

ABSTRACT

CARR, JESSICA LEIGH. An Analysis of Climatic and Economic Conditions Affecting Tourism in the Coastal Region of North Carolina. (Under the direction of Gene Brothers, Larry Gustke, and Karla Henderson).

The purpose of this research is to investigate selected climatic and economic conditions affecting tourism in the Coastal Region of North Carolina by using multiple regression analysis and comparing multiple models to determine the best fitting model(s). The research expands on current quantitative data obtained in the area to provide applications for tourism. This study is exploratory to determine if the applications of regression modeling can provide a better understanding of the tourists' consumer behavior and to provide a tool for tourism professionals to develop and implement policies and planning to maximize visitation. The research involves the application of standard linear multiple regression analysis for eight explanatory variables chosen based on literature and availability of data. The variables included in the research are rooms rented (represented by room demand), room supply, average daily rate, travel price index, gas prices for the lower eastern region of the United States, maximum temperature, minimum temperature, and precipitation averaged on a monthly basis. The results indicate that the climatic and economic variables used in this study explain over three-fourths of visitation to the Coastal Region of North Carolina. Temperature has the greatest explanatory power of all the variables used in the models to explain tourism to the Coastal Region. Precipitation had the least explanatory power within the models. The study provides empirical evidence of the impact of climatic and economic conditions on tourism, which indicates the influence they have on tourist behavior.

An Analysis of Climatic and Economic Conditions Affecting
Tourism in the Coastal Region of North Carolina

by
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DEDICATION

To my mother, Wendy, your enduring and unconditional love has been the foundation of my success through good times and bad. Thank you for being my sounding board.

To my father, Larry, you are the voice inside my head that drives me to achieve new goals. Thank you for helping me to become the adult I am today.

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To my husband, Brad, thank you for believing in me and supporting me through this process. You are my best friend and biggest fan.

BIOGRAPHY

Jessica Carr was born in Miami, Florida on February 17, 1978. She grew up in Ft. Lauderdale, Florida until she moved to Raleigh, North Carolina to attend college. In 1999, while in college at North Carolina State University, she joined the North Carolina Army National Guard as a Military Paralegal. While attending college she met her husband Brad Carr. They were married in St. Roberts, Missouri in 2001 after being reassigned from North Carolina. Jessica and Brad were relocated again to Fort Irwin, California. Jessica remained there until she obtained her Bachelors of Arts in Business Administration and commissioned as an officer in the U.S. Army through R.O.T.C. She was then stationed at Fort Bragg, North Carolina. Jessica served one tour in support of Operation Iraqi Freedom and later separated from the military in 2006. She remained in Hope Mills, North Carolina continuing to support her husband's military career.

After taking a few months, working at Campbell University at Buies Creek, North Carolina and traveling, the author decided to continue her education. She started her Master's of Science in Parks, Recreation, and Tourism Management at North Carolina State University in 2007. Jessica's previous work experience has provided her insight into public affairs, public relations, government, management, information operations, strategic planning, and leadership. She has guest lectured on tourism for undergraduates, worked as a graduate assistant contributing to the expansion of the North Carolina Travel Tracker from 2008-2009. Jessica has also worked on three tourism development plans throughout North Carolina under Dr. Gene Brothers, Dr. Larry Gustke, Dr. Leon Mohan, and Dr. Carol Kline.

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Chapter One

Introduction

The purpose of this study was to investigate selected climatic and economic conditions that affect tourism to the Coastal Region of North Carolina by exploring the use of multiple regression analysis and comparing multiple models to determine the model(s) that best fit. A secondary purpose of this study was to expand on the types of quantitative research done in North Carolina and provide alternative uses for the data collected by tourism professionals and organizations. Overall, tourism research using the traditional quantitative data collected in North Carolina has increased over the past decade. For example, the North Carolina Travel Tracker is a tourism barometer that allows tourism professionals to gauge, at a glance, how tourism is doing over an extended four year period. However, the possible uses of these data are vast and this study was designed to show how the data collected could be used for in-depth analyses. The remainder of this chapter provides an introduction to the research conducted in this study.

In North Carolina quantitative researchers, using mostly economic methods, have examined tourism in the regions of the state (i.e., Mountains, Piedmont, and Coastal Regions). However, no focus has been on the use of the quantitative data to examine the cause and effect relationships of “why people travel to the Coastal Region of North Carolina”. The tendency of tourism professionals and organizations is not to share the quantitative data collected for tourism with fellow organizations, which limits the ability for more comprehensive research. Another tendency within the tourism industry is to keep the data segmented rather than combining it with other data related to tourism for

comprehensive analysis. These practices limit the ability of tourism professionals to understand how changes in economic and environmental conditions affect tourism behavior.

As mentioned before, one way tourism data has been collected for use in research is through the North Carolina Travel Tracker. Various tourism organizations use this tool to predict or gauge tourism to their community, county, region, state, or nation. The North Carolina Travel Tracker presents a graphical representation of the past with no investigation into the cause and effect relationship the data have on tourism to North Carolina, or its three regions.

The Coastal Region in North Carolina was chosen for this research because of its unique and diverse geographic features, attractions, and climate patterns. The Coastal Region of North Carolina has tropical-like environments to the South and marsh/swamp-like regions to the North. This region is expansive encompassing 27 counties, which offer the Outer Banks in the North, Wilmington in the South, and many attractions in between. Historically, visitors have traveled to the Coastal Region of North Carolina during the months with more comfortable temperatures, which are graphed in Figure 1.1.

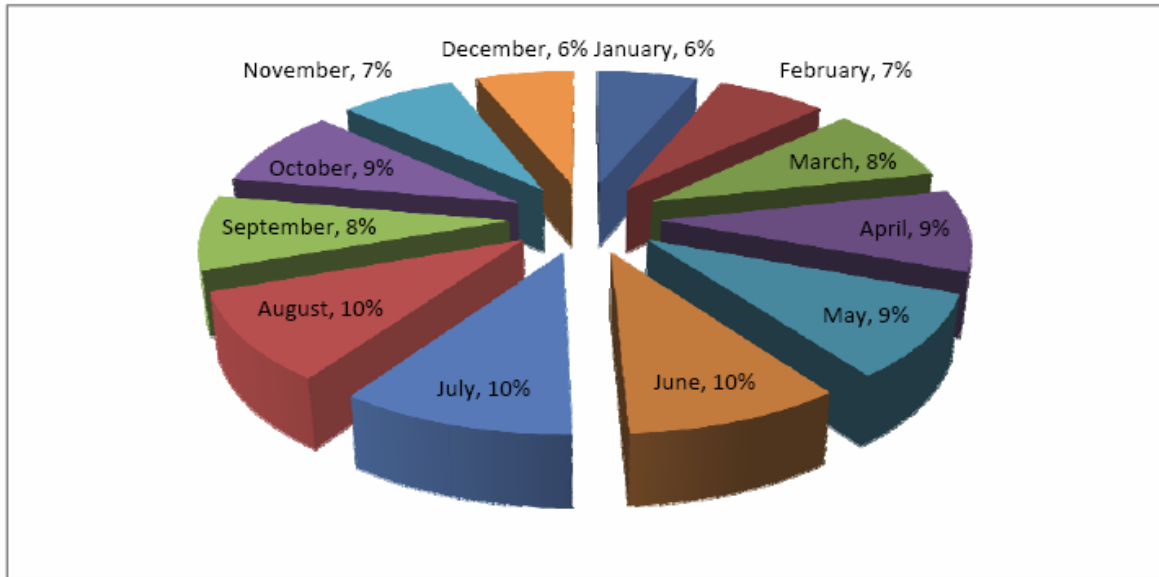


Figure 1.1 Average Monthly Room Demand Percentage Change for the Coastal Region of North Carolina (1995-2009)

Tourism professionals in the Coastal Region traditionally have forecasted and projected tourism based on experience and observation. The use of regression modeling can be used to explore tourism professionals' hypotheses of what affects tourism behavior. The use of forecast modeling has been increasing within the tourism industry throughout the world and is becoming important as a viable tool for forecasting tourism trends.

Scope and Scale of Tourism Research

Research in the tourism field has been gaining momentum over the past 30 years with appeal to scholars from various fields of research making it an interdisciplinary field of study. Research studies in tourism range from simple to complex models and methods. Contributions made to the industry include Tourism Satellite Accounts (TSA), structural

Destination Management Organization (DMO) modeling, destination position analysis, branding, customer service, and environmental contributions.

Since 1978, the use of statistical methods in tourism research has provided new empirical approaches to analyzing impacts to and from tourism. The importance of statistical modeling is significant to travel product providers to increase productivity and allow organizations to make more informed decisions. The modeling has become more streamlined and effective. Acher (1987; 1994), Fretchling (2001), Hiemstra and Wong (2002), Shih, Nicholls, and Holecek (2009), Song and Li (2008), Song and Witt (2000), and Stynes and Chen (1985) have conducted in-depth research into statistical modeling to determine the cause and effect relationship of tourism behavior using regression modeling.

The importance of this research can be summarized by Goeldner and Ritchie, “travel research is the systematic, impartial designing and conducting of investigations to solve travel problems” (2003, p. 500). However considering Smith’s (1995) perspective is important in that, “the industry lacks consistent, credible, and coherent data for many important decisions. The need for better data extends from the classroom to the boardroom, from local ‘mom-and-pop’ businesses to the United Nations” (p.2). Therefore there is an urgent need for accurate and effective statistical models within the industry.

Since Smith’s (1995) work, an increasing use of statistical research was observed by Li and Song (2008) indicating a shift in research philosophies in tourism. Furthermore, over the past three decades local, regional, and national economies have emphasized the importance of statistics in research tourism. Jafari’s (1990) article elaborated on several platforms that indicated the evolutionary processes of thinking about tourism and its emergence as a “knowledge-based field of study” (p.34).

Regression Analysis and Modeling

Regression analysis, like time series analysis, is a linear forecasting method that can be useful to explain and predict travel and tourism trends. It is a quantitative approach, using mathematical equations to explain tourism behaviors using different variables. Regression analysis is considered a casual or quantitative approach that allows researchers to simulate cause and effect relationships in forecasting. Choosing the appropriate model will provide the best fit to allow tourism managers and marketers to make more informed decisions (Frechtling, 2001).

Regression analysis is unlike time series because time series methods use past data to predict the future and only examine patterns versus the relationship of the variables. Both approaches are relevant to tourism professionals. However, regression analysis is pertinent to managers when attempting to explain why something is happening. For example, if managers want to determine when the best time is to employ a marketing plan they can use regression analysis to determine what causes lulls in tourism. Additionally, managers can use this information to predict future times to launch marketing to mitigate negative conditions.

The regression model can be one or more equations related to one another. To make the model applicable to tourism professionals the objective is to use a formula that will allow professionals to determine what does or does not contribute to tourism in a geographical region or location (Fretchling, 2001). For the purposes of my study the geographical location was the North Carolina Coastal Region.

Importance and Applications to North Carolina

The Travel and Tourism Industry is one of the fastest growing forms of economic stability for many communities throughout the world. The global economy is shifting from traditional industries such as milling and farming to service oriented industries providing communities around the world with another source of economic viability. In a changing global economy it behooves local communities in the Coastal Region of North Carolina to embrace the possibilities tourism offers. Because the travel and tourism industry is fragmented and encompasses so many industries, its success is one of the most vital to any economy. Predicting and identifying what contributes to tourist motivation and behavior is useful to the success of tourism managers, marketers, planners, and researchers. It enables them to make better and more accurate decisions for the long term effects of their tourism businesses and destinations.

Tourism is an important economic commodity for communities and business around the world. According to the United Nations World Tourism Organization (UNWTO), travel and tourism in the United States in 2008 has contributed an estimated \$5,890 billion in economic activity, which is equivalent to nearly 10% of the total Gross Domestic Product (GDP; United Nations World Tourism Organization Tourism Highlights, 2009). For 2008, North Carolina's Department of Tourism, Film, and Sports Development Office's economic impact of tourism fast facts (2009) reported domestic travel in North Carolina contributed \$16.9 billion to the state's GDP. According to North Carolina's Department of Tourism, Film, and Sports Development Office's 2008 Visitor and Trip Profile, North Carolina ranked 7th overall in the nation for travel and tourism and 6th in the nation for person trip volume (North Carolina's Department of Tourism, Film, and Sports Development, 2009). Understanding

how much the tourism industry contributes to communities is important and emphasizes the need for continued research in the tourism field.

As more communities, states, nations, regions, and unions begin to enter the global travel and tourism market, the industry is likely to become more competitive. Therefore, overcoming the competition and capturing a greater market share will be difficult. Industry leaders need to understand what affects tourist consumer behavior. Understanding tourist behavior serves to provide tourist professionals and leaders with the ability to incorporate policies, future plans, and marketing packages that can provide an edge to a destination and help overcome the increasingly competitive market. Because of the increasing competition among tourist destinations, supply and demand conditions are more complex requiring rigorous applied research (Matias, Nijkamp, & Neto, 2007).

To lessen the affects of competition in tourism, a better understanding of how climatic and economic variables influence and affect tourist behavior is necessary for tourism professionals. Because a portion of tourism research focuses on qualitative research to explain the cause and effect relationships of tourist behavior, my study intends to use a quantitative approach that will compliment the qualitative research already conducted. My study focuses on the variance in visitor numbers relative to climatic and economic variables over the course of fourteen years (1995-2008). Several factors may contribute to tourism such as improvement in transport systems and infrastructure, new information technologies and logistics (e.g. internet and online vacation packaging companies), increase in GDP and disposable income, more leisure time, and globalization (Matias et al., 2007). However, some of these variables are difficult to quantify and therefore are excluded from tourism studies (Shih et al., 2009).

