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Forecasting in the lodging industry: Emphasizing regional economic factors

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FORECASTING IN THE LODGING INDUSTRY: EMPHASIZING
REGIONAL ECONOMIC FACTORS

by

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of the requirements for the

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ABSTRACT

Forecasting in the Lodging Industry: Emphasizing Regional Economic Factors

by

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Budgeting and forecasting in the lodging industry may frequently involve the problems of inaccuracy and inefficiency, which may lead to a third problem, behavioral issues. To address these three common problems, this dissertation focuses on accuracy through quantitative analysis. Once accuracy is improved in budgeting and forecasting, efficiency would be expected to increase, and behavioral issues would be expected to decrease.

The hotel revenues of all 50 states and the District of Columbia were tested for whether their hotel revenues were affected by the economic activity in three venues: the same state, the nation, or another state. Hotel revenues were represented by the lodging industry Gross State Product (GSP), or the economic value-added concept of each state for lodging. Economic activity was represented by the state GSP without hotel revenues, the U.S. GSP without the GSP of the state tested, and the GSP of another state. Correlation was used to identify the most likely explanatory variable. Regression was then used to test the validity and the strength of the explanatory variable. Each state was
then categorized by which of these three economic factors (GSP) best explained hotel revenues of that state.

This study demonstrates that economic factors can assist the lodging industry to increase accuracy in budgeting and forecasting, and a framework is provided for further testing.
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CHAPTER 1

INTRODUCTION

The annual budgeting and forecasting process is a key measurement tool in the hotel business. Hotel executives at the property and corporate levels spend numerous hours preparing budgets and forecasts. The hotel industry is similar to other industries, where key corporate executives, such as the information technology manager, spend from 20 percent to 30 percent of their annual effort in completing the annual budget (Hope, Fraser, and Rosen, 2003). Excessive time spent on budgeting and forecasting takes away time spent on more profitable activities. In addition to the time element, the usefulness of budgets and forecasts may be questionable due to accuracy issues associated with the deployment of unsophisticated methods (Schmidgall and DeFranco, 1998). One of these unsophisticated methods in multi-unit hotel operations is the use of standardized budgeting systems that fail to consider regional economic factors (Brown and Atkinson, 2001). Another sophistication failure is a lack of quantitative analysis (Schmidgall and DeFranco, 1998). The lack of sophistication may lead to inefficient and ineffective budgeting processes (Fanning, 1999) as well as behavior problems, such as participant frustration (Kennedy, 1999).

Two main approaches address inaccuracy, inefficiency, and behavioral issues in budgeting and forecasting. The first approach is technology based. Software packages
from Oracle, PeopleSoft, SAP, Comshare, and many others, tackle the efficiency issues by integrating management processes such as strategic planning, budgeting, financial consolidation, and reporting functions (Whiting, 2000). These software innovations also attempt to reduce the behavioral issue indirectly by reducing participant time investment in the budgeting and forecasting process. The second approach is knowledge and quantitative-technique based. Hospitality consultants Smith Travel Research, PKF, and PriceWaterhouseCoopers address the accuracy issue by producing regular industry forecasts. The foci of these forecasts are occupancy and average daily rate (ADR). These consultants also forecast occupancy and ADR by market segment and major geographic region. Property or company specific forecasting services are available for a fee. Elaborate academic forecasting models and databases, such as the Regional Economic Model, Inc. (REMI) model, are also available for a fee (Treyz, 1993). With simplicity and cost considerations in mind, however, hotel companies may be somewhat reluctant to acquire efficient software and sophisticated models for budgeting and forecasting from industry consultants and academics.

The missing element, then, in addressing the inefficiencies, inaccuracies, and behavioral issues involved in budgeting and forecasting is a tool or process that is simple and cost effective (Athiyaman and Robertson, 1992). A framework for using simple quantitative techniques to identify hotel revenue drivers at the state level has not been produced for general use. There are several quantitative forecasting models available at various geographic levels, but they are either very sophisticated or costly. In other words, most hotel executives do not easily use them.
Schmidgall and DeFranco (1998) note that when a simple, cost effective budgeting and forecasting tool is not available, several problems may arise. These problems may include a failure to consider macroeconomic factors, and a failure to perform quantitative analysis on the completed forecast. A great deal of time may be spent on reviewing minutia rather than on identifying underlying factors, and the quantitative methods employed may not be applied in a scientific manner. The Schmidgall and DeFranco (1998) description of budgeting and forecasting in the hotel industry points to inefficiency and inaccuracy, which lead to managerial frustration. For example, an inaccurate and inefficient budgeting and forecasting process may lead to asking some hotel management teams to perform at unreasonable levels while failing to adequately challenge other management teams. Hotel executives may also miss opportunities to increase profitability by spending too much time on budgeting and forecasting. Inefficiencies in the budgeting and forecasting process detract from efforts to increase revenues and to improve operational efficiencies. When naïve methods are used to predict future revenues and profits, the budget review process may degenerate into discussion of whose opinion is right, versus strategic planning and decision-making based on economic factors.

This study identifies explanatory variables for the hotel revenues of each state and the District of Columbia, with the intent of segregating states by whether the hotel revenues are generated primarily from economic activity inside or outside of the state. This identification process begins by correlating the hotel and lodging industry revenue of each state with its respective state gross state product (GSP), the United States (U.S.) GSP, and the GSP of every other state and the District of Columbia. This study also
provides a framework for identifying hotel revenue drivers with the use of regression techniques. The highest correlated GSP with a given state’s hotel revenues will be used as the explanatory variable in a regression model. The GSP will be that of the same state, the U.S., or another state. The highest R squared value is used to classify the hotel revenues of each state and the District of Columbia. The information gleaned from this study is anticipated to directly assist hotel executives in raising their sophistication and accuracy level of budgeting and forecasting as well as to mediate managerial frustrations. This study will also indirectly assist hotel executives to improve budgeting and forecasting efficiency by providing an economic-based revenue focus.

Sub Problems

Closely associated with the process of building a budget and forecast is the difficult process of gaining approval for a budget. Galbraith (1996) found that corporate executives rejected unit-level forecasts approximately 50 percent of the time. Corporate executives also raised the bar of expected future performance at a similar frequency rate (Galbraith, 1996). The process is similar for hotel properties. At each review step, hotel management teams often revise their forecasts under protest and then resubmit them. When the actual results are available, the property is more than likely below the forecast and is penalized for this under-performance. Unfortunately, the cycle is repeated over and over again.

If a hotel is routinely exceeding budget, a similar but opposite result occurs. Due to the focus on meeting budget (Schmidgall & DeFranco, 1998), the forecast of a high-performing hotel may not be adjusted upward each month, because everyone is happy to
see actual results greater than forecast. Property managers in such circumstances have a tendency to increase expenditures. In good or adverse economies, then, forecast accuracy may suffer, because the underlying economic factors of hotel revenues are not the basis for reviewing the forecast.

Other factors at work that detract from budgeting and forecasting accuracy are related to agency theory. For example, a common conflict arises between owners of a business and the employees or agents, who express their self-interest. Owners want to make as much profit as possible, while the employees or agents want more pay, less work, and more benefits (Zimmerman, 2000). The biggest source of agency-related behavioral issues is the conflict created because budgets and forecasts provide a baseline for incentives, bonuses, management fees, and capital expenditures (Schmidgall & DeFranco, 1998). The corporate office is focused on meeting investor returns. Property managers are interested in exceeding budgets and earning bonuses. A low forecast positions the property for a lower annual budget for the coming year. A budget that is easy to achieve results in a bigger bonus. Corporate officers are extremely wary of such positioning by property managers. A greater accuracy and efficiency in the budgeting and forecasting process would likely reduce behavioral issues related to incentives and bonuses.

The Merging of Budgeting and Forecasting

After introducing the highlights of this research, it is important before going any further to establish the link between budgeting and forecasting. These two functions are inseparably bound and are becoming increasingly more synonymous. Whereas a forecast
formerly laid the foundation for completing the annual budget, some companies are now using a regular forecasting process to replace the annual budget (Nolan, 1999). The following section examines the forecasting and budgeting functions and how these two functions have evolved into a near singular function.

It is common industry practice for hotels to produce comprehensive annual operating budgets for the coming year (Schmidgall & DeFranco, 1998). It is also typical to forecast revenues and expenses every month for the remainder of the fiscal year, or at least for the next three to six months. Additional forecasts are required if there is a downturn in the economy.

A forecast is the starting point of budgeting (Shim, Siegel, & Liew, 1994), and typically a forecast is for a shorter time period than budgeting. A budget is a formal, long-range plan, and is used as a standard to compare actual performance (Schmidgall & DeFranco, 1998). With the help of computers, the forecast compilation process has approximated the comprehensive budgeting process without the formal presentation or defense. The first step in approaching an annual budget has traditionally been the preparation of a sales forecast, which is management's expectation of sales, expenses, volume, and financial transactions (Shim et al., 1994). Shim apparently includes expenses in the definition of a sales forecast with the idea that once sales volumes are forecasted, appropriate expenses to support the sales can easily be added.

A definition of a budget includes some elements of forecasting. In formally quantifying an organization's operational expectations, management aggregates a forecast of all expected future transactions (Zimmerman, 2000). The issue of differences between budgeting and forecasting, then, appears to be not so much in the process, but
rather in the purpose of the function. A key word in the Zimmerman (2000) budget
definition is ‘formal’. The annual budget becomes a benchmark to which actual results
are compared each month or accounting period. Morrell (2001) states that the link
between a forecast and a budget or plan is that a budget’s success is based on a set of
assumptions about the future (forecast).

Another key phrase of the Zimmerman (2000) budget definition is ‘expected
transactions’, which raises agency issues. Business owners desire to make a profit, which
may run counter to the interest of employees or agents. One role, therefore, of
accounting systems is that of a monitoring mechanism to align the interests of owners and
employees (Zimmerman, 2000). According to Zimmerman, the budget is simply a part of
the accounting process to partition decision rights and control behavior. The annual
budget, then, becomes the monitoring mechanism of actual financial performance. In
other words, a budget is more likely to be used as a behavior control tool than a forecast.

Montgomery (2002) identifies four best practices in joining the functions of
forecasting and budgeting, by combining them with strategic planning. The first best
practice is to have a clear “big picture” focus in strategic financial planning. The second
is to summarize and avoid too much detail. The third is to use statistical information and
parameters instead of general updates to previous forecasts, such as revenue per
salesperson. The fourth is to integrate the forecast with the operating budget by setting
cost center targets and allowing cost center managers to adjust line item costs as
circumstances change.

In summary, the mechanical process of assembling the numbers for a budget and for a
forecast, are the same. The difference between a budget and a forecast is often how each
is used. This dissertation focuses on identifying the economic factors that impact hotel revenues. The process is the same for budgeting and forecasting. Once hotel revenues are objectively and quantitatively calculated, the appropriate amounts of labor and expenses are easily calculated. The objective and quantitative analysis of revenues facilitates budgeting and forecasting accuracy and efficiency, as well as reduces managerial frustration.

Research Questions

As hotel executives at the corporate level begin formulating the budgeting and forecasting guidelines, one of the first questions to address is how much revenues should grow in the coming year. Hotel executives search for information that will support their revenue growth guidelines. Some options for supporting revenue increases include sales force information on future bookings and general economic activity. Whereas both of these options are helpful in formulating revenue increases, information regarding general economic conditions may be more objective than the sales force information.

As hotel executives review information regarding general economic conditions, two closely related questions arise. One such question concerns the relationship the general economic conditions have with the hotel revenues to be budgeted or forecasted. The strength of this relationship may determine whether an economic factor can be used to support the increase guideline. The other related question involves the geographic area that the economic factor impacts. Are hotel revenues of a given area affected by the economic activity of the area, or are they affected by national economic activity? Or, if hotel revenues of one area do not show strong relationships to economic activity of its
own area or of the nation, is there economic activity from one area that influences hotel revenues of another area? If so, how should these area differences be incorporated into the budget revenue guideline increases? Using a single increase guideline for every hotel in the country may cause inaccuracy, inefficiency, and behavioral issues. On the other hand, issuing budgeting guidelines for too many geographical areas may not be practical.

The key research questions, then, are: 1) What economic factors affect hotel revenues? 2) What is the process for identifying economic factors that affect hotel revenues? and, 3) How should hotels be categorized for assigning revenue increase guidelines for budgeting and forecasting purposes? As previously stated, this dissertation utilizes GSP as economic factors. Correlation and regression tests will identify the best explanatory GSP. Tests will be conducted on the hotel revenues of all 50 states plus the District of Columbia. The hotel revenues of each state will then be categorized according to the explanatory variables into one of three groups.

Hypotheses

In view of the research questions, the following hypotheses will be tested in this study:

HYPOTHESIS I: State GSP has no impact on state hotel revenues;
HYPOTHESIS II: U.S. GSP has no impact on state hotel revenues; and,
HYPOTHESIS III: A given state GSP has no impact on another state’s hotel revenues.
Justifications

Because of the inaccuracy, inefficiency, and behavioral issues involved with budgeting and forecasting, any tool that makes improvements in these areas is a step in the right direction. There are many software and forecasting model options currently available that will assist in improving the budgeting and forecasting process. However, the two main disadvantages of the current options are the cost and the level of difficulty. The hotel industry, in the aftermath of the September 11, 2001 terrorist attacks on New York’s World Trade Center and its negative effect on travel and tourism, is under intense pressure to reduce costs. Software that links budgeting with strategic planning and financial reporting is expensive. To implement such software, company culture changes may be needed. Comprehensive forecasting models are also expensive and require specialized economic knowledge to use. As will be discussed in chapter two, one of the factors that increase the level of acceptance of budget goals is the participation in the setting of goals by those expected to achieve them (Fosnaught, 1999; Whiting, 2000).

Sophisticated econometric models are not understood nor used by most hotel executives. This study provides a framework that utilizes a simple regression technique to find hotel revenue drivers in a regional setting. For such a purpose, the regression statistical technique is highly encouraged (Anderson, Sweeney, and Williams, 2001). Just as other studies have used economic factors to forecast tourism demand (Fish and Waggle, 1996; Sheldon, 1993; Uysal and Roubi, 1999), this study also emphasizes the use of economic factors to forecast hotel revenues. By using regional economic factors in the budgeting and forecasting process, the focus is on what a hotel can strategically do to optimize value under existing market conditions. By focusing on market conditions and using the
regression technique, hotel executives may improve the accuracy of and reduce their frustration with the budgeting and forecasting process.

Delimitations

This study is limited to statewide generalizations. Data is unavailable for smaller geographical locations, such as counties. This may not be very important for low population states, such as North Dakota. However, it may be very important for a state such as California, where the markets for San Francisco, Sacramento, Los Angeles, Anaheim, and San Diego, may be significantly different. Whereas these five areas of California may drive the major economic activity of the state, it is impossible to test for differences among these five regions with current, generally available data. Subsequent research may test smaller geographical regions than states for significant differences, using variables such as personal income on a county basis.

Economic forecasting models generally employ a group of equations, or econometrics, to identify explanatory variables and their corresponding impact on dependent variables. There are two main reasons for employing a forecasting technique other than econometrics in this dissertation. The two reasons are parsimony and cost effectiveness. In striving for parsimony and a corresponding low cost, the simple regression models tested in this dissertation study are intended as a framework for future investigation. The state-level hotel revenue data may reveal some valuable relationships among states to assist hotel industry executives to establish budgeting and forecasting revenue increase guidelines. However, the main purpose of this dissertation is to provide
an objective measure format, so that with specific data availability, budgeting and forecasting reviews can emphasize strategic issues rather than behavioral ones.

The hotel industry GSP is used to represent hotel revenues in this dissertation. Industry GSP is the economic concept of value added, which represents revenue less costs associated in producing the revenue. As explained in detail in chapter three, the valued added concept represents approximately 70 percent of total hotel and lodging revenues. Because value added represents revenue less costs incurred in producing the revenue, the value added concept closely resembles room revenue. Most of the costs associated with hotel and lodging revenue are from food and beverage costs and other expenses. The relationship of the value added concept to room revenues, and the idea that hotel room revenues drive other hotel revenues, support the use of the value added concept for hotel and lodging revenues. Therefore, hotel and lodging properties without food and beverage are well represented by the value added concept. In essence, all hotel revenues, less the cost of sales and other expenses, equal the industry GSP, or value added concept, for hotels.

Definitions

1. **Agency.** The act of representing someone else or a firm with the tendency to pursue one’s own self-interest (Webster, 1988 & Zimmerman, 2000).

2. **Budget.** A firm’s formal plan for all expected future operational transactions (Zimmerman, 2000). For purposes of this dissertation, the process of calculating expected operational transactions is considered the same as the forecasting calculation process.
3. **Bonus.** An incentive plan for additional compensation based on meeting financial goals.

4. **Bureau of Economic Analysis (BEA).** A division of the U.S. Department of Commerce that studies, analyzes, and supplies economic data.

5. **Forecast.** The calculation and prediction of future financial activity volume. In this dissertation, the calculation part is the same as the calculation process in budgeting.

6. **Gross State Product (GSP).** The total value added in production by the labor and property located in a state (BEA Help File).

7. **Judgmental Forecast Method.** A category of qualitative forecasting that emphasizes the use of expert human judgment to predict future financial activity.

8. **Metropolitan Statistical Area (MSA).** Major population centers for which demographic statistics are accumulated and reported.

9. **Moving average.** Updating the average of time series data by dropping the oldest observation and adding a recent observation before recalculating the average.

10. **Operating expenses.** All expenses of revenue producing departments of a hotel.

11. **Operating profit.** Hotel profit before fixed and financing charges.

12. **Qualitative Forecast Method.** The process of using human judgment to predict future financial activity based on objectively gathered information.

13. **Quantitative Forecast Method.** The objective use of statistical methods to forecast future financial activity.

14. **Value Added.** Gross output (sales, operating income, commodity taxes, and inventory change) less intermediate inputs (consumption of goods and services purchased from other U.S. industries or imported) (BEA Help File).
Summary

The current industry problems with budgeting and forecasting were discussed. The results of past studies and the essence of this dissertation were highlighted in this chapter. How the terms, budgeting and forecasting, among others, will be used in this dissertation were also described. The research questions and the hypotheses tests were revealed. Now this dissertation follows with a literature review of budgeting and forecasting in Chapter Two, which includes a history of forecasting, current industry practices in forecasting and budgeting, economic indicators used in forecasting, and various forecasting techniques.
CHAPTER 2

REVIEW OF RELATED LITERATURE

Historical Overview

Human fascination with the future is illustrated by the Delphic oracle, which functioned from the 8th century B.C. to the 4th century A.D. (Webster, 1988). In the middle of the Parnassus mountain range in the southern part of the Greek mainland with an awe-inspiring view of the Gulf of Corinth and northern Peloponnesus stood the Temple of Apollo at Delphi. Hospitable priests received the exhausted travelers that made the long and tiring climb to Delphi with good food and plentiful wine. While eating and drinking, the priests encouraged the visitors to talk about themselves, their needs, their desires, and their expectations. (Makridakis, 1990)

The day following the long journey and welcome reception, a supplicant would then put a question to the oracle for a fee or donation. The oracle, or sibyl, was portrayed by a number of aged virgins who put themselves into a trance by chewing on bay leaves. After evaluating the visitors’ profiles, the oracle would receive the client into a hollow beneath the temple and provide an answer to the question. The unintelligible reply was interpreted by the duty priests, who transcribed the answer onto a lead tablet in Greek hexameters. (Morrell, 2001) The predictions were given in such a way as to make their validation difficult (Makridakis, 1990).
The human fascination with the future kept the ancient Greek oracles in business for over 10 centuries. This human fascination for the future has continued as today's fortunetellers and astrologers perform functions similar to those of the Greek oracles. In the business world, however, there is a greater need for reliability of the information and for accuracy of the prediction. There are many factors that contribute to this need for predicting and planning for future events. The evolution into the industrial age engendered many of the factors that required predicting the future. Businesses took a greater interest in forecasting following World War II, which accelerated in the 1960's.

Need for Forecasting

Wheelwright & Makridakis (1985) identified five factors that have increased the commitment of businesses to forecasting. First of all, the business environment has become more complex. This complexity is due to population growth, global competition, and increased government regulation. The second factor is that organizations have grown. Organizational size results in decisions that have greater impact and are more important than decisions in smaller organizations. The third factor is that change is accelerating. Key relationships change quickly, and forecasting helps identify the new relationships. Morrell (2001) supports the change acceleration concept by noting that the pace of technological change has accelerated into a permanent industrial revolution. Morrell (2001) posits that the technological change is dominated by electronic developments and advances in biotechnology and genetic engineering. The fourth factor of Wheelwright & Makridakis (1985) is a shift to systematic decision-making, which requires justifying actions.
The fifth factor is that forecasting methods have been developed for practitioners and these methods no longer require experts. There are two principle advantages to the use of less sophisticated forecasters. The first is that more people can participate in the forecasting process, which may include more pertinent information to the forecast. The other advantage is related to broader participation, which tends to lead to a greater acceptance of the final forecast (Fosnaught, 1999). The potential disadvantage is that less sophisticated users may lack forecasting understanding, and their forecasting efforts may not yield accuracy.

