges and the number of case-mix-adjusted patient days, were shown to be closely linked to hospital financial performance. Simple and multiple regressions results for total margin, net operating margin and cash flow margin support the hypothesis that output measures are relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems' sector. Our results have demonstrated that the number of case-mix-adjusted discharges and the number of case-mix-adjusted patient days contribute to explain the earnings as well as the cash flow. Moreover, they have a lasting impact on hospitals' financial performance but especially in the net operating margin. These findings suggest that, both nonfinancial measures may play an important role in the evaluation of the achievement of the organizational objectives not only in the short-term but also in the long-term. An advantage of these measures is that data for both output measures is collected routinely by each hospital thus, this data is readily available to be used by hospitals' managers in the planning process.

Efficiency ratios provide some insight of the costs at which a given hospital provides services. Investor-owned multihospital systems concentrate a great deal of management energy on controlling these variables (Sear, 1992). Watkins find that the most sensitive measure of operational efficiency is the number of full-time-equivalent employees per occupied beds. This is considered one of the most useful cost indicators by the respondents to the Critical Access Hospitals (CAH) Financial Indicators Reports (Flex Monitoring Team, 2005). It is a measure of how many workers are employed to provide services (all types) to inpatients. Our second measure of operational efficiency is the number of work hours per adjusted patient day. This is a measure of labor intensity used by Sear to evaluate its role in determining operating margin. Based on our results, there is a strong correlation between the variable full-time-equivalent employees per occupied bed and the variable work hours per adjusted patient day, $R = 0.8575$, $p < 0.0001$. The results for the simple regression models have demonstrated that both measures impact negatively the financial performance of the hospitals members of the United States investor-owned multihospital systems' sector, which it is expected because both measures are essentially cost indicators. Also, both measures are negatively correlated with the total margin and with the net operating margin. In spite that both variables are cost indicators, our results demonstrate that both measures combined in the same model may impact hospital earnings or cash flow differently. Multiple regression results demonstrate that the number of full-time-equivalent employees per occupied bed is positively related to hospitals' financial performance, while the number of work hours per adjusted patient day is negatively related. This opposite relationship suggests that a highly labor intensity reduce earnings or cash flow while an adequate staffing pattern tend to enhance the financial performance of a hospital.

Even though these measures impact hospitals' earnings or cash flow negatively, indeed both contribute to identify areas where hospital managers need to focus their attention. Both measures involved inputs that are essential or necessary to operate a hospital and render services to patients. Our findings suggest that the way in which they are managed did not contribute to enhance hospitals' profitability. It would be of great benefit to hospitals a thoroughness examination of the impact of both factors, not only on hospital's economic activity but also, on quality of health care services. This examination should take into account those characteristics that define services offered by hospitals such as type of hospital and type of patients treated. Tests results to measure the effect of hospital type on their total margin, their net operating margin and their cash flow margin, suggest that the type of hospital could make a difference in the average profitability.

A third measure of operational efficiency used in this study is the occupancy rate. It represents a measure of hospital's existing capacity utilization (the extent to which beds are fully occupied) and it is one of the most used measures by the hospitals to develop their budget and to estimate their revenues. It is expected that an inadequate staffing pattern or a highly labor intensity impact negatively a hospital's financial performance, while an increase in the occupancy rate contributes to improve it. Occupancy rate is positively correlated with total margin and with net operating margin ($p < 0.0001$). It is correlated with the cash flow margin at a significance level (for the two-tailed test) less than 10%. Based on the results, the variable occupancy rate is positively correlated with current year total margin, $R = 0.0831$, $p < 0.0001$; with short-term total margin, $R = 0.1123$, $p < 0.0001$; and with long-term total margin, $R = 0.1975$, $p < 0.0001$. Also, it is positively correlated with current year net operating margin, $R = 0.0932$, $p < 0.0001$; with the short-term net operating margin, $R = 0.12$, $p < 0.0001$; and with the long-term net operating margin, $R = 0.0976$, $p < 0.0001$. It is one of the major determinants of hospital's total margin or net operating margin.

Simple and multiple regressions results for total margin, net operating margin or cash flow margin support hypothesis that operational efficiency measures are relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems' sector.

The number of case-mix-adjusted discharges per bed in service and, the number of case mix adjusted discharges per full-time-equivalent employee represent capacity productivity and manpower productivity, respectively. Capacity productivity is measured by the relationship of the number of case mix adjusted discharges to the number of staffed beds. Case-mix-adjusted discharges per bed provide a more accurate measure of total inpatient activity than discharges alone because it takes into account the beds capacity. On the other hand, manpower productivity is measured by the relationship of the number of case mix adjusted discharges to FTEs. Both measures are expected to impact financial performance positively. As the number of case-mix-adjusted discharges per bed rises, the inpatient activity or turnover is greater thus, the expected consequence is a positive impact on the level of revenue.

Based on the simple regressions results, the variable number of case-mix-adjusted discharges per bed only is significantly related to the total margin, to the long-term net operating margin and to the cash flow margin. The variable case-mix-adjusted discharge per FTE is not significant. Based on the results for the multiple regression models, neither CMAD/BED nor CMAD/FTE is significant. Obviously, the number of case-mix-adjusted discharges per bed is highly correlated with the number of case-mix-adjusted discharges,

$R = 0.4318$, $p < 0.0001$. Also, it is highly correlated with the occupancy rate, $R = 0.5618$, $p < 0.0001$. Both, CMAD and OCCP, proof to be relevant in explaining the total margin and the net operating margin. Almost all of the best models for total margin and net operating margin combined one or both explanatory variables. Probably, this would explain why the number of case-mix-adjusted discharges per bed is not significant. In summary, the empirical results demonstrate that there is no support for hypothesis 3. Productivity measures, CMAD/BED and CMAD/FTE, are not relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems' sector.

In response to the increasing concerns about quality, a growing number of healthcare institutions are carrying out quality programs and applying standards that require a great amount of investment in resources. Thus, healthcare managers are under pressure to provide evidence that quality interventions expenditures produce tangible benefits to their organizations. Unfortunately, there is little research evidence of the effectiveness of quality interventions and quality standards. Literature reviewed sustain that one reason for this lack of evidence is the challenge that represents the measuring of nonfinancial performance measures such as quality of care. Furthermore, the difficulty of encountering a causality relationship between quality of care and financial performance.

Despite the increasing concern about quality and the adoption of continuous quality improvement programs by healthcare organizations, the tendency is to use separate evaluative processes for quality of service, clinical effectiveness and financial performance. The focus is mainly on individual indicators; not on a multidisciplinary approach or on an integrated system. This study attempts to present evidence in favor of the relevance of quality measures to determine hospitals' profitability. Hospital audits are the most common and comprehensive types of quality assessment utilized by the healthcare industry. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) is an independent organization that sets the standards by which healthcare quality is uniformly measured in the United States. These standards are grouped into performance areas addressing a particular aspect of a hospital operation. They evaluate healthcare facilities for compliance with performance standards and patient safety following an extensive on-site review. Our quality measure summarized in one single index the results of the compliance of the hospitals under study with the following performance areas: (1) initial assessment procedures for admitted patients, (2) processes to organize and monitor medication use, (3) processes to organize and monitor anesthesia care, (4) processes to organize and monitor operative procedures, (5) human resources assessment of staff competency, (6) management of patient specific information, and (7) surveillance, prevention, and control of infection. Sections 3.2.4.1 to 3.2.4.7 describe briefly the focus of each performance areas. Hospitals in compliance received a value of one (1), while those out of compliance received a value of zero (0). Each hospital has an index that range from zero to seven.

Based on the simple regressions results, JCAHO demonstrates to be significantly related (positively) to each financial performance variable. This quality measure is positively correlated with the total margin, with the net operating margin and with the cash flow margin. Table 6.1 summarizes the correlation coefficients and the coefficients of determination between the quality measure and each dependent variable.

Table 6.1. Correlation Coefficients (R) and Determination Coefficients (R^2) for the Quality Measure

	Total Margin	*Net Operating Margin*	*Cash Flow Margin*
Current Year			
R	0.13201**	0.12908**	0.10415*
R^2	0.0174**	0.0167**	0.0168*
Short-term			
R	0.15001***	0.16243***	0.16155***
R^2	0.0225***	0.0264***	0.0261***
Long-Term			
R	0.17350***	0.19352****	0.16001***
R^2	0.0301***	0.0374****	0.0256***

** p<0.05; **p<0.01; ***p<0.001; ****p<0.0001; two-tailed test*

As time elapse, correlations coefficients and consequently, the coefficients of determination, tend to increase. The percent of variation explained by the quality measure is greater in the long-term.

Recall that those multiple regressions performed including the quality measure used the 1999 analytical database only, which is the database that contains the measure of quality. All multiple regressions results demonstrate that JCAHO is significantly related to each dependent variable. As time elapse (in the long-term), this relationship is stronger. Even though the quality measure assume a maximum value of seven, it is important to recognize that its contribution per unit (parameter estimates) is greater than the contribution of the remaining of the explanatory variables, as indicated by the regression models. See tables 5.15, 5.16 and 5.17.

Simple and multiple regressions results for total margin, net operating margin or cash flow margin support the hypothesis that the quality measure, JCAHO, is relevant in determining profitability in hospitals members of the United States investor-owned multihospital systems' sector.

Literature reviewed sustain that one of the most important limitations of the accounting measures is that they are the result of management action and organizational performance. They tell managers the consequences of decisions that already have been made but do little to predict future performance. Even when the ultimate goal is to maximize financial performance, current financial measures may not capture long-term benefits from decisions made now such as investments in research and development or customer satisfaction programs. Investments in customer satisfaction can improve subsequent economic performance by increasing revenues and loyalty of existing customers, attracting new customers and reducing transaction costs (Knowledge@Wharton, 2000).

Nonfinancial measures are gaining prominence within the business environment over financial measures because these measures provide a direct correlation to strategic objectives (Pangarkar and Kirkwood, 2006). When dealing with organizational strategy, a long-term approach is required. Many nonfinancial factors have demonstrated that they contribute to and have a lasting impact on a company's market value. Since these nonfinancial measures are more forward-looking and are linked to operational activities, they help to focus a manager's efforts.

The final part of this dissertation attempted to provide some evidence of the magnitude of the impact of nonfinancial performance measures on the long-term financial performance of hospitals members of the United States investor-owned multihospital systems. We hypothesized that long term impact is greater than short-term impact. Table 6.2 shows the models selected to corroborate our hypothesis.

Table 6.2 Description of Models Used to Test Hypothesis 5

Model 1: $TM_{S/Q} = -0.10191 - 0.01344\ FTE/OCCBED + 0.27676\ OCCP + 0.01925\ JCAHO$ $(R^2=0.1018)$

$TM_{L/Q} = -0.07861 - 0.01264\ FTE/OCCBED + 0.25519\ OCCP + 0.01608\ JCAHO$ $(R^2=0.1373)$

Model 2: $TM_{S/Q} = -0.10469 - 0.00196\ WH/APD + 0.27487\ OCCP + 0.01850\ JCAHO$ $(R^2=0.1011)$

$TM_{L/Q} = -0.04637 - 0.00273\ WH/APD + 0.23479\ OCCP + 0.01508\ JCAHO$ $(R^2=0.1517)$

Model 3: $TM_{S/Q}^{c} = -0.07147 + 3.70E\text{-}6\ CMAD + 0.17308\ OCCP$ $(R^2=0.0329)$

$TM_{L/Q}^{c} = -0.10721 + 2.17E\text{-}6\ CMAD + 0.19847\ OCCP$ $(R^2=0.0430)$

Model 4: $NOM_{S/Q} = -0.11290 - 0.01714\ FTE/OCCBED + 0.29067\ OCCP + 0.02171\ JCAHO$ $(R^2=0.1156)$

$NOM_{L/Q} = -0.11252 - 0.01434\ FTE/OCCBED + 0.28675\ OCCP + 0.01989\ JCAHO$ $(R^2=0.1487)$

Model 5: $NOM_{S/Q} = -0.12099 - 0.00238\ WH/APD + 0.29067\ OCCP + 0.02078\ JCAHO$ $(R^2=0.1133)$

$NOM_{L/Q} = -0.06288 - 0.00344\ WH/APD + 0.25572\ OCCP + 0.01886\ JCAHO$ $(R^2=0.1719)$

Model 6: $NOM_{S/Q}^{c} = -0.09536 + 4.20E\text{-}6\ CMAD + 0.18876\ OCCP$ $(R^2=0.0390)$

$NOM_{L/Q}^{c} = -0.08556 + 2.50E\text{-}6\ CMAD + 0.16509\ OCCP$ $(R^2=0.0200)$

Table 6.2. (continued)

Model 7:	$CFM_{S/Q} = 0.69118 - 0.00340\ WH/APD + 0.15373\ OCCP + 0.01447\ JCAHO$	(R^2=0.1494)
	$CFM_{L/Q} = 0.71009 - 0.00262\ WH/APD + 0.12849\ OCCP + 0.01491\ JCAHO$	(R^2=0.0995)
Model 8:	$CFM_{S/Q^c} = 0.79843 + 3.50E\text{-}6\ CMAD + 0.01427\ FTE/OCCBED - 0.00472\ WH/APD$	(R^2=0.0642)
	$CFM_{L/Q^c} = 0.82012 + 2.80E\text{-}6\ CMAD + 0.01176\ FTE/OCCBED - 0.00432\ WH/APD$	(R^2=0.0440)

S=short-term; L=long-term; Q= with quality; Q^c*=without quality*

Results of the multiple regressions analysis for total margin suggest that nonfinancial variables may explain variations in the total margin not only one year after but also, three years later. Indeed, models 1 and 2 explain more of the variation of the total margin in the long-term than in the short-term. However, Z-tests for differences between the regression coefficients are not significant ($p>.05$). Therefore, based on these results, we could not affirm that the long-term impact of the explanatory variables on the total margin is greater than the short-term impact.