Purpose of Study

The research questions developed for this study were: 1) Are there significant relationships between climatic variables and economic conditions (variables) related to visitation to the coast of North Carolina, 2) Can the relationships found explain and predict tourist behavior; 3) Is multiple regression analysis a useful tool for forecasting tourism behavior to the coastal region of North Carolina, and 4) Does the study provide a tool for decision makers to allow for better policy, marketing, and business choices in the North Carolina Coastal Region?

Based on a review of tourism research literature, tourism behavior clearly is influenced by climatic and economic conditions (Shih et al., 2009). However, little research has been conducted to determine how the combination of environmental and economic variables together influences tourist consumer behavior. The model in my research provides a quantitative tool for tourism managers at all levels to gauge tourism behavior as well as forecast tourism visitation. The research explores the relationship between climatic and economic factors and tourism along the coast of North Carolina. This study was conducted using multiple regression analysis. In addition the usefulness of the analysis was evaluated as a tool for forecasting tourism behavior.

Definitions

For my study, certain terms were defined and operationalized. They included the following:

Tourism Demand Forecasting: A process designed to reduce the risks of tourism marketing and other management decisions through the use of forecasting (Fletcher, 2001).

Visitor: Defined by the United Nations' World Tourism Organization, a visitor is someone who travels outside their usual environment for not more than one consecutive year for leisure, business, and other purposes (Goeldner & Ritchie, 2003).

Dependent Variable or Response Variable: The predicted variable in the regression equation.

Independent Variable or Explanatory Variable: The predictor variables in the regression equation.

Economic Variables:

Occupancy Supply (Rooms Available): The number of rooms times the number of days in the month (Church, C., 2009).

Gas Prices: The average monthly price for regular gas in the Lower Atlantic Region (Energy Information Administration, 2009).

Travel Price Index: A monthly report that measures the cost of travel away from home in the United States . based on U.S. Department of Labor price data collected for the monthly Consumer Price Index (CPI). (U.S. Travel Association, 2009).

Occupancy Demand: (further known either as Room Demand or Rooms Rented) the proportion of the hotel inventory occupied during a given month in the coastal region.

Average Daily Rate (ADR): The average cost of hotel rooms over the period of time and indicate fluctuations in demand in the area being studied and is used to determine travel expenditures.

Environmental Variables: Data provided in study was collected by the State Climate Office of North Carolina (State Climate Office of North Carolina, 2009).

Average Maximum Temperature: The average monthly high temperature for the Coastal Plains Region recorded in degrees Fahrenheit (F°).

Average Minimum Temperature: The average monthly low temperature for the Coastal Plains Region recorded in degrees Fahrenheit (F°).

Precipitation: The total amount of rainfall measured in inches in the Coastal Plains Region.

Regression Equation:

$Y = c + b_1x_1 + b_2x_2$, where Y is the true dependent, the b's are the regression coefficients for the corresponding x(independent) terms and where c is the constant or intercept.

Organization of Thesis

The organization of this thesis follows a standard format. In the next chapter a literature review of regression modeling in tourism is conducted. The third chapter provides a comprehensive explanation for the data collection and methods used in the research. The fourth chapter provides the findings of the research conducted and the last chapter provides the conclusions and discussion.

Chapter Two

Literature Review

Tourism as a Field of Study and Current Issues

The in-depth study of tourism by researchers and professionals has transpired from purely a business forum to a postmodern field of research (Tribe, 2005). Huyssens (1990) defines postmodern as “a slowly emerging cultural transformation in Western societies, a change in sensibility” (Huyssens, 1990; Sutton & House, 2009). Pearce (2005) argued that tourism study was not a field that is growing into a science with theory, but a field of research that incorporates phenomenon with diverse contributions and conceptual schemes. The dominance of strategic and policy focused work and the rapid growth of tourism studies has left a deficit in the development of theory in tourism as field.

Within the social science fields, economic modeling and analysis can be used to determine behavioral patterns of people related to theory. In this context tourism professionals applying economics to tourism need to incorporate human and social behavior (Bahar & Kozak, 2008). Tourists’ experiences are always influenced by external factors outside the control of the tourists, tourism companies, or tourism professionals who are promoting or selling the tourism product (Swarbrooke & Horner, 1999). An economic theory that takes into consideration choice behavior in tourism is consumer behavior theory. Consumer behavior is a difficult phenomenon to research, especially within the study of tourism (Swarbrooke & Horner, 1999). Motivations for vacationing and leisure travel are

personal and emotionally charged, and include both internal and external stimuli that shape people's decisions (Swarbrooke & Homer, 1999).

In tourism different conceptual schemes have been adapted and applied. Economic models are useful because they identify cause and effect relationships. Determining cause and effect relationships are indispensable to tourism professionals in predicting future outcomes and better understanding how tourists make their decisions. The importance of these models in tourism is addressed in the next section where a comprehensive review of tourism demand modeling and forecasting research is conducted.

The Importance of Statistical Analysis in Tourism

The degree in which a field of study has progressed is often based on the use of empirical research incorporating statistical techniques in the scientific method (Palmer, Sesé, & Montano, 2005). Over the past four decades, tourism demand analysis has seen major changes in research interest, growth of theoretical foundations, and advances in research methodologies (Li, Song, & Witt, 2005). This section presents an overview of trends in research analysis within the Hospitality and Tourism Industry with a focus on trends in research design and statistical techniques used over the past 30 years and published in industry journals.

The use of statistics in tourism to forecast visitation is increasing. The foundation for reviewing the breakdown of statistical processes in tourism began with Grazer and Stiff's (1987) work. Their study analyzed statistical techniques used in 922 journal articles published in four marketing journals between the years of 1980-1985. Their study provided a foundation for tourism researchers. Even though Grazer and Stiffs study reviewed articles

written within the marketing discipline, the significance of their contributions to tourism have been recognized by others such as Baloglu and Assante (1999), Crawford and McCleary (1992), Palmer et al. (2005), and Reid and Andereck (1989). These authors acknowledged the close relationship of marketing to tourism. The field of marketing has been long established and its methods and models have become more sophisticated.

Glazer and Stiff's (1987) analysis of research indicated 1009 uses of statistical methods and most of the researchers incorporated more than one method within their study. The findings indicated that regression and analysis of variance were the most commonly used in all but one journal. They also found that 30% of all journal articles reviewed presented experimental research designs. Glazer and Stiff showed that a reader of this literature needed to have an understanding of research design, statistical methods, and how the two can be appropriately combined.

Shortly after Grazer and Stiffs' (1987) work was published another article was published by Reid and Andereck (1989). Their article provided a breakdown of statistical techniques used in *Annals of Tourism Research* (ATR), *Tourism Management* (TM), and *Journal of Travel Research* (JTR) from 1978-1987. From the three journals a total of 659 articles were reviewed and of them 373 used some form of statistics or a combination of statistical methods. Similar to Grazer and Stiff, multiple regression was among the most commonly used statistical method. Reid and Andereck found that regression models, analysis of variance, nonparametric techniques, indexes and factor analysis were among the most commonly used methods. The authors further suggested the use of regression/correlation methods had been consistently used in forecast modeling over the ten year period.

These early reviews of statistical methods used in tourism research set a foundation followed by Crawford-Welch and McCleary (1992) who conducted a review of articles published in hospitality journals between the years of 1983-1989. They conducted a content analysis of articles published in five leading hospitality journals and found that of the multiple functional areas (i.e., human resources, management, and operations), human resources received the most attention. Regarding the statistical research, the authors found descriptive statistics and multiple regression and correlation were the most commonly used in hospitality and tourism research journals.

To continue expanding and defining trends with quantitative research in Hospitality and Tourism, Baloglu and Assante (1999) reviewed articles published from 1990-1996 in five hospitality journals. Their article examined boundaries and direction of hospitality research by analyzing the subject area and research method contents of articles published over a 7-year period. They incorporated type of research, type of sample, and unit of analysis employed in the article. They also focused on the nature of the article (i.e., conceptual vs. empirical), the industry to which the article related (i.e., lodging, food services, tourism, and education), the subject focus (i.e., marketing, administration, operations, research and development, and human resources), statistical analysis, unit of analysis, type of sample, and research design. The results indicated that of the 1,073 articles reviewed, human resources compiled the greatest number of articles followed by operations, marketing, and administration/strategy. The only year in which human resources was not the most researched topic in the five journals was 1996 when administration/strategy dominated the research. Of the total 653 research articles analyzed by Baloglu and Assante, 344 used some form of statistical analysis. Like Reid and Anderack

(1989) and Crawford-Welch and McCleary's (1992) findings, descriptive statistics led as the most commonly used statistical approach followed by correlation, analysis of variance, multiple regression, and factor analysis.

The most recent article representing a bibliometric study was conducted by Palmer, Sesé, and Montano (2005). Palmer et al. analyzed 1,790 articles in 12 tourism journals from 1998-2002. The purpose was to examine the use of statistical methods, which extended beyond descriptive techniques within the hospitality and tourism sciences. The results showed linear regression models, factor analysis--principle component analysis, and analysis of variance were the most commonly used techniques. A total of 158 journal articles incorporated linear regression models accounting for over 15% of the articles reviewed.

All these studies reviewed provided examples of statistical methods used in tourism forecast modeling research over the past 30 years. Combined, they provide a comprehensive review of more than 15 research journals and 5,097 articles showing an increase in the number of hospitality and tourism research journals in circulation as well as the frequency of statistics used. Even though statistical methods have expanded and varied in type, the most commonly used and consistently incorporated into tourism research were descriptive statistics, multiple regression, and correlation along with analysis of variance. Multiple regression, in particular has been shown to be practical, successful, and a useful tool within the tourism industry.

Forecast Modeling, Regression Analysis, and Tourism. According to Crouch (1994), regression analysis provided the most suitable and rigorous method for estimation of the relationship between several variables and a single dependent variable. Two forms of quantitative research related to tourism forecasting including time series analysis and regression analysis that both rely on accurate historical data. Time series is used particularly for forecasting future demand while regression analysis has been applied to assess and predict tourism behavior. Often the use of regression modeling in tourism has been limited and overlooked by tourism professionals who prefer time-series analysis to predict tourism trends. Over the past 10 years, however, a few researchers have published research that incorporates forecast and demand modeling in tourism. Among those discussed in this section are Crouch (1994), Song and Li (2007), and Witt and Witt (1995).

Crouch's (1994) research addressed practices in determining international tourism demand. He reviewed 85 studies to determine what was learned regarding tourism demand. He suggested economic factors as well as noneconomic factors were important. A review of the articles indicated income to be the most important determinant providing the greatest explanatory power for demand. Other factors that were reviewed were price, marketing, trends and fashion, special events, and other factors to include lag and lead effect, short and long term effects, and nature of competition. The conclusions drawn from Crouch were that empirical studies varied considerably across the 85 studies. He found that each of these factors were significant to determining international travel flows under varying conditions. Further, the magnitude of the variables fluctuates depending on the type of study conducted.

Following Crouch's (1994) analysis of empirical studies, Witt and Witt (1995) reviewed and evaluated the existing empirical literature on tourism demand forecasting in

another comprehensive review of the literature. Furthermore, they extended the review to evaluate the accuracy of tourism forecasts generated by various models. The researchers showed the results by discussing empirical findings, which suggested that traditional regression analysis produced reasonably good empirical results. Results for spatial models, time-series, and qualitative forecasting were also described. These authors also conducted an accuracy comparison of econometric with non-econometric forecasting, which indicated that econometric forecasting was more accurate. Regarding the forecasting technique, comparisons of the studies reviewed showed that no change model and autoregressive modeling consistently outperformed constant growth rate model, exponential smoothing, trend curve analysis, and econometrics when accuracy were measured by error magnitude. Autoregressive refers to the current periods value regressed on some collection of past values from the same time series (i.e., autoregressive, integrated, moving average model (ARIMA); Fretchling, 2001). Based on the studies reviewed by Witt and Witt, they concluded that implementing a single model appropriate for all origin-destinations was impossible.

Song and Li (2008) reviewed recent tourism demand modeling and forecasting. They found that since 2000, 121 articles have been written that incorporated some form of forecast modeling. Song and Li suggested forecasting literature was dominated by two sub categories of methods: non-casual time-series models and the casual econometric approaches. Of the 121 articles, 72 of the studies used time-series analysis and 71 used a variety of econometric models, which included regression models. Of the 71 articles using econometric modeling, 30 concentrated on the relationships between tourism demand and the influencing factors. Song and Li, like Li et al. (2005), and Lim (1999), concluded that tourism demand could be identified using econometric models. Econometric models have

the ability to show the casual relationships between tourism demand and its influencing factors. Song and Li were able to examine the use of time-series, econometric, and emerging forecasting techniques and their strengths and weaknesses. In conclusion, Song and Li indicated no clear evidence that one model could consistently outperform another and one model could fit every need within these studies.

The literature reviewed indicated the most essential factor when conducting multiple regression analysis was that the model developed must fit the purpose of the study. Multiple regression analysis incorporated techniques to explore the relationships between the dependent and independent variables. While multiple regression analysis is based on correlation, it provides a more complicated exploration of the interrelationship among a set of variables, which makes this method more appealing for complex real-life studies (Pallant, 2007). According to Hiemstra and Wong (2002), multiple regression assumes that the independent variables are largely independent and the subsequent error variance is not correlated. They noted that preliminary models using ordinary least squares regression indicated the presence of significant multicollinearity among the financial variables such as Gross Domestic Product (GDP; which is substituted for disposable income), Consumer Price Index (CPI), and exchange rates. They further expanded their research to include the use of lagging indicators, which means that the model measured net change in the dependent variable from one month to the next. The results of Hiemstra and Wong's study showed that CPI and GDP had a direct impact on forecasting tourism to an area.