Thomopoulos (1980) went further than the Wheelwright and Makridakis's (1985) contention of increased commitment to forecasting by stating that forecasts are essential for a company to survive and grow. In other words, forecasting is no longer an optional task. According to Thomopoulos, traditionally there have been three principal uses of forecasting. The first use relates to human curiosity. Humans have a penchant towards wanting to know the future. This same human curiosity supports industries related to horoscopes, astrology, and fortune telling (Makridakis, 1990).

The second use of forecasting according to Thomopoulos (1980) is for improved decision-making, which coincides with the fourth factor of Wheelwright and Makridakis (1985). The mere growth of companies results in an increase in the impact of decisions. As the impact of decisions grows, the need to make good decisions also grows. Likewise, the need to make good decisions results in a need for good information. Therefore, a good forecast can have very positive benefits. On the other hand, a bad forecast may be quite harmful. Stokes and Levitt (as cited in Burgess, 2000) note that inaccurate forecasts may lead to over or under staffing, poor guest service due to a
shortage of supplies, payment difficulties, and investor dissatisfaction. Makridakis (1990) adds that it may be as important to know the probability of failure or uncertainty of a forecast as well as forecast accuracy.

The third use of forecasting relates to the consensus generation (Thomopoulos, 1980). If management can agree on the long-range scenarios for a company, there is a greater possibility of making good strategic decisions that will benefit the company. A concerted use of a company’s resources towards key long-range goals can position a company for success. Fosnaught (1999) adds that the annual business planning process must be aligned with the short-term forecasting process to achieve a consensus forecast. Fosnaught (1999) emphasizes that the advantage of consensus forecasting is involvement, which drives commitment and enhances communication. Makridakis (1990) concurs that this third forecasting use is an important forecasting function that is frequently under-exploited.

Shim, Siegel, and Liew (1994) posit that the core reason for doing a forecast is that organizations operate in conditions of uncertainty and risk. The starting point for minimizing risk and uncertainty is forecasting. They point out that the need for forecasting engenders four types of forecasts. They are: 1) sales, or the expected level of sales; 2) cash flow, or finance; 3) economic, or business conditions such as employment and interest rates; and, 4) technological, or the impact of new products or services.

Morrell (2001) states that man’s chances of survival have been enhanced by his ability to foresee the consequences of his decisions. He agrees with Shim et al. (1994) that the objective of forecasting is to identify and evaluate risk, as well as to minimize uncertainty. Morrell (2001) believes that this is due to the constantly changing nature of
the business environment. He goes on to suggest that these forecasting objectives spawn a need for a scientific process.

In a slightly different categorization of forecasts than Shim et al. (1994), Morrell (2001) cites a range of forecasting purposes to include: 1) the annual budget; 2) investment projects; 3) commissioning and exploiting research; 4) appraisal of competition; and, 5) the feasibility of making acquisitions. In a similar breakdown, Makridakis and Wheelwright (1978) reduce the forecasting areas to three: 1) scheduling existing resources; 2) acquiring additional resources; and, 3) determining what resources are desired. The similarities of these three categorizations of forecasts indicate that the reasons for forecasting have not changed much in the last twenty years.

Jain (1999) supported the need to forecast by identifying three indicators of a forecasting explosion in today’s business world. The first indicator was that companies are hiring full-time forecasting executives. In a 1998 survey by the Institute of Business Forecasting 77 percent of respondents had hired one or more full-time forecasting executives during the last 10 years. The salaries of these forecasting executives ranged from $45,000 for a forecast analyst, to $153,000 for a vice-president of forecasting. Jain’s second and third indicators of increasing business activity in forecasting were the proliferation of forecasting software and the number of academic journals dedicated to forecasting.
Common Forecasting Characteristics
and Assumptions

The selection of the forecasting method depends upon the product life cycle and sometimes the firm or the industry (Shim et al. 1994). According to these authors, the forecasting selection criteria has six components: 1) cost (will benefits out-weigh costs?); 2) degree of complexity of relationships being examined; 3) term (short or long); 4) level of accuracy; 5) minimum tolerance level of errors; and, 6) data availability.

According to Makridakis (1990) forecasts can be broken down into three time frames, short-term, medium-term, and long-term. Short-term forecasts are for time frames as short as a few days to several months, but less than a year. The momentum in series data and their seasonality constitute the two greatest advantages of short-term forecast accuracy. Medium-term forecasts are for terms of one to two years and are mostly used for budgeting. These forecasts are also relatively accurate if patterns and relationships have not changed. Long-term forecasts are generally done for more than two years. Their use is mostly for capital expansion plans, research and development projects, new products and long-term strategies. Regardless of the forecasting term, Makridakis (1990) states that a simple statistical method is superior to all other methods.

There are some common rules, features and assumptions in forecasting. Morrell (2001) has compiled a list of 17 forecasting rules as follows: 1) the future has its roots in the past; 2) forecasts are dependent upon their underlying assumptions; 3) forecasts are also dependent upon historical data, which contain errors; 4) garbage in equals garbage out; 5) major trends change gradually; 6) spending decisions depend upon cash; 7) cash equals confidence; 8) financial change can be immediate, but physical change is slow; 9)
one business cycle generates the next; 10) statistics describe people and human activity; 11) man is a dynamic animal, and therefore, his reaction to problems must be allowed for in forecasts; 12) today’s best becomes tomorrow’s norm; 13) never overlook the weather and natural forces; 14) break down rather than build up, or forecast the total and then disaggregate the total into component parts; 15) treat any result which is at odds with common sense with suspicion; 16) it will be a fluke for a forecast to be exactly fulfilled; 17) a successful forecaster is made of sound judgment, shrewdness, wisdom, is numerate, has a feel of history, and, has a historical knowledge of politics and economics. In summary, Morrell provides some realistic and practical concepts to consider as the forecaster utilizes various techniques, which are applicable for even the very sophisticated ones.

Shim et al. (1994) present a shorter but similar list. They present common forecast features and assumptions as follows: 1) the use of historical data assumes that causal relationships will continue; 2) forecasts are rarely perfect; 3) forecast accuracy decreases as the time horizon increases; and, 4) forecasts for groups of items tend to be more accurate than forecasts for individual items. In other words, a forecast for an industry is likely to be more accurate than a forecast for an individual firm.

An important forecast characteristic is accuracy. There are several factors that affect forecast accuracy. Makridakis (1990) lists eight items as follows: 1) patterns or relationships might change over time, such as weather; 2) people can influence future events in a self-fulfilling or self-defeating role, which necessitates forecasting competitor reactions to a prediction; 3) forecasting accuracy decreases as the time horizon increases; 4) forecasting accuracy decreases as the rate of technological change increases; 5) the
easier the entry barriers, the more inaccurate the forecast, as new competitors can change patterns and relationships; 6) the faster the dissemination of information, the less useful the value of forecasting, as everyone will have the same information and arrive at similar predictions; 7) the more elastic the demand, the less accurate the forecast with all other things being equal; and, 8) forecasts for consumer products are more accurate than those for industrial products as one customer in an industrial setting can have a substantial impact on a forecast. Makridakis's eight characteristics of forecast accuracy provide the forecaster critical concepts to consider in designing a forecast process. For example, the forecaster for a fast changing technology company may want to keep Makridakis's fourth concept in mind in establishing the forecast term.

An aspect of accuracy is whether a firm can control key variables or not. Morrell (2001) states that climate, commodity prices, energy prices, labor markets, interest rates, taxes, legal restraints and obligations, and customers' purchasing power are outside a firm's control. Items or concepts within a firm's control are product development, use of capital, use of labor, marketing, long-term strategy, and planning.

Wheelwright and Makridakis (1985), taking a hint from the bay-leaf-chewing Oracles of Delphi, highlight some forecaster techniques to watch out for. One such technique is forecasting that there will be a recession every year. In this fashion, the forecaster can claim having forecast every recession since World War II. Another dubious forecasting technique noted by these two researchers is the prediction that a basic pattern or trend will continue. In other words, the likelihood that a basic trend or pattern will continue is high, and does not merit a significant forecasting effort. These researchers also warn of
self-fulfilling prophecies. If a forecaster predicts a drop in the stock market and people take action on such a prediction, a drop in the stock market may happen.

After examining the history of forecasting from the Greek Temple of Apollo at Delphi to the post World War II era, it is appropriate to include a statement by Makridakis and Wheelwright (1978). These two researchers wrote a book on forecasting with the purpose of consolidating available information and translating complicated methodologies into a format usable by managers. According to these authors, forecasting forms an important segment of the decision-making process. These two authors believe that forecasting is an attempt by management to become more scientific in addressing economic environmental issues. Makridakis and Wheelwright (1978, Preface) made a classic observation that is applicable to the hospitality industry today: “Although many managers and students are aware of the need for improved forecasting, few are familiar with the full range of existing techniques and their characteristics and few have the knowledge required to select and successfully apply the most appropriate methods in a specific situation.” This study addresses the issues of the quote from Makridakis and Wheelwright by providing a roadmap to use economic factors and regression techniques to forecast in the hotel industry.

After expounding on the history, needs for, and characteristics of forecasting, it is appropriate at this point to discuss the budgeting process in general and in hotels in particular to highlight the need to increase forecast accuracy and reduce the time management spends on budgeting.
Reasons for Planning and Budgeting

Makridakis (1990) identifies five reasons for budgeting or business planning. These reasons include concepts such as achieving desired goals and coping with uncertainty. One Makridakis reason for budgeting concurs with Zimmerman (2000) in that budget objectives must be communicated to obtain commitment and control. Other Makridakis reasons for budgeting include addressing the budgeting lead-time requirements. Montgomery (2002) supports the lead-time concept as well as that of achieving goals. According to Montgomery, an earnings forecast miss can have a negative impact on share price, and that an effective allocation of resources mandates an accurate understanding of business volumes in the short-term and the long-term.

Jehle (1999) notes that budgets form the basis for allocating resources to achieve company strategy and objectives. Fanning (1999) agrees that budgeting should integrate the formulation of strategy, financial reporting, and reward mechanisms. According to Jehle (1999), the budget is the cornerstone of the management planning and control (MPC) process by providing the goals and benchmarks for measuring actual performance against the strategic plan. Jehle stresses the need for speed and efficiency in the budgeting process so as to meet changing business conditions.

Besides noting a nine-step budget process, Kennedy (1999) elaborates on six possible functions of the budget process. The six possible functions of the budget process according to Kennedy are: 1) authorization; 2) forecasting and planning; 3) communication and coordination; 4) motivation; 5) evaluation and control; and, 6) decision-making. Kennedy cautions that, with a probability of meeting or exceeding budget at only 30 percent, if budget variances are used to punish budget holders,
dysfunctional behavior is the likely result. Kennedy suggests that the best alternative to top down (low motivation) or bottom up (low control) budget approaches is to allow participation within closely defined parameters.

Since budgeting can perform several functions, some researchers have noted some slight emphasis shifts in the budgeting process. Barsky and Bremser (1999) observe a change in budgeting emphasis from physical capital to human and information resources. Fanning (1999) notes that the budget information must be meaningful and sophisticated. Barsky and Bremser (1999) mention the importance of the role of budgets in performance measurement. They recommend the balanced scorecard approach to performance measurement. These two researchers then recommend integrating budgeting with performance measurement by evaluating the impact of investor and management expectations on the budget process. Their next recommended step to budgeting is to use the budget process to refine manager models of the firm according to the balanced scorecard approach. Finally, Barsky and Bremser emphasize that in order to align employee actions with strategic goals, it is important to use the budget to communicate core beliefs and critical interactive controls. This final concept coincides with the budget concepts of Makridakis (1990) and Zimmerman (2000).

The need for budgeting method changes in the hospitality industry are also being identified. Brown and Atkinson (2001) note that budgeting in hotels traditionally supported forecasting, cash flow management, cost control, and capital expenditures. In today’s fast-changing environment, however, Brown and Atkinson (2001) note that budgeting must also communicate corporate goals and objectives, form the basis of resource allocation, and provide grounds for performance appraisal. Brown believes that
hotels need to not only access, but to also use relevant external indicators. The need to use external indicators supports the purpose of this dissertation research.

Problems with Traditional Budgeting

The budgeting process, then, performs several functions, but many problems may be encountered. Kennedy (1999) notes that 99 percent of European companies operate formal budgeting systems, and that many participants are frustrated with the process. Fanning (1999) adds that the budget frustration is due to inefficient and ineffective budgeting processes. Walker and Johnson (1999) cite two main reasons for differences in actual results versus budget. The first reason is that forecasting models are imperfect. The second is that there is a divergence between organization and individual goals. Walker and Johnson (1999) focused on the impact of budget-based incentives on the behavior of managers and subordinates in the budget process. These researchers found that subordinates' estimation of sales volume exhibited slack-building behavior when incentive compensation was based on budget goals. They also found, however, that the slack effect could be reduced by a careful superior's review of the subordinate's budget proposal.

Fisher, Maines, Peffer, and Sprinkle (2002) conducted research on using budgets for performance evaluation with a specific emphasis on information asymmetry across organization levels and on resource allocation. These researchers found that when budgets are used for performance evaluations, budget slack increased. When budgets are used to allocate scarce resources, budget slack is reduced and subordinates are more forthcoming with private information. Fisher, et.al. (2002) also found that when the same
budget is used for both performance evaluation and allocation of scarce resources, which combines the management processes of planning and control, budget slack decreased.

Hope et al. (2003) claim that the budget process is killing chief information officers (CIO's) and chief financial officers (CFO's). These authors claim that the annual budget consumes four to five months or 20 percent to 30 percent of the information technology (IT) manager's annual time. One of the main causes for taking so much management time is the effort expended on revisions and delays (Brown and Atkinson, 2001).

Whiting (2000) notes that the budget process can be painstakingly slow, and that as a result, companies are looking for a shorter budget process that provides greater information.

Lapide (2000) contributes some valuable insight into problems of the forecasting phase of the budget process. He posits that many high level executives equate forecasting to the annual budgeting and planning process, which forms the basis for setting sales goals and allocating financial resources. Lapide warns, however, of four myths of executive conventional wisdom in regards to forecasting and budgeting. The first myth is that forecasts are always wrong, so why exert any effort on demand planning? Lapide explains that the purpose of forecasting is to increase the odds of being close to right, and that a main advantage of a formal forecast is to get everyone on the same page. The second myth Lapide mentions is that forecasting problems are solved by hiring an expert quantitative person. Lapide posits that other skills, such as communication and an understanding of what drives the business, are more important than quantitative expertise. Lapide's third myth is that purchasing a forecasting software package will solve forecasting problems. Lapide emphasizes that a business process that
includes cross-functional inputs and drives a consensus is more important than software alone. The fourth and final myth that Lapide identifies is that a forecasting process is too expensive. Lapide notes that it is more expensive to not forecast at all.

Myers (2001) identifies eight classic problems with the traditional static budget. The first relates to the sales manager finding a new account early in the year. If sales targets are not adjusted, the behavior tendency is to coast through much of the year. The second relates to the addition or the discontinuation of a new service or product. Actual performance comparisons of a budget that includes a discontinued product are obviously of diminishing value. The third is the issue of timing. Budget information is compiled three to six months before the beginning of a new fiscal year. Therefore, as the year progresses, the budget data used for comparison to actual performance is three to eighteen months old. The fourth factor is that if revenues are soft in the beginning of the year, sales targets are frequently pushed into later months of the year in hopes of regaining the sales pace during the year. The fifth factor is the year-end dash. If management is behind budget as the year-end approaches, distribution channels are overloaded with requests to take product delivery, which many times is heavily discounted or returned. If management is ahead of budget, customers may be asked to delay orders until the new-year begins. The sixth factor is the effort and time involved in preparing the budget. As previously mentioned, this can be up to 20% or 30% of key managers’ time. The seventh factor is the issue of linking the budget to compensation, even though the budget may be out of step with the market. The final factor is the difficulty in consolidating budget information from spreadsheets. Too many errors can occur in copying and transferring data.
Nolan (1999, p. 59) offers some valuable insights from the banking industry that are very applicable to the lodging industry. He notes, “Bank management generally considers the annual budgeting process to be the least rewarding endeavor of the year.” Nolan observes that when unit managers are asked for budget input, known as a bottom up approach, the sum of all units rarely meets the CEO’s expectations. On the other hand, if the CEO provides the budget goals, known as a top down process, the unit managers may save time to prepare the budget, but have a greater difficulty in achieving the goal. Nolan also notes that any bottom up approach usually goes through several review processes, so that the final goal is close to the top down, CEO’s goal anyway.

Brown and Atkinson (2001) identify five reasons current hotel budgeting processes are inefficient and ineffective. These reasons are similar to those of other industries. The first relates to reinforcing departmental barriers while hindering flexibility, responsiveness, and knowledge sharing. If hotel management teams do budgets by department without participating in the overall strategy sessions, managers become narrowly focused on their own departments and fail to see how their departments fit into the big picture. Hope et al. (2003) add that shareholder value models are undercut by the politics of the budget process. The second budgeting inefficiency of Brown and Atkinson (2001) is the rigid commitment to an out-of-date assumption. This inhibits management initiative and discourages the pursuit of continuous improvement. Hope, et al. (2003) agree with Brown and Atkinson (2001) by showing that commitments to numbers over a year old lead to salesperson behavior at year-end such as pressuring customers to order items they will return, or delaying orders until the following year. The third inefficiency is that current hospitality budget practices strengthen the traditional vertical chain of
command, which fails to empower people on the front line, who may be able to recognize
customer opportunities and trends better than the corporate executive. Hope, et al. (2003)
add that balanced scorecard approaches that include an element of customer service, may
be stymied by short-term financial goals. The fourth inefficiency of Brown and Atkinson
(2001) is the focus on cost minimization versus maximizing value. Budget reviewers
focus on saving a few hundred dollars in labor and expenses, when poor pricing and yield
management decisions may leave thousands of dollars on the table. Hope, et al. (2003)
add that activity based management is undermined by the traditional budget process
because costs are derived from the budget. The fifth inefficiency mentioned by Brown
and Atkinson (2001) is the failure to give lasting improvement and the failure to generate
congruent behavior. This is similar to their first inefficiency of departmentalizing the
budget process. Sales and rooms operations managers may be excited about some new
accounts attracted to the hotel, but food and beverage operations managers, for example,
may be fixated on inflationary increases and fail to explore revenue opportunities with
the new accounts.

Another issue identified by Brown and Atkinson (2001) is the tendency of companies
to adopt standardized budgeting approaches for multi-unit operations. This means, for
example, that an overbuilt market in Miami has the same budgeting guidelines as the
robust hotel market in Boston. Hope, et al. (2003) assert that the traditional budget
approach detracts from the benchmarking technique, or the process of comparing internal
units against each other, by giving all units the same increase goals. The findings of
Brown and Atkinson and Hope et al., support the regionalization of the budgeting process
that is consistent with this dissertation, as the national, broad brush approach fails to account for local market and operational circumstances.

One researcher found a grouping of forecasting problems similar to budgeting problems. A survey by the Armstrong Laing Group of the top 1,000 organizations in the UK, found that 75 percent of financial directors encounter internal barriers that prevent them from forecasting as often or as quickly as they would like (Credit Control, 2002). The three common obstacles were the finance staff time required to forecast, the cost center manager time to review forecasts, and the line manager resistance to frequent forecasts.

The literature mirrors the author's personal experience of budgeting and forecasting in the hotel business. Corporate officers would begin writing guidelines in the late spring for the capital and operations budgets. The capital budget would be segmented by dollar amount and time periods. The operations budget would contain sections for a wage survey, a marketing plan, and revenues with corresponding expenses. The preliminary property capital budget would be completed by July. The competitive wage scale would be completed in July, and the marketing plan would be completed in August. The property operations budgets would be completed in September, supposedly taking advantage of the information obtained from completing the capital budget, the wage scale, and the marketing plan.

Several levels of review were then conducted. The regional vice-president along with the regional controller and regional director of sales and marketing would review the property budget and make changes. The executive vice-president along with her financial and marketing executives would do the same. The CEO and/or senior officers
would also make their changes. The regional or executive vice-president would then present the budget to owners, who could also make change recommendations. Any change to the property budget at any level would require the property to make the changes and resubmit the new documents for the next level review. With each budget change, the property level managers experienced diminished ownership in the budget. Property managers began wondering why they were asked to put together a budget in the first place, if each corporate level was just going to increase the goals. Property level managers are left wondering if it were better to just be given the budget goals in the first place.