As well as the results of the multiple regressions analysis for the dependent variable total margin, the results of the regressions for net operating margin suggest that nonfinancial variables may explain variations in the net operating margin not only one year after but also, three years later. Indeed, models 4 and 5 explain more of the variation of the net operating margin in the long-term than in the short term. However, Z-tests for differences between the regression coefficients are not significant ($p>.05$). Therefore, based on these results, we could not affirm that the long-term impact of the explanatory variables on the net operating margin is greater than the short-term impact.

On the other hand the results of the multiple regressions analysis for the cash flow margin suggest that nonfinancial variables may explain variations in cash flow margin not only one year after but also, three years later. However, Z-tests for differences between the regression coefficients are not significant ($p>.05$). Therefore, based on these results, we could not affirm that the long-term impact of the explanatory variables on the cash flow margin is greater than the short-term impact.

Dikolli and Sedatole (2007) sustain that the value of nonfinancial performance measures for decision making and control purposes lies, to a significant degree, in the ability of such measures to serve as leading indicators of future financial performance. Even though, Z-test results do not support the hypothesis that the nonfinancial performance measures impact on profitability of hospitals is greater in the long-term than in the short-term, an important finding is the fact that nonfinancial performance measures under study have a lasting impact on the total margin, the net operating margin and the cash flow margin.

It is common to see the application of nonfinancial performance measures in the healthcare industry, particularly in hospitals, to improve the quality of patient services or clinical outcomes, to attract healthcare professionals, or to qualify for accreditation or any other requirement to be a certified as a healthcare provider. Our findings suggest that the use of nonfinancial performance measures by hospitals can improve their financial performance as well. For instance, an operational problem can be detected more quickly by measuring the number of full-time-equivalent employees per occupied bed or the number of work hours per adjusted patient day, so remedial steps could quickly be taken to solve it. If we can identify those variables associated with the high cost of health care, we will be able to get a financial benefit from this knowledge because a reduction in the costs of health care may imply an increase in profit margins.

Different measure types have different strengths and weaknesses (Chow and Van Der Stede, 2006). The value of nonfinancial performance measures do not reside in any individual measure. It arises from creating the entire set of measures along with a strategy that links them together. The choice of nonfinancial performance measures, their optimal combination with financial measures to obtain the optimal mix of measures, as well as the task to measure their role in value creation seems to be the great challenge. However, the potential benefits for the hospitals could be greater. It is important to identify, analyze and act on the right measurements. Each organization needs to identify the set of measures that work better for them, subject to their mission and objectives. Moreover, it is important to set the right performance targets. Outstanding nonfinancial performance is not always beneficial. Indeed, it often produces diminishing or even negative economic returns. For instance, a high occupancy rate not always produced a greater profit margin. An occupancy rate that exceeds the capacity of the hospital in terms of the number of employees to provide services to inpatients, may affect the quality of services (e.g. delay in treatments, complications, errors in the use of medications) with the consequence of an increased in costs that could reduced the profit margin of a hospital.

A final commentary, Epstein et al. (2000), affirm that nonfinancial measures are designed to capture the operating effects of managerial decisions that will, eventually, influence financial results. Therefore, the objective for managing an enterprise should be to manage all the identifiable drivers of profitability with regard to their effects on revenues and costs, so as to maximize the value of the firm to its stakeholders.

6.3 Limitations

Basically, this study presents limitations related to the data sources. We used three different databases to create our analytical databases: the American Hospital Association annual survey, the Medicare Cost Reports and Joint Commission. The common element to all of them was the Medicare provider number, which is the number used to match the data for the hospitals under study. Not all hospitals have assigned a Medicare provider number because not all of them are Medicare providers. Other hospitals, which in effect are Medicare providers, have no Medicare provider number (missing data). This required finding an alternate method to identify these hospitals with missing provider number in order to count with the major number of hospitals pertaining to the investor-owned multihospital systems sector. In addition to this, the Medicare cost reports database contains duplicate data thus, it was necessary to edit these databases before merging the files. According to 1999 AHA survey the size of the population of hospitals pertaining to the investor-owned multihospital systems sector is 1,155 hospitals. Our analytical databases count with 1,058 hospitals (92% of the population).

6.4 Future Research

Two essential input to output efficiency measures, such as the number of full-time equivalent employees per occupied bed and the number of work hours per adjusted patient day do not contribute to enhance hospitals' profitability. A thoroughness examination of the impact of both factors, not only on hospital's economic activity but also, on quality of health care services would be of great benefit to hospitals.

Tests results to measure the effect of hospital type on the total margin, the net operating margin and the cash flow margin, suggest that the type of hospital could make a difference in the average profitability. This finding requires further examination in order to know which specific aspects or characteristics of the type of hospital make the difference.

There is little research evidence of the effectiveness of quality interventions and quality standards on financial performance. Future studies in this area would contribute to demonstrate the benefits of quality measurement not only to improve quality of services to patients but also to reduce costs and enhance profitability.

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APPENDIX A: Tables

Table A.1. List of Variables and Field Description of the AHA File Investor-Owned

Field Name	***Field Description***	***Type***
aha_id	AHA identification number	Num
ADC	Average daily census=Admissions ÷ Patient days	Num
ADJADC	Adjusted average daily census=Adjusted inpatient days ÷ Number of days in the reporting period	Num
ADJADM	Adjusted admissions=Admissions + (Admissions x (Outpatient revenue ÷ Inpatient revenue))	Num
ADJPD	Adjusted patient days=Inpatient days + (Inpatient days x (Outpatient revenue ÷ Inpatient revenue))	Num
ADMH	Hospital unit admissions	Num
ADMTOT	Total facility admissions	Num
ASSUSE	If yes, have the hospital used the assessment to identify unmet health needs, excess capacity, or duplicate services in the community? 1=yes 0=no	Num
BDH	Hospital unit beds set up and staffed	Num
BDTOT	Total facility beds set up and staffed at the end of reporting period	Num
BSC	Bed size code: 1= 6-24 beds 2=25-49 beds 3=50-99 beds 4=100-199 beds 5=200-299 beds 6=300-399 beds 7=400-499 beds 8=500 or more beds	Num
CAPASS	Does your hospital work with other local providers, public agencies, our community representatives to develop a written assessment of the appropriate capacity for health services in the community? 1=yes 0=no	Num

Table A.1 (continued). List of Variables and Field Description of the AHA File Investor-Owned

Field Name	***Field Description***	***Type***
CNTRL	Control code – type of authority responsible for establishing policy concerning overall operation of the hospital Investor-owned (for-profit) 31= Individual 32= Partnership 33=Corporation	Num
CTRACK	Does the hospital work with other providers to collect, track and communicate clinical and health information across cooperating organizations? 1=yes 0=no	Num
DCOV	Days open during reporting period	Num
DTBEG	Beginning of reporting period	Num
DTEND	End of reporting period	Num
EXPTOT	Total facility expenses (excluding bad debt)	Num
FTE	Full time equivalent total personnel	Num
FTTOT	Full time total personnel	Num
FTTOTH	Total full time hospital unit personnel	Num
FYR	Was the hospital in operation 12 full months to the end of the reporting period? 1=yes 0=no	Num
HOSPBD	Total hospital beds	Num
HSASSESS	Does the hospital work with other local providers, public agencies or community representatives to conduct a health status assessment of the community? 1=yes 0=no	Num
HSIND	Does your hospital use health status indicators to design new services or modify existing services? 1=yes 0=no	Num
IPDH	Hospital unit inpatient days	Num
IPDTOT	Total facility impatient days	Num

Table A.1 (continued). List of Variables and Field Description of the AHA File Investor-Owned

Field Name	*Field Description*	*Type*
LOS	Short-term, long-term classification code 1= short-term 2= long-term	Num
LTPLAN	Does the hospital have a long term plan for improving the health of its community? 1=yes 0=no	Num
MAPP1	Accreditation by JCAHO: 1=yes 2=no	Num
MCNTRL	Control/ownership code (from membership)	Num
MISSION	Does the hospital mission statement include a focus on community benefit? 1=yes 0=no	Num
MLOS	Short-term, long-term classification code (from membership) 1= short-term 2= long-term	Num
MNAME	Hospital name (from membership)	Char
MSERV	Primary service code (from membership)	Num
MTYPE	Hospital type code: y=registered hospital n=not registered hospital	Char
NPAYBEN	Total facility employee benefits	Num
NPAYBENH	Hospital unit employee benefits	Num
PAYTOT	Total facility payroll expenses	Num
PAYTOTH	Hospital unit payroll expenses	Num
PRVDR_NUM	Medicare provider ID	Num
PTTOT	Part time total personnel	Num
PTTOTH	Total part time hospital unit personnel	Num

Table A.1 (continued). List of Variables and Field Description of the AHA File Investor-Owned

Field Name	***Field Description***	***Type***
QUALREP	Does the hospital, alone or with others, disseminate reports to the community on the quality and costs of health care services? 1=yes 0=no	Num
RESOURCE	Does the hospital have resources for its community benefit activities? 1=yes 0=no	Num
SERV	Service code – category best describing the hospital of the type of service provided to the majority of admissions	Num
SYSID	Health care system ID	Num
SYSNAME	System name (from membership)	Char
VEM	Emergency Room visits	Num
VOTH	Other outpatient visits	Num
VTOT	Total outpatient visits	Num

Table A.2. Variables Description Cost Reports Data (ResDAC)

Variable Name	*Description*	*Source (Cost Report Form)*
HOSP_NAME	Hospital (Component) Name	S200000-00200-0100
PRVDR_NUM	Hospital Provider Number (HCFAID)	S200000-00200-0200
DATE_CERTIFIED	Date Certified	S200000-00200-0300
BEDS	Total Number of Beds (Line 12)	S300001-01200-0100
BED_DAYS	Total Bed Days Available	S300001-01200-0200
PATIENT_DAYS	All Patient Days	S300001-01200-0600
FTE_EE_PAYROLL	Total Full Time Equivalent: Employees on Payroll (Line 12)	S300001-01200-1000
FTE_NONPAID	Total Full Time Equivalent: Nonpaid Workers (Line 12)	S300001-01200-1100
DISCHARGES	Discharges: Total All Patients	S300001-01200-1500
CONTROL_TYPE	Type of Control	S200000-01800-0100
HOSPITAL_TYPE	Type of Hospital	S200000-01900-0100
TOTAL_BEDS	Total: Total Number of Beds (Line 25)	S300001-02500-0100
TOT_FTE_EE_PAYROLL	Total: Total Full Time Equivalent: Employees on Payroll (Line 25)	S300001-02500-1000
TOT_FTE_NONPAID	Total: Total Full Time Equivalent: Nonpaid Workers (Line 25)	S300001-02500-1100
TOT_PT_REV	Total Patient Revenues	G300000-00100-0100
ALLW_DISC	Contractual Allowances and Discounts on Patients' Accounts	G300000-00200-0100

Table A.2 (continued.) Variables Description Cost Reports Data (ResDAC)

Variable Name	*Description*	*Source (Cost Report Form)*
NET_PT_REV	Net Patient Revenues= Total Patient Revenues- Contractual Allowances and Discounts on Patients' Accounts	G300000-00300-0100
OPER_EXP	Total Operating Expenses	G300000-00400-0100
NET_INC_PT_SERV	Net Income from Services to Patients = Net Patient Revenues – Total Operating Expenses	G300000-00500-0100
OTHER_INC	Total Other Income	G300000-02500-0100
TOTAL_INCOME	Total Income = Net Income from Services to Patients + Total Other Income	G300000-02600-0100
OTHER_EXP	Total Other Expenses	G300000-03000-0100
NET_INCOME	Net Income = Total Income – Total Other Expenses	G300000-03100-0100

Table A.3. List of Variables and Field Descriptions of the File JCAHO

ancomp	A 0/1 indicator for hospital compliance with the JCAHO anesthesia performance area, which applies to general, spinal, other major regional anesthesia, or sedation
asscomp	A 0/1 indicator for hospital compliance with the JCAHO initial patient assessment performance area, which relates to hospital practices to undertake and document patient needs when they are admitted to a hospital.
Aha_id	The AHA identification number for a hospital.
infcomp	A 0/1 indicator for hospital compliance with the JCHAO infection control performance area.
jcaho	A sum of how many performance areas under study in which the hospital was in compliance.
medcomp	A 0/1 indicator for hospital compliance with the JCAHO medication use performance area.
opcomp	A 0/1 indicator for hospital compliance with the JCAHO operative procedure performance area.
pincomp	A 0/1 indicator for hospital compliance with the JCAHO patient specific information performance area, which addresses the use of patient-specific data and information to facilitate patient care.
stafcomp	A 0/1 indicator for hospital compliance with JCAHO performance area for assessing staff competence
CNTRL	Control code – type of authority responsible for establishing policy concerning overall operation of the hospital. Investor-owned (for-profit): 31 = Individual 32 = Partnership 33 = Corporation
PRVDR_NUM	Medicare provider ID

Table A.4. Description of Explanatory Variables

Output Measures:		
CMAD	Case Mix Adjusted Discharges	(Total Discharges) x (Case-Mix-Index)
CMAPD	Case Mix Adjusted Patient Days	(Adjusted Patient Days[19]) x (Case-Mix-Index)
Operational Efficiency:		
FTE/OCCBED	Staff per Occupied Bed	Total FTE ÷ Adjusted Occupied Beds[20]
WH/APD	Work Hours per Adjusted Patient Day	Work Hours[21] ÷ Adjusted Patient Days
OCCP	Occupancy Rate	Total Patient Days ÷ Total Bed Days
Productivity:		
CMAD/BED	Case Mix Adjusted Discharges Per Bed in Service	CMAD ÷ Total Beds
CMAD/FTE	Case Mix Adjusted Discharges Per Full-Time Equivalent Employee	CMAD ÷ Total FTE
Quality Measures:		
JCAHO	A sum of how many performance areas under study in which the hospital was in compliance[22] with the JCAHO standards.	