Variables Used in Regression Analysis. The most common way to determine which variables are used in multiple regression is to categorize them into Push, Pull, and Resistance factors focusing on variables that change significantly over a period of time. Push factors are those variables that encourage travel away from the home such as population in origin market, GDP, disposable income, and demographics (i.e., age, education, and income). Pull factors represent those variables that attract a visitor to a destination (e.g., friends and relatives, climate/weather, commercial ties, social/cultural ties, and destination attractiveness). Lastly, resistance factors are those variables that constrain travel between origin and destination (e.g., price, natural disaster, and physical barriers; Fretchling, 2001).

A magnitude of potential explanatory variables exists. An article summarizing statistics used in international tourism demand produced a cumulative list of common characteristics used in quantitative tourism studies (Lim, 1999). The findings of the Lim's research indicated that income, transportation costs, and tourism prices were the three most prominent and frequently used explanatory variables in international tourism demand studies.

economic and climatic variables. Previous research suggested that economic variables traditionally used in forecast modeling account for the total demand of a destination. However, the sociological variables reflecting why people selected a destination or a type of tourism are mostly represented in qualitative research. Economic and sociological variables have been shown to have an influence on tourism, and so more research is needed using both economic and noneconomic variables (Crouch, 1994). Much

of the tourist demand literature focuses on the economic and sociological/ psychological aspects regarding why people travel. However, few researchers have addressed travel related to climate factors (Lise & Tol, 2002).

climatic variables research and application to tourism. Researchers are starting to understand the importance of climate on tourism destination choice. Only recently have tourism studies incorporated global warming climate change, and so the impact of climate on tourism is not yet known according to Lise and Tol (2002). Lise and Tol investigated the sensitivity of tourist demand for vacation destinations regarding climate using regression analysis. They also investigated the sensitivity of destination choices by international tourist to climate using three data sets. The first set of data was basic and covered the globe. The third set was detailed and only including Dutch tourists. The second data set fell in-between using Organization for Economic Cooperation and Development (OECD) countries with minor detail. The outcome of Lise and Tol's study showed climate matters in a way that can be quantified. They found climate had a strong affect on tourism demand. Their research showed that different holiday activities imply different preferences for holiday climates using factor and regression analysis.

Shih, Nicholls, and Holecek (2009) quantified the influence of weather variations on downhill ski lift ticket sales in Michigan. They contributed to forecast modeling by expanding on previous research conducted in the field to create better modeling techniques. The authors provided an alternate way to address potential impacts of climate change on the ski sector in Michigan from a supply-side approach. The emphasis was to understand the current relationships as vital precursors to the projection of future impacts of changing

weather conditions and to advise outdoor recreation and tourism stakeholders about the development and implementation of appropriate strategies.

Shih et al. (2009)'s case study was conducted using two ski resorts of different size and usage, but located within a reasonable proximity of each other. The conceptual model created used multiple regression with ordinary least squares and included simultaneous entry of all independent variables. This approach determined the affects of the independent variables on lift ticket sales for peak and off peak ski seasons. The outcome of the study indicated some consistencies and differences. Snow depth was the only local weather variable that showed statistical significance on weather climate influencing ski lift ticket sales. Further, economic shifts did not have an effect on ticket sales. The authors suggested that other reasons that influenced ticket sales were specials offered during off peak seasons and the ability to get accurate weather reports via internet about ski destination. These situations were also considered limitations by the authors because they were difficult to measure as independent variables. Shih et al.'s research indicated the importance of climate change on the ski industry and the importance of keeping better daily activity data that can be shared for future research.

economic variables used in tourism research. In tourism, economic variables can be used in regression modeling. Fretchling (2001) provided a comprehensive list of economic variables used in regression modeling and broke them down into push, pull, and resistant categories. However, he explained that this was not a complete list and there were more variables that could be used in regression modeling (See Table 2.1).

Table 2.1
Economic Variables Used in
Regression Modeling

Economic Variables	Category
GDP	Push
Disposable Income	Push
Consumer Price Index	Resistance
Travel Price Index	Resistance
Product Prices	Resistance
Prices of Substitutes	Resistance
Prices of Compliments	Resistance
Prices of Necessities	Resistance
Exchange Rates	Resistance
Taxes and Fees	Resistance
Arrival/Departure Taxes	Resistance
Terminal Fees	Resistance

Choosing the economic explanatory variables that are appropriate for the research being conducted is important. For example, the literature indicated that if international tourism demand was measured using international arrivals, the economic variables used could be personal disposable income, cost of living, exchange rate, and cost of travel by air or surface. Crouch (1994), Frechtling (2001), Hiemstra and Wong (2002), Song and Witt (2000), and Witt and Witt (1995) all used economic variables to explain tourism demand using forecast modeling. The most common variables used throughout tourism forecast

modeling were tourist arrivals, consumer prices, exchange rates, room rates, disposable income, cost to travel by air and surface, and interest rates.

The Importance of Consumer Tourism Behavior

Consumer tourist behavior is the study of the products tourists buy, why they purchase them, and how they make their purchasing decisions” (Swabrooke & Horner, 1999). Consumer tourist behavior can be explained by consumer behavior theory. My study was designed to explain consumer tourist behavior using multiple regression modeling and understand how to use the information presented to predict future tourist behavior.

Consumer Behavior Theory. According to McConnell and Brue (1999), consumer behavior theory is how consumers allocate their money (i.e., income) among the many goods and services available for purchase. Consumer behavior theory incorporates rational behavior, preferences, budget constraint, and prices. Ultimately the consumer has to choose the most satisfying mix of goods and services. Consumer behavior theory explained by Engel, Blackwell, and Miniard (1990) indicated that consumer purchasing decisions are influenced by consumer characteristics and outside stimuli.

Consumer Behavior Theory, like the study of tourism, is interdisciplinary. It has been used and modeled to fit multiple areas of study (e.g., psychology, sociology, business management, marketing, and economics). Kassarian (1982) provided a historical look at the development of consumer behavior theory. He indicated that consumer behavior has developed from many theories from multiple disciplines culminating in its own theories and models.

Consumer behavior theory can be used to answer the question of why a tourist would choose a destination or not. It can assist in determining what influences a tourist to purchase a service or product, which is called consumer tourist behavior. When trying to understand consumer tourist behavior, determining the factors influencing a tourist's behavior is the most difficult (Goeldner & Ritchie, 1994).

Consumer Tourist Behavior. A lack of empirical consumer behavior research exists in tourism. However, considering models that will develop and expand this topic to provide tourism professionals a more productive method to determining tourist behavior patterns is necessary (Swabrooke & Horner, 1999). Many factors affect tourists' consumer behavior. Most consumer behavior models focusing on tourism look at the personal motivators (i.e., qualitative factors, mostly gathered by surveys) to model tourist behavior patterns. However, not many consumer behavior models look at the factors that are external or uncontrollable by the tourist or the tourism professionals (e.g., weather, natural disaster, politics, war, disease, and economic crisis). These factors contribute to molding the tourist experience and inevitably affect future decision making processes and consumer tourist behavior. These external factors need to be taken into consideration in forecast modeling.

Swarbrooke and Horner's (1999) research covered the complex subject of tourists' consumer behavior. They examined main concepts in consumer behavior, the purchase-decision process, types of tourist behavior, tourism demand and tourist markets, and the relationship between tourist behavior and tourist demand. The models presented by Swarbrooke and Horner were organizational and not statistical conceptual models. The organizational models provided a qualitative look regarding different motivators and

determinants affect the tourists' decision make process. No models have addressed the impact of the uncontrollable external factors. Therefore, my study provided quantitative statistical research to gauge the impacts of external uncontrollable factors on tourist behavior to compliment the qualitative modeling previously conducted.

The Use of Regression Modeling to Determine Tourism Behavior

Tourism matters to the tourist, public sector managers, business interests, and tourism analysts and researchers according to Pearce (2005). For policy makers, the precise modeling of the factors influencing travel to the region and the identification of those factors that influence visitors' decisions is essential to accurately forecast visitation to the destination. Industry leaders need to understand how much climate and economic conditions affect the tourist because people are looking to maximize their vacation experiences when choosing a destination. Businesses that directly or indirectly related to tourism also have an investment in the understanding of tourist behavior. The better they understand consumer behavior and what drives tourist behavior, the more they maximize their profits. For researchers and analysts, the study of tourism behavior helps to better understand cultural and environmental concerns affecting the tourist decision making process. Continued research incorporating tourism facilitates the solidification of tourism as a social institution in contemporary life for communities around the globe (Pearce, 2005). Regression modeling is a helpful tool for marketers, policy makers, tourism managers, business owners, academics, and practitioners within the tourism industry to determine what motivates tourists to visit an area and to help define consumer tourist behavior.

Marketing. Archer (1987, 1994), Goeldner and Ritchie (1994), and Smith (1995) agreed that tourism analyses using quantitative analysis were important to tourism marketing. Marketing is a significant part of the tourism industry. The ability to forecast and understand consumer tourist behavior through quantitative methods is imperative to marketers and can contribute to their decisions regarding the implementation of future marketing plans.

According to Goeldner and Ritchie (1994), marketing was the most active discipline in tourism. As a tool it facilitates decision making and incorporates the study of consumer behavior, business, and economics using secondary data, which Goeldner and Ritchie identified as one of the most commonly used resources for forecast modeling. Archer (1987; 1994) echoed the importance that forecast modeling presented for marketers explaining that it was pertinent to plan for future events and marketing to specific market segments. Smith's research (1995) indicated that tourism managers and public officials rely and expect new marketing campaigns to generate increased tourist rates and revenues.

Marketing managers have used forecast modeling to identify travel patterns of tourists, groups of tourists, types of tourists, and market share. Marketers have used forecast modeling to study how groups or populations of people travel by dividing them into sub groups based on age, education, occupation, and income (Archer, 1987; 1994). This approach has been useful to identifying the segments of markets that generate most travel (Arhcer, 1987; 1994). Forecast modeling can also be used by marketers to examine the delayed effects of marketing efforts in an area. However, marketers have not used forecast modeling to examine demographics of tourist travel. My study showed marketers how to use quantitative secondary data to predict consumer behavior using multiple regression. Multiple

regression modeling can provide marketers with an understanding of how climatic and economic conditions affect tourist behavior to create marketing plans that will maximize these conditions and their overall influences on visitation.

Policy Makers and Managers. Tourism research and analysis has not always been relevant to planners, policy-makers, and developers (Smith, 1995). Smith argued a need for objective scientifically defensible data on economic and environmental aspects of tourism promotion and development. According to Archer (1987; 1994), top-management should incorporate demand forecasts for the implementation of long-term planning and policy objectives.

Policy-makers can conduct future planning using forecast modeling by understanding what contributes to the tourist consumer behavior so policies can be implemented to maximize the outcome. Providing tools for tourism professionals and practitioners to conduct research allows them to plan, operate, and control the tourism environment more efficiently and effectively.

For example, Louvieris' (2002) research examined the importance of forecast modeling to examine how tourism growth would affect Greece's infrastructure. Louvieris' research provided government planning and policy officials forecasting methods that addressed concerns related to tourism growth and infrastructure development. This study provided a tool for ongoing management to control sustainable growth in tourism demand by providing reliable forecast modeling to policy makers, managers, and government officials. The study provided information to the necessary officials to develop plans and create policy to mitigate the negative impacts tourism growth may have on Greece. In addition to this

example, research can reduce the risk in decision making providing a more significant impact on the outcomes of a destination or tourist business (Goeldner & Ritchie, 2003).

Academics and Practitioners. Reid and Andereck (1989) addressed the importance of statistical research for academics and practitioners as a useful tool to further research goals. They also emphasized the need to broaden the scope of tourism research as a field of study, which also was reinforced by Baloglu and Assante (1999), Crawford and McCleary (1992), Li et al. (2005), Lim (1999), Palmer et al. (2005) , and Reid and Andereck (1989).

The Importance of Developing Better Forecasting Models in Tourism

Continued research in tourism is necessary because it continues to help explain tourism as a social behavior, economic resource, and an industry. To understand tourism and how it impacts destinations and businesses, the individual behavior of tourists must be understood (Smith, 1995). Most quantitative research regarding tourist behavior has been econometric directly relating to tourism demand based on GDP, CPI, disposable income, and interest rates (Archer, 1994; Baloglu & Assante, 1999; Crawford & McCleary, 1992; Fretchling, 2001; Li et al., 2005; Lim, 1999; Palmer et al., 2005; Reid & Andereck, 1989).

Another reason research is important to the tourism industry is it helps ascertain the factors that affect tourism demand. This understanding assists in planning, policymaking, and budgeting purposes by tourism operators, investors, and government organizations concerned with tourism (Kim & Qu, 2002). Kim and Qu's reinforced Stynes and Chen's (1985), Archer (1987; 1994), and Song and Witt's (2000) earlier assessments that

developed better models or measures of tourism behavior is important. However, demand for a vacation destination also may be affected by special events such as political instability, social conflict, terrorism, economic recessions, world fairs, and sports (McCahon & Miller, 2002).

Archer (1987; 1994) addressed the strengths, weaknesses, and limitations of principal qualitative and quantitative forecasting methods and their applicability to tourism. He also discussed the need for forecasting, issues faced in forecasting, and how forecasting is an aid to management decision making.