The tools typically available for corporate managers in writing the budget guidelines and in reviewing the property budget proposals include inflation expectations, general market conditions, such as the PKF forecast, and intuition. The budget guidelines were typically national in scope. Whereas regional executives were somewhat empowered to make exceptions to the national guidelines, these same regional managers were under pressure to establish high property revenue and profit goals. There were no quantitative tools available to justify property proposed goals below the national guidelines.

The core issue in the budget process for property managers is that bonuses are tied to performance against budget. Therefore, property managers are highly interested in submitting the lowest possible budget that could be approved. Corporate officers are very aware of the property manager’s desire for an easy budget and a subsequent large bonus. The goal of corporate officers, then, is to stretch the property budgets as far as possible, while still making them attainable. A similar process occurred with forecasting. The difference was that bonuses were not tied to forecasts. Therefore, changes to the
forecast numbers did not have a monetary impact on the property managers, and they were not as connected to the forecast as to the budget. As a result, less time was spent on forecasts, and less emotional effort was expended for mandated changes.

Forecasting Task

Now that the budgeting process and related problems have been examined, and before detailing the various forecast approaches, it is appropriate to examine the basic task of forecasting as well as who forecasts. Shim et al. (1994) identify a six-step forecast process. The first step is to identify what is to be forecasted and why. This step includes the level of detail required and the amount of resources required and available. The second step is to establish the time horizon to be forecast, i.e., one week, three months, one year, or three years, etc. The third step is to select a forecasting technique or model. The fourth step is to gather data and test the model. The fifth step is to identify assumptions. The sixth and final step is to evaluate the forecast accuracy. Shim et al. conclude by stating that if the accuracy is unacceptable, then return to step three.

It is common for the forecast process to start at the top of the organization. Morrell (2001) proposes that the board of directors begins the planning process by providing a set of decisions regarding the company’s future. According to Morrell, the basis for decisions of the board of directors is data on the firm’s performance and operating ratios. Much of a firm’s forecasting relates to investment decisions, which originate from the firm’s long-term strategy and plans (Morrell, 2001). Croushore (1999) adds that even investors enter the forecasting arena by estimating corporate profits, which in turn can affect stock prices. Croushare offers some comfort to forecast recipients, however, by
noting that professional forecasters have demonstrated reasonable accuracy over time in predicting corporate profits. Onkel-Atay (1998) supports this finding in a study that compared forecast accuracy between security analysts and a Box-Jenkins model. Onkel-Atay found that the security analysts were more accurate, primarily due to the analyst’s information advantage.

In the hospitality industry, Smith and Lesure (1996) claim that the best available forecasting basis is the industry’s past trends. It is easy to see, then, how these authors define forecasting as the extrapolation of the trends in related data over a period of time. Smith, the founder of Smith Travel Research (STR), notes that many hotel forecasts come from small, biased samples, and that forecast reliability diminishes beyond six months. Another problem with hospitality forecasts as noted by Smith and Lesure (1996) is that the media tend to publish forecasts without qualification or explanation. Operators tend to discard all forecasts because the available forecasts are so varied. The natural tendency of operators, then, in regards to forecasts, is that they do not want to believe forecasts of gloom. They also do not want to hear optimistic forecasts, because such forecasts bring developers. Smith notes that STR solves the forecast reliability problem by gathering data from over 30,000 hotels, or 99 percent of U.S. hotels.

Forecasting Taxonomy

At this point it is appropriate to examine the various forecasting approaches. Most authors segment forecasting into two major approaches, qualitative and quantitative (Schmidgall, 2002). The qualitative and quantitative approaches are further segmented to show specific variations within these larger forecasting segments. Shim et al. (1994) use
four segments of forecasting approaches. In addition to quantitative and qualitative approaches, they add indirect methods and a special category for learned behavior, the Markov approach. Shim, et al. define the indirect methods to include market surveys, input/output analysis, and economic indicators. In some of his earlier work, Makridakis and Wheelwright (1978) classified quantitative forecasting into two major categories, naïve, which are based on intuition, and formal, which are based on statistical principles. He noted that in the 1950's, a major consideration for selecting one of the formal methods, smoothing, was computer capacity and management time. So, accuracy was slightly sacrificed for practical reasons.

The basis for categorizing most forecasting approaches was established by Wheelwright and Makridakis (1985), who state that planning and decision-making cannot succeed without forecasting. They also identify three forecasting categories: quantitative, technological, and judgmental. These authors identify three major sub-categories and nine additional sub-segments for quantitative forecasting methods, two major categories and seven additional sub-segments for technological forecasting methods, and three major sub-categories and seven additional sub-segments for judgmental forecasting methods. An explanation of these forecasting approaches follows.

I. Quantitative

A. Time series

1. Naïve—Simple rules, such as last year plus five percent.

2. Decomposition—Randomness models that identify trends, seasonality, and cycles

3. Simple time series—Smoothing or averaging past values
4. Advanced time series—Combination of past values and errors

B. Explanatory

1. Simple regression—one independent or explanatory variable
2. Multiple regression—two or more independent or explanatory variables
3. Econometric models—System of simultaneous regression equations that allows for the interdependence of variables
4. Multivariate methods—Time series statistical approach

C. Monitoring

1. Tracking signals—identifying non-random fluctuations

II. Technological

A. Extrapolation

1. Delphi—Systematic extrapolation of expert’s current knowledge
2. Trend extrapolations—Modify trend and extrapolate
3. Morphological research—Enumerate all possibilities to facilitate selection
4. Systems dynamics—Extrapolate interacting and non-linear trends

B. Normative

1. Cross impact—Predict occurrence of developments that appear most often
2. Pattern—Incorporating preferences to predict future
3. “La Perspective”—Using uncontrollable events and human actions to forecast in the long-term

III. Judgmental

A. Individual

1. Individual judgment—Intuitive or ad hoc methods of forecasting
a. Multiple attribute decision-making—Estimating subjective probabilities

B. Group

1. Committees—Groups meeting face to face to discuss the future
2. Sales force estimates—Aggregating a bottom-up sales person estimate
3. Juries of executive opinion—Joining marketing, finance, and production executive opinions

C. Aggregates

1. Anticipatory surveys—Sampling customers to learn their purchase intentions
2. Market research—Discovering customer preferences through new product pre-testing

There are other less comprehensive approaches to categorizing forecasting methods. Thomopoulos (1980) uses only three categories. The first category is qualitative and includes using all information available and judgment. The second category is causal and refers to any forecasting method that demonstrates a cause and effect relationship. The third category is time-series analysis and emphasizes that the underlying trends of the past will continue in the future.

Economic Indicator Time Frames

After examining forecasting and budgeting processes, it is now appropriate to discuss the economic indicators that forecasters use to predict the future. An important characteristic of economic indicators is their time frame. Shim, et al. (1994) categorize economic indicators as leading, coincident, and lagging. According to these authors, the main leading indicator is a composite index of eleven leading indicators that indicate the
direction of the economy for the next six to nine months. These eleven indicators that form the composite index are: 1) the average workweek of manufacturing production workers; 2) the initial unemployment claims; 3) the change in consumer confidence; 4) the percent change in prices of sensitive crude materials; 5) contracts and orders for plant and equipment; 6) vendor performance; 7) stock prices; 8) money supply; 9) new orders for manufacturers of consumer goods and materials; 10) residential building permits for private housing; and, 11) factory backlogs of unfilled durable goods orders (Shim, et al., 1994).

Gross Domestic Product (GDP), employment levels, retail sales, and industrial production are all coincident indicators according to Shim, et al. (1994). The unemployment rate, the labor cost per unit, loans outstanding, average prime rate charged by banks, ratio of consumer installment credit outstanding to personal income, and the ratio of manufacturing and trade inventories to sales are lagging indicators (Shim, et al., 1994).

Hospitality Economic Indicators

After discussing the time frame of economic indicators, it is appropriate to examine the economic indicators most used to predict hospitality industry activity and revenues. An econometric model developed by the Hotel Research Group and Torto Wheaton Research (1999) uses contemporaneous gross domestic product (GDP), contemporaneous hotel rates, and past hotel demand levels to predict national hotel demand, or rooms sold. For a regional model, Torto Wheaton Research (TWR) uses contemporaneous metropolitan income, past hotel demand levels, and past hotel rates to predict the
corresponding metropolitan hotel demand. In presenting these two models, TWR emphasizes the importance of using metro-specific forecasts for specific hotel acquisitions, as hotel market conditions may be significantly different across metropolitan boundaries.

The Hotel Research Group in conjunction with TWR developed a similar econometric model with explanatory variables of real personal income and lagged rate and occupancy (Hotel Research Group/Torto Wheaton Research, 2002). This same model is used for national as well as for metropolitan statistical area (MSA) forecasts of hotel demand. In some hotel markets, however, total employment is substituted for real personal income. The primary reason for using real personal income is that it represents the general level of economic activity, which is what drives hotel revenues. GDP, a broader measure of economic activity than personal income, is not used in this model, because many forecasts are done at the MSA level, and there is no equivalent measure of GDP at the MSA level. In addition to the economic factors used in the HRG/TWR model, this research group also tested the correlations of 75 MSA hotel markets of chain affiliated hotels to the national lodging sector and found a high correlation.

In yet another model, titled Share Down, by HRG/TWR to forecast property-specific revenue per available room (REVPAR), the relationship of individual hotel revenues to MSA hotel revenues is emphasized (Hotel Research Group/Torto Wheaton Group, 2002). Imitating the finance model of dividing asset risk into systematic or market-related sources and unsystematic or asset specific sources, hotel revenues are presumed to have large systematic and small unsystematic components. This model functions by first estimating the MSA hotel revenues with the previously described HRG/TWR
econometric models. A link is then established between the property and MSA revenues. The property revenue can then be estimated based on the relationship of the property to the MSA hotel market. Asset-specific variables, such as renovations, repositioning, management changes, and competitive set changes, are also added to the model as dummy variables. One of the major contributions of this model is the establishment of the link between a particular hotel property's revenue and the larger geographic market's hotel revenues.

PricewaterhouseCoopers (PwC) also issues regular lodging industry forecasts. Their national forecast is based on growth rates of macroeconomic variables such as GDP, inflation, consumer spending, and unemployment (PricewaterhouseCoopers, 2000). PwC also uses econometric models, which are based on the regression statistical technique to forecast lodging revenues. In a modified forecasting model to specifically address the demand changes or rooms sold in one market segment caused by price changes in another market segment, GDP is used as a macroeconomic variable in conjunction with the rates of the two segments being examined (Hanson, 2000). Because the data for such tests are times series, and because the focus is on changes in price and demand, logarithmic transformations are used for all variables so that the estimated coefficients can be interpreted as elasticities.

To forecast tourist demand for Las Vegas and Atlantic City, Reece (2001) used state-level data from the American Travel Survey (ATS), which is conducted by the U.S. Department of Transportation's Bureau of Transportation Statistics. Reece selected income, age, lifestyle, and distance as state-level explanatory variables for his model.
Reece reports that prior tourism demand studies used explanatory variables such as income, price, and exchange rates in econometric models.

Fish and Waggle (1996) use total household expenditures as a surrogate for income to predict vacation trips in the U.S. Sheldon (1993) explains that in forecasting international tourism, the GDP of a country represents the country’s income in the forecasting model. Sheldon states that in international models, exchange rates and relative price levels must be included with income in the econometric causal forecasting model. Chan (1993) tested a times series regression approach with a sine function in time to forecast tourist arrivals in Singapore, because explanatory variables, such as GDP, are not always available for the model time periods. An important contribution of Chan’s studies was that simple models perform as well as complex models in the time frame of less than two years. Athiyaman and Robertson (1992) concur with Chan regarding the use of simple models in their tests of forecasting models that predict Hong Kong arrivals from Thailand. Latham (1993) reiterates the use of income, prices, and exchange rates as explanatory variables in a regression forecasting model for international tourism demand.

Kimes and Fitzsimmons (1990) developed a regression model to identify hotel sites for La Quinta Inns. Kimes and Fitzsimmons found that 80 percent of the guests of nine hotels selected a hotel because of their visiting destinations within a distance of four miles from the hotel. The explanatory variables consisted of La Quinta brand market penetration, room rate of the market area, area income, and proximity to a university or college. The dependent variable (DV) was the operating profit margin. Although the Kimes and Fitzsimmons study was not directly related to budgeting, but rather to new development, the approach is useful to this dissertation. One of the steps in the Kimes
and Fitzsimmons model building process was a test of correlations between a group of potential independent variables (IV’s) and the DV. The explanatory variables with the highest correlations were selected for the regression model. Also, this model did not replace the current site selection procedure, but it did assist in the decision making process. This dissertation does not recommend abolishing the budgeting and forecasting process, but rather recommends enhancing it.

In summary, most hotel and tourism forecasting models use personal income instead of GDP as the primary explanatory variable. Because GDP includes all household consumption, investment, government purchases, and net exports, it is a broader measure than personal income (Mankiw, 2004). The two main reasons for the use of personal income over GDP are availability and representativeness. Personal income figures are available in the U.S. on a quarterly basis at county, state, and national levels. GDP figures are national by definition, and are available quarterly, but are presented at an annual rate. Personal income data is also more available than GDP in many countries (Chan, 1993). Personal income is also a major component of GDP, and, therefore, represents GDP in regression models. Additional discussion in the methodology chapter will address the similarities of GSP to GDP and personal income and why GSP is an appropriate measure for this dissertation regression model.

After discussing economic factors in forecasting models, an important concept is the geographic scope of forecasting. In the following section is a discussion of the development of regional economic models.
Regionalization of Government Economic Forecast Models

Some of the first entities to recognize the need to develop regional forecasting models were local and state governments. Treyz (1993) showed that national government policy changes, international events, national business cycles, and natural disasters have diverse regional effects. For example, during an oil shortage, Treyz points out that general economic output may rise in Texas and Louisiana, but decline in most other states. Treyz (1993) posits that relevant concepts to regional models are demographics, microeconomics, and to a lesser degree, the adapted effect of macroeconomics.

Treyz (1993) continues by expounding on key characteristics of regional forecasting models that predict the effect of national government policies and the effect of external changes. The first characteristic is the regional geographic area, which can be a single region or a set of several regions. A second characteristic may be space, wherein the forecasting model examines economic activity across continuous space. A third characteristic is the possibility of important interactions among regions. A key overall characteristic of regions within the United States is that there is a free movement of goods, services, capital, and people. Above all, regional models should represent important features of regional economies. The purpose of Treyz' (1993) work was to document regional economic models. According to Treyz (1993), other authors had previously surveyed regional economic models and approaches, Bolton (1985), Burress (1988), and Sivitanidou (1988). It is important to note that Treyz was one of the first to document regional economic models, which was not until the early 1990's.
Trez (1993) categorized the regional economic models in somewhat the same manner as Wheelwright and Makridakis (1985), but with an emphasis on the factors that drive regional economies. The Trez (1993) categories are as follows: 1) Non-structural models that include past trends and take into account regional effects of national industry changes and shifts in the local share; they are statistical methods used to find past regularities; 2) Structural models that are causal in nature and can be simple with two or three relationships, or complex with thousands of equations. The key types of variables of structural models are economic, or measured aspects of economic phenomena, exogenous, or determined outside of the regional economy, and endogenous, or determined within the regional economy.

The simplest of Trez's (1993) models is \( Y = CG + IL \). The \( Y \) represents regional earned income. The \( CG \) represents consumer and local government spending. The \( IL \) represents investment or savings by individuals and local governments. To this model is added \( XFG - M \), wherein \( XFG \) represents exports, including federal government expenditures, and \( M \) represents imports from outside the region. Overall, the model is attempting to identify total value added products and services in the regional economy.

Crone and McLaughlin (1999) support many of Trez's findings with a case study of the city of Philadelphia. These researchers posit that a regional model is necessary because national economic forecasts attempt to specify a full range of economic relationships among many variables. Some of these many national variables may or may not apply to a regional geographic area. Crone and McLaughlin (1999) used changes in employment and the unemployment rate, housing permits, and initial unemployment claims for the Philadelphia model. As a general rule these researchers posit that any
variable that reduces out-of-sample errors over the past 10 years should be included in the regional model.

Hotel Industry Forecasting Practices

After examining the progress of economic forecasting in a regional setting, it is now appropriate to turn to the state of forecasting and budgeting in the hospitality industry. Schmidgall and DeFranco (1999) surveyed hotels throughout the United States on their forecasting techniques. They found seven techniques were mostly used to forecast revenues for rooms, room service, restaurant, banquet, and beverage. The seven techniques were: 1) prior year's budgeted dollar amounts multiplied by 1 + X percent; 2) number of guests by expected spending per guest; 3) expected units sold by expected average price per unit; 4) change in advance bookings from prior year; 5) last year's actual revenues; 6) last year's actual revenues adjusted subjectively; 7) average of several past years' revenues multiplied by 1 + X percent.

Schmidgall and DeFranco (1999) found that 72.7 percent of the 260 hotels responding used the technique of expected units sold by expected average price per unit for rooms forecasting. For restaurant revenues 45.5 percent of the 217 respondents used the number of guests by expected spending per guest technique (Schmidgall and DeFranco, 1999). The same technique was used by 40.6 percent of the 211 respondents for beverage revenues. For banquet revenues the last year's actual revenues adjusted subjectively technique was used by 32.7 percent of the 232 respondents.

One of the most important findings of the Schmidgall and DeFranco (1999) research was that all seven techniques reported were of the quantitative, naïve category. These
authors carefully suggest that more sophisticated techniques should be considered. Factors such as need for accuracy and data availability determine forecasting techniques hotel managers use for forecasting (Schmidgall and DeFranco, 1999). The current tendency for hotel managers to utilize less sophisticated forecasting techniques, then, indicates that the more sophisticated techniques may not be understood as mentioned by Makridakis and Wheelwright (1978). These two authors state that formal quantitative techniques are becoming more popular because of the greater accuracy. These authors also believe that the use of less sophisticated methods is due to a lack of knowledge of other forecasting methods, or because managers prefer the more subjective approaches, such as using last year’s numbers plus a certain percent (Makridakis and Wheelwright, 1978).

After examining economic factors, the importance of regional forecasting models, and hotel industry forecasting practices, it is appropriate to examine various forecasting techniques. The first section is quantitative forecasting, which will emphasize regression techniques. The following sections cover qualitative, sales force composite, and judgmental forecasting techniques.

Forecasting Techniques

Quantitative Forecasting with an
Emphasis on Regression

The three main categories of quantitative forecasting techniques are time series, explanatory, and monitoring (Wheelwright and Makridakis, 1985). The often-used naïve time series method involves simple rules, such as last year plus a percent. Other frequent
time series methods according to Wheelwright and Makridakis include identifying trends, cycles, seasonality, exponential smoothing and moving averages. The main characteristic of time series forecasting according to Wheelwright and Makridakis is that it is not causal, but relies on historical patterns to continue in the future. Explanatory techniques show how independent or explanatory variables (IV) impact dependent variables (DV). One explanatory statistical technique is regression. Simple regression uses one explanatory variable. Multiple regression employs two or more IV's. Econometric models are composed of a system of simultaneous regression equations. As the common quantitative forecasting technique employs regression, and this dissertation also employs regression, additional discussion on regression is appropriate.

The regression technique assesses the relationship between a DV, or response variable, and one or several IV, or explanatory variables (Tabachnick and Fidell, 2001). There are three major purposes of the regression statistical technique: description, control, and prediction (Neter, Kutner, Nachtsheim, and Wasserman, 1996). A description purpose may be accomplished by simply portraying a relationship between the IV(s) and DV. An example of the control purpose is when administrative action is taken based upon the statistical relationship. Prediction is accomplished when the statistical pattern is used to estimate the value of the DV associated with additional IV’s.

Regression is especially useful in predicting the magnitude of the dependent variable (Hair, Anderson, Tatham, and Black, 1998). In other words, the magnitude represents the change in the DV for each one unit change in the IV (Tabachnick and Fidell, 2001). The simple regression formula, which is the same as the formula for the slope of a line with the addition of an error term, is: \( Y_i = \beta_0 + \beta_1 X_i + \epsilon_i \). \( Y \) is the DV in trial i. \( \beta_0 \) is the
constant or intercept term. \( \beta_1 \) is the coefficient of the IV 1 and represents the slope of the regression line. \( X_i \) is the independent or explanatory variable in trial i, and \( \varepsilon_i \) is the error term in trial i (Neter, Kutner, Nachtsheim, and Wasserman, 1996).

The regression technique finds the "best" IV coefficient, or slope of the line, by using the least squares calculation (Hair, Anderson, Tatham, and Black, 1998). According to these authors, this is done by subtracting the value of the estimated DV from the mean of the observed value of the DV, squaring the result, and summing the squares. The IV coefficient for the regression equation is the one with the lowest sum of the squares. It is also known as the regression sum of squares. The strength of the relationship between the IV and DV is determined by the coefficient of determination (\( R^2 \)), which is the sum of the squares just described divided by the total sum of squares. The total sum of squares is calculated by subtracting the actual or observed value of the DV from the DV mean, squaring the result, and summing the squares (Hair, et al., 1998).