[19] Adjusted Patient Days = (Patient Days)x [1+ (Total Outpatient Revenue ÷ Total Inpatient Revenue)]
[20] Adjusted Occupied Beds = Total Beds x [((Total Patient Days ÷ Days in Period)÷Total Beds) x (Total Patient Revenue ÷ Total Inpatient Revenue)] = [(Total Patient Days ÷ Days in Period) x (Total Patient Revenue ÷ Total Inpatient Revenue)] = [Average Daily Census x (Total Patient Revenue ÷ Total Inpatient Revenue)]
[21] Work Hours = Total FTE x 2080 hours
[22] Compliance Code: 1= hospital was in compliance 0= hospital was not in compliance

Table A.5. Description of Financial Performance Variables

Profitability Measures:

TM	Total Margin	Net Income ÷ (Net Patient Revenues + Total Other Income)
NOM	Net Operating Margin	Net Income from Services to Patients ÷ Net Patient Revenues
CFM	Cash Flow Margin	(Net Income + Depreciation + Contractual Allowances and Discounts on Patients' Account) ÷ Total Patient Revenues

Table A .6. Descriptive Statistics for the Four Main Types of Hospitals

General Short Term Hospitals

Variable	*n*	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*	Coefficient Variation
CMAD	1812	6.61	84,439	8,758	9,146	104.42%
CMAPD	1794	52.05	587,749	60,305	61,797	102.48%
FTE_OCCBED	1805	0.14	49.37	4.81	2.49	51.81%
WH_APD	1793	0.98	98.88	27.91	11.40	40.87%
OCCP	1828	0.00	1.07	0.47	0.20	41.94%
CMAD_BED	1812	0.11	1,044	54.35	37.95	69.82%
CMAD_FTE	1810	0.06	412.27	15.97	11.36	71.16%
JCAHO	479	2.00	7.00	5.40	1.27	23.62%
TM	3528	-10.89	5.93	0.03	0.30	884.45%
NOM	3528	-10.49	8.26	0.02	0.35	1477.67%
CFM	3379	-0.64	6.39	0.75	0.19	24.76%

General Long Term Hospitals

Variable	*n*	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*	*Coefficient Variation*
CMAD	6	1,987	10,110	5,849	3,774	64.51%
CMAPD	6	13,334	86,303	49,565	38,830	78.34%
FTE_OCCBED	163	1.34	13.69	3.69	1.73	46.88%
WH_APD	163	7.67	78.24	21.18	9.92	46.85%
OCCP	163	0.17	0.98	0.69	0.16	23.55%
CMAD_BED	6	40.55	64.13	54.72	8.71	15.92%
CMAD_FTE	6	8.05	16.70	10.47	3.20	30.56%
JCAHO	4	5.00	7.00	5.75	0.96	16.65%
TM	325	-1.52	0.44	0.05	0.19	407.10%
NOM	325	-1.54	0.44	0.03	0.19	557.68%
CFM	317	-0.19	1.08	0.63	0.12	19.10%

Note: Computed using data from 1999 to 2001 for nonfinancial variables and data from 1999 to 2004 for financial variables

Table A.6 (continued). Descriptive Statistics for the Four Main Types of Hospitals

Psychiatric Hospitals

Variable	*n*	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*	*Coefficient Variation*
CMAD	0					
CMAPD	0					
FTE_OCCBED	328	0.03	32.67	2.88	2.75	95.26%
WH_APD	325	3.53	83.65	16.48	8.67	52.61%
OCCP	333	0.19	1.01	0.60	0.19	32.01%
CMAD_BED	0					
CMAD_FTE	0					
JCAHO	0					
TM	642	-10.70	2.18	-0.05	0.58	-1159.53%
NOM	642	-12.06	2.14	-0.10	0.76	-744.95%
CFM	593	-5.04	2.23	0.62	0.29	46.83%

Rehabilitation Hospitals

Variable	*n*	*Minimum*	*Maximum*	*Mean*	*Standard Deviation*	*Coefficient Variation*
CMAD	0					
CMAPD	0					
FTE_OCCBED	260	0.57	7.80	2.90	0.64	22.05%
WH_APD	260	3.24	88.60	18.92	7.98	42.18%
OCCP	262	0.10	1.04	0.76	0.18	24.05%
CMAD_BED	0					
CMAD_FTE	0					
JCAHO	2	7.00	7.00	7.00	-	0.00%
TM	521	-1.09	0.43	0.13	0.13	101.05%
NOM	521	-1.11	0.43	0.12	0.14	117.27%
CFM	519	0.03	1.31	0.65	0.13	19.57%

Note: Computed using data from 1999 to 2001 for nonfinancial variables and data from 1999 to 2004 for financial variables

Table A.7. Means of Dependent Variables by Type of Hospital

	Total Margin					
Hospital Type	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
General Short-Term	0.0439	0.0455	0.0309	0.0494	0.0204	0.0142
General Long-Term	-0.0886	0.0187	0.0363	0.0831	0.1199	0.1029
Psychiatric	-0.0835	-0.1068	-0.1135	0.0061	-0.0272	0.0355
Rehabilitation	0.1088	0.0921	0.0945	0.2003	0.1549	0.1471
	Net Operating Margin					
Hospital Type	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
General Short-Term	0.0296	0.0310	0.0155	0.0375	0.0058	0.0223
General Long-Term	-0.1288	0.0133	0.0313	0.0709	0.1136	0.1046
Psychiatric	-0.1223	-0.1368	-0.1402	-0.0305	-0.0665	-0.1097
Rehabilitation	0.0925	0.0771	0.0816	0.1933	0.1444	0.1383
	Cash Flow Margin					
Hospital Type	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
General Short-Term	0.7092	0.7254	0.7432	0.7713	0.7807	0.7871
General Long-Term	0.5852	0.6061	0.6289	0.6533	0.6912	0.6387
Psychiatric	0.6040	0.6191	0.6308	0.6515	0.6574	0.5839
Rehabilitation	0.6215	0.6371	0.6726	0.6398	0.6486	0.6541

Table A.8. Correlation Coefficients for Lags Equal to One Year (Short-term)

Statistic	CMAD	CMAPD	FTE/OCCBED	WH/APD	CMAD/BED	CMAD/FTE	OCCP	JCAHO	TM	NOM	CFM
Mean	8492	58665	4.31	25.33	53.30	15.66	0.5239	5.40	0.0336	0.0171	0.7132
Standard Deviation	9043	61101	2.55	11.93	38.25	11.24	0.2194	1.26	0.3869	0.3949	0.1998
N	1898	1879	2687	2666	1898	1896	2719	499	2635	2635	2529
Variables											
CMAD	1.00										
CMAPD	0.9627	1.00									
FTE/OCCBED	-0.1593	-0.1779	1.00								
WH/APD	-0.2167	-0.2400	0.8575	1.00							
CMAD/BED	0.4318	0.3837	-0.1512	-0.2137	1.00						
CMAD/FTE	0.2994	0.2511	-0.2809	-0.3547	0.2738	1.00					
OCCP	0.5618	0.5443	-0.3776	-0.4401	0.5856	0.3256	1.00				
JCAHO	0.0540	0.0717	-0.0057	-0.0496	0.1314	0.0792	0.1051	1.00			
TM	0.1592	0.1491	-0.0772	-0.0853	0.1113	0.0836	0.1123	0.1500	1.00		
NOM	0.1739	0.1631	-0.0918	-0.1025	0.1280	0.0995	0.1200	0.1624	0.9832	1.00	
CFM	0.1871	0.1812	-0.0137	-0.0483	0.1063	0.1353	0.0048	0.1616	0.2079	0.2114	1.00

Table A.9. Correlation Coefficients for Lags Equal to Three Years (Long-term)

Statistic	CMAD	CMAPD	FTE/OCCBED	WH/APD	CMAD/BED	CMAD/FTE	OCCP	JCAHO	TM	NOM	CFM
Mean	8492	58665	4.31	25.33	53.30	15.66	0.5239	5.40	0.0444	0.0295	0.7363
Standard Deviation	9043	61101	2.55	11.93	38.25	11.24	0.2194	1.26	0.2637	0.4145	0.2350
N	1898	1879	2687	2666	1898	1896	2719	499	2479	2479	2353
Variables											
CMAD	1.0000										
CMAPD	0.9627	1.0000									
FTE/OCCBED	-0.1593	-0.1779	1.0000								
WH/APD	-0.2167	-0.2400	0.8575	1.0000							
CMAD/BED	0.4318	0.3837	-0.1512	-0.2137	1.0000						
CMAD/FTE	0.2994	0.2511	-0.2809	-0.3547	0.2738	1.0000					
OCCP	0.5618	0.5443	-0.3776	-0.4401	0.5856	0.3256	1.0000				
JCAHO	0.0540	0.0717	-0.0057	-0.0496	0.1314	0.0792	0.1051	1.0000			
TM	0.1535	0.1432	-0.0871	-0.1070	0.1341	0.0540	0.1975	0.1735	1.0000		
NOM	0.1127	0.0881	-0.0484	-0.0623	0.0858	0.0467	0.0976	0.1935	0.6399	1.0000	
CFM	0.1522	0.1423	0.0319	0.0085	0.0935	0.1194	-0.0392	0.1600	0.0610	0.0625	1.0000

Table A.10. Descriptive Statistics for the Accounts of the Statements of Accounts

			Total Patient Revenue			
Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	919	914	872	847	826	802
Minimum	$ 2,137,178	$ 409,511	$ 1,608,862	$ 721,275	$ 620,187	$ 583,511
Maximum	1,475,986,722	2,143,935,805	2,473,872,172	1,987,451,781	2,183,299,653	2,470,165,134
Mean	108,328,423	127,943,049	153,746,643	182,223,210	193,117,046	214,146,850
Median	50,425,987	57,634,471	66,824,765	76,061,920	83,342,751	99,979,134
Standard Deviation	149,466,986	182,125,074	$ 221,678,409	253,936,309	266,207,001	288,221,497

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

Contractual Allowances and Discounts on Patient's Accounts

Descriptive Statistic	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*
N*	906	904	870	843	822	798
Minimum	$ 6,614	$ 62,297	$ 162,988	$ 182,841	$ 287,987	$ 302,584
Maximum	1,269,963,379	1,823,827,657	2,076,655,506	1,281,052,283	1,414,354,780	1,592,087,575
Mean	67,412,793	82,245,002	101,618,037	124,830,479	135,523,003	153,952,031
Median	26,789,763	30,493,359	37,989,050	43,506,730	53,285,247	61,821,125
Standard Deviation	104,388,341	133,914,067	166,144,821	192,722,272	203,557,112	219,910,575

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

Net Patient Revenues

Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	920	914	873	847	827	803
Minimum	$ (27,209,920)	$ 146,178	$ (84,395,419)	$ 384,067	$ (14,747,595)	$ (16,224,443)
Maximum	599,926,298	687,525,813	594,404,996	738,924,832	768,944,873	878,077,559
Mean	41,823,728	46,597,883	52,301,696	58,408,986	58,555,352	64,277,549
Median	22,814,444	25,464,522	27,675,075	30,924,892	30,256,874	36,158,075
Standard Deviation	53,061,172	59,675,855	66,692,839	72,854,721	71,773,261	78,086,975

**Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

Total Operating Expenses						
Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	933	917	875	850	827	804
Minimum	$ 2,009,580	$ 310,845	$ 1,883,999	$ 790,242	$ 241,213	$ 627,184
Maximum	482,026,305	504,361,498	563,791,531	637,560,040	684,230,561	706,550,343
Mean	37,966,803	41,614,718	47,242,458	52,172,579	54,413,313	60,031,726
Median	22,442,176	24,346,782	27,469,056	30,176,616	30,136,553	34,160,913
Standard Deviation	44,628,432	48,856,225	55,692,965	62,517,183	64,107,778	70,130,368

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

Net Income from Services to Patients

Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	933	917	875	850	827	804
Minimum	$ (101,102,015)	$ (39,194,288)	$ (135,286,399)	$ (154,593,563)	$ (85,850,743)	$ (80,282,124)
Maximum	480,967,912	500,502,603	347,046,445	162,679,095	114,047,887	203,761,453
Mean	3,274,172	4,830,719	4,939,691	6,098,974	4,142,039	4,165,875
Median	167,036	334,985	839,778	1,857,259	1,046,801	1,292,165
Standard Deviation	20,254,997	21,507,463	19,284,885	17,256,445	14,751,130	17,659,317