Challenges in Tourism Research Modeling

Tourism research provides a spectrum of possibilities. Tourism has several possibilities for innovative and original research, which can be meaningful to the field of study. However, challenges make research in the industry difficult. Challenges proposed by Smith (1995) are lack of credible measurements for describing the size and impact of tourism, diversity in the industry (e.g., an industry or a group of related industry), spatial and regional complexities, and a high degree of fragmentation or lack of coherent organizational structure.

Tourism has been slow to find credibility as a research field because of the multiple ways to define it as a field of study. Further, travel and tourism does not have defined theory directly related to it. Tourism was founded more on design principles rather than theory (Cohen, 1995; Franklin & Crang, 2001). Research in the industry is pulled from other disciplinary research fields and incorporated or related to the interdisciplinary area of

tourism. There are no defined methods of collecting data, which leaves the data used by researchers in the field always up for scrutiny (Smith, 1995).

Forecast modeling has been conducted in tourism over the past 30 years and is finding increasing importance within this field of study. Accurate forecast modeling is critical to the results and can be misleading if done incorrectly (Johnson & Ashworth, 1990). Since no distinct set of tourism forecasting methods exist, it is important to create feasible methods and models within tourism (Fletcher, 2001).

Chapter Three

Methods

Introduction

The purpose of this chapter is to explain the research methodology and design in this study. This study formulated and tested a conceptual model that included a selection of variables determined to affect tourist behavior and visitation to the Coastal Region of North Carolina. The first section of this chapter discusses the conceptual model illustrating the measurement and testing of climatic and economic conditions related to visitation. The second section describes the predictive nature of the modeling.

The research questions were:

1. Are there significant relationships between climatic variables and economic conditions (variables) related to visitation to the coast of North Carolina?
2. Can the relationships found explain and predict tourist behavior?
3. Is multiple regression analysis a useful tool for forecasting tourism behavior to the Coastal Region of North Carolina?
4. Does the study provide a tool for decision makers to allow for better policy, marketing, and business choices in the North Carolina Coastal Region?

Research Design

Based on the method chosen for this study, determining the relationships through correlation of the climatic and economic variables was important for the model design. The method chosen was Multiple Regression Analysis, a subcategory of quantitative forecasting

methods called causal forecasting methods. The significance of causal forecasting methods such as multiple regression analysis are they attempt to mathematically simulate a cause and effect relationship, which can be modified as necessary to meet the needs of individual destinations and attractions throughout the world (Fletchling, 2001).

Multiple regression analysis is a group of techniques that explore the relationship between one dependent variable and several independent variables (Pallant, 2007). These statistics also allow the incorporation of variables that may be independent of each other, but react together. These variables may differ from destination to destination and business to business. When determining the model to use, understanding that statistical complexity does not necessarily lead to scientific progress was important when choosing the best method and model (Palmer et al., 2005).

Conceptual Model. For my study, the following model was used:

$$Y = a + b_1MaxT_1 + b_2MinT_2 + b_3P_3 + b_4S_4 + b_5TPI_5 + b_6ADR_6 + b_7G_7$$

where: Y = visitation represented by monthly room demand which is measured by rooms sold

MaxT = Maximum Average Monthly Temperature

MinT = Minimum Average Monthly Temperature

P = Average Monthly Precipitation

S = Monthly Room Supply

TPI = Monthly Tourism Price Index

ADR = Monthly Average Daily Room Rate

G = Average Monthly Gas Price for the Southeast Region

The conceptual model incorporated in this study was derived from the method multiple regression analysis, consumer behavior theory, the study area, and the data available for collection that reflected tourists' consumer behavior processes for choosing a destination. From the conceptual model, a systematic approach was incorporated to find the best model fit to predict and explain tourist behavior to the region. The modeling design is discussed followed by descriptions of the dependant and independent variables chosen for the conceptual model that provided the best predictive and explanatory benefits for understanding tourist behavior.

Modeling. The conceptual model was a standard linear multiple regression model with simultaneous entry of all independent variables. Rooms rented (i.e., room demand) was applied as the dependent or outcome variable. The conceptual model was developed to address the purpose of this study, which was to expand on previous research efforts regarding what variables affecting tourism behavior and forecasting at a destination. The theoretical foundation for the modeling was based on consumer behavior theory, which was the influence of the tourists' decision making process by consumer characteristic and outside stimuli.

Model Comparison. From the Conceptual Model, twelve other models were developed for comparisons incorporating combinations of the explanatory variables. The models were created to represent explanatory variables used in the conceptual model. However, variables that had a correlation greater than .9 were not incorporated into the same model. The resulting combinations were depicted in thirteen models. The use of model comparison in multiple regression was highly recommended by other researchers (e.g., Agresti & Finley, 2009; Fretchling, 2001; Garrion, 1999; Pallant, 2007; & Shih et al., 2008). Comparing models incorporating different combination explanatory variables was important to ensure that the model implemented was the best fit and provided the best predictive ability in future research. Multiple regression analysis can be used in many ways for model comparison. The most common techniques are forward stepwise, backward stepwise, and dropping method. However, these modeling techniques present issues and some practitioners have acknowledged concerns about the uses and misuses of the techniques. They indicated that careful thought should be given to the choice of modeling

and the variables chosen when conducting model comparison (Pallant, 2007; Tabachnick & Fidell, 2007).

Researchers have also split the regression models to account for variables such as seasonality (Shih et al., 2009). The approach of splitting regression models for comparison of the affects of variables on visitation is impractical for two reasons. First, all variables observations are needed to determine if the regression model is a good fit, and if any observations were omitted the results could be cumbersome. The second reason was that if the regressions were split, the models could lose their predictive power because there would be fewer observations. When working with linear modeling, having a larger pool of observations is important (Garson, 2009).

For the purpose of my study, a general model comparison was conducted for the 13 Models to identify the best fit for predicting tourist consumer behavior in the Coastal Region of North Carolina. The criteria used to determine the model with the best fit were R Square, Adjusted R Square, F-statistic, model statistical significance, squared semi-partial correlation, the explanatory variables overall contribution to the model, and the statistical significance of the explanatory variables (Garson, 2009; Pallant, 2007; Tabachnick & Fidell, 2007). Each model was assessed on those criteria and compared to identify the model best suited to predict tourism to the Coastal Region of North Carolina. To construct effective modeling, appropriate variables were chosen.

Dependent and Independent Variables. Several explanatory variables can explain tourist behavior. Prior to collecting data, identifying which variables will be used was important. The factors that affect tourism can be broken into three categories; push, pull, and resistant factors (Fretchling, 2001). Push factors constitute those variables characteristic of a population in an origin market that encourages travel away from home (e.g., population size, GDP, and leisure time). Pull factors are variables which attract visitors to a destination (e.g., friends/relatives, climate/weather, and commercial ties). Lastly resistant factors are variables that constrain travel between an origin and a destination (e.g., prices of services, and cost of travel). When modeling for multiple regression incorporating explanatory variables from the different categories is important. However, the frequency of data collection often limits the ability to incorporate variables from all three categories. My study was able to incorporate variables from two of the three categories: pull and resistance factors. These two categories were important to my multiple regression modeling when examining tourist behavior to the destination. The variables that represented the pull factors were Average Monthly Maximum Temperature, Average Monthly Minimum Temperature, and Precipitation. Room Supply, ADR, TPI, and Average Monthly Gas Prices were considered to be resistant factors.

The literature review uncovered the variables most commonly used in forecasting research. Many variables could be used as the response variable and explanatory variables. For the purposes of my study, room demand for the Coastal Region of North Carolina was used as the response variable to identify visitation to the region. Room demand represented the proportion of the hotel/motel inventory occupied during a given month in the Coastal Region, and was presented as rooms rented. Rooms rented only captured the volume of

overnight visitors and did not account for those who were staying in home rentals, vacation properties, or with friends or family (VFR). Even though it only captured a specific demographic of traveler (i.e., hotel/motel users), the collection process was consistent and accurate. The average rooms sold per month for the years 1995-2008 for the coastal region are illustrated in Figure 3.1.

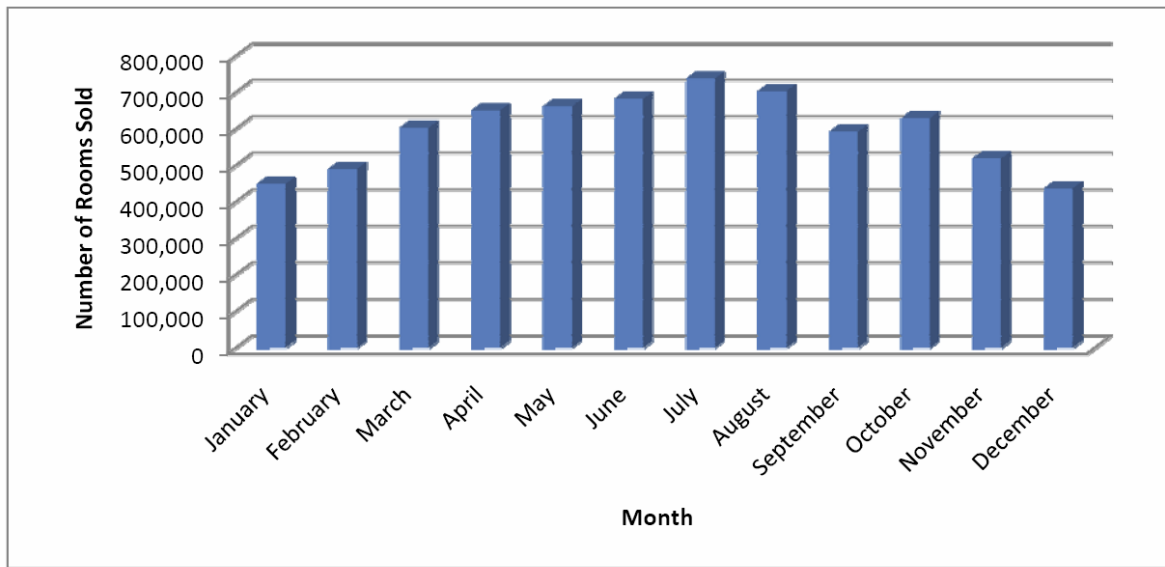


Figure 3.1 Average Monthly Rooms Sold for the Coastal Region of North Carolina (1995-2009)

The explanatory or independent variables were chosen based on previous research and the ability to acquire reliable monthly observations. Variables incorporated in the study were Average Daily Rate (US dollar), Room Supply (numeric), Travel Price Index (US dollar), Average Monthly Gas Prices (US dollar), Average Monthly Minimum Temperature (F), Average Monthly Maximum Temperature (F), and Average Monthly Precipitation in inches (See Table 3.1).

Table 3.1
Dependent and Independent Variables
For the Coastal Region of North Carolina

File Name	Variable Name	Variable Label
NC Coast.sav	Y	Rooms Rented (numeric)
	MaxT	Average Maximum Temperature (F)
	MinT	Average Minimum Temperature (F)
	P	Average Monthly Precipitation (inches)
	TPI	Travel Price Index (US dollars)
	ADR	Average Daily Room Rate (US dollars)
	G	Average Monthly Gas Prices (US dollars)
	S	Room Supply (numeric)

Prices and income were identified as the two most common explanatory factors in previous research regarding tourism to a destination (Crouch, 1994; Lim, 1997; Shih et al., 2009). Average Daily Rate was the average cost of hotel/motel rooms over the period of time and indicated fluctuations in demand in the area being studied. Room Supply was the available rooms in a given area. Travel Price Index (TPI) measured the seasonally unadjusted inflation rate of the cost of travel away from home in the United States. The TPI was based on U.S. Department of Labor price data collected for the monthly Consumer Price Index (CPI; U.S. Travel Association and U.S. Department of Labor, 2009). The TPI is directly comparable and highly correlated with to the CPI. Therefore, CPI was not used in

the study. TPI was included to represent the income factor because it was reflective of the consumers' perceptions of current economic conditions (Shih et al., 2009). Average monthly gas prices reflected the average monthly price of gas in the Lower Atlantic Region of the United States. The states included Florida, Georgia, South Carolina, North Carolina, Virginia, West Virginia, and Washington D.C.

Three monthly weather variables recorded by the State Climate Office of North Carolina for the coastal region were available for inclusion in the regression: Average Monthly Minimum, Maximum Temperature, and Precipitation. The Average Monthly Minimum or Maximum temperatures were the monthly mean of the minimum and maximum daily temperatures for all weather stations recording in the Coastal Region of North Carolina. The Average Monthly Precipitation was the mean monthly precipitation including rain, snow, and hail. These variables were considered pull factors. Since warmer weather usually facilitates good beach weather, maximum and minimum temperatures should have a positive impact on visitation (i.e., the higher the temperature the greater the visitation).

The expected impacts of each explanatory variable on the model were identified in Table 3.2. The climatic variables Average Maximum and Minimum Temperature were expected to have a positive impact on the model because visitors like to travel to the beach during periods of warmer weather. The climatic variable Precipitation was expected to have a negative effect. The economic variables ADR, TPI, and Gas Prices were expected to be negative since prices increase within the regression models. Lastly, the economic variable Supply was expected to have a positive effect indicating that when more rooms are available, the amount of rooms rented will increase.