Qualitative Forecasting

After explaining some characteristics of quantitative forecasting approaches, it is appropriate to examine qualitative forecasting procedures. According to Shim, et al. (1994), the two main forecasting categories are qualitative and quantitative. As already mentioned, Wheelwright and Makridakis (1985), included qualitative forecasting under the category of judgmental forecasts. Shim, et al. (1994) segment qualitative forecasting into five categories: 1) expert opinions; 2) Delphi; 3) sales force polling; 4) consumer surveys; and, 5) program evaluation and review technique (PERT). These five qualitative forecasting categories will be discussed in further detail below.
Expert opinions are subjective views of expert executives. These executive opinions are usually in conjunction with a quantitative method such as trend extrapolation. The advantage of expert opinion forecasts is that they are quick and without elaborate statistics and can be conducted in the absence of adequate data (Shim, et al., 1994). One potential disadvantage of the expert opinion forecasting method is the phenomenon known as groupthink, which is a mentality of prioritizing consensus above accuracy and reality (Hellriegel & Slocum, 2004).

The current Delphi method was developed in the 1950's by workers at Rand Corporation, while working on U.S. Air Force project Delphi. The project applied expert opinion to estimate an optimal number of atomic bombs to reduce munitions by a required amount (Rowe, 1998). The Delphi method is an iterative consensus process of polling a panel of experts individually via a questionnaire format. The experts are individually questioned until a reasonable consensus is obtained from members of the panel. The disadvantage of the Delphi method is the low reliability and the potential lack of consensus (Shim, et al., 1994).

The sales force polling technique has the advantage of being the closest to the ultimate customer. There are four other attributes of the sales force polling that makes this forecasting method attractive. They are: 1) simplicity and ease of use; 2) inclusion of knowledge of those closest to buyers of product or service; 3) focus of forecasting responsibility on those most able to affect results; and, 4) segmentation of information by territory, product, customer, and salesperson (Shim, et al., 1994).

Consumer surveys are conducted by telephone, personal interviews, or mail. A statistical analysis is then conducted with the survey data (Shim, et al., 1994). The final
qualitative method, PERT, is characterized by completing three estimates, a pessimistic one, a most likely one, and an optimistic one. Expected values and standard deviations are calculated for each of the three scenarios. There are advantages to using the PERT method. The first advantage is that it is easier and more realistic for experts to give three scenarios rather than one. Second, there is a calculated measure of dispersion between a plus or minus two standard deviations (Shim, et al., 1994).

Sales Force Composite Forecasting Method

Peterson (1989) defines the sales force composite as the sum of sales representatives future revenue estimates of their respective territories. Because very little literature on sales force composite forecasting is based on empirical data, Peterson posits that it is difficult to assess the proper role and utilization of the sales force composite forecast. Based primarily on judgment, experience, and reasoning, most sales representatives comply with forecasting directions and provide their numbers promptly (Peterson, 1989). Sometimes the aggregate forecasts of sales representatives are the primary forecasting tool, and sometimes they are compared to time series or regression estimates as a control tool (Peterson, 1989).

One of the dangers of using a sales force composite forecast is that sales quotas are frequently based on the forecast, which leads to under-forecasting (Peterson, 1989). Despite the under-forecasting risk, 52 percent of consumers goods firms, and 54 percent of industrial goods firms surveyed use the sales force composite forecast as the primary forecast method (Peterson, 1989). Recommendations to maximize the use of the sales force forecasting method include training, precise instructions, not raising forecasts too
high if forecasts are optimistic, not rewarding the exceeding of quotas based on forecasts, prioritizing accuracy, avoiding excessive time spent on the forecasting process, and compensating for forecasting task.

Judgmental Forecasting

Wright and Goodwin (1998) claim that all forecasting requires judgment, even if only for the selection of a method or the formulation of a model, and that judgmental forecasting now focuses on providing appropriate support and on the subjective estimation of probabilities. Wheelwright and Makridakis (1985), who favor quantitative forecasting techniques, acknowledge that when quantitative techniques fail, human judgment is needed to predict the impact of change and subsequent patterns. Judgmental forecasting exhibits a dilemma, the essence of which is the phenomenal human cerebral abilities of imagination and creativity versus the numerous human biases (Wheelwright and Makridakis, 1985). Table 1 lists identified biases by Wright and Goodwin in the first chapter by Makridakis and Gaba (1998) with a corresponding compensating technique.
Table 1 Judgmental Forecasting Biases

<table>
<thead>
<tr>
<th>Judgmental Bias</th>
<th>Compensating Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inconsistency</td>
<td>Formalize process and rules</td>
</tr>
<tr>
<td>Conservatism</td>
<td>Monitor environmental changes and take action</td>
</tr>
<tr>
<td>Recency</td>
<td>Recognize that cycles exist; consider fundamental factors</td>
</tr>
<tr>
<td>Availability</td>
<td>Comprehensive information</td>
</tr>
<tr>
<td>Anchoring</td>
<td>Be objective and discuss possible changes</td>
</tr>
<tr>
<td>Illusory Correlations</td>
<td>Verify statistical significance and avoid spurious relationships</td>
</tr>
<tr>
<td>Selective Perception</td>
<td>Include diversity of opinions</td>
</tr>
<tr>
<td>Regression Effects</td>
<td>Realize that random errors increase probability of negative ones when positive ones have occurred</td>
</tr>
<tr>
<td>Attribution of success/failure</td>
<td>Publish mistakes and learn from them</td>
</tr>
<tr>
<td>Optimism and wishful thinking</td>
<td>Have more than one person independently forecast</td>
</tr>
<tr>
<td>Searching for supportive evidence</td>
<td>Collect disconfirming evidence</td>
</tr>
<tr>
<td>Understanding Uncertainty</td>
<td>Consider many possible future events</td>
</tr>
</tbody>
</table>

There are also biases associated with conventional wisdom that require compensating techniques as shown in Table 2 below.
Table 2 Conventional Wisdom Forecasting Biases

<table>
<thead>
<tr>
<th>Conventional Wisdom Biases</th>
<th>Compensating Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td>More information means greater accuracy</td>
<td>Avoid redundant sources</td>
</tr>
<tr>
<td>It is easy to distinguish between useful and irrelevant information</td>
<td>Verify accuracy of all information</td>
</tr>
<tr>
<td>Overconfidence in the correctness of information</td>
<td>Weigh equally all sources</td>
</tr>
<tr>
<td>We can decide rationally the time to quit</td>
<td>Accept sunk costs and end unprofitable projects</td>
</tr>
<tr>
<td>Monetary rewards and punishments equal better performance</td>
<td>Recognize human aspirations and self-esteem</td>
</tr>
<tr>
<td>Confidence in self-assessment</td>
<td>Third party assessment</td>
</tr>
<tr>
<td>Experience and expertise equal accurate decisions</td>
<td>Only minimum level of experience and expertise needed for forecasting</td>
</tr>
<tr>
<td>Stable preferences</td>
<td>Introduce two points of view for each preference</td>
</tr>
</tbody>
</table>

(Makridakis and Gaba, 1998)

Related Research

Literature related to budgeting and forecasting contains psychological concepts. O’Connor and Lawrence (1998) cite context effects such as prospect theory (Kahneman & Taversky, 1979), which suggests that people make different decisions when faced with the prospect of losses versus being faced with the prospect of gains. O’Connor and Lawrence (1998) also note that forecasts that contain contextual information are more accurate than statistical models alone. The studies of O’Connor and Lawrence also show that people can identify high reliability versus low reliability information and use it to prepare more accurate forecasts.

Bolger and Harvey (1998) discuss normative economic theory and the use of heuristics. These two authors explain that the normative decision theory posits that probabilities and utilities of outcomes are assessed in an unbiased manner, and that
choices are made by systematic evaluation of the options. Research shows, however, that people rarely make decisions normatively because of capacity limitations (Bolger and Harvey, 1998). People, then, according to Bolger and Harvey, rely on heuristics, or rules of thumb that lead to satisfactory, but rarely optimal decisions. Bolger and Harvey cite several common heuristics that are pertinent to forecasting: 1) the availability of recent data eases recall, 2) representativeness, or data similarity, dominates other cues, 3) limited cognitive capacity may cause relevant data to be overlooked; 4) trade-offs may occur between effort and accuracy; 5) forecast evaluations may be biased by the first data set reviewed that sets in motion an anchor-and-adjust process; 6) people tend to remember the forecast as being more accurate than it was; and, 7) there is a tendency to persist in an activity in which some investment has already been made.

Armstrong and Collopy (1998) studied the integration of statistical and judgmental forecasting processes. They found that when experts have domain knowledge and when significant trends are involved, that the integration of statistical and judgmental processes improves forecast accuracy. Three conditions that maximize integrating the statistical and judgmental methods are relevant quantitative data, judgmental inputs that provide different information, and unbiased judgments according to Armstrong and Collopy. Overall, these two researchers found that the integration was most effective when judgment was used as input to statistical forecasting.
Suggestions for Solving Budgeting and Forecasting Problems

After a review of budgeting and forecasting characteristics and techniques and related problems associated with the budgeting and forecasting processes, it is not surprising that related literature addresses how to solve the budgeting and forecasting problems. Most of these budgeting and forecasting improvement solutions focus on the use of enhanced technology, a change in the reporting system, and changes in performance measurement. This budgeting and forecasting cognate literature seems to have an underlying assumption that forecast accuracy is at sufficient levels if these new tools are utilized. In other words, there is a lack of focus on explanatory variables, which is the basis of this research. Fanning (1999, p.24) of KPMG consulting states, “Most of the innovations in budgeting practice to date have focused on the quantity of analysis and the speed with which this can be produced. Little regard has been paid to the quality of analysis and the way in which the analysis helps an organization reach its corporate objectives.”

One of the most significant technological innovations in budgeting and forecasting is the use of the Internet. Kinsella (2000) proposes that the cumbersome and error-prone spreadsheets can be replaced by Internet technology. In essence, properties or business units dial in to a central database and input budget or forecast numbers. This is done over a secure company Intranet connection, and properties or units can only access their own data. Reports are instantly available that show the impact of the budget or forecast numbers input by the units. When units are satisfied with the input, they give the command that updates the database with the new information. Corporate forecasting staff can run consolidated reports at any time with data input by units. The use of the
Internet to do budgets and forecasts allows a shift in emphasis from information
gathering to information analysis (Kinsella, 2000). An important part of the Internet
budgeting and forecasting approach is the availability of real-time information systems,
so that everyone sees the same information at the same time.

Another significant proposal to change the budgeting and forecasting processes is one
to eliminate the fixed budget in favor of a rolling forecast. This approach typically uses
actual information year-to-date plus the forecast for the remaining months in the fiscal
year. A similar rolling forecast approach is to always use a 12-month time period with a
certain number of months with actual data and the remaining number of months with
forecast data. Rolling forecasts are typically done on a monthly or quarterly basis.

Gurton (1999) notes that one purpose for using a rolling forecast is to match the budgets
with the targets given to analysts. Fanning (1999) highlights three advantages for using a
rolling forecast: 1) broadens organization perspective as well as increases the significance
of less tangible factors; 2) tailors new process configuration and measurement tools to
business requirements; and, 3) differentiates between required and anticipated
performance (if stretch goals are used).

Another key budgeting and forecasting change proposal is compensation related.
Gurton (1999) states that a rolling forecast can introduce significant problems when
compensation is linked to the budget, and, that in general, compensation changes need to
coincide with budget changes. Fanning (1999) adds that financial measures should not be
used to the exclusion of other measures. Hope et al. (2003) posit that performance
contracts should be based on fixed targets rather than on targets of relative improvement,
such as last year. In accordance with the research of Fisher, et al. (2002), no matter what
the budget approach is, budget slack is likely to be present, if the budget is used for performance evaluation without including the allocation of scarce resources.

There are other budgeting and forecasting concepts that some authors suggest would improve the process. Fanning (1999) makes three recommendations. The first is to separate new and mature units being budgeted. The second is to separate units into short-term and long-term needs. The third is to adapt budget timetables to business requirements. Hope et al. (2003) recommend basing budget goals on maximizing performance potential. They also propose that employee evaluation be based on relative improvement with hindsight. The hindsight would be senior executives evaluating performance at the end of each period given prevailing conditions and comparisons with peers, competitors, and prior periods. Fanning (1999) also recommends that budgets be integrated with other strategic management processes.

Literature Summary

Today's fast changing business environment requires quality planning and decision-making. In order to make quality decisions, accurate information about future business levels is critical. The budgeting and forecasting process provides the information about the future for quality planning and decision-making. Great frustration arises from the budgeting and forecasting process, however, due to the lack of an objective, market-based approach to revenue increase guidelines. Economic indicators are frequently not used, and national guidelines are often used, when significant regional differences exist. Simplicity and cost-effectiveness are needed to implement changes in the budgeting and forecasting process. This dissertation provides a framework to budgeting and forecasting.
by utilizing a simple regression technique to test which GSP economic factor drives hotel revenues of each state and the District of Columbia
CHAPTER 3

METHODOLOGY

Antecedents to Research Design

Chapters One and Two identified accuracy, efficiency and behavioral problems with current budgeting and forecasting practices in the hotel industry. This dissertation proposes that one method for increasing accuracy and efficiency and reducing managerial frustration in budgeting, is to use an objective measure to identify hotel revenue factors. This chapter presents the methodology to identify hotel revenue factors for each state of the United States with a simple regression model.

Some preliminary investigations were conducted to find what hotel companies and economists were doing to forecast hotel revenues. A senior vice-president of a major international hotel chain was consulted regarding his company’s budgeting and forecasting revenue guidelines. His company used national economic indicators, and he was unaware of any efforts to identify regional hotel revenue drivers; thus, he encouraged efforts to do so. An Orange County, California forecast performed by Chapman University was also reviewed to see what variables were used to predict county economic activity. County personal income and residential housing starts were important factors in the Chapman model. Forecasting models of hospitality consulting firms were also reviewed, and several hospitality consultants were contacted about their models. The
consultants at PKF shared their forecasting models and the corresponding assumptions used therein. The major variable in the PKF regional model, as previously discussed, was regional personal income. The PKF representative was also supportive of efforts to examine hotel industry forecasting accuracy on a regional basis.

Overview of Research Design

After the preliminary interviews and investigations described above indicated that there was a need to identify regional hotel revenue factors, an economic indicator, data, and a statistical technique needed to be discovered. For this purpose, gross state product (GSP), on a state and national level, state-level hotel revenue data, and correlation and regression statistical techniques were selected. Each of these aspects of the research design will be discussed below.

Selecting an Economic Indicator

Discussing some general economic terms and how they are calculated lays the groundwork for selecting the explanatory variables in this dissertation. First of all, national income is considered to be the sum of wages, rent, interest and profits, which are defined to be the sum of earnings of production factors for a time period (Shapiro, 1966). These production factors that lead to national income can be measured by identifying the final product. There are two ways to measure the final product. The first way is to add up every dollar of income earned in producing final product. The second way is to add up every dollar of expenditure on final product. The income earned in producing final product, and the expenditures on final product are the same according to Shapiro.
The economic explanation of national income leads to the definition of a specific national income measurement, Gross Domestic Product (GDP). Mankiw (2004) explains that GDP measures two concepts at the same time to arrive at the market value of all final goods and services over a specific period of time within a particular country. This is similar to the double entry accounting system, which is that for every debit there is an equal credit. In other words, the two sides of the GDP measurement are the total income of everyone in the economy, and the total expenditures on the economy's output of goods and services. Mankiw adds that in the total economy, income must equal expenditures.

The GDP computation, then, adds up total expenditures by households on the one hand, and total income in the form of wages, rent, and profit, paid by firms on the other hand (Mankiw, 2004). The market value portion of GDP is defined as all items produced in the economy and sold legally in markets. The market value of housing services assumes that homeowners pay rent to themselves. Another important component of the GDP definition is that only final goods are counted. Mankiw uses the example of a Hallmark greeting card, which is counted, but the intermediate good (i.e., paper, from International Paper), is not counted. Temporary increases and decreases to inventory are added or subtracted from GDP. Similarly, new car sales are included in GDP, but used car sales are not. Everything produced within a geographic boundary is included (ownership is not a factor), and the time periods are most often a quarter or a year.

The equation of GDP is $Y = C + I + G + NX$, where $Y$ is GDP, $C$ is consumption, $I$ is Investment, $G$ is government purchases, and $NX$ is net exports (Mankiw, 2004). Consumption is the spending by households on goods and services. Investment represents capital equipment, inventories, and structures that will produce more goods.
Government purchases are goods and services by local, state, and federal governments, which include government worker salaries and spending on public works. It is important to note that government purchases do not include transfer payments, such as social security benefit payments. Net exports represent purchases of domestically produced goods by foreigners minus domestic purchases of foreign goods (Mankiw, 2004).

As was shown in chapter two, many authors have used personal income for tourism model applications. In a tourist arrival prediction model to Las Vegas and Atlantic City, Reece (2001) used income, age, lifestyle, and distance as independent variables (IV’s). Fish and Waggle (1996) used a measure similar to personal income, household expenditures, to predict vacation trips in the United States (U.S.). Latham (1993) also used personal income along with prices and exchange rates to predict international tourism demand. However, tourism, which is driven by personal income, represents only one segment of the hotel industry. The tourism sector is commonly referred to as the leisure segment.

The other major segment in the hotel industry is business related. The designation of guests as leisure or business is determined by trip purpose. If the trip purpose is pleasure or vacation, hotels designate the guest as leisure. If the trip purpose is business related, the guest is designated as business. The location of the hotel will often determine the trip purpose of its guests. In other words, business travelers, because of their location to business centers, primarily frequent center-city, airport, and many suburban hotels. Resorts and roadside inns are primarily frequented by leisure travelers due to the attractions of their location, or the nature of their locations en route to other destinations. Resorts, however, also host many business-related groups. In order to include both
leisure and business hotel guests, a broader economic indicator of hotel revenue than personal income is needed. The economic indicator of general economic activity of a state is GSP, which indicates the market value of goods and services produced by the labor and property within a state (Market, 1995).

Another description of GSP is value added, which is gross output less intermediate inputs. Gross outputs are sales, other operating income, commodity taxes, and inventory change. Intermediate inputs are consumption of goods and services purchased from other U.S. industries or imported (U.S. Department of Commerce, Bureau of Economic Analysis, Help File, April 2003, hereinafter referred to as BEA Help File). Morrell (2001, p. 149) defines valued added as the “difference between the firm’s sales revenue and what it buys to produce those sales”. GSP is the state counterpart of gross national product (GNP), which is very similar to GDP. The only difference between GNP and GDP is that GNP excludes income produced by foreign nationals in the U.S., but includes income by U.S. citizens living abroad (Mankiw, 2004). For a given period of time, GDP is the final market value of all goods and services produced within a country; therefore, it includes the income of foreign nationals in the U.S. and excludes income of U.S. citizens living abroad, according to Mankiw.

One other very similar measure of national economic activity is U.S. GSP, which is the sum of all individual state GSPs. The U.S. GSP differs from GDP by excluding the compensation of federal civilian and military stationed abroad, and the consumption of capital for military structures and equipment located abroad. Based on the definitions of Mankiw (2004) and the BEA website, and the concept of distance in the studies of Reece...
(2001) and Kimes (1990), state GSPs and the U.S. GSP can be considered as acceptable measures for indicating economic activity within the U.S. and each of its states.

Value Added Economic Concept

Represents Hotel Revenues

Another part of the BEA website for GSP is that there are GSP estimates for 63 industries. One of the 63 industries is hotels and lodging. The industry GSP is composed of employee compensation, indirect business tax and nontax liability, and property-type income (BEA, Help File, April 2003). Employee compensation includes all wages, salaries and benefits, or supplements to wages and salaries. Indirect business taxes and nontax liabilities include sales taxes, property taxes, licenses, permits, inspection fees, special assessments, rents, royalties, and donations. Property-type income includes profits before taxes, net interest, rental income, inventory valuation adjustment, corporate capital consumption allowance, and business transfer payments. The GSP estimates are in millions of real dollars, with the 1996 GSP index set at 100 (BEA, Help File, April 2003).