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

Total Other Income

Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	933	915	873	848	827	803
Minimum	$ -	$ -	$ -	$ -	$ -	$ -
Maximum	96,608,661	71,062,628	126,601,453	25,483,229	47,308,348	57,728,640
Mean	1,024,768	1,098,343	1,090,503	967,087	953,662	1,178,995
Median	300,377	304,415	291,737	307,501	292,015	343,943
Standard Deviation	3,708,849	3,965,678	4,721,663	2,018,785	2,531,577	3,875,960

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

			Total Income			
Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	933	917	875	850	827	804
Minimum	$ (69,905,810)	$ (33,207,572)	$ (134,337,489)	$ (154,593,563)	$ (85,525,416)	$ (56,279,809)
Maximum	484,016,174	504,573,596	347,046,445	165,804,779	117,734,202	204,308,991
Mean	4,300,742	5,926,666	6,027,702	7,063,786	5,095,701	5,343,278
Median	659,195	738,394	1,237,356	2,469,302	1,489,795	1,814,235
Standard Deviation	20,162,019	22,257,070	20,853,402	17,574,743	15,076,732	17,703,996

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

	Total Other Expenses					
Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	282	261	257	227	189	219
Minimum	$ -	$ -	$ -	$ 8	$ 16	$ 14
Maximum	30,362,225	32,077,494	23,296,742	28,822,656	56,299,712	66,725,493
Mean	1,402,422	1,677,135	1,786,729	2,531,725	4,188,634	4,220,452
Median	77,976	93,176	97,732	121,764	244,511	287,857
Standard Deviation	3,595,537	3,781,602	3,749,134	5,226,988	8,742,057	9,103,824

** Total Hospitals = 1058*

Table A.10 (continued). Descriptive Statistics for the Accounts of the Statements of Accounts

	Net Income					
Descriptive Statistic	***1999***	***2000***	***2001***	***2002***	***2003***	***2004***
N*	933	917	875	850	827	804
Minimum	$ (69,905,810)	$ (33,338,809)	$ (134,337,489)	$ (154,593,563)	$ (85,525,416)	$ (56,279,809)
Maximum	473,664,180	504,369,682	347,046,445	165,804,779	88,000,061	204,308,991
Mean	3,881,639	5,449,314	5,502,914	6,387,666	4,139,323	4,193,677
Median	562,774	535,883	1,028,630	2,095,377	1,293,783	1,418,634
Standard Deviation	19,782,744	22,035,484	20,731,869	16,956,439	13,383,284	15,887,344

** Total Hospitals = 1058*

APPENDIX B: Repeated Measures ANOVA

Repeated Measures ANOVA

The GLM Procedure

Repeated Measures Analysis of Variance for Total Margin

Sphericity Tests

Variables	DF	Mauchly's Criterion	Chi-Square	Pr > ChiSq
Transformed Variates	14	0.1023342	1730.3774	<.0001
Orthogonal Components	14	0.1674321	1356.6462	<.0001

Repeated Measures ANOVA (continued)

Total Margin

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no YEAR Effect
H = Type III SSCP Matrix for YEAR
E = Error SSCP Matrix

S=1 M=1.5 N=377.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.99615232	0.58	5	757	0.7117
Pillai's Trace	0.00384768	0.58	5	757	0.7117
Hotelling-Lawley Trace	0.00386254	0.58	5	757	0.7117
Roy's Greatest Root	0.00386254	0.58	5	757	0.7117

MANOVA Test Criteria and F Approximations for the Hypothesis of no YEAR*HOSPITAL_TYPE Effect
H = Type III SSCP Matrix for YEAR*HOSPITAL_TYPE
E = Error SSCP Matrix

S=5 M=0.5 N=377.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.90777601	2.12	35	3186.8	0.0001
Pillai's Trace	0.09403450	2.08	35	3805	0.0002
Hotelling-Lawley Trace	0.09960491	2.15	35	2141.9	0.0001
Roy's Greatest Root	0.07386014	8.03	7	761	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Repeated Measures ANOVA (continued)

Total Margin

The GLM Procedure
Repeated Measures Analysis of Variance
Tests of Hypotheses for Between Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPITAL_TYPE	7	5.96661963	0.85237423	6.53	<.0001
Error	761	99.31324641	0.13050361		

The GLM Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

						Adj Pr > F	
Source	DF	Type III SS	Mean Square	F Value	Pr > F	G - G	H - F
YEAR	5	0.0429335	0.0085867	0.15	0.9794	0.9242	0.9261
YEAR*HOSPITAL_TYPE	35	3.2750770	0.0935736	1.66	0.0087	0.0316	0.0308
Error(YEAR)	3805	214.3708164	0.0563392				

Greenhouse-Geisser Epsilon	0.5836
Huynh-Feldt Epsilon	0.5915

Repeated Measures ANOVA (continued)

The GLM Procedure
Repeated Measures Analysis of Variance for Net Operating Margin

Sphericity Tests

Variables	DF	Mauchly's Criterion	Chi-Square	Pr > ChiSq
Transformed Variates	14	0.0144455	3216.5907	<.0001
Orthogonal Components	14	0.2387774	1087.2008	<.0001

Repeated Measures ANOVA (continued)

Net Operating Margin

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no YEAR Effect
H = Type III SSCP Matrix for YEAR
E = Error SSCP Matrix

S=1 M=1.5 N=377.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.99478253	0.79	5	757	0.5541
Pillai's Trace	0.00521747	0.79	5	757	0.5541
Hotelling-Lawley Trace	0.00524484	0.79	5	757	0.5541
Roy's Greatest Root	0.00524484	0.79	5	757	0.5541

The GLM Procedure
Repeated Measures Analysis of Variance

MANOVA Test Criteria and F Approximations for the Hypothesis of no YEAR*HOSPITAL_TYPE Effect
H = Type III SSCP Matrix for YEAR*HOSPITAL_TYPE
E = Error SSCP Matrix

S=5 M=0.5 N=377.5

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.91548748	1.93	35	3186.8	0.0008
Pillai's Trace	0.08606464	1.90	35	3805	0.0011
Hotelling-Lawley Trace	0.09062139	1.96	35	2141.9	0.0007
Roy's Greatest Root	0.06535530	7.11	7	761	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Repeated Measures ANOVA (continued)

Net Operating Margin

The GLM Procedure
Repeated Measures Analysis of Variance
Tests of Hypotheses for Between Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPITAL_TYPE	7	7.1948073	1.0278296	6.07	<.0001
Error	761	128.7543030	0.1691909		

The GLM Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

						Adj Pr > F	
Source	DF	Type III SS	Mean Square	F Value	Pr > F	G - G	H - F
YEAR	5	0.0997646	0.0199529	0.26	0.9328	0.8814	0.8838
YEAR*HOSPITAL_TYPE	35	3.5765299	0.1021866	1.35	0.0809	0.1142	0.1128
Error(YEAR)	3805	287.4978980	0.0755579				

Greenhouse-Geisser Epsilon	0.7092
Huynh-Feldt Epsilon	0.7195

Repeated Measures ANOVA (continued)

The GLM Procedure
Repeated Measures Analysis of Variance for Cash Flow Margin

Sphericity Tests

Variables	DF	Mauchly's Criterion	Chi-Square	Pr > ChiSq
Transformed Variates	14	0.0125062	2918.5401	<.0001
Orthogonal Components	14	0.3263662	745.85564	<.0001

Repeated Measures ANOVA (continued)

Cash Flow Margin

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of no YEAR Effect
H = Type III SSCP Matrix for YEAR
E = Error SSCP Matrix

S=1 M=1.5 N=331

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.99189622	1.08	5	664	0.3674
Pillai's Trace	0.00810378	1.08	5	664	0.3674
Hotelling-Lawley Trace	0.00816999	1.08	5	664	0.3674
Roy's Greatest Root	0.00816999	1.08	5	664	0.3674

The GLM Procedure
Repeated Measures Analysis of Variance

MANOVA Test Criteria and F Approximations for the Hypothesis of no YEAR*HOSPITAL_TYPE Effect
H = Type III SSCP Matrix for YEAR*HOSPITAL_TYPE
E = Error SSCP Matrix

S=5 M=0 N=331

Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.87797931	2.93	30	2658	<.0001
Pillai's Trace	0.12598966	2.88	30	3340	<.0001
Hotelling-Lawley Trace	0.13451018	2.97	30	1759.6	<.0001
Roy's Greatest Root	0.09256355	10.31	6	668	<.0001

NOTE: F Statistic for Roy's Greatest Root is an upper bound.

Repeated Measures ANOVA (continued)

Cash Flow Margin

The GLM Procedure
Repeated Measures Analysis of Variance
Tests of Hypotheses for Between Subjects Effects

Source	DF	Type III SS	Mean Square	F Value	Pr > F
HOSPITAL_TYPE	6	12.89590001	2.14931667	23.37	<.0001
Error	668	61.42605456	0.09195517		

The GLM Procedure
Repeated Measures Analysis of Variance
Univariate Tests of Hypotheses for Within Subject Effects

						Adj Pr > F	
Source	DF	Type III SS	Mean Square	F Value	Pr > F	G - G	H - F
YEAR	5	0.02487688	0.00497538	0.81	0.5409	0.5026	0.5041
YEAR*HOSPITAL_TYPE	30	0.53867112	0.01795570	2.93	<.0001	<.0001	<.0001
Error(YEAR)	3340	20.46346674	0.00612679				

Greenhouse-Geisser Epsilon	0.6955
Huynh-Feldt Epsilon	0.7059

APPENDIX C: Simple Regressions

SIMPLE REGRESSIONS

		Dependent Variable					
		Total Margin		Net Operating Margin		Cash Flow Margin	
Variable	Statistic	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
CMAD	Parameter Estimate	5.90E-06	4.50E-06	6.53E-06	4.50E-06	4.32E-06	3.41E-06
	t-value	6.85	5.86	6.79	4.46	5.95	5.23
	P>|t|	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Adjusted R-square	0.0242	0.0263	0.0308	0.0127	0.0395	0.0220
CMAPD	Parameter Estimate	8.08E-07	6.05E-07	9.01E-07	5.11E-07	6.21E-07	4.70E-07
	t-value	6.95	5.87	6.92	2.62	6.11	5.19
	P>|t|	<0.0001	<0.0001	<0.0001	=0.0089	<0.0001	<0.0001
	Adjusted R-square	0.0210	0.0274	0.0255	0.0076	0.0373	0.0191
FTE/OCCBED	Parameter Estimate	-1.04E-02	-9.24E-03	-1.27E-02	-8.48E-03	-1.17E-03	3.21E-03
	t-value	-2.70	-2.91	-2.86	-2.19	-0.48	1.32
	P>|t|	=0.0070	=0.0038	=0.0043	=0.0288	=0.6295	=0.1887
	Adjusted R-square	0.007	0.0082	0.0100	0.0019	0.0054	0.000038
WH/APD	Parameter Estimate	-2.43E-03	-2.41E-03	-2.99E-03	-2.33E-03	-8.68E-04	1.86E-04
	t-value	-3.84	-4.14	-4.20	-2.64	-1.63	0.33
	P>|t|	=0.0001	<0.0001	<0.0001	=0.0083	=0.0163	=0.7417
	Adjusted R-square	0.0085	0.0122	0.0120	0.0034	0.0074	-0.00087

SIMPLE REGRESSIONS (continued)

		Dependent Variable					
		Total Margin		Net Operating Margin		Cash Flow Margin	
Variable	Statistic	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
OCCP	Parameter Estimate	1.95E-01	2.51E-01	2.12E-01	1.88E-01	4.19E-03	-4.42E-02
	t-value	4.87	7.53	5.03	2.86	-0.14	-1.63
	P>|t|	<0.0001	<0.0001	<0.0001	=0.0044	=0.8877	=0.1037
	Adjusted R-square	0.0131	0.0424	0.0149	0.0099	0.0056	0.000619
CMAD/BED	Parameter Estimate	9.71E-04	9.71E-04	1.13E-03	8.07E-04	5.76E-04	4.87E-04
	t-value	2.36	2.04	2.40	1.57	1.97	1.96
	P>t|	=0.0184	=0.0420	=0.0167	=0.1181	=0.0490	=0.0074
	Adjusted R-square	0.0113	0.218	0.0155	0.0079	0.0159	0.0087
CMAD/FTE	Parameter Estimate	2.46E-03	1.28E-03	2.99E-03	1.50E-03	2.45E-03	2.09E-03
	t-value	1.15	0.95	1.25	1.01	1.54	1.59
	P>|t|	=0.2513	=0.3438	=0.2132	=0.3118	=0.1252	=0.1125
	Adjusted R-square	0.0058	0.0052	0.0090	0.0022	0.0235	0.0132
JCAHO	Parameter Estimate	2.36E-02	2.19E-02	2.66E-02	2.68E-02	1.81E-02	1.82E-02
	t-value	3.28	3.56	3.51	3.92	3.19	3.04
	P>|t|	=0.0011	=0.0004	=0.0005	=0.0001	=0.0015	=0.0025
	Adjusted R-square	0.0205	0.0281	0.0244	0.0354	0.0240	0.0235