Table 3.2
Independent Variables Tested in Regression Analysis
and Expected Sign of the Coefficient

Independent Variable	Temporal Resolution	Expected Sign
Maximum Temperature	Monthly	Positive
Minimum Temperature	Monthly	Positive
Precipitation	Monthly	Negative
Supply	Monthly	Positive
ADR	Monthly	Negative
Gas Prices	Monthly	Negative
TPI	Monthly	Negative

Data Collection. This study used secondary data sources for the nine variables chosen for the regression analysis. Reliability of the data was crucial to the outcome of the study. Therefore, only reliable organizations that were responsible for the collection of specific data were used. Fourteen years of monthly data were collected, except for gas prices. Gas prices were collected by week and then averaged for the months of the year. Room demand, Supply, and ADR data were provided by Smith Travel Research. The State Climate Office of North Carolina provided the weather/climate data for the coastal region of North Carolina. Travel Price Index data were collected from the U.S Travel Association. Finally, Gas Prices were collected from Energy Information Administration. Gas prices and weather/climate data were public record. Room demand, occupancy, ADR, and TPI data were proprietary, but provided for use in this study at no cost.

Once all the data were collected, they were formatted into a spread sheet using a computer program, Statistical Package for Social Sciences (SPSS). PAWS 17 was the predictive analytical software program used. Each column was identified by the variable name and each row was identified by which monthly observation it represented.

Study Area. The Coastal Region of North Carolina incorporated 27 counties with 16 in direct contact with the Atlantic Ocean or the main inlets from the Atlantic Ocean. The North Carolina counties included in this study were: Brunswick, Columbus, Bladen, New Hanover, Pender, Duplin, Onslow, Jones, Carteret, Lenoir, Craven, Pamlico, Beaufort, Hyde, Pitt, Martin, Washington, Tyrell, Dare, Bertie, Chowan, Perquimans, Pasquotank, Camden, Currituck, Hertford, and Bertie. A map of the region is provided in Figure 3.2.

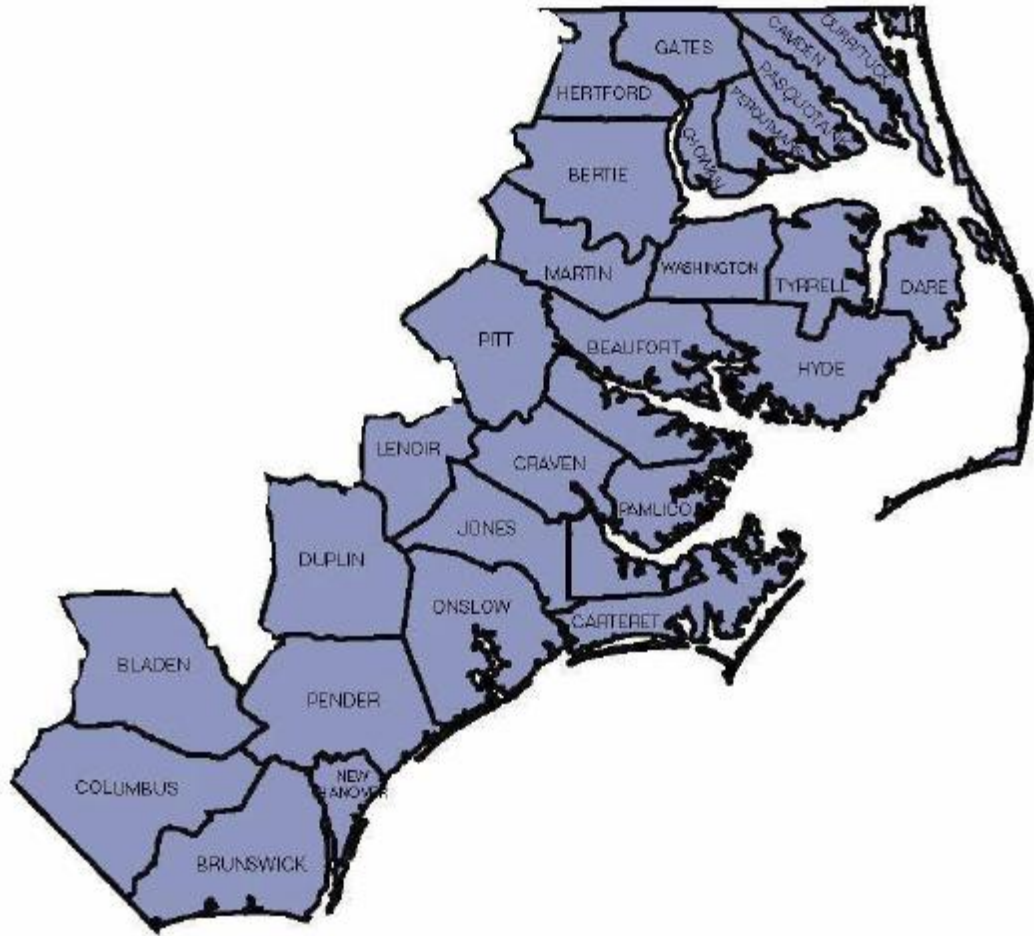


Figure 3.2 Map of Coastal North Carolina

The Coastal Region of North Carolina is characterized by mild winters and temperate summers. Average January temperatures range between 40-50 degrees Fahrenheit. In August the temperatures range between 75-85 degrees Fahrenheit (State Climate Office of North Carolina, 2009). According to the Kopper-Geiger Climate Classification Scheme, North Carolina is classified as a humid subtropical climate where the summers are humid (Rosenberg, 2009).

The Coastal Region of North Carolina is considered a regional destination hosting the Outer and Inner Banks. According to the North Carolina Department of Commerce 13% of all visitor activity in North Carolina was to the beaches (North Carolina Department of Commerce, 2009).

Predictive Nature of Multiple Regression Models

Based on this North Carolina information, one of the objectives of this study was to develop a statistical model to explain variability in visitation and to predict future tourist behavior based on the relationship of response and explanatory variables. This relationship was based on the interactions among the explanatory variables and the dependent variable. The explanatory variables chosen for the conceptual model explained variance of the dependent variable and also explained the relative predictive importance of the independent variables by reviewing the R Square Scores and beta coefficients (Garrison, 1999). The Adjusted R Square was the predictive ability of the model if a new set of data was used and the beta coefficients was used to construct the predictive equation (Garrison, 1999).

To summarize, this chapter provided an overview of the research design and methods. The overview included development of the conceptual model and the incorporation of model comparison methods to determine the best combination of explanatory variables chosen for this study. The next chapter discusses the findings of the study.

Chapter Four

Analysis and Results

This chapter presents results of analysis of each regression model tested. First, the assumptions made in development of the multiple regression models are reviewed. The statistical results for each regression model are provided along with a discussion of the individual explanatory variables and their contribution to the model. Of the 13 models, 12 were a variation of the Conceptual Model, which was run as one of the possible models (Model One). Rooms Rented was the dependent variable and for the purpose of this study represented visitation to the Coastal Region of North Carolina. Finally, model comparison provided the opportunity to identify which combination of independent variables provided the best explanation and fit for the Coastal Region of North Carolina. In Table 4.1 the breakdown of the different models compared for fit are presented.

Table 4.1
Independent Variables for
Multiple Regression Models Tested

Model 1 Conceptual Model	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
Maximum Temperature	MaxT	MaxT	MaxT	MaxT	MaxT	MaxT						
Minimum Temperature							MinT	MinT	MinT	MinT	MinT	MinT
Precipitation	P	P	P	P	P	P	P	P	P	P	P	P
Supply	S	S	S	S	S	S	S	S	S	S	S	S
Travel Price Index	TPI	TPI	TPI				TPI	TPI	TPI			
Average Daily Rate		ADR		ADR	ADR			ADR		ADR	ADR	
Gas Prices			G	G		G			G	G		G

Assumptions

Each model was reviewed to determine if it met the necessary assumptions of multiple regression. The assumptions reviewed were sample size, outliers, multicollinearity, homoscedasticity, heteroscedasticity, and linearity. The models presented were conducted using standard multiple regression where all variables were entered into the equation simultaneously and each independent variable in the model was measured by predictive power over the other independent variables (Pallant, 2007). In my study, tourism demand was defined by rooms rented and the independent variables were Average Maximum Temperature (MaxT), Average Minimum Temperature (MinT), Precipitation (P), Supply (S), Travel Price Index (TPI), Average Daily Room Rate (ADR), and Average Gas Prices (G). In Table 4.1, 13 models are presented and the combinations of variables of each are listed.

Sample Size. The assumption regarding sample size was that the sample size provided enough observations to make generalizations. According to the literature there was no set number of observations that were required to create a good data set. However, Pallant (2007) recommended that there be more than 15 observations per predictor. Tabacnhick and Fidell (2007) also suggested that when determining a sample size the equation $n=50+8m$ can be used, where m is the number of predictor variables. According to Garson (2009), sample sizes with less than 5 cases per independent variable were generally considered unacceptable, even for exploratory research. The North Carolina Coastal Visitation dataset that was used to run each model was comprised of 168 observations per predictor. Therefore, sample size was more than adequate.

Outliers. To meet the multiple regression assumption for outliers I examined the data set to identify if outliers were present and removed them from the data set prior to running the multiple regression analysis. Multiple regression analysis is reactive to outliers and could cause the model to be inaccurate or ineffective for practical use (Agresti & Finley, 2009; Pallant, 2007).

To determine if any outliers were present, the North Carolina Coastal Visitation data set was transformed into z-scores, also known as standardized scores, using SPSS. The standardized scores allowed for a comparison of the observations from different nominal distributions (i.e., independent variables) used in the study (McDaniel, 2009). The standardized scores were observed for any observations that fell outside the parameters of negative (-) 3.3 and positive 3.3. Using standardized scores to determine the presence of outliers, two observations including Precipitation and Supply were determined to contain outliers. The observations were removed from the main data set to run all models.

Multicollinearity. When running multiple regression, examining the correlations among the independent variables is imperative to prevent multicollinearity; which could occur when independent variables are highly correlated ($r \geq .9$; Pallant, 2007). A regression model can be run using independent variables that are highly correlated with one another. However, the likelihood of multicollinearity occurring is high.

The assumption of multicollinearity was addressed to examine possible issues with variable correlations within the models. Multiple regression analysis does not respond well to multicollinearity, which was the relationship between independent variables when they are

highly correlated ($r \geq .9$). To check for multicollinearity, or the correlation between variables in the model, a review of the correlations table was necessary. SPSS ran collinearity diagnostics on the variables during the multiple regression analysis. The multicollinearity of the variables was represented by tolerance and variance inflation factor (VIF). Tolerance explained what portion of the independent variable was not explained by the other independent variables in the model and VIF was the inverse of tolerance. VIF explained what portion of the independent variable was explained by the other independent variables in the model. Therefore identifying models with a tolerance less than .10 and a VIF value of more than 10 was important (Pallant, 2007).

After analyzing all models, it was determined that the Model 1 (Conceptual Model), 3, 4, 9, and 10 were invalidated due to VIF values higher than 10 and tolerance values less than .10. A high degree of correlation was found between variables used in these four models. These models were removed from the study and any further examination. A review of the variable correlations used in those models indicated that TPI and Gas Prices were too highly correlated to be run within the same model as well as were TPI and ADR. After reviewing the VIF and Tolerance values for the Model 1 (Conceptual Model), high and low temperatures were extremely correlated and created extremely high VIF values and could not be run in the same model.

A review of the Models 2, 5, 6, 7, 8, 11, 12, and 13's Tolerance and VIF values indicated that their Tolerance and VIF values fell within the acceptable range. A visual overview of the models Tolerance and VIF values are presented in Tables 4.2 and 4.3. A comparison of the models' values indicated that Model 2, 7, 8, and 13 had the most

conductive VIF and tolerance values falling the furthest from 10 and .10 within the range of tolerance for multicollinearity.

The worst VIF and Tolerance values presented were in Models 5 and 11, falling marginally into the range tolerance for multicollinearity. Even though the values presented for Models 5 and 11 fell within the acceptable range to meet the assumption of multicollinearity, there could be future implications for the models. Therefore, only models 2, 5, 6, 7, 8, 11, 12, and 13 and their findings are described in detail.

Table 4.2
Variance Inflation Factor Values for Multiple Regression Models
for the Coastal Region of North Carolina

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
(Conceptual Model)													
MaxT	55.334	1.283	5.006	1.378	3.458	2.159	1.291						
MinT	73.897							1.416	6.501	1.527	4.164	2.450	1.425
P	1.863	1.179	1.233	1.180	1.207	1.177	1.178	1.294	1.294	1.294	1.294	1.293	1.284
S	2.786	1.585	1.840	2.688	2.127	1.629	1.238	1.599	1.840	2.726	2.148	1.825	1.250
TPI	32.573	1.484	6.347	18.653				1.484	7.264	18.742			
ADR	17.417		13.366		9.088	3.125			15.723		9.920	3.212	
G	15.865			14.611	3.380		1.162			14.674	3.588		1.162

Table 4.3
Tolerance Values for Multiple Regression Models
for the Coastal Region of North Carolina

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13
	(Conceptual Model)												
MaxT	0.018	0.779	0.200	0.726	0.289	0.463	0.774						
MinT	0.014							0.706	0.154	0.655	0.240	0.408	0.702
P	0.537	0.848	0.811	0.848	0.828	0.850	0.849	0.773	0.773	0.773	0.773	0.773	0.773
S	0.359	0.631	0.543	0.372	0.470	0.547	0.808	0.625	0.543	0.367	0.465	0.548	0.800
TPI	0.057	0.674	0.158	0.054				0.674	0.138	0.053			
ADR	0.063		0.075		0.110	0.320			0.064		0.101	0.311	
G	0.031			0.068	0.296		0.860			0.068	0.279		0.861

Homoscedasticity, Heteroscedasticity, and Linearity. The assumptions of homoscedasticity, heteroscedasticity, and Linearity may also affect the results. Homoscedasticity, according to Agresti and Finley (2009), is the conditional distribution of y throughout the explanatory variables. Homoscedasticity is the fundamental relationship between the dependent and independent variables. This assumption can be checked from the residuals scatterplot generated by SPSS during the multiple regression analysis. When reviewing the scatterplots to determine homoscedasticity, examining the shape of the distribution is important. The best shape of the plot should be rectangular around zero and randomly dispersed. If the shape is curvilinear, or higher on one side, an issue with the model and a violation of this assumption may exist (Pallant, 2007). When the assumption of homoscedasticity is violated, heteroscedasticity may be occurring or there may be issues with linearity.