Based upon the value added nature of the industry GSP for hotels and other lodging places, it was selected to represent hotel revenues for each state. Theoretically, the value added concept of hotel revenues less costs of goods and services to generate the hotel revenues, appears to be a reasonable proxy for hotel revenues. To test the concept, however, a national hotel industry statement of income for all hotel segments for the year 1992, a year in the middle of this dissertation's sample time of 1977 to 2000, was compared to the value added concept. The results are shown in Table 3.
Table 3 Comparison of Value Added and Accounting Income*

<table>
<thead>
<tr>
<th></th>
<th>Revenues</th>
<th>Cost of Sales</th>
<th>Payroll Costs</th>
<th>Other Exp</th>
<th>Accounting Profit</th>
<th>Economic Value Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooms</td>
<td>67.60</td>
<td></td>
<td>11.69</td>
<td>6.15</td>
<td>49.75</td>
<td></td>
</tr>
<tr>
<td>Food &amp; Beverage</td>
<td>26.40</td>
<td>7.31</td>
<td>11.40</td>
<td>3.09</td>
<td>4.59</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>5.90</td>
<td></td>
<td>1.70</td>
<td>1.66</td>
<td>2.73</td>
<td></td>
</tr>
<tr>
<td>Total Op Depts.</td>
<td>99.90</td>
<td>7.31</td>
<td>24.80</td>
<td>10.90</td>
<td>57.07</td>
<td>81.69</td>
</tr>
<tr>
<td>A&amp;G</td>
<td>5.00</td>
<td></td>
<td>4.80</td>
<td>-9.79</td>
<td>-4.80</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>2.50</td>
<td></td>
<td>3.40</td>
<td>-5.89</td>
<td>-3.40</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
<td>4.90</td>
<td>-4.90</td>
<td>-4.90</td>
<td></td>
</tr>
<tr>
<td>Prop Operations</td>
<td>2.60</td>
<td></td>
<td>2.70</td>
<td>-5.29</td>
<td>-2.70</td>
<td></td>
</tr>
<tr>
<td>Mgt &amp; FranchiseFees</td>
<td>3.50</td>
<td></td>
<td>-3.50</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property Taxes</td>
<td>3.20</td>
<td></td>
<td>-3.20</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>1.00</td>
<td></td>
<td>-1.00</td>
<td>-1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FFE Reserve</td>
<td>1.20</td>
<td></td>
<td>-1.20</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land &amp; Bldg Rent</td>
<td>2.00</td>
<td></td>
<td>-2.00</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equip Rent</td>
<td>0.30</td>
<td></td>
<td>-0.30</td>
<td>-0.30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>7.09</td>
<td></td>
<td>-7.09</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deprec &amp; Amort</td>
<td>6.99</td>
<td></td>
<td>-6.99</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Fixed</td>
<td>0.60</td>
<td></td>
<td>-0.60</td>
<td>-0.60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income B4 Tax</td>
<td>99.90</td>
<td>7.31</td>
<td>34.89</td>
<td>52.56</td>
<td>5.32</td>
<td>63.99</td>
</tr>
</tbody>
</table>

*(PricewaterhouseCoopers, 1992)

The accounting data in Table 3 is based on percentages, with total revenues equaling 100 percent. The format of the statement of income is in accordance with hospitality accounting standards as explained in the *Uniform System of Accounts for the Lodging Industry* (1996), with the addition of the column for economic value added. Each accounting revenue and expense category was evaluated against the definition of value added and correspondingly included as an addition or subtraction to value added. In other words, revenues, less the cost of producing the revenues, equals value added. In hotel accounting vernacular, cost of sales and other expenses were generally subtracted from total hotel revenues, with the exception of specifically defined expenses, such as...
interest and property taxes, which are not considered as revenue producing. The value added concept equaled 63.99 percent of hotel revenues. The "Economic Value Added" amount for total operating departments is calculated by subtracting "Cost of Sales" and "Other Exp" from revenues (99.90 - 7.31 - 10.90 = 81.69). All other deductions from the 81.69 operating department value added profit are undistributed department other expenses or fixed charges according to the definition of the value added concept. All such deductions are shown with a minus sign in the "Economic Value Added" column and can be traced to the "Other Exp" column (81.69 - 4.80 - 3.40 - 4.90 - 2.70 - 1.00 - 0.30 - 0.60 = 63.99)

Many property operations department Other Expenses, which were 2.7 percent in this example, may be included in, as opposed to deducted from, value added. The inclusion of property operations other expenses in the value added concept is possible because many hotels outsource maintenance projects that some hotels do with their own labor. Permits, licenses, legal fees, and other transfer payments to corporate offices are not itemized in this statement of income example, which could amount to one to three percent of revenues. The total of non-itemized and property operations expenses added to the 63.99 percent ranges from approximately 68 percent to 70 percent (63.99 + 2.7 + 1 to 3 = 68 to 70). If the cost of sales were added to this number, which would be the case for all limited service lodging products, the value-added concept would represent approximately 75 percent to 77 percent of hotel revenues (68 to 70 + 7.31 = 75 to 77). By contrast, personal income would only represent approximately 35 percent of revenues, or the amount in Table 3 under "Payroll costs". In summary, the result of this comparison of concepts of hotel accounting profit and value added results in a
conservative estimate that the economic value added concept represents 70 percent of hotel revenues, which is sufficiently representative to use in the regression model.

Using data from the year 2000 from Smith Travel Research (STR), a similar comparison of accounting and economic value added was made (STR, The Host Study, 2001). The STR data was presented in the Uniform System format, but lacked specific figures for cost of sales and certain fixed charges, such as equipment rent and insurance. The itemized fixed charges in the PricewaterhouseCoopers report amounted to a reduction of 1.3 percent to the value-added concept (Insurance, 1.00, and Rent, 0.30). The STR report calculates to approximately 71 percent of revenues before debt and fixed charges, which is an approximate improvement over the 1992 data of 5 percent. In other words, the economic value added data of the year 2000, better represents hotel revenues than the data of the year 1992 by 5 percent. These two comparisons of accounting and economic value-added data support the use of the value-added concept to represent hotel revenues in the regression tests.

The selection of GSP data is also important in regards to the geographic sample area. By definition, state GSP and U.S. GSP, are respectively state or national in scope. There are several reasons for selecting state-level data to evaluate. The first reason is that no other study has used state-level data to evaluate hotel revenues. As has been discussed in Chapter Two, most industry forecasts are national, regional, county, or metropolitan statistical area (MSA) specific. The second reason is that states represent regional geographic entities of economic activity that react differently to national economic events (Treyz, 1993). A third reason is that states also represent a balance between too many geographic regions, such as counties, and too few geographic regions, which are formed
from groupings of states, such as New England and Rocky Mountains. County data, for example, represent such a large quantity of data that a national company would have difficulty establishing budgeting and forecasting revenue increase guidelines for so many entities. A potential problem with using groupings of states is the discrepancy between groupings of states used by hotel industry researchers such as STR (Smith Travel Research, 2001) and the BEA (2003). Table 4 below compares the groupings of these two entities.

Table 4 Comparison of Regional Groupings of Hotel Revenues

<table>
<thead>
<tr>
<th>Smith Travel Research Regions</th>
<th>Bureau of Economic Research Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td>New England</td>
<td>New England</td>
</tr>
<tr>
<td>Middle Atlantic</td>
<td>Mideast</td>
</tr>
<tr>
<td>South Atlantic</td>
<td>Great Lakes</td>
</tr>
<tr>
<td>East North Central</td>
<td>Plains</td>
</tr>
<tr>
<td>East South Central</td>
<td>Southeast</td>
</tr>
<tr>
<td>West North Central</td>
<td>Southwest</td>
</tr>
<tr>
<td>West South Central</td>
<td>Rocky Mountains</td>
</tr>
<tr>
<td>Mountain</td>
<td>Far West</td>
</tr>
<tr>
<td>Pacific</td>
<td></td>
</tr>
</tbody>
</table>

A fourth reason for using state-level data is availability. Hotel revenues are available for every state and the District of Columbia on an annual basis from 1977 to 2000 (BEA, Help File, April 2003). Hotel revenues are not publicly available at a more local level on an annual basis. Public hotel companies only report company-wide data to the Securities and Exchange Commission. Local level data for a few geographic locations would also have limited generalizability. Consultants that obtain local level data are under strict
obligation to maintain confidentiality. Finally, there is no theoretical basis for excluding one or more states from a study of state hotel revenues.

Data Collection

GSP data is available for all fifty states and the District of Columbia from 1977 to 2000 (BEA, 2003). The 63-industry breakdown is also available for the same time frame. The industry of interest for this study is titled hotels and lodging. An Excel spreadsheet was established to download the data for all 50 states plus the District of Columbia in sections. The first section contained GSP data for all 51 geographic areas plus a total for the U.S. for the 24 years. The second section contained the hotel industry value added data for the same geographic areas and time periods.

The web site data downloads with rows representing geographic areas (states) and columns representing years. This data was then transposed so that rows represented years and columns represented geographic regions. This was done so that the data could be easily copied into the statistical programs of SPSS and E-Views for correlation and regression analysis. These two new sections of data were then used to create additional sections. The third section represented the state GSP less the hotel industry GSP of the respective state. This was done to avoid redundancy in the data that would eventually be used in the regression model. A fourth section was established to subtract each state GSP from the U.S. GSP for the same redundancy issue.

After explaining the economic indicators of this dissertation, their corresponding geographic scope, and how the data was collected, the next step is to discuss the statistical techniques used to test the hypotheses.
Statistical Techniques

Correlation

After selecting several possible independent variables (IV’s), Kimes and Fitzsimmons (1990) first ran correlations between the IV’s and the dependent variable (DV) before attempting a regression model. The most significantly correlated IV’s with the DV were then tested in the regression model. Tabachnick and Fidell (2001) note that the ideal regression model will result when there is high correlation between IV’s and the DV, but a low correlation among IV’s. This dissertation study employs the technique correlating the IV’s with the DV. The correlation results are also used to identify the priority testing of which of the three hypotheses is appropriate for each state hotel revenues.

SPSS is the software program for conducting the correlation tests. The Pearson correlation test is used to determine the significance and strength of the variable correlations. The correlation tests consist of a two-step process for each state due to the potential redundancy issue of the IV and DV containing the same data. The first step is to correlate the hotel revenues of a state, the respective state GSP without lodging, and the U.S. GSP without the respective state GSP. The second step is to correlate the state hotel revenues with the GSP of every other state. In the second step, hotel revenues are not subtracted from the state GSP, because there is no redundancy between the hotel revenues of one state and the GSP of another state.

The two-step process establishes three correlations for each state. The three correlations are between the hotel revenues of one state and the same state’s GSP, the hotel revenues of a state and the U.S. GSP, and the hotel revenues of a state and the GSP of one or more states. Each of the three correlations is to be examined for significance.
The strongest of these three correlations with the highest significance level leads to testing the three hypotheses, or whether a given state’s hotel revenue is driven by its own state, national, or another state’s economic activity. Table 5 summarizes the correlation and regression model selection process.

Table 5 Selection of Regression Model Using Correlation Values

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step One: Run Correlation Tests for hotel revenues of each state and the corresponding GSP of the state without hotel revenues and the U.S. GSP without the GSP of the state.</td>
<td>Step Three: Select the highest correlated GSP for a regression test. In the case of more than one GSP with the highest correlation value, run regression tests for all GSP’s at the highest correlation value.</td>
</tr>
<tr>
<td>Step Two: Run correlation test between hotel revenues of each state and the GSP of every other state.</td>
<td>Step Four: Run regression tests from highest to lowest correlation until a significant model is found that satisfies all assumption tests.</td>
</tr>
<tr>
<td></td>
<td>Step Five: Select the GSP with the highest R Squared value of all significant models tested to explain hotel revenues of a given state.</td>
</tr>
</tbody>
</table>

Regression

The regression models are to be fitted according to the correlation strength and the satisfaction of the simple regression assumptions, which are normality, error independence, and error constancy. The most correlated variable, or the highest percent of the three correlation tests at the same significance level, becomes the IV in the regression model of explaining hotel revenues. The DV is the hotel revenues of a given state represented by the hotels and lodging industry GSP. The software E-Views is used for the regression tests.
The regression model is examined for significance, or P value, which must be .05 or lower. The t statistics of the IV and intercept term are also examined for significance, which must also be .05 or lower. The R² value is also examined, which is the explanatory value of the IV. If the t statistic of the IV and the P value of the model are .05 or lower, then regression assumption tests proceed.

The normality test in E-Views is the Jarque-Bera test. A low P value associated with the statistic would lead to the rejection of the null hypothesis that there is a normal distribution. Since the regression model involves time-series data, the Breusch-Godfrey test, which is a Lagrange multiplier (LM) approach, is used to examine serial autocorrelation of the regression error terms. The null hypothesis of the Bruesch-Godfrey test is that there is no autocorrelation, or that the error terms are independent of each other. A significant test statistic with a low P value would show that autocorrelation exists. The final regression assumption test is for non-constancy of variance, or heteroskedasticity, of the dependant variable. The E-Views test for heteroskedasticity is the White test. The null hypothesis of the White test is that the variance of the DV remains constant when the value of the IV changes. A significant test statistic would reject the null hypothesis and indicate heteroskedasticity.

The White test has some additional test advantages of model specification as stated in the Help section of Eviews, the software used for statistical analysis in this dissertation: "White also describes this approach as a general test for model misspecification, since the null hypothesis underlying the test assumes that the errors are both homoskedastic and independent of the regressors, and that the linear specification of the model is correct. Failure of any one of these conditions could lead to a significant test statistic. Conversely,
a non-significant test statistic implies that none of the three conditions is violated” (Eviews, 1994-1999).

If the Jarque-Bera normality test fails, the criteria for this dissertation study is that the IV cannot be used, and the next most correlated IV is tested. If the Bruesch-Godfrey test is significant, autocorrelation may be present. A more comprehensive explanation of the remedy provided by E-Views if the Bruesch-Godfrey test is significant as it applies to the data in this dissertation follows. If the White test is significant, the criteria for this dissertation is that the IV cannot be used, and the next highest correlation value of an IV is tested.

**Autocorrelation**

Autocorrelation, or serial correlation, exists when the error terms are correlated over time (Neter, et al., 1996). According to Neter, et al., there is a risk of autocorrelation in many business and economic models, when data is times series based, such as the models in this dissertation, with data of 24 consecutive years. With this common problem, E-Views adds a variable to the regression equation, known as AR (1), to determine if the error terms are irreparably correlated, or if the ordinary least squares procedure is overstating the error term relationship. Autocorrelation may indicate that there is at least one explanatory variable missing from the regression model (Neter, et al., 1996; E-Views Help, 2002). For this reason, E-Views adds the AR (1) as an additional variable, which removes the residual of the most recent past observation from the residual of the current observation. The E-Views autocorrelation test equation compared to the simple regression equation is as follows:

The simple regression equation according to Neter, et al. (1996), is:
\[ Y_t = \beta_0 + \beta_1 \chi_t + \epsilon_t. \]

\( Y_t \) is the DV in period \( t \); \( \beta_0 \) is the intercept term; \( \beta_1 \) is the coefficient of IV \( \chi_t \); \( \chi_t \) is the IV in period \( t \) and \( \epsilon_t \) is the error term in period \( t \).

The error term, \( \epsilon_t \), in the simple regression equation is defined as follows:

\[ \epsilon_t = \rho \epsilon_{t-1} + \upsilon_t. \]

\( \rho \) is the autocorrelation parameter such that \( |\rho| < 1 \), and \( \upsilon_t \) is an independent \( N(0, \sigma^2) \).

The E-Views autoregressor correction technique modifies the simple regression equation as follows: \[ Y_t = \beta_0 + \beta_1 \chi_t + \beta_2 \epsilon_{t-1} + \epsilon_t \] The beta and rho coefficients are estimated by E-Views using a Marquardt nonlinear least squares algorithm (E-Views Help, 2002). The AR (1) term becomes the lagged residual, and performs two functions. The first function is to test if \( \rho = 0 \) in the error term equation. The second function is to remove the effect of the error term from the hypothesis test for the slope coefficient if \( \rho \neq 0 \). Since the estimated value of \( \rho \) is the coefficient of AR (1), the use of the E-Views AR (1) model estimation yields a consistent estimator of the slope coefficient. Some small bias may still exist in small samples. If the t statistics for the \( \beta_1 \) and \( \beta_2 \) coefficients are significant, and the P value of the model is less than .05, then the original model, or the model without the autoregressor term, can be considered robust.

The hotel revenues of each state and the District of Columbia will be tested in the format just described. States will then be categorized by which alternative hypothesis was satisfied. The three categories will be own state GSP, U.S. GSP, or feeder state GSP. If the GSP of a feeder state best explains the hotel revenues of a given state, the feeder state will be listed along with the state being tested. Examples of the regression and
Figure 1 shows the SPSS correlation test for California.

### Correlations

<table>
<thead>
<tr>
<th></th>
<th>California Hotel Revenues</th>
<th>California GSP w/o Hotel rev</th>
<th>US GSP w/o California</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pearson Correlation</strong></td>
<td>1.000</td>
<td>.997**</td>
<td>.989**</td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td><strong>Sum of Squares</strong></td>
<td>117094307.33</td>
<td>16265551166.0</td>
<td>103552218691.667</td>
</tr>
<tr>
<td>and Cross-products</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>Covariance</strong></td>
<td>5091056.841</td>
<td>707197876.783</td>
<td>4502270377.899</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

### California GSP w/o Hotel rev

<table>
<thead>
<tr>
<th></th>
<th>Pearson Correlation</th>
<th><strong>Sig. (2-tailed)</strong></th>
<th>Sum of Squares</th>
<th>and Cross-products</th>
<th>Covariance</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>California Hotel Revenues</strong></td>
<td>.997</td>
<td>.000</td>
<td>16265551166.0</td>
<td>0.00</td>
<td>707197876.783</td>
<td>24</td>
</tr>
<tr>
<td><strong>US GSP w/o California</strong></td>
<td>.989</td>
<td>.000</td>
<td>103552218691.667</td>
<td>0.00</td>
<td>4502270377.899</td>
<td>24</td>
</tr>
</tbody>
</table>

**Correlation is significant at the 0.01 level (2-tailed).**

The Pearson Correlation test indicates that the California GSP without hotel revenues had a higher correlation than the U.S. GSP without California to California hotel revenues. A similar correlation test was run with all state GSP's and California hotel revenues. No other state GSP was more correlated than the California GSP with its own hotel revenues.
The next step in the process is to run a regression model with California GSP without hotel revenues as the IV, and California hotel revenues as the DV. Figure 2 shows the E-Views simple regression model for California. The P value of the model and the t statistic of the DV are both less than .05, so the assumption tests continue.