APPENDIX D: Full Models

FULL MODELS INCLUDING QUALITY

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Total Margin/Current Year

Data Summary

Number of Observations	473
Mean of TM	0.05788
Sum of TM	27.37613

Design Summary

Number of Clusters	473

Fit Statistics

R-square	0.1495
Adjusted R-square	0.1348
Root MSE	0.1460
Denominator DF	472

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for Dependent Variable Total Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	10.23	<.0001
Intercept	1	0.46	0.4984
CMAD	1	4.82	0.0286
CMAPD	1	2.83	0.0932
FTE_OCCBED	1	0.67	0.4126
WH_APD	1	1.88	0.1705
OCCP	1	7.38	0.0068
CMAD_BED	1	0.11	0.7373
CMAD_FTE	1	0.02	0.8987
jcaho	1	3.60	0.0585
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 472.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0444934	0.06566627	-0.68	0.4984
CMAD	0.0000056	0.00000255	2.20	0.0286
CMAPD	-0.0000006	0.00000034	-1.68	0.0932
FTE_OCCBED	-0.0049101	0.00598789	-0.82	0.4126
WH_APD	-0.0013306	0.00096945	-1.37	0.1705
OCCP	0.1800619	0.06628773	2.72	0.0068
CMAD_BED	0.0001790	0.00053314	0.34	0.7373
CMAD_FTE	0.0003377	0.00265206	0.13	0.8987
jcaho	0.0102767	0.00541871	1.90	0.0585
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 472.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Net Operating Margin/Current Year

Data Summary

Number of Observations	473
Mean of NOM	0.04399
Sum of NOM	20.80594

Design Summary

Number of Clusters	473

Fit Statistics

R-square	0.1702
Adjusted R-square	0.1559
Root MSE	0.1600
Denominator DF	472

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for Dependent Variable Net Operating Margin/Current Year (continued)
Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	11.41	<.0001
Intercept	1	0.13	0.7208
CMAD	1	7.27	0.0073
CMAPD	1	5.05	0.0250
FTE_OCCBED	1	1.32	0.2512
WH_APD	1	3.41	0.0652
OCCP	1	6.60	0.0105
CMAD_BED	1	0.18	0.6710
CMAD_FTE	1	0.00	0.9540
jcaho	1	3.59	0.0588
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 472.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0254211	0.07109073	-0.36	0.7208
CMAD	0.0000070	0.00000261	2.70	0.0073
CMAPD	-0.0000008	0.00000034	-2.25	0.0250
FTE_OCCBED	-0.0081644	0.00710697	-1.15	0.2512
WH_APD	-0.0021807	0.00118006	-1.85	0.0652
OCCP	0.1827385	0.07112718	2.57	0.0105
CMAD_BED	0.0002496	0.00058707	0.43	0.6710
CMAD_FTE	0.0001626	0.00281507	0.06	0.9540
jcaho	0.0109615	0.00578574	1.89	0.0588
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 472.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Cash Flow Margin/Current Year

Data Summary

Number of Observations	459
Mean of CFM	0.73268
Sum of CFM	336.29808

Design Summary

Number of Clusters	459

Fit Statistics

R-square	0.1401
Adjusted R-square	0.1248
Root MSE	0.1322
Denominator DF	458

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for Dependent Variable Cash Flow Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	7.48	<.0001
Intercept	1	71.38	<.0001
CMAD	1	1.66	0.1980
CMAPD	1	0.16	0.6916
FTE_OCCBED	1	2.53	0.1126
WH_APD	1	0.61	0.4357
OCCP	1	1.82	0.1781
CMAD_BED	1	0.63	0.4263
CMAD_FTE	1	1.80	0.1798
jcaho	1	3.16	0.0760
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 458.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.6182323	0.07317442	8.45	<.0001
CMAD	0.0000024	0.00000182	1.29	0.1980
CMAPD	-0.0000001	0.00000021	-0.40	0.6916
FTE_OCCBED	-0.0160074	0.01006837	-1.59	0.1126
WH_APD	0.0012597	0.00161448	0.78	0.4357
OCCP	0.1088875	0.08074167	1.35	0.1781
CMAD_BED	-0.0005739	0.00072077	-0.80	0.4263
CMAD_FTE	0.0043385	0.00322946	1.34	0.1798
jcaho	0.0092911	0.00522377	1.78	0.0760
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 458.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Total Margin/Short-term

Data Summary

Number of Observations	468
Mean of TM	0.06135
Sum of TM	28.71371

Design Summary

Number of Clusters	468

Fit Statistics

R-square	0.1125
Adjusted R-square	0.09705
Root MSE	0.1920
Denominator DF	467

Class Level Information

Class Variable	Levels	Values
Y	1	1999

FULL MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Total Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	8.31	<.0001
Intercept	1	3.87	0.0497
CMAD	1	0.00	0.9690
CMAPD	1	0.55	0.4597
FTE_OCCBED	1	0.71	0.4001
WH_APD	1	0.17	0.6815
OCCP	1	6.20	0.0131
CMAD_BED	1	0.51	0.4738
CMAD_FTE	1	2.27	0.1326
jcaho	1	6.95	0.0086
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 467.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1429051	0.07263907	-1.97	0.0497
CMAD	-0.0000001	0.00000205	-0.04	0.9690
CMAPD	0.0000002	0.00000028	0.74	0.4597
FTE_OCCBED	-0.0064752	0.00768874	-0.84	0.4001
WH_APD	-0.0004275	0.00104101	-0.41	0.6815
OCCP	0.2754060	0.11059850	2.49	0.0131
CMAD_BED	-0.0006523	0.00090987	-0.72	0.4738
CMAD_FTE	0.0028775	0.00191007	1.51	0.1326
jcaho	0.0185849	0.00704712	2.64	0.0086
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 467.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Net Operating Margin/Short-term

Data Summary

Number of Observations	468
Mean of NOM	0.05249
Sum of NOM	24.56630

Design Summary

Number of Clusters	468

Fit Statistics

R-square	0.1229
Adjusted R-square	0.1076
Root MSE	0.1983
Denominator DF	467

Class Level Information

Class Variable	Levels	Values
Y	1	1999

FULL MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Net Operating Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	8.80	<.0001
Intercept	1	2.47	0.1165
CMAD	1	0.14	0.7123
CMAPD	1	0.11	0.7366
FTE_OCCBED	1	1.78	0.1828
WH_APD	1	0.33	0.5675
OCCP	1	6.14	0.0136
CMAD_BED	1	0.22	0.6395
CMAD_FTE	1	0.39	0.5320
jcaho	1	8.32	0.0041
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 467.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1281773	0.08151400	-1.57	0.1165
CMAD	0.0000008	0.00000210	0.37	0.7123
CMAPD	0.0000001	0.00000028	0.34	0.7366
FTE_OCCBED	-0.0115472	0.00865458	-1.33	0.1828
WH_APD	-0.0006722	0.00117486	-0.57	0.5675
OCCP	0.2762769	0.11148763	2.48	0.0136
CMAD_BED	-0.0004260	0.00090891	-0.47	0.6395
CMAD_FTE	0.0016285	0.00260375	0.63	0.5320
jcaho	0.0212817	0.00737685	2.88	0.0041
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 467.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Cash Flow Margin/Short-term

Data Summary

Number of Observations	456
Mean of CFM	0.74269
Sum of CFM	338.66820

Design Summary

Number of Clusters	456

Fit Statistics

R-square	0.1883
Adjusted R-square	0.1737
Root MSE	0.1314
Denominator DF	455

Class Level Information

Class Variable	Levels	Values
Y	1	1999

FULL MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Cash Flow Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	9.54	<.0001
Intercept	1	79.39	<.0001
CMAD	1	0.26	0.6080
CMAPD	1	0.14	0.7041
FTE_OCCBED	1	0.30	0.5848
WH_APD	1	5.04	0.0253
OCCP	1	2.73	0.0989
CMAD_BED	1	0.51	0.4746
CMAD_FTE	1	2.40	0.1223
jcaho	1	7.78	0.0055
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 455.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.6106986	0.06853842	8.91	<.0001
CMAD	0.0000008	0.00000161	0.51	0.6080
CMAPD	0.0000001	0.00000019	0.38	0.7041
FTE_OCCBED	0.0037324	0.00682562	0.55	0.5848
WH_APD	-0.0026390	0.00117576	-2.24	0.0253
OCCP	0.1251756	0.07569382	1.65	0.0989
CMAD_BED	-0.0004829	0.00067478	-0.72	0.4746
CMAD_FTE	0.0042764	0.00276258	1.55	0.1223
jcaho	0.0145488	0.00521633	2.79	0.0055
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 455.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Total Margin/Long-term

Data Summary

Number of Observations	460
Mean of TM	0.06164
Sum of TM	28.35267

Design Summary

Number of Clusters	460

Fit Statistics

R-square	0.1667
Adjusted R-square	0.1519
Root MSE	0.1464
Denominator DF	459

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for Dependent Variable Total Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	9.08	<.0001
Intercept	1	1.01	0.3143
CMAD	1	1.50	0.2219
CMAPD	1	0.01	0.9342
FTE_OCCBED	1	0.04	0.8494
WH_APD	1	2.87	0.0912
OCCP	1	7.76	0.0056
CMAD_BED	1	0.26	0.6112
CMAD_FTE	1	0.89	0.3460
jcaho	1	6.13	0.0137
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 459.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0617218	0.06127695	-1.01	0.3143
CMAD	0.0000020	0.00000161	1.22	0.2219
CMAPD	-0.0000000	0.00000019	-0.08	0.9342
FTE_OCCBED	0.0018603	0.00979312	0.19	0.8494
WH_APD	-0.0026796	0.00158304	-1.69	0.0912
OCCP	0.1865146	0.06697220	2.78	0.0056
CMAD_BED	-0.0002230	0.00043827	-0.51	0.6112
CMAD_FTE	0.0014943	0.00158400	0.94	0.3460
jcaho	0.0146032	0.00589997	2.48	0.0137
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 459.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Net Operating Margin/Long-term

Data Summary

Number of Observations	460
Mean of NOM	0.05438
Sum of NOM	25.01545

Design Summary

Number of Clusters	460

Fit Statistics

R-square	0.1846
Adjusted R-square	0.1701
Root MSE	0.1593
Denominator DF	459

Class Level Information

Class Variable	Levels	Values
Y	1	1999

FULL MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Net Operating Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	10.11	<.0001
Intercept	1	1.26	0.2630
CMAD	1	1.56	0.2130
CMAPD	1	0.01	0.9264
FTE_OCCBED	1	0.17	0.6760
WH_APD	1	4.03	0.0453
OCCP	1	7.35	0.0070
CMAD_BED	1	0.16	0.6939
CMAD_FTE	1	0.37	0.5460
jcaho	1	7.81	0.0054
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 459.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0753579	0.06723955	-1.12	0.2630
CMAD	0.0000020	0.00000158	1.25	0.2130
CMAPD	0.0000000	0.00000018	0.09	0.9264
FTE_OCCBED	0.0050332	0.01203679	0.42	0.6760
WH_APD	-0.0038488	0.00191707	-2.01	0.0453
OCCP	0.2081655	0.07677989	2.71	0.0070
CMAD_BED	-0.0001976	0.00050174	-0.39	0.6939
CMAD_FTE	0.0009947	0.00164631	0.60	0.5460
jcaho	0.0182365	0.00652373	2.80	0.0054
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 459.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Cash Flow Margin/Long-term

Data Summary

Number of Observations	448
Mean of CFM	0.77611
Sum of CFM	347.69843

Design Summary

Number of Clusters	448

Fit Statistics

R-square	0.1304
Adjusted R-square	0.1146
Root MSE	0.1369
Denominator DF	447

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for Dependent Variable Cash Flow Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	8	7.95	<.0001
Intercept	1	93.99	<.0001
CMAD	1	1.98	0.1605
CMAPD	1	1.28	0.2582
FTE_OCCBED	1	1.80	0.1806
WH_APD	1	8.19	0.0044
OCCP	1	3.27	0.0710
CMAD_BED	1	0.94	0.3328
CMAD_FTE	1	1.68	0.1955
jcaho	1	6.61	0.0105
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 447.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.6530959	0.06736614	9.69	<.0001
CMAD	0.0000030	0.00000214	1.41	0.1605
CMAPD	-0.0000003	0.00000029	-1.13	0.2582
FTE_OCCBED	0.0093327	0.00695930	1.34	0.1806
WH_APD	-0.0031767	0.00111020	-2.86	0.0044
OCCP	0.1479556	0.08175989	1.81	0.0710
CMAD_BED	-0.0006538	0.00067424	-0.97	0.3328
CMAD_FTE	0.0030876	0.00238155	1.30	0.1955
jcaho	0.0148894	0.00579065	2.57	0.0105
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 447.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MDELS EXCLUDING QUALITY

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Total Margin/Current Year

Data Summary

Number of Observations	1858
Mean of TM	0.03444
Sum of TM	63.99616

Design Summary

Number of Clusters	650

Fit Statistics

R-square	0.04306
Adjusted R-square	0.03840
Root MSE	0.3271
Denominator DF	649

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for Dependent Variable Total Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	13.42	<.0001
Intercept	1	0.00	0.9513
CMAD	1	3.77	0.0525
CMAPD	1	2.34	0.1270
FTE_OCCBED	1	4.15	0.0421
WH_APD	1	12.00	0.0006
OCCP	1	3.43	0.0645
CMAD_BED	1	0.17	0.6795
CMAD_FTE	1	0.38	0.5383
Y	2	0.64	0.5260