Heteroscedasticity is the assumption that any set of the residuals all have the same variance (Fretchling, 2001). A violation for the assumption of heteroscedasticity occurs when the standard deviation increases as the mean increases for the distribution of the dependent variable (Agresti & Finley, 2009). Heteroscedasticity can be identified if there is variance in the model's scatterplot such as the residuals taking the shape of a bow tie or a fan like shape, which indicates heteroscedasticity (Osborne & Waters, 2002).

Linearity is the linear relationship between the explanatory variables and the dependant variable. Like homoscedasticity, linearity can also be examined reviewing the model's scatterplot. When reviewing the scatterplot the scores should create a relatively straight line. There should be no U or arch shape created by the scatterplot (Pallant, 2007).

Violations of homoscedasticity, heteroscedasticity, and linearity can occur in a small amount without affecting or violating the models predictive power. However, a gross violation will weaken the model's strength to unknown amounts and potentially be an indicator of Type 1 error (Osborne & Waters, 2002; Tabachnick & Fidell, 2007). A review of each models scatterplot was conducted. Each model's residuals seemed to fluctuate randomly around the zero with no obvious trend occurring and they fell within tolerance of what is acceptable. The models' scatterplots are compiled in Figure 4.1. Based on the assessment of the models' scatterplots the assumptions of homoscedasticity and linearity were met.

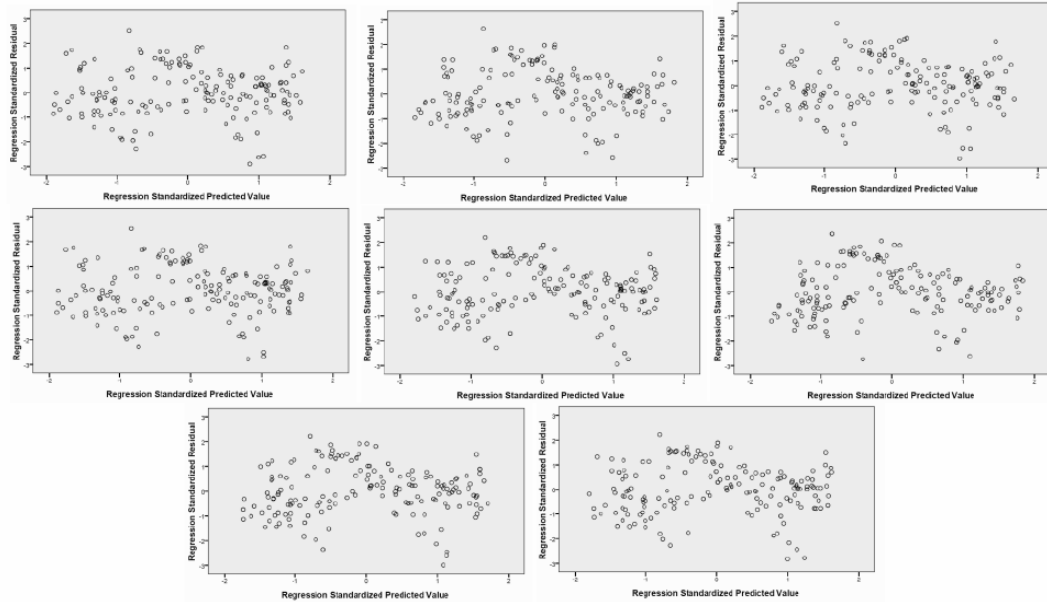


Figure 4.1 Scatterplots of Multiple Regression Models that Met the Assumption of Multicollinearity

A review of the assumptions concluded that the sample size was large enough for multiple regression analysis and outliers were identified and removed. Models that had issues with multicollinearity were discarded from further analysis. Lastly, scatterplots were reviewed for issues with homoscedasticity, heteroscedasticity, and linearity. The next section provides an in-depth examination of each model, which includes an evaluation of the model results R scores, F- test, and levels of significance.

Model Summaries

The model summary provided the value of R, R squared, and the adjusted R squared, the F-test, and significance values. According to Garrison (1999), multiple regression models can ascertain that a grouping of explanatory variables explains a proportion of the variance of a dependent variable (y) at a significant level conducting a significance test using R squared. The R value indicates the ability of the model to predict the dependent variable (y) by the set of explanatory variables given (Agresti & Finlay, 2009). The R squared describes the strength of association between y and the set of explanatory variables as they act together in the regression model as well as how much variance in the dependant variable is explained by the model (Agresti & Finlay, 2009; Pallant, 2007). The adjusted R squared is the less biased estimate of the population value and the likelihood of or the estimated success of explanation when a new set of data is implemented into the equation (Agresti & Finlay, 2009; Lani, 2009).

The objective in reviewing each model's summary is to ensure that the properties of R and R squared are met. The two primary properties are that R squared falls between 0 and 1 and that the size of R squared will determine how well the set of explanatory variables collectively predict y. The two properties were used to explain the cause and effect relationship of how explanatory variables affect rooms rented in the Coastal Region of North Carolina (Agresti & Finlay, 2009).

When reviewing the F-test statistic and statistical significance of the model, the question asked is, "Do the explanatory variables collectively have a statistically significant affect on the response variable?" (Agresti & Finlay, 2009; p. 335). The null and alternate

hypothesis was reviewed to understand how the F-test statistic expressed the significance of the model in relation to the R squared values. At this point the null hypothesis was tested:

$$H_0: \beta_1 = \beta_2 = \dots = \beta_k = 0.$$

The null hypothesis indicates that rooms rented in the Coastal Region of North Carolina did not depend on the values of high and low temperatures, precipitation, gas prices, TPI, ADR, or supply. In other words the number of rooms rented in the Coastal Region was statistically independent of all explanatory variables. The alternative hypothesis indicated that at least one of the explanatory variables represented in the model was related to y, controlling for the other variables (Agresti & Finlay, 2009).

The alternative hypothesis was represented by:

$$H_a: \text{At least one } \beta_i \neq 0$$

The distribution of the F-test statistic was also something that the ANOVA table addressed. When reviewing the F-test statistics for the models the larger the R squared value was, the larger the F- test statistic would be. The F- test statistic is important to the significance of the model, because the larger it is the greater the evidence is against the null hypothesis. The F-test statistic is directly related to the P-value or significance section in the ANOVA tables produced by SPSS (Agresti & Finlay, 2009; Garrison, 1999; Pallant, 2007). The greater the F-test statistic was the stronger the evidence was against the null hypothesis and the smaller the P-value was the more statistically significant the model (Agresti & Finlay, 2009).

Explanatory Variables. Even though the equations may be significant this does not mean that all the explanatory variables have a significant effect on y (i.e., the dependent variable of rooms rented) when controlling for all the other explanatory variables (Pallant, 2007). Within multiple regression models:

[t]he parameter β_1 measures the partial effect of x_1 on y , that is, the effect of a one-unit increase in x_1 , holding x_2 constant. The partial effect of x_2 on y , holding x_1 constant, has slope β_2 . Similarly, for a multiple regression model with several predictors, the beta coefficient of a predictor describes the change in the mean of y for one-unit increase in the predictor, controlling for the other variables in the model.

The parameter α (constant) represents the mean of y when each explanatory variable equals 0 (Agresti & Finlay, 2009; p. 325).

The beta value that is largest regardless of negative or positive sign is the independent variable with the greatest contribution. By comparing the beta weights a relative predictive power of the independent variables can be established for the multiple regression models (Garrison, 1999). The column labeled "Sig." identifies which variable is making a statistically significant unique contribution to the equation (Pallant, 2007).

Actual Sign of Coefficient of Independent Variables Tested in Regression

Analysis. This section discusses the independent variable sign coefficients tested in the regression models. Table 3.2 in Chapter Three presented the expected signs of the coefficients used in the regression analysis. In all eight models ADR and TPI's sign of coefficient was consistently opposite of what was expected representing a positive coefficient. However, the variables Average Monthly Temperature (MaxT), Average

Minimum Temperature (MinT), Supply (S), and Gas Prices (G) met the expected sign of the coefficient (See Table 4.4).

Table 4.4
Actual Sign of Coefficient of Independent Variables
Tested in Regression Analysis

*Independent Variables presenting signs
Opposite of the Expected Sign of Coefficient*

	Model 2	Model 5	Model 6	Model 7	Model 8	Model 11	Model 12	Model 13
P	Positive		Positive	Positive				
TPI	Positive				Positive			
ADR		Positive	Positive			Positive	Positive	

*Independent Variables presenting the
Expected Sign of Coefficient*

	Model 2	Model 5	Model 6	Model 7	Model 8		Model 12	Model 13
MaxT	Positive	Positive	Positive	Positive				
MinT					Positive	Positive	Positive	Positive
P		Negative			Negative	Negative	Negative	Negative
S	Positive	Positive	Positive	Positive	Positive	Positive	Positive	Positive
G		Negative		Negative		Negative		Negative

The combination of the variables determined the sign of coefficient for Precipitation (P). When Precipitation was paired with Average Maximum Temperature, Supply, and TPI in Model 2 the sign of the coefficient for Precipitation was positive. The variable Precipitation also presented a positive coefficient when it was paired with Average Maximum

Temperature, Supply, and ADR in Model 6. Precipitation also presented a positive sign of the coefficient when paired with the variables Average Maximum Temperature and Gas Prices in Model 7. However, Precipitation met its expected negative sign of the coefficient when it was paired with all three variables: Average Maximum Temperature, ADR, and Gas Prices in Model 5 and 11. Surprisingly, in every model where Precipitation was paired with Average Minimum Temperature, the sign of the coefficient met the expected negative sign.

The remainder of this section will examine the explanatory variables and their individual significance to the models 2, 5, 6, 7, 8, 11, 12, and 13.

Model 2

The equation used for Model 2 was:

$$Y = a + b_1MaxT_1 + b_2P_2 + b_3S_3 + b_4TPI_4$$

Model 2 represented visitation (i.e., rooms rented) regressed by Average Maximum Temperature, Precipitation, Supply, and TPI. These four predictors accounted for over three-fourths of the variance in performance scores ($R^2 = .787$). The results of Model 2's regression were statistically significant, $F(4, 161) = 148.646$, $p < .0005$. Model 2's explanatory variables accounted for 78.7% of the reasons why visitors travel to the Coastal Region. Given the sample size and the combination of variables there was only a fraction of difference between the R square value and the Adjusted R square, which indicated that a new set of data the model could predict over 78% of visitation to the Coastal Region of North Carolina.

The multiple regression analysis revealed that Average Maximum Temperature was the most significant predictor of visitation ($\beta = .819$, $p = .0005$) in Model 2, followed by

Supply ($\beta = .166$, $p = .0005$), Precipitation ($\beta = .005$, $p = .901$), and TPI ($\beta = .010$, $p = .816$). Only Average Maximum Temperature and Supply were statistically significant at the .01 level. These statistics are displayed in Table 4.5.

Table 4.5
Summary of Multiple Regression for Model 2
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.887	0.787	0.782	148.646	0.000
	B	Std. Error	β	T	Sig.
(Constant)	-139024.975	55608.455		-2.500	0.013
MaxT	6589.895	331.680	0.819	19.868	0.000**
P	250.602	2005.087	0.005	0.125	0.901
S	0.246	0.068	0.166	3.633	0.000**
TPI	36.554	156.644	0.010	0.233	0.816

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

The results indicated that for every 1° (F) the temperature increases, rooms rented will increase by 6,590 rooms, for every additional 1" of rainfall a month rooms rented will increase by 251 rooms, and for every additional one dollar it cost to travel, rooms rented will increase by 37 rooms. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = -13,9025 + 6,590_1MaxT_1 + 251_2P_2 + .5S_3 + 37_4TPI_4$$

Model 5

The equation used for Model 5 was:

$$Y = a + b_1MaxT_1 + b_2P_2 + b_3S_3 + b_4ADR_4 + b_5G_5$$

Model 5 was regressed using Average Maximum Temperature, Precipitation, Supply, ADR, and Gas Prices. Model 5's predictors accounted for nearly four-fifths of the variance in performance scores ($R^2 = .797$). The overall regression model was statistically significant, $F(5, 160) = 125.596$, $p < .0005$. Model 5 presented the best R values of all the regression models analyzed in the study. The combination of variables presented in this model represented 79.7% of why rooms were rented in the Coastal Region of North Carolina according the R square value. The adjusted R square indicated that if a new set of data were to be incorporated, the model would predict 79.1% visitation to the Coastal Region of North Carolina.

Like Model 2, the Average Maximum Temperature made the greatest contribution to the regression model and was the most significant predictor of visitation ($\beta = .674$, $p = .0005$), followed by the explanatory variables: ADR ($\beta = .299$, $p = .006$), Gas Prices ($\beta = -.164$, $p = .011$), Supply ($\beta = .084$, $p = .107$), and Precipitation ($\beta = -.014$, $p = .730$). Average Maximum Temperature and ADR were statistically significant at the .01 level and Gas Prices was individually statistically significant at the .05 level, as seen in Table 4.6. Neither Supply nor Precipitation was statistically significant.