Dependent Variable: HOTELS  
Method: Least Squares  
Date: 04/03/03  Time: 16:39  
Sample: 1977 2000  
Included observations: 24

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSPWOHOTELS</td>
<td>0.007162</td>
<td>0.000109</td>
<td>65.69422</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>6.906621</td>
<td>82.65325</td>
<td>0.083561</td>
<td>0.9342</td>
</tr>
</tbody>
</table>

R-squared 0.994928
Adjusted R-squared 0.994698
S.E. of regression 164.2996
Sum squared resid 593876.2
Log likelihood -155.4510
Durbin-Watson stat 0.293528

Figure 2 California Regression Model

The next step is to test for normality with the Jarque-Bera test. The Jarque-Bera statistic is 2.07 with a P value of .35. The null hypothesis is not rejected, which indicates a normal distribution. The next step is the Bruesch-Godfrey test for error independence, or serial correlation. Figure 3 shows the Bruesch-Godfrey test as being significant. In other words, the P value is less than .05, which indicates possible serial correlation.
Breusch-Godfrey Serial Correlation LM Test:

<table>
<thead>
<tr>
<th>Test Equation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable: RESID</td>
</tr>
<tr>
<td>Method: Least Squares</td>
</tr>
<tr>
<td>Date: 07/01/03 Time: 14:52</td>
</tr>
<tr>
<td>Presample missing value lagged residuals set to zero.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSPW0HOTELS</td>
<td>-3.31E-05</td>
<td>6.16E-05</td>
<td>-0.536934</td>
<td>0.5972</td>
</tr>
<tr>
<td>C</td>
<td>16.56545</td>
<td>45.75169</td>
<td>0.362073</td>
<td>0.7211</td>
</tr>
<tr>
<td>RESID(-1)</td>
<td>1.105427</td>
<td>0.217064</td>
<td>5.092629</td>
<td>0.0001</td>
</tr>
<tr>
<td>RESID(-2)</td>
<td>-0.267327</td>
<td>0.233289</td>
<td>-1.145906</td>
<td>0.2654</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.731407</td>
<td>Mean dependent var</td>
<td>-1.63E-13</td>
<td></td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.691118</td>
<td>S.D. dependent var</td>
<td>160.6882</td>
<td></td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>89.30587</td>
<td>Akaike info criterion</td>
<td>11.97302</td>
<td></td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>159510.8</td>
<td>Schwarz criterion</td>
<td>12.16937</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-139.6763</td>
<td>F-statistic</td>
<td>18.15407</td>
<td></td>
</tr>
<tr>
<td>Durbin-Watson stat</td>
<td>1.987898</td>
<td>Prob(F-statistic)</td>
<td>0.000006</td>
<td></td>
</tr>
</tbody>
</table>

The next test is the White test for constancy of variance, or heteroskedasticity. Figure 4 shows an insignificant P value, or P is greater than .05, which indicates constancy of variance. As explained earlier, an insignificant White test indicates normality and error independence also.
White Heteroskedasticity Test:

<table>
<thead>
<tr>
<th></th>
<th>F-statistic</th>
<th>Obs*R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-statistic</td>
<td>2.561772</td>
<td>4.707059</td>
</tr>
<tr>
<td>Probability</td>
<td>0.101034</td>
<td>0.095033</td>
</tr>
</tbody>
</table>

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/01/03  Time: 15:09
Sample: 1977 2000
Included observations: 24

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>-22304.80</td>
<td>28401.70</td>
<td>-0.785333</td>
<td>0.4410</td>
</tr>
<tr>
<td>GSPWOHOTELS</td>
<td>0.107495</td>
<td>0.084973</td>
<td>1.265053</td>
<td>0.2197</td>
</tr>
<tr>
<td>GSPWOHOTELS^2</td>
<td>-4.77E-08</td>
<td>5.67E-08</td>
<td>-0.841385</td>
<td>0.4096</td>
</tr>
</tbody>
</table>

R-squared            | 0.196127    | Mean dependent var | 24744.84
Adjusted R-squared  | 0.119568    | S.D. dependent var | 28740.38
S.E. of regression  | 26967.48    | Akaike info criterion | 23.35912
Sum squared resid    | 1.53E+10    | Schwarz criterion | 23.50638
Log likelihood       | -277.3094   | F-statistic      | 2.561772
Durbin-Watson stat   | 0.782089    | Prob(F-statistic) | 0.101034

Figure 4 California White Heteroskedasticity Test

After assuring that regression assumptions for normality and constancy of variance are not violated, the serial correlation possibility is tested with the autoregressor term, AR (1). Figure 5 shows a significant test, which means that auto correlation is not a problem with this model.
Dependent Variable: HOTELS  
Method: Least Squares  
Date: 04/03/03   Time: 16:41  
Sample(adjusted): 1978 2000  
Included observations: 23 after adjusting endpoints  
Convergence achieved after 9 iterations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSPWOHOTELS</td>
<td>0.006798</td>
<td>0.000348</td>
<td>19.53260</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>339.9462</td>
<td>400.6014</td>
<td>0.848590</td>
<td>0.4062</td>
</tr>
<tr>
<td>AR(1)</td>
<td>0.859711</td>
<td>0.102456</td>
<td>19.53260</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared        | 0.998505    | Mean dependent var | 5118.913 |
Adjusted R-squared | 0.998355  | S.D. dependent var | 2182.563 |
S.E. of regression | 88.51302   | Akaike info criterion | 11.92528 |
Sum squared resid  | 156691.1   | Schwarz criterion   | 12.07339 |
Log likelihood    | -134.1408  | F-statistic         | 6678.241 |
Durbin-Watson stat | 1.401861   | Prob(F-statistic)   | 0.000000 |

Inverted AR Roots | .86 |

Figure 5 California Autocorrelation Significance

Hypotheses Testing

The state GSP data from BEA is in alphabetical order with Alabama first and Wyoming last. A pilot study was done with the first twelve states, from Alabama to Hawaii. The first test was run with Alabama data. The correlation tests indicated that the U.S. GSP score was .998 versus the state GSP score of .996. Three other states had a score of .998, Florida, Virginia, and New Hampshire. With equal correlation scores, the U.S. GSP, Florida, Virginia, and New Hampshire were selected for testing in a regression mode. If the regression models were insignificant, or if one of the regression assumptions were violated, the GSP used as the IV was rejected for explaining the hotel revenues of the state being tested. According to Table 4, if more than one regression model were significant, the GSP with the highest R squared value was selected. Table 6

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contains the correlations and corresponding significance values of the first 12 states. The possible hypothesis tests are also indicated.

Table 6 Pilot Study Correlations and Hypothesis Test Categorization

<table>
<thead>
<tr>
<th>State</th>
<th>State GSP Corr</th>
<th>U.S. GSP Corr</th>
<th>Feeder State Corr</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>.996**</td>
<td>.998**</td>
<td>.998** FL, VA, NH,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MA, TX</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Alaska</td>
<td>.784**</td>
<td>.987**</td>
<td>.989** KS, MA, TX</td>
<td></td>
</tr>
<tr>
<td>Arizona</td>
<td>.992**</td>
<td>.997**</td>
<td>.997** DE, FL, IL,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MI, MN, MO, NH, VA</td>
<td></td>
</tr>
<tr>
<td>Arkansas</td>
<td>.997**</td>
<td>.995**</td>
<td>.997** KS, MI</td>
<td>1 or 3</td>
</tr>
<tr>
<td>California</td>
<td>.997**</td>
<td>.989**</td>
<td>.997** CT, ME, MD</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>VT</td>
<td>1 or 3</td>
</tr>
<tr>
<td>Colorado</td>
<td>.998**</td>
<td>.998**</td>
<td>.999** UT, AZ</td>
<td>3</td>
</tr>
<tr>
<td>Connecticut</td>
<td>.991**</td>
<td>.983**</td>
<td>.991** MA</td>
<td>1 or 3</td>
</tr>
<tr>
<td>Delaware</td>
<td>.959**</td>
<td>.959**</td>
<td>.975** CA, ME, RI</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>.971** CT, MD</td>
<td>3</td>
</tr>
<tr>
<td>District of Col.</td>
<td>.990**</td>
<td>.961**</td>
<td>.991** HI</td>
<td>3</td>
</tr>
<tr>
<td>Florida</td>
<td>.999**</td>
<td>.999**</td>
<td>.999** VA</td>
<td>1, 2, or 3</td>
</tr>
<tr>
<td>Georgia</td>
<td>.998**</td>
<td>.997**</td>
<td>.998** MN, NC</td>
<td>1 or 3</td>
</tr>
<tr>
<td>Hawaii</td>
<td>.991**</td>
<td>.985**</td>
<td>.995** DC</td>
<td>3</td>
</tr>
</tbody>
</table>

** Significant at the .01 level.

Based on the selection of the IV, regression tests would proceed as explained with the California example. In the Alabama example, the regression model with U.S. GSP as the IV was significant with an R squared value of .9964, and all regression assumption tests were satisfied. The remaining 11 states were tested. The results are shown in Table 7.
Table 7 Hypothesis Pilot Study Test Results

<table>
<thead>
<tr>
<th>State and Hypothesis</th>
<th>Test</th>
<th>Adjusted R Squared</th>
<th>JB/P value</th>
<th>Bruesch Godfrey P</th>
<th>White Hetero P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama (2)</td>
<td></td>
<td>0.9964</td>
<td>.64/.73</td>
<td>0.66</td>
<td>0.54</td>
</tr>
<tr>
<td>Alaska (3, TX)</td>
<td></td>
<td>0.9731</td>
<td>1.60/.45</td>
<td>0.00</td>
<td>0.50</td>
</tr>
<tr>
<td>Arizona (3, IL)</td>
<td></td>
<td>0.9940</td>
<td>0.21/.90</td>
<td>0.02</td>
<td>0.72</td>
</tr>
<tr>
<td>Arkansas (3, KS)</td>
<td></td>
<td>0.9944</td>
<td>2.79/.25</td>
<td>0.65</td>
<td>0.58</td>
</tr>
<tr>
<td>California (1)</td>
<td></td>
<td>0.9947</td>
<td>2.07/.35</td>
<td>0.00</td>
<td>0.10</td>
</tr>
<tr>
<td>Colorado (3, UT)</td>
<td></td>
<td>0.9980</td>
<td>2.92/.08</td>
<td>0.96</td>
<td>0.98</td>
</tr>
<tr>
<td>Connecticut (3, MA)</td>
<td></td>
<td>0.9812</td>
<td>1.16/.56</td>
<td>0.00</td>
<td>0.05^</td>
</tr>
<tr>
<td>Delaware (3, ME)</td>
<td></td>
<td>0.9429</td>
<td>2.47/.29</td>
<td>0.12</td>
<td>0.08</td>
</tr>
<tr>
<td>District of Col (3, ME)</td>
<td></td>
<td>0.9504</td>
<td>2.82/.24</td>
<td>0.00</td>
<td>0.08</td>
</tr>
<tr>
<td>Florida (2)</td>
<td></td>
<td>0.9960</td>
<td>1.51/.47</td>
<td>0.29</td>
<td>0.50</td>
</tr>
<tr>
<td>Georgia (1)</td>
<td></td>
<td>0.9965</td>
<td>.52/.77</td>
<td>0.85</td>
<td>0.11</td>
</tr>
<tr>
<td>Hawaii (3, DC)</td>
<td></td>
<td>0.9896</td>
<td>3.15/.21</td>
<td>0.00</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Notes: 1 California failed the normality test. 2 Hawaii failed the normality test. 3 Florida failed the error constancy test. 4 The White test was .054.

Of the first 12 states tested in the pilot study, four states were tested by Hypothesis 1, five states were tested by Hypothesis 2, and three states were tested by Hypothesis 3.

The disbursement indicates a need for the three alternatives. Eight regression models of the 12 states worked according to the first order selection of the correlation tests. Four of the first order regression models failed assumption tests, so the next highest correlation test was run successfully. The notes below Table 6 describe why the independent variable with the highest correlation value failed the regression tests.

Methodology Summary

This dissertation study began from conversations with industry executives and with examinations of hotel forecasting models. Subsequent research in budgeting and
forecasting, led to the search for greater accuracy and efficiency, and for less behavioral issues in the budgeting and forecasting process. State-level economic data was found that represents hotel revenues, is accessible, sufficiently regional, and not overwhelmingly local. Correlation tests identify whether the hotel revenues of a given state are explained by the same state’s economic activity, the national economy, or some other state’s economic activity. Regression tests support one of these three hypotheses. Simple regression was used to achieve parsimony in the models, which increases their potential use in the hotel industry. Simple regression also avoids multicollinearity, which is a potential problem with a broad explanatory variable such as GSP. A special autoregressive test is used if needed with the time series data to discover if autocorrelation exists. This dissertation provides a framework to using objective measures to discover hotel revenue drivers in an effort to increase accuracy and efficiency, and to reduce behavior issues associated with the budgeting and forecasting process.
CHAPTER 4

FINDINGS OF THE STUDY

Introduction

The use of correlation to identify significant relationships for testing in simple regression models was explained in Chapter 3. The guidelines for utilizing the correlation test results in regression models were also described. After prioritizing the explanatory variables for testing in regression models, and after fitting the models, all significant regression models had to pass assumption tests to be acceptable. In Chapter 4 the results of the various correlation and regression tests are discussed. The hotel revenues of each state of the United States (U.S.) of America, plus the District of Columbia were tested to find the geographic area of general economic activity that best explains the hotel revenues of each state. As explained in Chapter 3, the economic concept of value added represents hotel revenues. The correlation test results are first discussed. The regression test results are then reported. Many possible reasons for the relationships between one state’s hotel revenues and a particular GSP are discussed. An in-depth review of such relationships may merit future research.
Correlation Results

Hotel revenues of all 50 states plus the District of Columbia were tested for correlation significance with the respective state GSP, the US GSP, and all other state’s GSP. The use of correlation to identify IV’s is supported by a statistical textbook (Tabachnick and Fidell, 2001), as well as by a previous similar study (Kimes and Fitzsimmons, 1990).

SPSS was used to conduct the correlation tests. The hotel revenues of each state were first tested for correlation with their own GSP without hotel revenues and with the U.S. GSP without the respective state GSP. The hotel revenues of each state were then tested for correlation with the GSP of every other state. All correlation values recorded were significant at the .01 level. Three decimal points were used to distinguish correlation relationships.

Tables 8, 9, and 10 below show the correlation results according to hypotheses categories. The states are listed in alphabetical order in the first column. Subsequent columns to the right represent the correlation values according to the respective Hypotheses One, Two, and Three. The feeder state column with Hypothesis Three correlation values contains groupings of states in postal codes with the highest to lowest correlation value.
<table>
<thead>
<tr>
<th>State</th>
<th>Same State GSP Correlation</th>
<th>US GSP Correlation</th>
<th>Feeder State GSP Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>.996**</td>
<td>.998**</td>
<td>FL, NH, VA, .998**</td>
</tr>
<tr>
<td>Alaska</td>
<td>.784**</td>
<td>.987**</td>
<td>KS, .989**, MA, TX, .987**</td>
</tr>
<tr>
<td>Arizona</td>
<td>.992**</td>
<td>.997**</td>
<td>DE, FL, IL, MI, MN, MO, NH, VA, .997**</td>
</tr>
<tr>
<td>Arkansas</td>
<td>.997**</td>
<td>.995**</td>
<td>KS, MS, .997**</td>
</tr>
<tr>
<td>California</td>
<td>.997**</td>
<td>.989**</td>
<td>CT, ME, MD, VT, .997**</td>
</tr>
<tr>
<td>Colorado</td>
<td>.998**</td>
<td>.998**</td>
<td>UT, .999**, AZ, .998**</td>
</tr>
<tr>
<td>Connecticut</td>
<td>.991**</td>
<td>.983**</td>
<td>MA, .991**</td>
</tr>
<tr>
<td>Delaware</td>
<td>.959**</td>
<td>.959**</td>
<td>CA, .975**</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>.990**</td>
<td>.961**</td>
<td>HI, .991**</td>
</tr>
<tr>
<td>Florida</td>
<td>.999**</td>
<td>.999**</td>
<td>VA, .999**</td>
</tr>
<tr>
<td>Georgia</td>
<td>.998**</td>
<td>.997**</td>
<td>MN, NC, .998**</td>
</tr>
<tr>
<td>Hawaii</td>
<td>.991**</td>
<td>.985**</td>
<td>DC, .995**</td>
</tr>
<tr>
<td>Idaho</td>
<td>.996**</td>
<td>.984**</td>
<td>NV, OR, .994**</td>
</tr>
<tr>
<td>Illinois</td>
<td>.997**</td>
<td>.997**</td>
<td>DE, .998**</td>
</tr>
<tr>
<td>Indiana</td>
<td>.992**</td>
<td>.994**</td>
<td>MN, .996**</td>
</tr>
<tr>
<td>Iowa</td>
<td>.995**</td>
<td>.992**</td>
<td>WA, .997**</td>
</tr>
<tr>
<td>Kansas</td>
<td>.986**</td>
<td>.985**</td>
<td>UT, .992**</td>
</tr>
<tr>
<td>Kentucky</td>
<td>.994**</td>
<td>.994**</td>
<td>AZ, GA, UT, .997**</td>
</tr>
<tr>
<td>Louisiana</td>
<td>.973**</td>
<td>.967**</td>
<td>TX, .984**, UT, .983**</td>
</tr>
<tr>
<td>Maine</td>
<td>.996**</td>
<td>.996**</td>
<td>CA, CT, MD, MA, NJ, RI, VA, .998**</td>
</tr>
<tr>
<td>Maryland</td>
<td>.963**</td>
<td>.980**</td>
<td>NV, OR, .996**</td>
</tr>
<tr>
<td>State</td>
<td>Same State GSP Correlation</td>
<td>US GSP Correlation</td>
<td>Feeder State GSP Correlation</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------</td>
<td>--------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>.997**</td>
<td>.992**</td>
<td>CA, CT, ME, MD, NY, RI .997**</td>
</tr>
<tr>
<td>Michigan</td>
<td>.991**</td>
<td>.994**</td>
<td>NC .995**</td>
</tr>
<tr>
<td>Minnesota</td>
<td>.987**</td>
<td>.985**</td>
<td>CO .991**; AZ, NC .990**; GA, WA .989**; UT .988**; TX, ID .987**; NH, OR .986**; NV .985**</td>
</tr>
<tr>
<td>Mississippi</td>
<td>.865**</td>
<td>.870**</td>
<td>CO .927**</td>
</tr>
<tr>
<td>Missouri</td>
<td>.991**</td>
<td>.992**</td>
<td>AZ, CO .998**</td>
</tr>
<tr>
<td>Montana</td>
<td>.971**</td>
<td>.962**</td>
<td>ID .989**</td>
</tr>
<tr>
<td>Nebraska</td>
<td>.966**</td>
<td>.970**</td>
<td>CO .992**; UT .987**; NV .985**; OR, TX .984**; GA .981**; ID, WA .979**; MN .977**; NH .972**; IN, KS .970**; KY .971**; WY .876**</td>
</tr>
<tr>
<td>Nevada</td>
<td>.997**</td>
<td>.990**</td>
<td>ID, OR .998**</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>.986**</td>
<td>.981**</td>
<td>MA .986**</td>
</tr>
<tr>
<td>New Jersey</td>
<td>.987**</td>
<td>.979**</td>
<td>DC .992**; VT .990**; HI, ME .989**; CT, MD .987**; NY .986**; AL, PA, WV .985**; SC .984**; MS, VA .983**; KS, MO, OH .981**; DE, RI .980**; AR .979**</td>
</tr>
<tr>
<td>New Mexico</td>
<td>.997**</td>
<td>.992**</td>
<td>AR, MT, SD .997**</td>
</tr>
<tr>
<td>New York</td>
<td>.993**</td>
<td>.996**</td>
<td>MA, NH .997**; CA, NC, RI .996**; MN, VA .995**</td>
</tr>
<tr>
<td>North Carolina</td>
<td>.998**</td>
<td>.994**</td>
<td>AZ, GA .999**</td>
</tr>
<tr>
<td>North Dakota</td>
<td>.960**</td>
<td>.948**</td>
<td>UT .980**; NV .979**; CO, OR .978**; ID .975**;</td>
</tr>
<tr>
<td>Ohio</td>
<td>.996**</td>
<td>.995**</td>
<td>IO .997**</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>.949**</td>
<td>.911**</td>
<td>LA .955**</td>
</tr>
<tr>
<td>Oregon</td>
<td>.995**</td>
<td>.989**</td>
<td>IO, NV, WA .995**</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>.995**</td>
<td>.998**</td>
<td>MA, NH, VA .998**</td>
</tr>
<tr>
<td>Rhode Island</td>
<td>.992**</td>
<td>.992**</td>
<td>NH .996**; MN, NC .994**</td>
</tr>
</tbody>
</table>
Table 10 State Correlation South Carolina to Wyoming

<table>
<thead>
<tr>
<th>State</th>
<th>Same State GSP Correlation</th>
<th>US GSP Correlation</th>
<th>Feeder State GSP Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Carolina</td>
<td>.995**</td>
<td>.998**</td>
<td>GA, NC .999**</td>
</tr>
<tr>
<td>South Dakota</td>
<td>.999**</td>
<td>.979**</td>
<td>ID, IO .989**</td>
</tr>
<tr>
<td>Tennessee</td>
<td>.991**</td>
<td>.989**</td>
<td>AZ, GA, OR, UT .993**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IO, KY, MN, NV .992**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AR, IL, IN, NE, WI .991**</td>
</tr>
<tr>
<td>Texas</td>
<td>.994**</td>
<td>.986**</td>
<td>CO, UT .992**</td>
</tr>
<tr>
<td>Utah</td>
<td>.996**</td>
<td>.981**</td>
<td>CO .998**</td>
</tr>
<tr>
<td>Vermont</td>
<td>.996**</td>
<td>.988**</td>
<td>ME .998**</td>
</tr>
<tr>
<td>Virginia</td>
<td>.997**</td>
<td>0.995**</td>
<td>CT, MA, NY, RI .998**</td>
</tr>
<tr>
<td>Washington</td>
<td>.995**</td>
<td>.992**</td>
<td>IO .998**</td>
</tr>
<tr>
<td>West Virginia</td>
<td>.980**</td>
<td>.989**</td>
<td>CO, TX .993**</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>.995**</td>
<td>.993**</td>
<td>UT .999**</td>
</tr>
<tr>
<td>Wyoming</td>
<td>.990**</td>
<td>.954**</td>
<td>CO, ID, UT .980**</td>
</tr>
</tbody>
</table>

The correlation tests were effective in identifying the geographic entity that explains state hotel revenues. As explained in Chapter 3, the highest correlation value was tested first in the simple regression model. If more than one GSP had the same highest correlation value, all GSPs at the highest correlation value were tested for selecting a regression model. If no significant and valid regression models were found at the highest correlation value, the GSP at the next highest correlation value was tested for selecting a regression model. Of the 51 states and the District of Columbia, 39, or 76 percent, have regression models selected based on the highest correlation value. Regression models were not established for five states, or 10%, due to at least one assumption violation. The hotel revenue models of the other seven states were estimated based on the next highest correlation value that passed all regression assumption tests.
Regression Test Results

E-Views was the software used to run the simple regression tests. Each state’s hotel revenues were used as the DV. The IV’s used were the same state’s GSP without hotel revenues, the U.S. GSP without the same state’s GSP, or another state’s GSP. The IV with the highest correlation value was tested first. All successful regression tests were significant at the .001 level. Five decimal points were used to distinguish R squared values. Residual tests were then conducted to assure normality, error independence, and error constancy. A failure of normality or error constancy caused the IV to be rejected and the next highest-level correlation IV to be tested. A failure of error independence led to an additional test of the first autoregressor term, known as AR (1) in E-Views, as explained in Chapter 3. If the AR (1) correction model was significant at the .05 level, and if the t statistics of the IV and the AR (1) term were significant at the .05 level, the IV was considered robust in explaining state hotel revenues. A failure of the AR (1) correction caused the IV to be rejected, and the IV with the next highest correlation value to be tested. This process continued until a significant IV was found that satisfied the regression assumption tests.