NOTE: The denominator degrees of freedom for the F tests is 649.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0147926	0.02828667	-0.52	0.6012
CMAD	0.0000156	0.00000803	1.94	0.0525
CMAPD	-0.0000017	0.00000114	-1.53	0.1270
FTE_OCCBED	0.0156869	0.00770127	2.04	0.0421
WH_APD	-0.0040238	0.00116134	-3.46	0.0006
OCCP	0.0949132	0.05125399	1.85	0.0645
CMAD_BED	0.0000935	0.00022632	0.41	0.6795
CMAD_FTE	-0.0002358	0.00038293	-0.62	0.5383
Y 1999	0.0222501	0.01961908	1.13	0.2572
Y 2000	0.0171279	0.01826248	0.94	0.3487
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 649.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Net Operating Margin/Current Year

Data Summary

Number of Observations	1858
Mean of NOM	0.01897
Sum of NOM	35.25125

Design Summary

Number of Clusters	650

Fit Statistics

R-square	0.05546
Adjusted R-square	0.05086
Root MSE	0.3281
Denominator DF	649

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

FULL MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Net Operating Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	14.38	<.0001
Intercept	1	0.26	0.6134
CMAD	1	4.72	0.0303
CMAPD	1	2.93	0.0872
FTE_OCCBED	1	3.31	0.0694
WH_APD	1	18.98	<.0001
OCCP	1	1.35	0.2463
CMAD_BED	1	0.65	0.4217
CMAD_FTE	1	0.07	0.7943
Y	2	0.69	0.5002

NOTE: The denominator degrees of freedom for the F tests is 649.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.0024048	0.03140783	0.08	0.9390
CMAD	0.0000170	0.00000785	2.17	0.0303
CMAPD	-0.0000019	0.00000112	-1.71	0.0872
FTE_OCCBED	0.0146499	0.00805481	1.82	0.0694
WH_APD	-0.0049931	0.00114598	-4.36	<.0001
OCCP	0.0681600	0.05873337	1.16	0.2463
CMAD_BED	0.0002252	0.00028008	0.80	0.4217
CMAD_FTE	-0.0001141	0.00043735	-0.26	0.7943
Y 1999	0.0228451	0.01941416	1.18	0.2397
Y 2000	0.0170702	0.01824372	0.94	0.3498
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 649.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Cash Flow Margin/Current Year

Data Summary

Number of Observations	1799
Mean of CFM	0.72578
Sum of CFM	1305.7

Design Summary

Number of Clusters	643

Fit Statistics

R-square	0.1014
Adjusted R-square	0.09683
Root MSE	0.1538
Denominator DF	642

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

FULL MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Cash Flow Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	12.20	<.0001
Intercept	1	532.34	<.0001
CMAD	1	7.81	0.0054
CMAPD	1	0.35	0.5565
FTE_OCCBED	1	0.90	0.3434
WH_APD	1	0.28	0.5946
OCCP	1	0.02	0.9003
CMAD_BED	1	0.01	0.9192
CMAD_FTE	1	1.90	0.1682
Y	2	11.48	<.0001

NOTE: The denominator degrees of freedom for the F tests is 642.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7332814	0.03149206	23.28	<.0001
CMAD	0.0000048	0.00000171	2.79	0.0054
CMAPD	-0.0000001	0.00000021	-0.59	0.5565
FTE_OCCBED	-0.0065830	0.00694345	-0.95	0.3434
WH_APD	-0.0005915	0.00111094	-0.53	0.5946
OCCP	0.0053404	0.04262538	0.13	0.9003
CMAD_BED	0.0000115	0.00011281	0.10	0.9192
CMAD_FTE	0.0011197	0.00081156	1.38	0.1682
Y 1999	-0.0290097	0.00623613	-4.65	<.0001
Y 2000	-0.0149944	0.00491186	-3.05	0.0024
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 642.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Total Margin/Short-term

Data Summary

Number of Observations	1802
Mean of TM	0.03908
Sum of TM	70.42665

Design Summary

Number of Clusters	638

Fit Statistics

R-square	0.03938
Adjusted R-square	0.03456
Root MSE	0.3289
Denominator DF	637

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for Dependent Variable Total Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	11.93	<.0001
Intercept	1	0.57	0.4506
CMAD	1	8.63	0.0034
CMAPD	1	2.45	0.1180
FTE_OCCBED	1	2.14	0.1439
WH_APD	1	5.21	0.0227
OCCP	1	3.95	0.0474
CMAD_BED	1	0.67	0.4136
CMAD_FTE	1	0.00	0.9708
Y	2	0.41	0.6608

NOTE: The denominator degrees of freedom for the F tests is 637.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.0304729	0.03876440	0.79	0.4321
CMAD	0.0000067	0.00000228	2.94	0.0034
CMAPD	-0.0000005	0.00000029	-1.57	0.1180
FTE_OCCBED	-0.0073456	0.00502019	-1.46	0.1439
WH_APD	-0.0015046	0.00065887	-2.28	0.0227
OCCP	0.1051034	0.05290738	1.99	0.0474
CMAD_BED	0.0001372	0.00016774	0.82	0.4136
CMAD_FTE	-0.0000259	0.00070669	-0.04	0.9708
Y 1999	0.0043756	0.01125674	0.39	0.6976
Y 2000	-0.0124282	0.02051883	-0.61	0.5449
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 637.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Net Operating Margin/Short-term

Data Summary

Number of Observations	1802
Mean of NOM	0.02462
Sum of NOM	44.37116

Design Summary

Number of Clusters	638

Fit Statistics

R-square	0.05077
Adjusted R-square	0.04601
Root MSE	0.3330
Denominator DF	637

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for Dependent Variable Net Operating Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	12.07	<.0001
Intercept	1	0.73	0.3938
CMAD	1	9.64	0.0020
CMAPD	1	2.93	0.0875
FTE_OCCBED	1	4.92	0.0269
WH_APD	1	4.32	0.0381
OCCP	1	2.20	0.1384
CMAD_BED	1	1.24	0.2658
CMAD_FTE	1	0.02	0.8978
Y	2	0.37	0.6938

NOTE: The denominator degrees of freedom for the F tests is 637.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.0393594	0.04283715	0.92	0.3585
CMAD	0.0000076	0.00000246	3.10	0.0020
CMAPD	-0.0000005	0.00000031	-1.71	0.0875
FTE_OCCBED	-0.0129447	0.00583442	-2.22	0.0269
WH_APD	-0.0014890	0.00071648	-2.08	0.0381
OCCP	0.0893316	0.06021303	1.48	0.1384
CMAD_BED	0.0002550	0.00022899	1.11	0.2658
CMAD_FTE	0.0000945	0.00073545	0.13	0.8978
Y 1999	0.0010974	0.01188957	0.09	0.9265
Y 2000	-0.0151806	0.02053194	-0.74	0.4600
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 637.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Cash Flow Margin/Short-term

Data Summary

Number of Observations	1739
Mean of CFM	0.74801
Sum of CFM	1300.8

Design Summary

Number of Clusters	628

Fit Statistics

R-square	0.06641
Adjusted R-square	0.06155
Root MSE	0.2021
Denominator DF	627

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

FULL MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Cash Flow Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	13.71	<.0001
Intercept	1	463.63	<.0001
CMAD	1	4.79	0.0290
CMAPD	1	0.02	0.8797
FTE_OCCBED	1	8.10	0.0046
WH_APD	1	30.49	<.0001
OCCP	1	0.02	0.8893
CMAD_BED	1	0.04	0.8432
CMAD_FTE	1	1.51	0.2192
Y	2	4.24	0.0148

NOTE: The denominator degrees of freedom for the F tests is 627.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7800853	0.03957684	19.71	<.0001
CMAD	0.0000035	0.00000159	2.19	0.0290
CMAPD	-0.0000000	0.00000020	-0.15	0.8797
FTE_OCCBED	0.0147348	0.00517756	2.85	0.0046
WH_APD	-0.0045217	0.00081882	-5.52	<.0001
OCCP	-0.0063002	0.04525112	-0.14	0.8893
CMAD_BED	0.0000204	0.00010310	0.20	0.8432
CMAD_FTE	0.0009266	0.00075336	1.23	0.2192
Y 1999	-0.0332301	0.01294851	-2.57	0.0105
Y 2000	-0.0188773	0.01103965	-1.71	0.0878
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 627.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Total Margin/Long-term

Data Summary

Number of Observations	1697
Mean of TM	0.02591
Sum of TM	43.97127

Design Summary

Number of Clusters	597

Fit Statistics

R-square	0.04496
Adjusted R-square	0.03987
Root MSE	0.2584
Denominator DF	596

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

FULL MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Total Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	9.50	<.0001
Intercept	1	2.78	0.0962
CMAD	1	4.66	0.0313
CMAPD	1	1.39	0.2391
FTE_OCCBED	1	0.63	0.4285
WH_APD	1	1.88	0.1708
OCCP	1	11.50	0.0007
CMAD_BED	1	0.84	0.3597
CMAD_FTE	1	2.23	0.1362
Y	2	13.05	<.0001

NOTE: The denominator degrees of freedom for the F tests is 596.

Estimated Regression Coefficients

<table>
<tr><th>Parameter</th><th>Estimate</th><th>Standard Error</th><th>t Value</th><th>Pr > |t|</th></tr>
<tr><td>Intercept</td><td>-0.0887995</td><td>0.04070972</td><td>-2.18</td><td>0.0296</td></tr>
<tr><td>CMAD</td><td>0.0000043</td><td>0.00000197</td><td>2.16</td><td>0.0313</td></tr>
<tr><td>CMAPD</td><td>-0.0000003</td><td>0.00000028</td><td>-1.18</td><td>0.2391</td></tr>
<tr><td>FTE_OCCBED</td><td>0.0052638</td><td>0.00664393</td><td>0.79</td><td>0.4285</td></tr>
<tr><td>WH_APD</td><td>-0.0012963</td><td>0.00094530</td><td>-1.37</td><td>0.1708</td></tr>
<tr><td>OCCP</td><td>0.1727803</td><td>0.05094477</td><td>3.39</td><td>0.0007</td></tr>
<tr><td>CMAD_BED</td><td>0.0002354</td><td>0.00025679</td><td>0.92</td><td>0.3597</td></tr>
<tr><td>CMAD_FTE</td><td>-0.0004281</td><td>0.00028688</td><td>-1.49</td><td>0.1362</td></tr>
<tr><td>Y 1999</td><td>0.0507666</td><td>0.01031843</td><td>4.92</td><td><.0001</td></tr>
<tr><td>Y 2000</td><td>0.0078210</td><td>0.01428608</td><td>0.55</td><td>0.5843</td></tr>
<tr><td>Y 2001</td><td>0.0000000</td><td>0.00000000</td><td>.</td><td>.</td></tr>
</table>

NOTE: The denominator degrees of freedom for the t tests is 596.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

FULL MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Net Operating Margin/Long-term

Data Summary

Number of Observations	1697
Mean of NOM	0.01949
Sum of NOM	33.07793

Design Summary

Number of Clusters	597

Fit Statistics

R-square	0.02838
Adjusted R-square	0.02320
Root MSE	0.3573
Denominator DF	596

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

FULL MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for Dependent Variable Net Operating Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	5.94	<.0001
Intercept	1	0.02	0.8954
CMAD	1	2.46	0.1172
CMAPD	1	1.66	0.1978
FTE_OCCBED	1	0.16	0.6934
WH_APD	1	3.39	0.0660
OCCP	1	3.38	0.0667
CMAD_BED	1	0.01	0.9181
CMAD_FTE	1	2.57	0.1093
Y	2	3.91	0.0205

NOTE: The denominator degrees of freedom for the F tests is 596.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0126949	0.06820660	-0.19	0.8524
CMAD	0.0000145	0.00000924	1.57	0.1172
CMAPD	-0.0000018	0.00000141	-1.29	0.1978
FTE_OCCBED	0.0032982	0.00836215	0.39	0.6934
WH_APD	-0.0022459	0.00121945	-1.84	0.0660
OCCP	0.1359196	0.07397489	1.84	0.0667
CMAD_BED	0.0000308	0.00029978	0.10	0.9181
CMAD_FTE	-0.0006672	0.00041600	-1.60	0.1093
Y 1999	0.0295558	0.02178239	1.36	0.1753
Y 2000	-0.0156680	0.02326263	-0.67	0.5009
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 596.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for Dependent Variable Cash Flow Margin/Long-term

Data Summary

Number of Observations	1612
Mean of CFM	0.77901
Sum of CFM	1255.8

Design Summary

Number of Clusters	584

Fit Statistics

R-square	0.04690
Adjusted R-square	0.04154
Root MSE	0.2018
Denominator DF	583

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for Dependent Variable Cash Flow Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	9	8.32	<.0001
Intercept	1	493.76	<.0001
CMAD	1	5.56	0.0187
CMAPD	1	1.32	0.2502
FTE_OCCBED	1	4.83	0.0284
WH_APD	1	18.12	<.0001
OCCP	1	0.49	0.4864
CMAD_BED	1	0.10	0.7547
CMAD_FTE	1	1.95	0.1630
Y	2	0.10	0.9066

NOTE: The denominator degrees of freedom for the F tests is 583.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7896823	0.03439203	22.96	<.0001
CMAD	0.0000040	0.00000168	2.36	0.0187
CMAPD	-0.0000003	0.00000023	-1.15	0.2502
FTE_OCCBED	0.0125167	0.00569690	2.20	0.0284
WH_APD	-0.0040867	0.00095992	-4.26	<.0001
OCCP	0.0308974	0.04436472	0.70	0.4864
CMAD_BED	-0.0000268	0.00008562	-0.31	0.7547
CMAD_FTE	0.0007543	0.00054003	1.40	0.1630
Y 1999	-0.0051796	0.01259327	-0.41	0.6810
Y 2000	-0.0017529	0.00555163	-0.32	0.7523
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 583.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