Table 4.6
Summary of Multiple Regression for Model 5
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.893	0.797	0.791	125.596	0.000
	B	Std. Error	β	T	Sig.
(Constant)	-23476.026	70730.001		-0.332	0.740
MaxT	5424.349	533.138	0.674	10.174	0.000**
P	-686.646	1986.550	-0.014	-0.346	0.730
S	0.124	0.077	0.084	1.622	0.107
ADR	2295.450	823.119	0.299	2.789	0.006**
G	-23024.866	9174.141	-0.164	-2.510	0.013*

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

The findings for this model indicated that for every 1° (F) the temperature increases, rooms rented will increase by 5,424. For every additional 1" of rainfall during a month rooms rented will decrease by 687 rooms and for every one dollar gas price increases rooms rented will decrease by 23,025 rooms. Model 5 also indicated that for every one dollar room rates increase, rooms rented will increase by 2,296. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = -23,476 + 5,424_1MaxT_1 - 687_2P_2 + .1_3S_3 + 2,296_4ADR_4 - 2,3025_5G_5$$

Model 6

The equation used for Model 6 was:

$$Y = a + b_1MaxT_1 + b_2P_2 + b_3S_3 + b_4ADR_4$$

Visitation was regressed in Model 6 using Average Maximum Temperature, Precipitation, Supply, and ADR. The four predictors, like Model 2, accounted for more than three-fourths of the variance in performance scores ($R^2 = .789$). The Results of Model 6 were statistically significant, $F(4, 161) = 150.468$, $p < .0005$. Based on the F-statistical value, Model 6 had the strongest evidence against the null hypothesis. The combination of explanatory variables explained 78.4% of visitation to the region. The adjusted R square indicated little change from the R square value, providing a promising result of 78.4% predictive ability for visitation to the region given a new set of data.

Model 6's regression β coefficient that made the greatest significant impact on the model was Average Maximum Temperature. The explanatory variable Average Maximum Temperature, like Models 2 and 5, was the strongest predictor of visitation ($\beta = .776$, $p = .0005$) to the Coastal Region of North Carolina. The explanatory variables that followed were Supply ($\beta = .133$, $p = .007$), ADR ($\beta = .081$, $p = .207$), and Precipitation ($\beta = .002$, $p = .960$). Only Average Maximum Temperature and Supply were statistically significant at a .01 level and are displayed in Table 4.7.

Table 4.7
Summary of Multiple Regression for Model 6
For the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.888	0.789	0.784	150.468	0.000

	B	Std. Error	β	T	Sig.
(Constant)	-94454.928	65888.049		-1.434	0.154
MaxT	6244.235	428.205	0.776	14.582	0.000**
P	99.819	1993.700	0.002	0.050	0.960
S	0.196	0.072	0.133	2.718	0.007**
ADR	622.092	490.560	0.081	1.268	0.207

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

A review of the model suggested that for every 1° (F) the temperature increases during the month, rooms rented will increase by 6,244 rooms. The findings also indicated that for every additional 1" of rainfall rooms rented will increase by 100. Surprisingly, for every one dollar increase in the average daily room rates rooms rented increase by 622 rooms. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = -94,455 + 6,244_1MaxT_1 + 100_2P_2 + .2_3S_3 + 622_4ADR_4$$

Model 7

The equation used for Model 7 was:

$$Y = a + b_1MaxT_1 + b_2P_2 + b_3S_3 + b_4G_4$$

Visitation is represented in this model by the explanatory variables Average Maximum Temperature, Precipitation, Supply, and Gas Prices. The four predictors accounted for nearly four-fifths of the variance in the R Square scores ($R^2 = .787$). The results from Model 7 were statistically significant, $F(4,161) = 148.788$, $p < .0005$ and the explanatory variables used in this model explained 78.7% of visitation to the Coastal Region. Like the other models presented, the adjusted R square was remarkably aggressive in relation to the R square value predicting 78% of visitation to the Coastal Region of North Carolina given a new set of explanatory data.

The multiple regression for Model 7 revealed that the explanatory variable, Average Maximum Temperature was again the most significant predictor ($\beta = .820$, $p = .0005$) of visitation to the Coastal Region of North Carolina. Supply ($\beta = .178$, $p = .0005$), Gas Prices ($\beta = -.016$, $p = .676$), and Precipitation ($\beta = .003$, $p = .931$) follow only providing marginal individual contributions in relation to Average Maximum Temperature. Analysis of this model showed that only Average Maximum Temperature and Supply are individually statistically significant at .01 using a 95% confidence interval and can be viewed in Table 4.8.

Table 4.8
Summary of Multiple Regression for Model 7
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.887	0.787	0.782	148.788	0.000

	B	Std. Error	β	T	Sig.
(Constant)	-145697.764	56671.334		-2.571	0.011
MaxT	6601.181	332.601	0.820	19.847	0.000**
P	174.650	2003.271	0.003	0.087	0.931
S	0.263	0.060	0.178	4.397	0.000**
G	-2301.271	5491.824	-0.016	-0.419	0.676

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

A review of the Beta values suggest that for every 1° (F) increase in temperature, rooms rented will increase by 6,601 and for every additional 1" of rainfall, rooms rented will increase by 175. For every one dollar increase in the cost of gas, rooms rented will decrease by 2,301 rooms. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = -14,5698 + 6,601_1MaxT_1 + 175_2P_2 + .3_3S_3 - 2,301_4G_4$$

Model 8

The equation used for Model 8 was:

$$Y = a + b_1MinT_1 + b_2P_2 + b_3S_3 + b_4TPI_4$$

Model 8's visitation was regressed by the explanatory variables Average Minimum Temperature, Precipitation, Supply, and TPI to represent visitation to the Coastal Region of North Carolina. The results indicated, that the four predictive variables accounted for approximately three-fourths of the variance in performance scores ($R^2 = .747$). The results presented in Model Eight were statistically significant, $F(4, 161) = 119.127$, $p < .0005$. The combination of variables used in this model explained 74.7% of visitation to the region. However, the adjusted R square was slightly more conservative. It can be interpreted that if a new set of data was provided given this model it would only predict 74.1% of visitation to the region.

Model 8's multiple regression analysis identified Average Minimum Temperature ($\beta = .827$, $p = .0005$) was the most significant predictor of the four explanatory variables used in the model. The explanatory variables Supply ($\beta = .159$, $p = .002$), Precipitation ($\beta = -.068$, $p = .134$), and TPI ($\beta = .015$, $p = .755$) followed in significant contributions. The analysis indicated that the explanatory variables that made an individual statistically significant contribution at .01 levels (95% confidence interval) were Average Minimum Temperature and Supply which are displayed in Table 4.9.

Table 4.9
Summary of Multiple Regression for Model 8
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.865	0.747	0.741	119.127	0.000

	B	Std. Error	β	T	Sig.
(Constant)	47751.042	60731.278		0.786	0.433
MinT	6127.747	349.218	0.827	17.547	0.000**
P	-3441.913	2286.700	-0.068	-1.505	0.134
S	0.235	0.074	0.159	3.180	0.002**
TPI	53.379	170.535	0.015	0.313	0.755

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

This model indicated that for every 1° (F) the temperature increases rooms rented will increase by 6,128 and for every additional dollar it costs to travel away from home (TPI) rooms rented will increase by 53. For every 1" increase in rainfall rooms rented will decrease by 3,442. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = 47,751 + 6,128_1 MinT_1 - 3,442_2 P_2 + .2_3 S_3 + 53_4 TPI_4$$

Model 11

The equation used for Model 11 was:

$$Y = a + b_1MinT_1 + b_2P_2 + b_3S_3 + b_4ADR_4 + b_5G_5$$

Model 11 incorporated the explanatory variables Average Minimum Temperature, Precipitation, Supply, ADR, and Gas Prices. These predictors accounted for just over three-fourths of the variance in performance scores ($R^2 = .761$). The results of Model 11's regression were statistically significant, $F(5, 160) = 102.153$, $p < .0005$. Model 11's F- test statistic value was significantly smaller than the other models presented indicating that it had the least evidence against the null hypothesis of any model being analyzed. The explanatory variables used in this model explained 76.1% of visitation to the Coastal Region and the adjusted R square was more conservative indicating the models predictive ability is 75.4%

Model 11's results indicated that the explanatory variable with the most significant predictive power was Average Minimum Temperature ($\beta = .632$, $p = .0005$). The other explanatory variables from the model followed were ADR ($\beta = .373$, $p = .003$), Gas Prices ($\beta = -.196$, $p = .008$), Supply ($\beta = .060$, $p = .294$), and Precipitation ($\beta = -.069$, $p = .119$). The individual variables that were statistically significant at the .01 level were Average Minimum Temperature, ADR, and Gas. Supply and Precipitation were not individually statistically significant within this combination of variables (See Table 4.10).

Table 4.10
Summary of Multiple Regression for Model 11
For the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.873	0.761	0.754	102.153	0.000
	B	Std. Error	β	T	Sig.
(Constant)	151396.215	69915.152		2.165	0.032
MinT	4681.430	583.728	0.632	8.020	0.000**
P	-3495.320	2229.404	-0.069	-1.568	0.119
S	0.088	0.084	0.060	1.053	0.294
ADR	2861.277	932.092	0.373	3.070	0.003**
G	-27501.615	10244.971	-0.196	-2.684	0.008**

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

The model indicated that for every 1° (F) increase in temperature rooms rented will increase by 4,681. It can also be deduced that for every one dollar increase in gas prices rooms rented will decrease by 27,502. In contrast, for every one dollar increase in cost to rent a room, rooms rented will increase by 2,861. It can also be inferred from the model that for every 1" additional inch of rain fall rooms rented will decrease by 3,495. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = 151,396 + 4,681_1 MinT_1 - 3,495_2 P_2 + .1_3 S_3 + 2,861_4 ADR_4 - 27,502_5 G_5$$

Model 12

The equation used for Model 12 was:

$$Y = a + b_1MinT_1 + b_2P_2 + b_3S_3 + b_4ADR_4$$

Model 12's visitation was regressed by the explanatory variables Average Minimum Temperature, Precipitation, Supply, and ADR. These predictors accounted for approximately three-fourths of the variance in performance scores ($R^2 = .757$). The results of Model 12's regression were statistically significant, $F(4, 161) = 121.217, p < .0005$. This models evidence against the null hypothesis was not the strongest, however it still argues strongly against it. The explanatory variables used in this model explained 75.1% of visitation to the Coastal Region and the adjusted R square were more conservative indicating the models predictive ability was 74.5%.

This model indicated that the explanatory variable with the most significant predictive power was Average Minimum Temperature ($\beta = .768, p = .0005$) providing the greatest unique contribution. Explanatory variables that followed were Supply ($\beta = .119, p = .027$), ADR ($\beta = .105, p = .139$), and lastly Precipitation ($\beta = -.065, p = .147$). Average Minimum Temperature was statistically significant at the .01 level and Supply was statistically significant at the .05 level using a 95% confidence interval and can be reviewed in Table 4.11. The remaining two variables, Precipitation and ADR were not individually statistically significant. However, they were important to the overall success of the model and will be discussed further in Chapter Five.

Table 4.11
Summary of Multiple Regression for Model 12
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.866	0.751	0.745	121.217	0.000
	B	Std. Error	β	T	Sig.
(Constant)	92018.505	67590.057		1.361	0.175
MinT	5686.826	456.279	0.768	12.463	0.000**
P	-3311.573	2270.895	-0.065	-1.458	0.147
S	0.175	0.078	0.119	2.229	0.027*
ADR	803.716	540.496	0.105	1.487	0.139

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

The analysis of the model suggested that for every 1° (F) increase in temperature rooms rented will increase by 5,687. The model also suggests that for every additional 1" of rainfall rooms rented will decrease by 3,312. It can also be deduced from the model that for every one dollar increase in the average daily rate to rent a room, rooms rented will increase by 804. These B values are used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant (B value) is represented by a. The following equation shows a visual representation of the data provided:

$$Y = 9,2019 + 5,687_1 MinT_1 - 3,312_2 P_2 + .2_3 S_3 + 804_4 ADR_4$$

Model 13

The equation used for Model 13 was:

$$Y = a + b_1MinT_1 + b_2P_2 + b_3S_3 + b_4G_4$$

Lastly, an examination of Model 13's model summary was conducted. The explanatory variables used in this regression model were Average Minimum Temperature, Precipitation, Supply, and Gas Prices. The combination of these predictive variables accounted for nearly three-fourths of the variance in visitation to the Coastal Region of North Carolina ($R^2 = .747$). Results of this model's regression was statistically significant, $F(4, 161) = 119.104$, $p < .0005$. Like Models 8, 11, and 12, Model 13's R square value was not as strong as the previous models which incorporated Average Maximum Temperature. This model's R square explained 74.7% of why visitors vacation in the Coastal Region of North Carolina. Slightly, more conservative than the R square value the adjusted R square value predicted 74.1% of visitation to the Coastal Region given a new set of data.

Like the other models, temperature made the largest individual contribution. Average Minimum Temperature was the most significant predictor ($\beta = .828$, $p = .0005$) of visitation in this model. The explanatory variables that followed were Supply ($\beta = .172$, $p = .0005$), Precipitation ($\beta = -.069$, $p = .0126$), and Gas Prices ($\beta = -.012$, $p = .784$). The only individual explanatory variables that were statistically significant at a 95% confidence interval ($p = .01$) were Average Minimum Temperature and Supply (See Table 4.12).