There were seven states whose hotel revenues were explained by their own state’s GSP, which is Hypothesis One. There were two states whose hotel revenues were explained by the U.S. GSP, which is Hypothesis Two. There were 36 states and the District of Columbia, whose hotel revenues were explained by feeder states, which is Hypothesis Three. The hotel revenues of five states were not explained by any of the three hypotheses of this dissertation. Detailed comments follow regarding the groupings of states in each of the hypotheses categories.

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Hypothesis One Findings

Table 11 contains the seven states whose hotel revenue regression models were significant for their own state's GSP. Therefore, the null hypothesis of the state GSP having no impact on hotel revenues could be rejected.

Table 11 Hypothesis One State Economic Activity Explains Hotel Revenues

<table>
<thead>
<tr>
<th>State</th>
<th>Correlation</th>
<th>R Squared</th>
<th>Coeff to GSP</th>
<th>% HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>0.997</td>
<td>0.99470</td>
<td>0.00716</td>
<td>0.710%</td>
</tr>
<tr>
<td>Georgia</td>
<td>0.998</td>
<td>0.96650</td>
<td>0.00750</td>
<td>0.790%</td>
</tr>
<tr>
<td>Idaho</td>
<td>0.996</td>
<td>0.99143</td>
<td>0.00646</td>
<td>0.730%</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>0.997</td>
<td>0.99451</td>
<td>0.00762</td>
<td>0.680%</td>
</tr>
<tr>
<td>South Dakota</td>
<td>0.999</td>
<td>0.97983</td>
<td>0.01049</td>
<td>0.830%</td>
</tr>
<tr>
<td>Tennessee</td>
<td>0.991</td>
<td>0.98049</td>
<td>0.00973</td>
<td>0.920%</td>
</tr>
<tr>
<td>Texas</td>
<td>0.994</td>
<td>0.98819</td>
<td>0.00620</td>
<td>0.630%</td>
</tr>
</tbody>
</table>

The state economic activity exhibits high coefficients of determination, or R squared values. Although there is a varied geographic representation of states whose hotel revenues are explained by their own state's GSP, these states support the concept that state hotel revenues coincide with state economic activity. For the 24 years tested, the states of California, Texas, Massachusetts, and Georgia had some of the highest economic activity of all states in the U.S. in terms of state GSP. The hotel revenues of these states had similar rankings over the same time period. The similar rankings of GSP and hotel revenues supports the concept that people stay in hotels of these states to buy or sell products from or to companies in these states. Table 12 contains the GSP rankings of the seven Hypothesis One states with their corresponding hotel revenue rankings. The data for the 24 years was added and ranked for GSP and hotel revenues.
The rankings of GSP and hotel revenues of the states of Idaho and South Dakota also support the idea that state hotel revenues coincide with state economic activity, albeit in the opposite direction of the previous four states discussed. Low state economic activity coincides with low levels of hotel revenue within the state.

Geography may combine with economic activity to explain these Hypothesis One hotel revenues. With the exception of Massachusetts, the states in this Hypothesis One group are physically large. Also, the four states with the highest GSP of these seven states are coastal or gateway states. The lowest GSP states of the Hypothesis One group, Idaho and South Dakota, are land-locked. Although Tennessee is land-locked, the east-west travel between Nashville and Memphis, combined with out-of-state travelers staying overnight to do business with Tennessee companies, supports the concept that Tennessee’s hotel revenues have a strong relationship with Tennessee’s economic activity.

The additional regression tests of the GSP of states with the same correlation value as the GSP of California reveal some additional insights into California’s hotel revenues. The GSP of Connecticut, Maine, and Vermont were also significant in explaining the

<table>
<thead>
<tr>
<th>State</th>
<th>GSP Ranking</th>
<th>Hotel Revenue Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Georgia</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Idaho</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>South Dakota</td>
<td>49</td>
<td>48</td>
</tr>
<tr>
<td>Tennessee</td>
<td>20</td>
<td>14</td>
</tr>
<tr>
<td>Texas</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>
hotel revenues of California, but had lower R squared values than the GSP of California without hotel revenues. The economies of these three New England states, though less important than California’s own economy for California hotel revenues, may merit future research on California hotel revenue forecasting.

Hypothesis Two Findings

Table 13 contains the two states whose hotel revenue regression models were significant for the U.S. GSP. Therefore, the null hypothesis of the U.S. GSP having no impact on hotel revenues for these states could be rejected.

Table 13 Hypothesis Two National Economic Activity Explains State Hotel Revenues

<table>
<thead>
<tr>
<th>State (2)</th>
<th>Correlation</th>
<th>R Squared</th>
<th>Coeff to GSP</th>
<th>% HR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>0.998</td>
<td>0.99638</td>
<td>0.00004</td>
<td>0.370%</td>
</tr>
<tr>
<td>Florida</td>
<td>0.999</td>
<td>0.99797</td>
<td>0.00080</td>
<td>1.480%</td>
</tr>
</tbody>
</table>

The coefficients of determination, or R squared values, were above 99 percent. The same testing procedures were used for the Hypothesis Two group as for the Hypothesis One group.

Although the hotel revenues of these two states are very different in volume, they are similar in that both depend on national economic activity. Alabama hotel revenues represent less than .5 percent of Alabama’s GSP. Alabama’s GSP ranking of states is 25, while Alabama’s hotel revenue ranking is 34. The GSP and hotel revenue rankings tend to indicate that Alabama does not have strong activity in the hotel business segment, and

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that the leisure segment is influenced by national economic activity. The national aspect of visitors is supported by a 2002 economic impact study that calculated 10.7 million visitors staying overnight in Alabama lodging places (Deravi, 2002). It appears that the U.S. GSP represents the ability of leisure travelers to utilize Alabama hotels.

For the 24 years studied, Florida’s hotel revenue ranking is three, compared to it’s GSP ranking of five. Florida hotel revenues are nearly 1.5 percent of Florida’s GSP. The higher ranking of Florida hotel revenues than the ranking of GSP, and the high percent of Florida hotel revenues to Florida’s GSP, support the relationship of Florida hotel revenues to national economic activity. The many tourist attractions of Florida attract travelers from many parts of the U.S., and make Florida one of the leading North American tourist centers (World Book Encyclopedia, 1990, vol. 7). The hotel revenues of Florida, then, are best explained by national economic activity. In spite of Florida’s strong GSP, the state GSP failed the White test in explaining Florida’s hotel revenues, which further supports the need for a national explanation.

**Hypothesis Three Findings**

Table 14 contains the 36 states and the District of Columbia whose hotel revenues were explained by another state’s GSP. Therefore, the null hypothesis of the feeder state GSP having no impact on hotel revenues could be rejected.
### Table 14 Hypothesis Three Feeder State Economic Activity Explains Hotel Revenues

<table>
<thead>
<tr>
<th>State (Feeder)</th>
<th>Correlation</th>
<th>R Squared</th>
<th>Coeff to GSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska (TX)</td>
<td>0.987</td>
<td>0.97305</td>
<td>0.00035</td>
</tr>
<tr>
<td>Arizona (IL)</td>
<td>0.997</td>
<td>0.99401</td>
<td>0.00500</td>
</tr>
<tr>
<td>Arkansas (KS)</td>
<td>0.997</td>
<td>0.99435</td>
<td>0.00325</td>
</tr>
<tr>
<td>Colorado (UT)</td>
<td>0.999</td>
<td>0.99795</td>
<td>0.02484</td>
</tr>
<tr>
<td>Connecticut (MA)</td>
<td>0.991</td>
<td>0.98117</td>
<td>0.00233</td>
</tr>
<tr>
<td>Delaware (ME)</td>
<td>0.972</td>
<td>0.94293</td>
<td>0.00290</td>
</tr>
<tr>
<td>District of Columbia (ME)</td>
<td>0.976</td>
<td>0.95036</td>
<td>0.03277</td>
</tr>
<tr>
<td>Hawaii (DC)</td>
<td>0.995</td>
<td>0.98958</td>
<td>0.04495</td>
</tr>
<tr>
<td>Illinois (DE)</td>
<td>0.998</td>
<td>0.99674</td>
<td>0.06511</td>
</tr>
<tr>
<td>Indiana (MN)</td>
<td>0.996</td>
<td>0.99096</td>
<td>0.00367</td>
</tr>
<tr>
<td>Iowa (WA)</td>
<td>0.997</td>
<td>0.99373</td>
<td>0.00172</td>
</tr>
<tr>
<td>Kansas (NV)</td>
<td>0.989</td>
<td>0.97510</td>
<td>0.00407</td>
</tr>
<tr>
<td>Kentucky (AZ)</td>
<td>0.997</td>
<td>0.99382</td>
<td>0.00346</td>
</tr>
<tr>
<td>Louisiana (UT)</td>
<td>0.983</td>
<td>0.96483</td>
<td>0.01406</td>
</tr>
<tr>
<td>Maine (CA)</td>
<td>0.998</td>
<td>0.99603</td>
<td>0.00025</td>
</tr>
<tr>
<td>Maryland (NV)</td>
<td>0.996</td>
<td>0.99230</td>
<td>0.03086</td>
</tr>
<tr>
<td>Michigan (NC)</td>
<td>0.995</td>
<td>0.98899</td>
<td>0.00402</td>
</tr>
<tr>
<td>Mississippi (CO)</td>
<td>0.927</td>
<td>0.85340</td>
<td>0.00908</td>
</tr>
<tr>
<td>Missouri (AZ)</td>
<td>0.998</td>
<td>0.99543</td>
<td>0.00713</td>
</tr>
<tr>
<td>Montana (ID)</td>
<td>0.989</td>
<td>0.97703</td>
<td>0.00630</td>
</tr>
<tr>
<td>Nevada (ID)</td>
<td>0.998</td>
<td>0.99547</td>
<td>0.35393</td>
</tr>
<tr>
<td>New Hampshire (MA)</td>
<td>0.988</td>
<td>0.97542</td>
<td>0.00105</td>
</tr>
<tr>
<td>New Mexico (MT)</td>
<td>0.997</td>
<td>0.99425</td>
<td>0.02365</td>
</tr>
<tr>
<td>North Dakota (UT)</td>
<td>0.980</td>
<td>0.95852</td>
<td>0.00196</td>
</tr>
<tr>
<td>Ohio (IO)</td>
<td>0.997</td>
<td>0.99321</td>
<td>0.01496</td>
</tr>
<tr>
<td>Oklahoma (LA)</td>
<td>0.955</td>
<td>0.90741</td>
<td>0.00181</td>
</tr>
<tr>
<td>Oregon (NV)</td>
<td>0.995</td>
<td>0.98999</td>
<td>0.00788</td>
</tr>
<tr>
<td>Pennsylvania (NH)</td>
<td>0.988</td>
<td>0.99577</td>
<td>0.04132</td>
</tr>
<tr>
<td>Rhode Island (NC)</td>
<td>0.994</td>
<td>0.98758</td>
<td>0.00074</td>
</tr>
<tr>
<td>South Carolina (NC)</td>
<td>0.999</td>
<td>0.99742</td>
<td>0.00379</td>
</tr>
<tr>
<td>Utah (CO)</td>
<td>0.998</td>
<td>0.99565</td>
<td>0.00370</td>
</tr>
<tr>
<td>Vermont (ME)</td>
<td>0.998</td>
<td>0.99594</td>
<td>0.01246</td>
</tr>
<tr>
<td>Virginia (RI)</td>
<td>0.998</td>
<td>0.99620</td>
<td>0.05253</td>
</tr>
<tr>
<td>Washington (IO)</td>
<td>0.998</td>
<td>0.99580</td>
<td>0.01842</td>
</tr>
<tr>
<td>West Virginia (TX)</td>
<td>0.993</td>
<td>0.98650</td>
<td>0.00040</td>
</tr>
<tr>
<td>Wisconsin (UT)</td>
<td>0.997</td>
<td>0.99738</td>
<td>0.01166</td>
</tr>
<tr>
<td>Wyoming (CO)</td>
<td>0.980</td>
<td>0.95921</td>
<td>0.00122</td>
</tr>
</tbody>
</table>
There are two main characteristics of the explanatory variables of the Hypothesis Three tests. These characteristics are proximity and type of economic activity. The Hypothesis Three findings will be discussed in terms of feeder state proximity and type of economic activity. The findings of Hypothesis Three include some explanatory relationships that are not readily understood. Some initial attempts have been presented at uncovering the not so readily understood economic relationships, but it is beyond the scope of this dissertation to fully explain the economic reason of every explanatory GSP. Additional research is needed to fully understand the nature of several independent and dependent variable relationships.

Feeder States and Proximity

Of the 37 feeder states (including the District of Columbia), nine, or 24 percent, of the state hotel revenues were explained by the GSP of adjoining states. These nine states and their adjoining explanatory states are as follows: Colorado/Utah; Connecticut/Massachusetts; Montana/Idaho; Nevada/Idaho; New Hampshire/Massachusetts; Oregon/Nevada; South Carolina/North Carolina; Utah/Colorado; and Wyoming/Colorado.

There appears to be meaningful interaction among the hotel revenues and the economic activity of several mountain west states. The economic activity of Colorado explains the hotel revenues of two adjoining states, Utah and Wyoming. The ranking of Colorado’s GSP among all states of the U.S. is 23, which is higher than the GSP ranking of Utah (35) and Wyoming (48). These three states share economic activities in ski resorts, national parks, and mineral products. Thus, the hotel revenue segments of
business and leisure of Utah and Wyoming tend to follow the economic engine of Colorado.

The reciprocal relationship of the GSP of Utah explaining the hotel revenues of Colorado involves more than the proximity of the Utah economy. Colorado hotel revenues represent more than one percent of Colorado’s GSP, which indicates a strong leisure hotel segment. If the Utah economy is doing well, it may represent the ability of many people around Utah and Colorado to engage in overnight travel for outdoor and recreation activities that are available in Colorado.

In explaining the hotel revenues of two adjoining states, Montana and Nevada, the economic activity of Idaho exhibits some of the same characteristics found in the relationship between Utah and Colorado. The rankings of Montana’s GSP and hotel revenues among U.S. states are low (47 and 44). The hotel revenues of Montana for both the business and leisure segments tend to follow the economic activity of Idaho. The relationship of Nevada hotel revenues and Idaho economic activity, however, is quite different than that of Idaho and Montana. Nevada’s hotel revenues rank second among the U.S. states, and represent over 14 percent of Nevada’s GSP, while Nevada’s GSP ranks 37th. Nevada’s hotel revenues, then, indicate a significant leisure hotel segment. The economic activity of Idaho may serve as a proxy of the ability of people in states surrounding Nevada to travel to Nevada for conventions, entertainment, and gaming. This relationship of Idaho’s GSP and Nevada’s hotel revenues is similar to the relationship of Utah’s GSP and Colorado’s hotel revenues.

The proximity of Massachusetts, whose GSP ranks tenth in the nation, explains the hotel revenues of New Hampshire and Connecticut. The New Hampshire GSP ranking is
41, while its hotel revenue ranking is 39. The Connecticut GSP ranking is 22, while its hotel revenue ranking is 31. The rankings of GSP and hotel revenues support the concept that a higher hotel ranking than the GSP ranking indicates a stronger leisure than business hotel segment, as was the case with Florida, Nevada, and Colorado. The rankings also support the opposite situation, which is that a higher GSP ranking than the hotel ranking indicates a stronger business than leisure hotel segment. The GSP and hotel revenue rankings of these two states indicate that Connecticut has more business than leisure hotel activity, whereas New Hampshire has a relatively stronger leisure hotel segment. The proximity and strength of the Massachusetts economic activity helps explain both the business and leisure segments of hotel revenues of Connecticut and New Hampshire.

Of this Hypothesis Three group, hotel revenues of eight states, or 22 percent, are explained by the GSP of nearby states. These states with their corresponding explanatory states are as follows: Arkansas/Kansas; Indiana/Minnesota; New Mexico/Montana; North Dakota/Utah; Ohio/Iowa; Oklahoma/Louisiana; Pennsylvania/New Hampshire; and, Vermont/Maine. The combination of the nine adjoining and eight nearby states comprises 46 percent of the Hypothesis Three group. Discussion of the hotel revenues explained by nearby states follows.

The economic activity of Kansas and the hotel revenues of Arkansas are similar in several ways. The hotel revenue ranking of Arkansas is 41, while the GSP ranking of Arkansas is 33, which indicates lower hotel activity than general economic activity. This condition indicates a low leisure hotel market segment. The opposite was true in high hotel revenue ranking states of Nevada, Florida, and Colorado. The second largest manufacturing segment of Kansas is food processing (World Book Encyclopedia, 1990).
Much of Kansas’s food processing is for animal feed, which relates to the beef, poultry, hogs, and dairy businesses of Arkansas. With a small leisure hotel segment and complementary industries, forecasters may look to the business activity of Kansas to explain Arkansas hotel revenues. The relationships of hotel revenues and the economic activity of the seven other nearby states are similar to the relationship described between Arkansas’s hotel revenues and Kansas’s economic activity.

Feeder States and Type of Economic Activity

In the Hypothesis Three group, the state hotel revenues of 19 states and the District of Columbia were explained by the GSP of not so nearby states. The hotel revenues of three of these states, Alaska, Arizona, and Hawaii, have a documented or practical explanation. The relationship of the business segment of Alaska’s hotel revenues and the economic activity of Texas has practical value due to the petroleum industry in both states. As the nation’s third largest GSP, Texas’s economic activity also represents the ability of individual leisure travelers from anywhere in the U.S. to utilize Alaska hotels.

Arizona’s hotel revenue ranking is 13, while Arizona’s GSP ranking is 24. Arizona’s hotel revenues represent 1.4 percent of GSP. The volume of Arizona’s hotel revenues indicates that many overnight travelers come from outside of Arizona. One of the biggest feeder markets of Arizona’s hotels is Illinois (Arizona Office of Tourism, 2001). The economic activity of Illinois serves as a proxy for the hotel revenues of Arizona, which are derived from company meetings, conventions, and individuals escaping winter weather.
Hawaii's hotel revenues as a percent of GSP were second only to Nevada's at five percent. Hawaii's hotel revenue ranking was eight, while the GSP ranking was 40. The significant hotel revenue of Hawaii indicates much overnight travel from outside of Hawaii. The Pacific location of Hawaii facilitates travel from both the western U.S. and from international locations. The relationship of Hawaii's hotel revenues with the GSP of the District of Columbia indicates the presence of national and international explanatory factors to explain the hotel revenues of Hawaii.

The strength of the findings of this Hypothesis Three group is that state hotel revenues are most influenced by the economic activity of another state. In other words, there is a regional influence, as opposed to a national one. There may also be some relationships uncovered that were previously unrecognized, such as the GSPs of several western states explaining the hotel revenues of several mid-western and eastern states. The weakness of these findings is that the underlying reasons for many of these hotel revenue and GSP relationships are not known. The research needed to fully explain the relationships identified in this Hypothesis Three group is beyond the scope of this dissertation. These relationships are recommended for future research in Chapter 5.

States Failing Regression Tests

There were five states for which valid regression models cannot be established due to assumption violations. Extensive tests were conducted for all GSP variables with high correlations to the hotel revenues of these states, but they all failed the regression assumption tests. These five states were Minnesota, Nebraska, New Jersey, New York, and North Carolina.
Linking the Findings and the Literature

After presenting the findings of the statistical tests, it is appropriate to relate these findings to the literature on budgeting and forecasting. One of the most important consistent findings with the literature is the importance of a regional emphasis in explaining hotel revenues (Brown and Atkinson, 2001). Treyz (1993) emphasized regional differences and was the first to document a regional economic model to predict regional revenues. In this dissertation the hotel revenues of 43 states and the District of Columbia, or 44 regional entities were explained by the corresponding state GSP without hotel revenues or a feeder state GSP. This represents 86 percent of the entities tested.

Another consistent concept of the findings of this dissertation is the success of utilizing correlation to identify IV’s for the correlation model (Tabachnick and Fidell, 2001, and Kimes and Fitzsimmons, 1990). All 46 significant regression models were based on IVs identified by correlation tests. The five states for which a significant explanatory variable was not found still exhibit strong correlation values between their own hotel revenues and the GSP of other states, which may form the basis for further study.

Whereas correlation analysis may be a powerful tool in identifying strong relationships, the statistical process is simple to understand and to apply. An important part of this dissertation was to suggest ways to improve the quantitative analysis of budgeting and forecasting in hotels (Schmidgall and DeFranco, 1998), as well as to keep the process simple and cost effective (Athiyaman and Robertson, 1992). In their statistical textbook, Hinkle, Wiersma, and Jurs (1998) present correlation as a basic statistical procedure before treating regression and other more complex statistical
techniques. Simple regression is also easy to understand and is available on Excel spreadsheets, a common software tool widely available in the hotel industry. Regression is the preferred technique for forecasting by Anderson, Sweeney, and Williams (2001).