APPENDIX E: Best Models

BEST MODELS INCLUDING QUALITY

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Current Year

Data Summary

Number of Observations	473
Mean of TM	0.05788
Sum of TM	27.37613

Design Summary

Number of Clusters	473

Fit Statistics

R-square	0.1482
Adjusted R-square	0.1390
Root MSE	0.1457
Denominator DF	472

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	5	16.06	<.0001
Intercept	1	1.10	0.2937
CMAD	1	8.13	0.0046
CMAPD	1	4.25	0.0397
WH_APD	1	7.77	0.0055
OCCP	1	20.13	<.0001
jcaho	1	3.60	0.0584
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 472.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0456286	0.04340917	-1.05	0.2937
CMAD	0.0000059	0.00000209	2.85	0.0046
CMAPD	-0.0000006	0.00000030	-2.06	0.0397
WH_APD	-0.0020005	0.00071791	-2.79	0.0055
OCCP	0.2041924	0.04551629	4.49	<.0001
jcaho	0.0102824	0.00541878	1.90	0.0584
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 472.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Current Year

Data Summary

Number of Observations	473
Mean of NOM	0.04399
Sum of NOM	20.80594

Design Summary

Number of Clusters	473

Fit Statistics

R-square	0.1679
Adjusted R-square	0.1589
Root MSE	0.1597
Denominator DF	472

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	5	17.87	<.0001
Intercept	1	0.53	0.4656
CMAD	1	11.32	0.0008
CMAPD	1	6.87	0.0090
WH_APD	1	12.88	0.0004
OCCP	1	19.39	<.0001
jcaho	1	3.50	0.0621
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 472.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0349114	0.04781092	-0.73	0.4656
CMAD	0.0000072	0.00000215	3.37	0.0008
CMAPD	-0.0000008	0.00000030	-2.62	0.0090
WH_APD	-0.0031704	0.00088346	-3.59	0.0004
OCCP	0.2157530	0.04899528	4.40	<.0001
jcaho	0.0108483	0.00580121	1.87	0.0621
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 472.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Current Year

Data Summary

Number of Observations	459
Mean of CFM	0.73268
Sum of CFM	336.29808

Design Summary

Number of Clusters	459

Fit Statistics

R-square	0.1086
Adjusted R-square	0.1027
Root MSE	0.1338
Denominator DF	458

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	17.59	<.0001
Intercept	1	322.95	<.0001
CMAD	1	28.87	<.0001
FTE_OCCBED	1	13.92	0.0002
jcaho	1	3.48	0.0626
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 458.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7373451	0.04103022	17.97	<.0001
CMAD	0.0000032	0.00000059	5.37	<.0001
FTE_OCCBED	-0.0188096	0.00504116	-3.73	0.0002
jcaho	0.0101540	0.00543990	1.87	0.0626
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 458.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Short-term

Data Summary

Number of Observations	474
Mean of TM	0.06195
Sum of TM	29.36387

Design Summary

Number of Clusters	474

Fit Statistics

R-square	0.1018
Adjusted R-square	0.09606
Root MSE	0.1913
Denominator DF	473

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	18.87	<.0001
Intercept	1	3.18	0.0750
FTE_OCCBED	1	6.51	0.0111
OCCP	1	30.96	<.0001
jcaho	1	7.72	0.0057
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 473.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1019062	0.05711324	-1.78	0.0750
FTE_OCCBED	-0.0134354	0.00526754	-2.55	0.0111
OCCP	0.2767641	0.04974323	5.56	<.0001
jcaho	0.0192550	0.00693058	2.78	0.0057
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 473.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 2** - Dependent Variable Total Margin/Short-term

Data Summary

Number of Observations	475
Mean of TM	0.06180
Sum of TM	29.35647

Design Summary

Number of Clusters	475

Fit Statistics

R-square	0.1011
Adjusted R-square	0.09541
Root MSE	0.1912
Denominator DF	474

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 2** - Dependent Variable Total Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	20.95	<.0001
Intercept	1	3.18	0.0753
WH_APD	1	7.06	0.0081
OCCP	1	28.66	<.0001
jcaho	1	7.00	0.0084
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 474.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1046913	0.05873545	-1.78	0.0753
WH_APD	-0.0019576	0.00073664	-2.66	0.0081
OCCP	0.2748728	0.05134023	5.35	<.0001
jcaho	0.0184970	0.00699227	2.65	0.0084
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 474.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Short-term

Data Summary

Number of Observations	475
Mean of NOM	0.05287
Sum of NOM	25.11254

Design Summary

Number of Clusters	475

Fit Statistics

R-square	0.1133
Adjusted R-square	0.1077
Root MSE	0.1972
Denominator DF	474

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	22.33	<.0001
Intercept	1	3.89	0.0492
WH_APD	1	9.25	0.0025
OCCP	1	29.46	<.0001
jcaho	1	8.10	0.0046
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 474.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1209859	0.06136215	-1.97	0.0492
WH_APD	-0.0023797	0.00078252	-3.04	0.0025
OCCP	0.2906675	0.05354904	5.43	<.0001
jcaho	0.0207778	0.00729903	2.85	0.0046
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 474.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 2** - Dependent Variable Net Operating Margin/Short-term

Data Summary

Number of Observations	474
Mean of NOM	0.05301
Sum of NOM	25.12458

Design Summary

Number of Clusters	474

Fit Statistics

R-square	0.1156
Adjusted R-square	0.1099
Root MSE	0.1972
Denominator DF	473

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 2** - Dependent Variable Net Operating Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	20.48	<.0001
Intercept	1	3.53	0.0608
FTE_OCCBED	1	9.17	0.0026
OCCP	1	31.46	<.0001
jcaho	1	9.03	0.0028
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 473.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1128979	0.06008081	-1.88	0.0608
FTE_OCCBED	-0.0171409	0.00566077	-3.03	0.0026
OCCP	0.2906673	0.05182559	5.61	<.0001
jcaho	0.0217126	0.00722482	3.01	0.0028
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 473.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Short-term

Data Summary

Number of Observations	462
Mean of CFM	0.74146
Sum of CFM	342.55620

Design Summary

Number of Clusters	462

Fit Statistics

R-square	0.1494
Adjusted R-square	0.1438
Root MSE	0.1336
Denominator DF	461

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	20.46	<.0001
Intercept	1	213.11	<.0001
WH_APD	1	23.56	<.0001
OCCP	1	13.22	0.0003
jcaho	1	7.40	0.0068
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 461.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.6911810	0.04734646	14.60	<.0001
WH_APD	-0.0034009	0.00070072	-4.85	<.0001
OCCP	0.1537330	0.04228238	3.64	0.0003
jcaho	0.0144717	0.00531852	2.72	0.0068
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 461.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Long-term

Data Summary

Number of Observations	467
Mean of TM	0.06218
Sum of TM	29.03960

Design Summary

Number of Clusters	467

Fit Statistics

R-square	0.1517
Adjusted R-square	0.1462
Root MSE	0.1468
Denominator DF	466

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	21.51	<.0001
Intercept	1	0.94	0.3330
WH_APD	1	11.18	0.0009
OCCP	1	30.74	<.0001
jcaho	1	6.45	0.0114
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 466.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0463690	0.04784307	-0.97	0.3330
WH_APD	-0.0027322	0.00081724	-3.34	0.0009
OCCP	0.2347853	0.04234739	5.54	<.0001
jcaho	0.0150754	0.00593576	2.54	0.0114
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 466.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 2** - Dependent Variable Total Margin/Long-term

Data Summary

Number of Observations	466
Mean of TM	0.06264
Sum of TM	29.19233

Design Summary

Number of Clusters	466

Fit Statistics

R-square	0.1373
Adjusted R-square	0.1317
Root MSE	0.1479
Denominator DF	465

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 2** - Dependent Variable Total Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	20.20	<.0001
Intercept	1	2.73	0.0991
FTE_OCCBED	1	5.63	0.0181
OCCP	1	38.87	<.0001
jcaho	1	7.50	0.0064
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 465.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0786069	0.04756194	-1.65	0.0991
FTE_OCCBED	-0.0126419	0.00532765	-2.37	0.0181
OCCP	0.2551901	0.04092943	6.23	<.0001
jcaho	0.0160820	0.00587173	2.74	0.0064
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 465.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

```
                          The SURVEYREG Procedure

       Regression Analysis for Model 3 - Dependent Variable Total Margin/Long-term

                               Data Summary

                Number of Observations           461
                Mean of TM                   0.06117
                Sum of TM                   28.19994


                              Design Summary

                  Number of Clusters           461


                              Fit Statistics

                    R-square                0.1627
                    Adjusted R-square       0.1553
                    Root MSE                0.1463
                    Denominator DF             460


                        Class Level Information

                   Class
                   Variable      Levels    Values

                   Y                  1    1999
```

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 3** - Dependent Variable Total Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	17.86	<.0001
Intercept	1	0.50	0.4809
CMAD	1	7.88	0.0052
WH_APD	1	10.70	0.0012
OCCP	1	11.68	0.0007
jcaho	1	6.01	0.0146
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 460.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0340435	0.04825954	-0.71	0.4809
CMAD	0.0000022	0.00000077	2.81	0.0052
WH_APD	-0.0027939	0.00085426	-3.27	0.0012
OCCP	0.1724546	0.05046605	3.42	0.0007
jcaho	0.0145466	0.00593209	2.45	0.0146
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 460.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Long-term

Data Summary

Number of Observations	467
Mean of NOM	0.05530
Sum of NOM	25.82426

Design Summary

Number of Clusters	467

Fit Statistics

R-square	0.1719
Adjusted R-square	0.1666
Root MSE	0.1591
Denominator DF	466

Class Level Information

Class Variable	Levels	Values
Y	1	1999

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	24.15	<.0001
Intercept	1	1.43	0.2331
WH_APD	1	13.72	0.0002
OCCP	1	31.80	<.0001
jcaho	1	8.34	0.0041
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 466.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0628832	0.05266359	-1.19	0.2331
WH_APD	-0.0034435	0.00092969	-3.70	0.0002
OCCP	0.2557170	0.04534375	5.64	<.0001
jcaho	0.0188597	0.00652916	2.89	0.0041
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 466.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 2** - Dependent Variable Net Operating Margin/Long-term

Data Summary

Number of Observations	466
Mean of NOM	0.05539
Sum of NOM	25.81018

Design Summary

Number of Clusters	466

Fit Statistics

R-square	0.1487
Adjusted R-square	0.1432
Root MSE	0.1614
Denominator DF	465

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 2** - Dependent Variable Net Operating Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	22.53	<.0001
Intercept	1	4.40	0.0366
FTE_OCCBED	1	5.58	0.0185
OCCP	1	41.74	<.0001
jcaho	1	9.42	0.0023
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 465.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1125154	0.05366311	-2.10	0.0366
FTE_OCCBED	-0.0143442	0.00607040	-2.36	0.0185
OCCP	0.2867529	0.04438441	6.46	<.0001
jcaho	0.0198875	0.00647856	3.07	0.0023
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 465.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 3** - Dependent Variable Net Operating Margin/Long-term

Data Summary

Number of Observations	461
Mean of NOM	0.05429
Sum of NOM	25.02952

Design Summary

Number of Clusters	461

Fit Statistics

R-square	0.1829
Adjusted R-square	0.1757
Root MSE	0.1586
Denominator DF	460

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **<u>Model 3</u>** - Dependent Variable Net Operating Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	19.71	<.0001
Intercept	1	0.88	0.3488
CMAD	1	7.73	0.0056
WH_APD	1	13.21	0.0003
OCCP	1	12.36	0.0005
jcaho	1	7.94	0.0050
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 460.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0499392	0.05324611	-0.94	0.3488
CMAD	0.0000023	0.00000082	2.78	0.0056
WH_APD	-0.0035302	0.00097131	-3.63	0.0003
OCCP	0.1902354	0.05412075	3.52	0.0005
jcaho	0.0184127	0.00653523	2.82	0.0050
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 460.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS INCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Long-term

Data Summary

Number of Observations	454
Mean of CFM	0.77467
Sum of CFM	351.69931

Design Summary

Number of Clusters	454

Fit Statistics

R-square	0.09949
Adjusted R-square	0.09349
Root MSE	0.1384
Denominator DF	453

Class Level Information

Class Variable	Levels	Values
Y	1	1999

BEST MODELS INCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	14.18	<.0001
Intercept	1	210.90	<.0001
WH_APD	1	13.67	0.0002
OCCP	1	8.61	0.0035
jcaho	1	6.56	0.0108
Y	0	.	.