Schmidgall and DeFranco (1998) reported that macroeconomic factors are not widely used in hotel budgeting and forecasting when a cost-effective tool is unavailable, which results in failing to identify the underlying factor. This dissertation successfully employs GSP as the macroeconomic factor. The GSP data is available on the BEA website, and can be downloaded to a personal computer spreadsheet. Simple regression may be performed in Excel, or copied through a cut and paste procedure into a statistical software format for running the regression equation.

Summary

The hotel revenues of all 50 states and the District of Columbia were tested under three hypotheses for explanatory variables. The correlation statistical technique was successful in identifying GSP explanatory variables for state hotel revenues. Simple regression was used to identify significant relationships between the GSP of specific entities and state hotel revenues. Eighty-six percent of the state hotel revenues were explained by the same state GSP or another state’s GSP, which supports the need for a regional emphasis in establishing revenue increase guidelines. Additional implications of regional economic factors are discussed in Chapter 5.
CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

After reviewing the findings of the three hypotheses tests in Chapter 4, this chapter integrates the key concepts of the previous chapters and addresses the implications of the findings. The key concepts are first reviewed. They are followed by a discussion of the implications of the findings of each hypothesis. Subsequently, some hotel industry budgeting and forecasting recommendations are presented. Finally, some suggestions for future research and the limitations of this study are discussed.

Review of Key Concepts

This dissertation has focused on three problems in budgeting and forecasting in the lodging industry. The three focus problems are inaccuracy and inefficiency in budgeting and forecasting, and behavior issues related to inaccuracy and inefficiency. These three concepts dynamically interact. For example, if a hotel management company has a strategic goal to increase profits by ten percent in the coming year, and calculates a need to increase revenues by five percent to meet the profit goal, budget instructions may be issued to grow revenue by six percent or more. If the national economy is expected to only grow three percent, such a six percent growth target may be unrealistic. Several
hotels in the chain may be in local economies that are anticipated to perform at levels below or above the national economy. With a national growth target, however, some hotel management teams will be asked to meet unrealistic targets, while other management teams will be insufficiently challenged. Both situations present potential behavioral issues. Low morale, reducing key brand guest services, or simply increasing employee turnover, are some possible behavioral results of unrealistic targets. Free riding and overspending are some possible outcomes of insufficiently challenging management teams.

This dissertation builds upon the findings of Brown and Atkinson (2001), Schmidgall and DeFranco (1998), Treyz (1993), Fanning (1999), and Kennedy (1999). These authors reported how a lack of sophistication and a lack of a regional focus in budgeting and forecasting may lead to inefficient and inaccurate budgeting and forecasting processes, which may cause behavioral issues. The first issue of accuracy is the main focus of this dissertation, which establishes an objective, quantitative approach to budgeting and forecasting. One approach to objective and quantitative budgeting and forecasting includes an emphasis on identifying which economic factors impact hotel revenues. Once accuracy is improved, efficiency will also improve by reducing the number and magnitude of revisions required. If accuracy and efficiency are improved, there is less likelihood of related behavioral issues. Budget targets based on objective economic data facilitate discussion on strategic issues, rather than on behavioral issues.

After discussing the desirability of objective, quantitative budgeting and forecasting, the literature was reviewed. The literature review focused on budgeting and forecasting theory, business needs for budgeting and forecasting, current practices, and causes and
solutions for inaccuracy, inefficiency, and related behavioral issues. Thomopoulos (1980) and Wheelwright and Makridakis (1985) describe the growing need for accurate and frequent forecasts in business since World War II. Shim, Siegel, and Liew (1994), and Morrell (2001) posit that the need forecasting addresses is the reduction of risk and uncertainty. Makridakis (1990) and Morrell (2001) specifically address the need for forecasting accuracy, which directly relates to reducing risk and uncertainty.

Barsky and Bremser (1999) discuss the role of budgets in performance measurement, which sets the stage for behavioral issues in budgeting and forecasting. Zimmerman (2000) recognizes the role of self-interest in the budgeting process, while Walker and Johnson (1999) show that a divergence between personal and organizational goals may lead to a difference between actual results and budget. Fanning (1999) posits that behavioral issues are related to inefficient and ineffective budgeting processes. Lapide (2000) and Myers (2001) discuss problems with various current practices in budgeting and forecasting, which include the significant time commitment, in part due to inaccuracy and inefficiency.

Other studies focused on the types of forecasting methods. The two broadest types of forecasting are quantitative and qualitative (Schmidgall, 2002). Wheelwright and Makridakis (1985) present a comprehensive breakdown of forecasting methods. Regression, a quantitative technique, and the technique used in this dissertation, is reviewed at length. Qualitative techniques, the sales composite forecast and judgmental forecasts in particular, were also reviewed for their application in combination with the regression technique. These two latter qualitative techniques were also found to be used heavily in current practices.
Methodology Summary

Correlation was used to identify the most likely explanatory variables for state hotel revenues. Using SPSS, hotel revenues of each state were tested for correlation with the same state gross state product (GSP) without hotel revenues, the U.S. GSP without the same state GSP, and every other state GSP. The hotel revenues were removed from the same state GSP, and the state GSP was removed from the U.S. GSP to avoid redundancy in certain tests.

Several models were reviewed to find an appropriate approach to improve hotel revenue forecasting. The Hospitality Research Group/Torto Wheaton Group (2002), the Price Waterhouse Coopers model (2000) and several tourism models, Reece (2001), Fish and Waggle (1996), Chan (1993), and Kimes and Fitzsimmons (1990), utilize local, state, and national economic factors as independent variables for predicting hotel or tourist revenues. Many models use personal income or gross domestic product (GDP) as explanatory variables. The advantage of using GDP is the inclusion of economic factors other than wages. The disadvantage of using GDP is the unavailability of data in some countries and in short time periods. This dissertation uses gross state product (GSP), which is available on an annual basis from 1977 to 2000, and which is similar to GDP on a state level. The state level data was used to obtain a regional approach to forecasting.

A major step in building a model to explain regional hotel revenues was to obtain the data for hotel revenues. Public hotel company revenue is only available in global terms and possibly at the brand segment level. Property by property hotel revenue is confidential and is not generally available. The economic value added concept was used to represent hotel revenues on a state level. Two representative tests were made with
national hotel data to verify that the value added concept adequately represents hotel revenue.

The GSP with the highest correlation value with a given state’s hotel revenues was the first independent variable used in a simple regression model. If more than one GSP had the same correlation value, all GSP’s at the highest correlation value were tested for explanatory value. Regression assumption tests for normality, error independence, and error constancy were run for each significant regression equation. If abnormality or heteroskedasticity were detected, the regression models were rejected. If error dependency was detected, the E-Views AR (1) test, or autoregressor correction, was conducted. If the regression model with the AR (1) variable was significant, the original regression model was accepted. The highest R squared value of various significant regression equations was then used as the best-fit model.

Implications of Hypothesis One Findings

There were seven states whose hotel revenues were best explained by the same state GSP without hotel revenues. The Hypothesis One findings support the concept that the hotel revenues of many locations coincide with the local or regional economic activity. In other words, people stay in hotels because they travel to an area to buy or sell products from local businesses. The more local businesses buy or sell, the greater the same area hotel revenues. There was no location pattern among these seven states, as they represented several regions of the nation, which indicates that there is no geographic restriction to the relationship of local economic activity and local hotel revenues. Except
for Massachusetts, which is large in area compared to some neighboring states, the other six states are sizable in square miles.

This Hypothesis One test supports the multiple hotel development concept of a particular geographic region, which is similar to the study of Kimes and Fitzsimmons (1990). For example, if a chain has a hotel in Texas, it may be ought to have three, one in Houston, one in Dallas, and one in Austin, the state capital. For conventions and tourism a fourth hotel in San Antonio may also be appropriate. There is a significant amount of travel that occurs among these cities for business, convention, and pleasure purposes.

There is certainly economic activity in other states and nations that influence the hotel revenues of Texas, however, the state of Texas economic activity dominates the explanation of Texas's hotel revenues. It appears that the economic activity of Texas drives how many visitors from within or without the state come to do business in Texas, or come to visit friends, relatives, or attractions, which are the primary reasons for staying in hotels.

From the point of view of state economic activity, California is very similar to Texas. Due to the north-south travel patterns and tourism attractions, a hotel chain would want to have hotels in San Francisco, Los Angeles, Orange County, San Diego, and probably Sacramento, the state capital. As a coastal state, there is substantial pacific-rim economic interaction with the California economy. However, the in-state economic activity, just as in Texas, dominates the explanation of hotel revenues. There was one additional relationship for California worth noting. There were three other states whose GSP also were significant in regression equations with California's hotel revenues. These states were Connecticut, Maine, and Vermont. A further review of the hotel revenues of
Connecticut and Maine indicate a significant regression equation with the GSP of Massachusetts. An additional New England state interaction is that the GSP of Maine explained the hotel revenues of Vermont. The hotel revenues of Massachusetts were also significant with the GSP of California. The relationships among the hotel revenues and GSP of California, and the New England states of Connecticut, Maine, Vermont, and Massachusetts, merit additional research. It appears that there is a strong economic interaction between the technology industries of California and these New England states. The GSP of California, however, remains the best indicator of California hotel revenues.

The hotel revenues of other states in this Hypothesis One group, such as Tennessee, Idaho, and South Dakota, are also explained by the economic activity within the state. Unlike California, these three states seem to have less interaction with economic activity outside the state. The GSP of eight states had significant regression equations with the hotel revenues of Tennessee, but all eight failed assumption tests, and, therefore, were rejected. The insignificant regression models of these other state GSPs further support the relationship of Tennessee's economic activity and hotel revenues. The GSP of Nevada and Oregon were also significant in explaining Idaho's hotel revenues, but the correlation levels and R squared levels were less than those of the GSP of Idaho. Whereas the most important finding in studying Idaho’s hotel revenues was their relationship to Idaho’s GSP, the additional information regarding their relationship with the GSPs of Nevada, and Oregon, support the concept that hotel revenues coincide with the regional economic activity. South Dakota may be simply an issue of hotel revenues tied to the in-state economic activity, which is at a relatively low level compared to many other states.
The hotel revenues of the remaining states in this hypothesis one group, Georgia, Massachusetts, New Mexico, and Oregon highlight the importance of in-state economic activity, but also support the relationship of hotel revenues to regional economic activity. For example, the hotel revenues of Oregon also had significant regression equations with the GSPs of the nearby states of Nevada, Idaho, and Washington.

Implications of Hypothesis Two Findings

There were only two states, Alabama and Florida, whose hotel revenues were best explained by the U.S. GSP. Whereas the hotel revenues of these two states had significant equations with other states’ GSP, the national economic activity was the strongest explanation of hotel revenues for these two states. Alabama has a relatively low economic activity level in comparison to many states, thus the hotel revenues of Alabama appear to be related to the national economy. By comparison, the state of Florida has a high level of tourism that is supported by visitors from several areas around the country. The results of this hypothesis test tend to show that hotel revenues of states with low economic activity or with highly concentrated tourism attractions tend to be explained best by national economic activity. Other states, such as Alaska, Arizona, and Colorado, could arguably be placed in this Hypothesis Two category, as their hotel revenues also tested significant with the U.S. GSP. As well, another group of industrial states, such as Illinois, Michigan, and Pennsylvania, whose own economies are influenced by economic activity, could also be placed in this Hypothesis Two group. The hotel revenues of these industrial states tested significant with the U.S. GSP. The
implication is that hotel revenues of states with high levels of tourism or manufacturing may be best predicted by using national economic factors.

Implications of Hypothesis Three Findings

There are 36 states and the District of Columbia in the Hypothesis Three group, whose hotel revenues are best explained by the GSP of another state. The number of hotels in this group is both logical and somewhat surprising. A pre-supposition of this study was that hotel revenues were either driven by local or national economic activity. The author's suspicion was also that the independent variable, local or national economic activity, would distinguish a state's hotel revenues as being either business or leisure oriented. In other words, if local business activity did not explain a given state's hotel revenues, the travelers to such a state would be from several states. These travelers from several states would make over-night travel decisions measured by national economic activity. The author also thought that in a few cases only, the local or national economic activity might not adequately explain a given state's hotel revenues. In such cases, it was thought that the economic activity of nearby states might explain the hotel revenues of such states. The correlation and regression tests indicated that the hotel revenues of 17 states were best explained by economic activity of adjoining or nearby states.

The large number of states in this Hypothesis Three group indicates that much economic interaction exists among the hotel revenues of one state and the economic activity of other states. For a forecasting hotel executive, this may mean that segmenting states into small groups is appropriate for forecasting accuracy. Therefore, the groupings of STR and the BEA are still too large to identify important regional influences. A
recommendation of combining several states with small hotel revenues into forecasting groups is proposed as a suggestion for further research.

There were 20 states in the Hypothesis Three group whose hotel revenues were explained by states that are not adjoining or near. As discussed above in Hypothesis Two implications, many states could arguably be placed in a national economic activity category. The remaining states may or may not have readily available explanations. Many possible explanations have been offered in this dissertation, but additional research is suggested. To fully explain the issue, it is recommended that apparent spurious relationships not be discarded without additional testing. Usefulness of the relationship is the recommended sorting criteria. For example, Dr. Roll of UCLA predicted Florida's weather better than meteorologists by using the futures prices of frozen orange juice (Dobbs, 2003).

Mississippi hotel revenues are the least explained by the GSP of any other state with an R squared value of 85 percent. The U.S. GSP explains 75 percent of Mississippi's hotel revenues. Hoteliers forecasting Mississippi hotel revenues may simply want to use a national economic factor and review any particular hotel circumstances for adjustments to the national trends. The use of a national economic factor would also facilitate grouping Mississippi's hotel revenues with Alabama and Florida.

The GSP of Arizona best explains Missouri's hotel revenues. From a practical standpoint, however, the GSP of the adjoining state of Kansas also explains Missouri's hotel revenues. The GSP of Kansas would be the practical choice to explain Missouri's hotel revenues, as well as allow Missouri to be grouped with other Midwestern states.
The hotel revenues of North Dakota have a strong relationship with western states that would allow a grouping with these states. Washington is similar to Missouri. For a slight loss of explanatory value, the state’s hotel revenues could be explained by Oregon and other western states, and allow inclusion in a western state forecasting group. West Virginia hotel revenues are apparently related to the economic activity of Texas. No other explanation is readily apparent.

Observations About States Failing Hypotheses Tests

There are some interesting observations that can be made regarding the hotel revenues of five states that were not explained by any of the three hypotheses tests. With only five states in this category, it means that 45 other states and the District of Columbia, or 90 percent, are explained by these three hypotheses tests. There appear to be two sub-groups within these five states, whose hotel revenues are unexplained by this study. One such sub-group includes the states of New York and New Jersey. These are states for which no regression test was significant. The lack of significant explanatory variables in the U.S. would indicate that economic factors outside the U.S. are involved in explaining the hotel revenues of these two states.

The second such sub-group includes the states of Minnesota, Nebraska, and North Carolina. Although none of these three states’ hotel revenues had a significant regression equation with any significant correlation value in the U.S., there were other significant relationships worth noting. The GSP of Minnesota explained the hotel revenues of Indiana, the GSP of Nebraska explained the hotel revenues of Kansas, and the GSP of
North Carolina explained the hotel revenues of South Carolina. North Carolina's GSP was also significant at a lower R squared value than the selected state in explaining the hotel revenues of the states of Kansas and Michigan. Further research may reveal that a grouping with other Midwestern states may be significant by including these three states.

Integration of Qualitative and Regression Techniques

Makridakis (1990) posits that a simple statistical forecasting method is superior to other methods. Schmidgall and DeFranco (1998) highly recommend greater quantitative analysis in hotel forecasting. This dissertation supports the use of simple statistical techniques, in this case simple regression, to identify significant regional economic factors of hotel revenues. However, just as this dissertation has emphasized the regression technique, it has also recognized the importance of practicality in regression relationships. Human judgment may be required to sort through the regression equations to find a practical explanatory variable.

Hotel executives are also familiar with the capabilities of their subordinates and local market conditions. Knowledge of people's abilities, knowledge of the strength of the brand in the local marketplace, and knowledge of regression relationships combine to strengthen the budgeting and forecasting process. The economic factors can serve as a baseline for revenue increases, while adjustments can be made up or down from the baseline depending on manager strengths and brand strength. The studies of Schmidgall and DeFranco (1998) and Brown and Atkinson (2001) indicate that current hotel industry
practices emphasize the manager ability and brand strength arguments to the exclusion of quantitative analysis to set budgeting and forecasting guidelines.

Limitations

There are several limitations to this study. First, GSP is a broad economic factor, and as such, may have a relationship with the revenues of most industries. This is one of the reasons for the high correlations and R squared values in the regression tests of this dissertation. This is also the reason for using small differences to identify the explanatory variable. People from many industries, however, stay in hotels. From this standpoint, GSP is an appropriate economic factor to explain hotel revenues, especially hotel revenues on a state level. Depending on the geography of the hotel revenues being examined, other economic factors may be more appropriate. For example, the hotel revenues of Orlando, Florida, may be more related to U.S. personal income than the U.S. GSP. One advantage of using personal income is its monthly availability.

Second, hotel revenues of some states may need international explanatory variables. This dissertation concentrated on U.S. variables to explain hotel revenues. Although GSP is impacted by international economic activity, international economic factors may add explanatory value to states such as New York and New Jersey, which were not explained by U.S. economic factors.

Third, this dissertation examined total lodging revenues in each state. There was no market segmentation in the tests for explanatory variables. Therefore, it is not appropriate to assume that gross state product would impact each market segment
equally. Hotel executives could use their proprietary data to test their own market segments with the appropriate GSP as an explanatory variable.

Finally, the relationship of several states’ hotel revenues and other states’ GSPs were not readily apparent. This dissertation established a framework for identifying explanatory variables for state hotel revenues. Initial explanations of not so apparent relationships were also provided. Additional research may uncover the depth and nature of these not so readily apparent relationships.

Future Research

This dissertation presents several opportunities for future research. This study has focused on state-level data. There are many hotel markets that merit greater segmentation than that of a state level. The states of California and Texas were discussed in this regard. An even more localized approach may also be necessary. For example, there are frequently distinct hotel markets between downtown and airport markets of large metropolitan areas, such as Los Angeles, New York, Atlanta, and Dallas. On the other hand, maybe the hotel revenues of states such as North Dakota, Montana, and Wyoming should be combined. Whether expanding or contracting the geographical area of a state, this dissertation can be used as a framework for identifying economic factors that influence hotel revenues.

This dissertation included some of the behavioral issues of inaccurate and inefficient budgeting and forecasting. One of the underlying causes of behavioral issues in budgeting and forecasting is that budgets are linked to incentive compensation. Accurate and efficient budgeting and forecasting methods may significantly reduce related
behavioral issues, but there are opportunities to explore other compensation approaches as well.

This dissertation focused on the identification of explanatory variables from a historical perspective. The next step would be to test the predictive nature of these explanatory variables. A longitudinal study tracking the accuracy of the relationship between the appropriate forecasted GSP and the corresponding actual state hotel revenues would test the predictive value of state or U.S. GSP.

While striving for parsimony and cost effectiveness, this dissertation did not consider lagged variables. Some current industry forecasting models include lagged variables for occupancy, average daily rate (ADR), and new development. Future research may include lagged variables to test model improvement, especially for states with lower $R^2$ values, and for states without significant regression models.

There were several significant regression models of feeder state relationships that are not readily understood. Some initial investigations indicate possible explanations, but additional research is appropriate to fully understand these relationships. Hotel forecasters may use the relationships identified in this dissertation, however, additional information would make the not so readily understood relationships more useful.

Summary

Hotel revenues in the U.S. are highly related to local, regional and national economic activity, as represented by state and U.S. GSP. Correlation tests between hotel revenues of states and the GSP of all states and the U.S. lead directly to significant regression models. The regression models for hotel revenues of most states also have practical
value. In other words, the use of the same state GSP, a neighboring state, or the U.S. GSP to explain state hotel revenues seems logical when examining a given state's hotel market. This study is consistent with prior research on this subject. Hotel executives conducting revenue forecasts could easily use the simple regression technique employed in this dissertation to identify economic factors for their hotels. The use of regression would increase the accuracy and efficiency of the budgeting and forecasting process. Once the regional economic factors are identified, the budgeting process can then focus on strategic property initiatives that may boost a property's performance above general market conditions. In fact, with one piece of information, anticipated group room sales, the corporate office armed with regional economic factors could produce the property budget and forecast and save countless, unproductive hours of property managers. Once revenues are determined, data from multiple previous years is available to track profit performance.
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