NOTE: The denominator degrees of freedom for the F tests is 453.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7100915	0.04889630	14.52	<.0001
WH_APD	-0.0026154	0.00070741	-3.70	0.0002
OCCP	0.1284937	0.04377820	2.94	0.0035
jcaho	0.0149127	0.00582262	2.56	0.0108
Y 1999	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 453.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS EXCLUDING QUALITY

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Current Year

Data Summary

Number of Observations	1858
Mean of TM	0.03444
Sum of TM	63.99616

Design Summary

Number of Clusters	650

Fit Statistics

R-square	0.03550
Adjusted R-square	0.03237
Root MSE	0.3282
Denominator DF	649

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	6	18.71	<.0001
Intercept	1	0.82	0.3670
CMAD	1	16.99	<.0001
FTE_OCCBED	1	4.71	0.0303
WH_APD	1	10.68	0.0011
OCCP	1	4.48	0.0347
Y	2	0.63	0.5345

NOTE: The denominator degrees of freedom for the F tests is 649.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0384974	0.03356738	-1.15	0.2519
CMAD	0.0000042	0.00000101	4.12	<.0001
FTE_OCCBED	0.0168571	0.00776647	2.17	0.0303
WH_APD	-0.0037768	0.00115559	-3.27	0.0011
OCCP	0.1093328	0.05167056	2.12	0.0347
Y 1999	0.0214558	0.01927973	1.11	0.2662
Y 2000	0.0185373	0.01874269	0.99	0.3230
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 649.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Current Year

Data Summary

Number of Observations	1858
Mean of NOM	0.01897
Sum of NOM	35.25125

Design Summary

Number of Clusters	650

Fit Statistics

R-square	0.05339
Adjusted R-square	0.05032
Root MSE	0.3282
Denominator DF	649

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	6	16.82	<.0001
Intercept	1	3.91	0.0483
CMAD	1	6.92	0.0087
CMAPD	1	3.47	0.0631
FTE_OCCBED	1	3.03	0.0824
WH_APD	1	22.69	<.0001
Y	2	0.45	0.6358

NOTE: The denominator degrees of freedom for the F tests is 649.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.0484493	0.03580650	1.35	0.1765
CMAD	0.0000186	0.00000709	2.63	0.0087
CMAPD	-0.0000020	0.00000107	-1.86	0.0631
FTE_OCCBED	0.0142659	0.00819930	1.74	0.0824
WH_APD	-0.0053369	0.00112031	-4.76	<.0001
Y 1999	0.0187577	0.02014354	0.93	0.3521
Y 2000	0.0163549	0.01832047	0.89	0.3723
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 649.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Current Year

Data Summary

Number of Observations	1812
Mean of CFM	0.72631
Sum of CFM	1316.1

Design Summary

Number of Clusters	647

Fit Statistics

R-square	0.08883
Adjusted R-square	0.08681
Root MSE	0.1605
Denominator DF	646

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

BEST MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Current Year (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	21.96	<.0001
Intercept	1	1218.08	<.0001
CMAD	1	46.49	<.0001
FTE_OCCBED	1	5.32	0.0214
Y	2	11.85	<.0001

NOTE: The denominator degrees of freedom for the F tests is 646.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7473863	0.02032940	36.76	<.0001
CMAD	0.0000044	0.00000065	6.82	<.0001
FTE_OCCBED	-0.0091540	0.00396887	-2.31	0.0214
Y 1999	-0.0305604	0.00630928	-4.84	<.0001
Y 2000	-0.0145883	0.00539165	-2.71	0.0070
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 646.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Short-term

Data Summary

Number of Observations	1831
Mean of TM	0.03855
Sum of TM	70.58076

Design Summary

Number of Clusters	640

Fit Statistics

R-square	0.03294
Adjusted R-square	0.03083
Root MSE	0.3277
Denominator DF	639

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	24.33	<.0001
Intercept	1	12.59	0.0004
CMAD	1	18.56	<.0001
OCCP	1	11.08	0.0009
Y	2	0.37	0.6896

NOTE: The denominator degrees of freedom for the F tests is 639.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0714752	0.02667127	-2.68	0.0076
CMAD	0.0000037	0.00000087	4.31	<.0001
OCCP	0.1730856	0.05199688	3.33	0.0009
Y 1999	0.0026640	0.01112888	0.24	0.8109
Y 2000	-0.0135927	0.02026259	-0.67	0.5026
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 639.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Short-term

Data Summary

Number of Observations	1831
Mean of NOM	0.02433
Sum of NOM	44.55258

Design Summary

Number of Clusters	640

Fit Statistics

R-square	0.03900
Adjusted R-square	0.03690
Root MSE	0.3328
Denominator DF	639

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	24.51	<.0001
Intercept	1	17.97	<.0001
CMAD	1	18.48	<.0001
OCCP	1	10.94	0.0010
Y	2	0.38	0.6835

NOTE: The denominator degrees of freedom for the F tests is 639.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0953648	0.02942796	-3.24	0.0013
CMAD	0.0000042	0.00000098	4.30	<.0001
OCCP	0.1887607	0.05707071	3.31	0.0010
Y 1999	0.0001330	0.01179409	0.01	0.9910
Y 2000	-0.0161185	0.02030609	-0.79	0.4276
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 639.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 2** - Dependent Variable Net Operating Margin/Short-term

Data Summary

Number of Observations	1811
Mean of NOM	0.02409
Sum of NOM	43.62308

Design Summary

Number of Clusters	640

Fit Statistics

R-square	0.04439
Adjusted R-square	0.04175
Root MSE	0.3333
Denominator DF	639

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

BEST MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 2** - Dependent Variable Net Operating Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	5	19.77	<.0001
Intercept	1	0.65	0.4203
CMAD	1	19.34	<.0001
FTE_OCCBED	1	3.05	0.0811
OCCP	1	6.60	0.0104
Y	2	0.36	0.6960

NOTE: The denominator degrees of freedom for the F tests is 639.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0261797	0.04267645	-0.61	0.5398
CMAD	0.0000043	0.00000098	4.40	<.0001
FTE_OCCBED	-0.0106136	0.00607501	-1.75	0.0811
OCCP	0.1479716	0.05759734	2.57	0.0104
Y 1999	-0.0011182	0.01172586	-0.10	0.9241
Y 2000	-0.0164827	0.02026364	-0.81	0.4163
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 639.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Short-term

Data Summary

Number of Observations	1739
Mean of CFM	0.74801
Sum of CFM	1300.8

Design Summary

Number of Clusters	628

Fit Statistics

R-square	0.06419
Adjusted R-square	0.06149
Root MSE	0.2021
Denominator DF	627

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Short-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	5	23.42	<.0001
Intercept	1	1454.80	<.0001
CMAD	1	29.18	<.0001
FTE_OCCBED	1	7.41	0.0067
WH_APD	1	36.45	<.0001
Y	2	5.56	0.0041

NOTE: The denominator degrees of freedom for the F tests is 627.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.7984263	0.02196739	36.35	<.0001
CMAD	0.0000035	0.00000065	5.40	<.0001
FTE_OCCBED	0.0142703	0.00524388	2.72	0.0067
WH_APD	-0.0047218	0.00078213	-6.04	<.0001
Y 1999	-0.0330182	0.01185246	-2.79	0.0055
Y 2000	-0.0181307	0.01085455	-1.67	0.0954
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 627.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Long-term

Data Summary

Number of Observations	1721
Mean of TM	0.02639
Sum of TM	45.42469

Design Summary

Number of Clusters	598

Fit Statistics

R-square	0.04304
Adjusted R-square	0.04081
Root MSE	0.2570
Denominator DF	597

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

Regression Analysis for **Model 1** - Dependent Variable Total Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	17.42	<.0001
Intercept	1	13.58	0.0002
CMAD	1	11.10	0.0009
OCCP	1	18.74	<.0001
Y	2	13.12	<.0001

NOTE: The denominator degrees of freedom for the F tests is 597.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.1072186	0.02528842	-4.24	<.0001
CMAD	0.0000021	0.00000064	3.33	0.0009
OCCP	0.1984700	0.04584903	4.33	<.0001
Y 1999	0.0502172	0.01011695	4.96	<.0001
Y 2000	0.0082851	0.01422935	0.58	0.5606
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 597.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Long-term

Data Summary

Number of Observations	1721
Mean of NOM	0.02025
Sum of NOM	34.85375

Design Summary

Number of Clusters	598

Fit Statistics

R-square	0.02001
Adjusted R-square	0.01773
Root MSE	0.3563
Denominator DF	597

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

BEST MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Net Operating Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	4	9.20	<.0001
Intercept	1	4.17	0.0417
CMAD	1	13.37	0.0003
OCCP	1	5.09	0.0245
Y	2	3.77	0.0237

NOTE: The denominator degrees of freedom for the F tests is 597.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	-0.0855582	0.05032257	-1.70	0.0896
CMAD	0.0000025	0.00000069	3.66	0.0003
OCCP	0.1650910	0.07320920	2.26	0.0245
Y 1999	0.0281606	0.02169826	1.30	0.1948
Y 2000	-0.0150266	0.02293701	-0.66	0.5126
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 597.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

BEST MODELS EXCLUDING QUALITY (CONTINUED)

The SURVEYREG Procedure

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Long-term

Data Summary

Number of Observations	1612
Mean of CFM	0.77901
Sum of CFM	1255.8

Design Summary

Number of Clusters	584

Fit Statistics

R-square	0.04397
Adjusted R-square	0.04100
Root MSE	0.2019
Denominator DF	583

Class Level Information

Class Variable	Levels	Values
Y	3	1999 2000 2001

BEST MODELS EXCLUDING QUALITY (CONTINUED)

Regression Analysis for **Model 1** - Dependent Variable Cash Flow Margin/Long-term (continued)

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	5	13.11	<.0001
Intercept	1	1110.84	<.0001
CMAD	1	19.43	<.0001
FTE_OCCBED	1	4.08	0.0437
WH_APD	1	20.67	<.0001
Y	2	0.14	0.8665

NOTE: The denominator degrees of freedom for the F tests is 583.

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	0.8201291	0.02237140	36.66	<.0001
CMAD	0.0000028	0.00000063	4.41	<.0001
FTE_OCCBED	0.0117603	0.00581894	2.02	0.0437
WH_APD	-0.0043191	0.00095010	-4.55	<.0001
Y 1999	-0.0065880	0.01243828	-0.53	0.5966
Y 2000	-0.0014522	0.00542747	-0.27	0.7891
Y 2001	0.0000000	0.00000000	.	.

NOTE: The denominator degrees of freedom for the t tests is 583.
Matrix X'X is singular and a generalized inverse was used to solve the normal equations. Estimates are not unique.

APPENDIX F: Z-test for Differences Between Regression Coefficients

Z - test for Differences Between Regression Coefficients

	Dependent Variable: Total Margin Including Quality - Model A					
Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
FTE/OCCBED	-0.0134354	0.00526754	-0.0126419	0.00532765	-0.105912249	0.5438
OCCP	0.2767641	0.04974323	0.2551901	0.04092943	0.33490928	0.3707
JCAHO	0.019255	0.00693058	0.016082	0.00587173	0.34931431	0.3632

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

	Dependent Variable: Total Margin Including Quality - Model B					
Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
WH/APD	-0.0019576	0.00073664	-0.0027322	0.00081724	0.70403064	0.2420
OCCP	0.2748728	0.05134023	0.2347853	0.04234739	0.602351807	0.2743
JCAHO	0.018497	0.00699227	0.0150754	0.00593576	0.373049511	0.3557

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
	Dependent Variable: Net Operating Margin Including Quality- Model A					
FTE/OCCBED	-0.0171409	0.00566077	-0.0143442	0.0060704	-0.336941846	0.6255
OCCP	0.2906673	0.05182559	0.2867529	0.04438441	0.057367363	0.4761
JCAHO	0.0217126	0.00722482	0.0198875	0.00647856	0.188074937	0.4247

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

	Dependent Variable: Net Operating Margin Including Quality- Model B					
Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
WH/APD	-0.0023797	0.00078257	-0.0034435	0.00092969	0.875403078	0.1894
OCCP	0.2906675	0.05354904	0.255717	0.04534375	0.498097063	0.3121
JCAHO	0.0207778	0.00729903	0.0188597	0.00652916	0.195861411	0.4247

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

	Dependent Variable: Cash Flow Margin Including Quality					
Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
WH/APD	-0.0034009	0.00070072	-0.0026154	0.00070741	-0.788884703	0.7852
OCCP	0.153733	0.04228238	0.1284937	0.0437782	0.414688933	0.3409
JCAHO	0.0144717	0.00531852	0.0149127	0.00582262	-0.055921634	0.5199

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

	Dependent Variable: Total Margin Excluding Quality					
Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
CMAD	0.0000037	0.00000087	0.0000021	0.00000064	1.481417979	0.0694
OCCP	0.1730856	0.05199688	0.19847	0.04584903	-0.366170747	0.6443

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

Explanatory Variable	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
	Dependent Variable: Net Operating Margin Excluding Quality					
CMAD	0.0000042	0.00000098	0.0000025	0.00000069	1.418391455	0.0793
OCCP	0.1887607	0.05707071	0.165091	0.0732092	0.254990179	0.4013

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$

Z - test for Differences Between Regression Coefficients

Explanatory Variable	Dependent Variable: Cash Flow Margin Excluding Quality					
	Short-Term Parameter Estimate	Standard Error	Long-Term Parameter Estimate	Standard Error	Z-Value	P > Z
CMAD	0.0000035	0.00000065	0.0000028	0.00000063	0.77330365	0.2206
FTE/OCCBED	0.0142703	0.00524388	0.0117603	0.00581894	0.320432767	0.3745
WH/APD	-0.0047218	0.00078213	-0.0043191	0.0009501	-0.327234317	0.6293

Hypothesis Test:

Ho: No difference between long-term parameter estimates and short-term parameter estimates

Ha: Difference between long-term parameter estimates and short-term parameter estimates

Decision Criteria: Reject the null hypothesis (Ho) if $p < 0.05$