Table 4.12
Summary of Multiple Regression for Model 13
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
	0.865	0.747	0.741	119.104	0.000

	B	Std. Error	β	T	Sig.
(Constant)	42165.982	61737.175		0.683	0.496
MinT	6134.798	350.260	0.828	17.515	0.000**
P	-3521.161	2286.964	-0.069	-1.540	0.126
S	0.254	0.065	0.172	3.882	0.000**
G	-1639.864	5980.045	-0.012	-0.274	0.784

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

Even though Supply was statistically significant, the impact on rooms rented was nonexistent in comparison to the other variables in the model. For every increase in one room available to rent, rooms rented increased by zero. Whereas, for every 1° (F) increase in temperature rooms rented will increase by 6,135. For every additional 1" of rainfall rooms rented will decrease by 3,521 and for every additional dollar gas prices increase rooms rented will decrease by 1,640. These B values were used to predict future visitation given a new set of data and are represented in the multiple regression equation by b. The constant's B value is represented by a. The following equation shows a visual representation of the data provided:

$$Y = 42,166 + 6,135_1 MinT_1 - 3,521_2 P_2 + .3_3 S_3 - 1,640_4 G_4$$

Model Comparison

Using a variation of model comparison, this section compares the findings for the eight regression models reviewed. Chapter Five will discuss the results of the model comparison to determine which model(s) best fit the Coastal Region of North Carolina.

Comparison of *R* Values. This section will conduct a comparison of the models *R* values, *F*-statistic, and significance as reported in Table 4.12. According to Agesti and Finlay (2009) the “*R* square describes the strength of association between *y* and the set of explanatory variables acting together as predictors in the model” (p. 331). The multiple correlations of the models are the sample correlations, which are computed between the *y* and \hat{y} - values and are denoted by *R*. When reviewing *R* and determining whether or not correlation exists between *y* and \hat{y} , *R* should always fall between 0 and 1. The better predictions of *y* by the set of explanatory variables are identified by *R* being closer to 1 than 0 (Agesti & Finlay, 2009). This relationship is important when comparing the models values to facilitate choosing the best fit for modeling visitation to the Coastal Region.

Table 4.13
Model Summaries of Multiple Regression Models
for the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.
Model 2	0.887	0.787	0.782	148.646	0.000
Model 5	0.893	0.797	0.791	125.596	0.000
Model 6	0.888	0.789	0.784	150.468	0.000
Model 7	0.887	0.787	0.782	148.788	0.000
Model 8	0.865	0.747	0.741	119.127	0.000
Model 11	0.873	0.761	0.754	102.153	0.000
Model 12	0.866	0.751	0.745	121.217	0.000
Model 13	0.865	0.747	0.741	119.104	0.000

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

*. Correlation is significant at the .05 level (2-tailed).

n = 168

Model 5 had the best predictive ability followed by Model 6, Model 7, and Model 2. Model 7's F- test statistic had stronger evidence against the null hypothesis than Model 2. Models 8, 11, 12, and 13 provided good R values, but their predictive values were significantly lower than Models 2, 5, 6, and 7. However, more comparisons of the models should be conducted before making a final decision. Figure 4.2 provides a visual comparison of the models' Adjusted R Square Values, which is indicative of the predictive ability of the models if an entirely new set of data was incorporated.

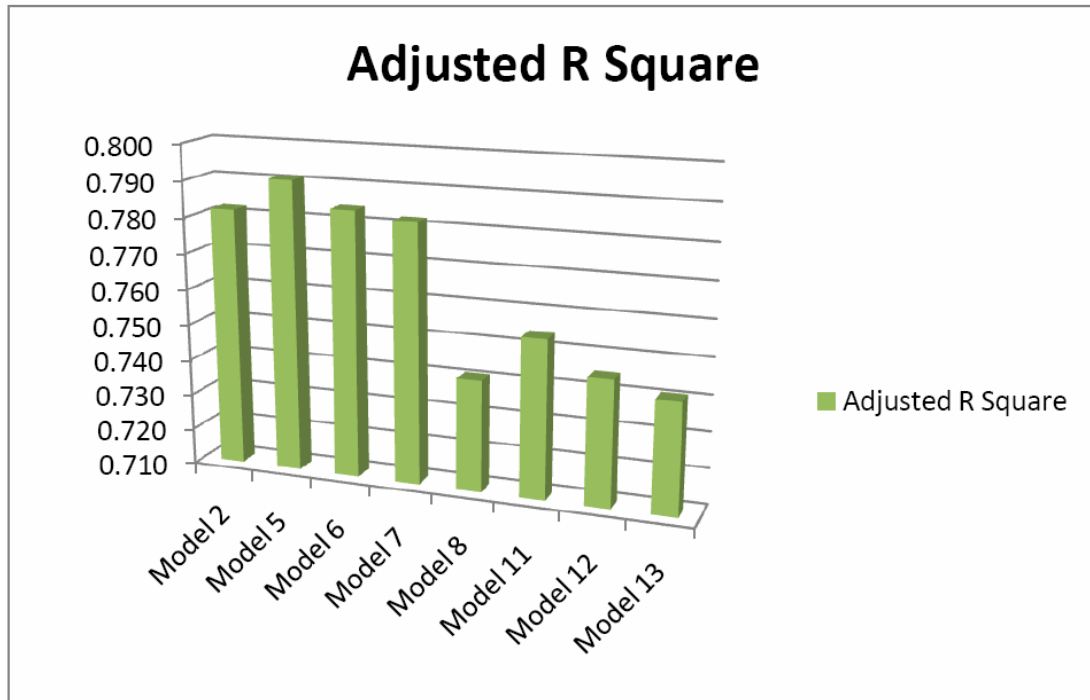


Figure 4.2 Comparison of Multiple Regression Models Adjust R Square Values for the Coastal Region of North Carolina

Directly related to the R square is the F distribution. The larger the R squared value, the larger the F- test statistic becomes, which indicates stronger evidence against the null hypothesis (H_0). Model 6 indicated the strongest evidence against the null hypothesis out of all the models compared, followed by Models 7, 2, and 5.

Comparison of Explanatory Variables. According to Tabernack and Fiddel (2007), the relationship of the independent variables to the regression was important. The relationship is examined by reviewing the relationship between the independent variables and the dependent variable. This relationship of the independent variable with the dependent variable needs to be considered. A review of the individual explanatory variables and the contributions made to the overall model are examined in Tables 4.14, 4.15, 4.16 and 4.17. Table 4.14 reviews the explanatory variables correlation, which is the full relationship with the dependent variable. The total relationship of the explanatory variables with the dependent variable was correlated to the .01 level. Average Maximum Temperature and Average Minimum Temperature had the highest correlation with rooms rented followed by Supply, ADR, and Precipitation. Gas Prices and TPI had the lowest correlation values.

Table 4.14
Correlation Chart of Explanatory and Dependent Variables
For the Coastal Region of North Carolina

	Y	MaxT	MinT	P	S	TPI	ADR	G
Y	1	0.873**	0.846**	0.321**	0.416**	0.239**	0.702**	0.190**
MaxT	0.873**	1	0.986**	0.374**	0.297**	0.161*	0.687**	0.168*
MinT	0.846**	0.986**	1	0.460**	0.305**	0.154*	0.696**	0.161*
P	0.321**	0.374**	0.460**	1	0.063	-0.023	0.256**	-0.004
S	0.416**	0.297**	0.305**	0.063	1	0.568**	0.642**	0.365**
TPI	0.239**	0.161*	0.154*	-0.023	0.568**	1	0.764**	0.939**
ADR	0.702**	0.687**	0.696**	0.256**	0.642**	0.764**	1	0.690**
G	0.190**	0.168*	0.161*	-0.004	.365**	0.939**	0.690**	1

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

A Review of the β coefficients indicated Average Maximum and Minimum Temperature had the greatest unique contributions to all models followed by ADR. The explanatory variables Supply and Gas Prices varied in their unique contributions to the model depending on the other variables they were paired with. The variables that had the least individual contribution were Precipitation and TPI (See Table 4.15).

Table 4.15
Comparison of Explanatory Variables Individual Contribution to the
Multiple Regression Models for the Coastal Region of North Carolina

Beta	Model 2	Model 5	Model 6	Model 7	Model 8	Model 11	Model 12	Model 13
MaxT	0.819	0.674	0.776	0.820				
MinT					0.827	0.632	0.768	0.828
P	0.005	-0.014	0.002	0.003	-0.068	-0.069	-0.065	-0.069
S	0.166	0.084	0.133	0.178	0.159	0.060	0.119	0.172
TPI	0.010				0.015			
ADR		0.299	0.081			0.373	0.105	
G		-0.164		-0.016		-0.196		-0.012

A comparison of the models' individual variables statistical significance indicated that Average Maximum Temperature and Average Minimum Temperature were statistically significant ($p=.01$) at a 95% confidence interval in all models. Supply was not significant when modeled with both ADR and Gas Prices (Models 5 and 11). However Supply was statistically significantly modeled with ADR and Gas Prices separately (Models 6, 7, 12, and

13). Precipitation was not individually statistically significant ($p=.05$) at a 95% confidence interval in any model. In contrast with the variable Supply, the variables Gas Prices and ADR were only statistically significant ($p=.05$) at a 95% confidence interval when paired together in a model (See Table 4.16).

Table 4.16
Comparison of Individual Explanatory Variables Statistical Significance to the Multiple Regression Models for the Coastal Region of North Carolina

	Model 2	Model 5	Model 6	Model 7	Model 8	Model 11	Model 12	Model 13
MaxT	0.000**	0.000**	0.000**	0.000**				
MinT					0.000**	0.000**	0.000**	0.000**
P	0.901	0.730	0.960	0.931	0.134	0.119	0.147	0.126
S	0.000**	0.107	0.007**	0.000**	0.002**	0.294	0.027*	0.000**
TPI	0.816				0.755			
ADR		0.006**	0.207			0.003**	0.139	
G		0.013*		0.676		0.008**		0.784

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

Last, and the most important comparison of the explanatory variables, was the squared semi-partial correlation. This value represented how much the R square value decreased if an independent variable was removed from the model. When determining which model had the best combination of explanatory variables, this value was considered. Table 4.17 provides a breakdown of the squared semi-partial correlation for the models

compared. The model that had the best distribution of variables and the least impact on the R Square value was Model 11 followed by Model 5.

Table 4.17
Comparison of Squared Semi-partial Correlation for the
Multiple Regression Models for the Coastal Region of North Carolina

	Model 2	Model 5	Model 6	Model 7	Model 8	Model 11	Model 12	Model 13
MaxT	0.523	0.131	0.279	0.521				
MinT					0.483	0.096	0.240	0.482
P	0.000	0.000	0.000	0.000	0.004	0.004	0.003	0.004
S	0.017	0.003	0.010	0.026	0.016	0.002	0.008	0.024
TPI	0.000				0.000			
ADR		0.010	0.002			0.014	0.003	
G		0.008		0.000		0.011		0.000

Models 5 and 11 had VIF and tolerance values that were close to violating the assumption of multicollinearity. They were reviewed to determine if they could be modified to create a better model for predicting and explaining tourism to the Coastal Region of North Carolina. ADR was highly correlated with both Supply and Gas Prices, which could have been causing the issues with multicollinearity. Since models had already been run incorporating the variable combinations of Supply and ADR and Supply and Gas Prices, the explanatory variable Supply was removed from models 5 and 11. The results indicated that the overall fit for both models improved. Both models had improved R scores and the

explanatory variables had better distribution of contributions to the overall regression models (See Tables 4.18 and 4.19).

Table 4.18
Modified Model 5's Multiple Regression
For the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F- Statistic	Sig.	
	0.893	0.797	0.792	158.871	0.000	
	B	Std. Error	β	T	Sig.	sr2
(Constant)	84978.939	21519.629		3.949	0.00**	
MaxT	5090.534	1966.987	0.632	10.386	0.000**	0.135
P	-1138.312	628.867	-0.022	-0.579	0.564	0.000
ADR	3164.479	8524.548	0.413	5.032	.000**	0.032
G	-28616.194	490.152	-0.203	-3.357	.001**	0.014

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

Table 4.19
Modified Model 11's Multiple Regression
For the Coastal Region of North Carolina

	R	R Square	Adjusted R Square	F-Statistic	Sig.	
	0.874	0.763	0.757	130.615	0.000	
	B	Std. Error	β	T	Sig.	sr2
(Constant)	220767.580	19459.273		11.345	0.00**	
MinT	4442.226	532.415	0.598	8.344	0.000**	0.102
P	-3708.478	2213.963	-0.073	-1.675	0.096	0.004
ADR	3514.791	708.513	0.458	4.961	.000**	0.036
G	-31783.861	9421.746	-0.226	-3.373	.001**	0.017

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

* . Correlation is significant at the .05 level (2-tailed).

n = 168

Chapter four presented the results and comparison of the models included in this study. The outcomes of the models were based on the combination of variables implemented and the interaction of the independent variables with each other and the dependent variable. The regression models provided information for understanding how tourist behavior was related to climatic and economic conditions. The next chapter discusses the implications of these findings and the best fit to explain tourist behavior to the Coastal Region of North Carolina.

Chapter Five

Discussion, Implications, Conclusion

The purpose of this chapter is to present the significance of research findings, conclusions derived from the results found during data analysis, and significant contributions made by the research. This study used multiple regression analysis to explore the interaction of climatic variables (i.e., Maximum Average Temperature, Minimum Average Temperature, and Precipitation) and economic variables (i.e., TPI, Supply, ADR, and Gas Prices) to explain and predict tourist behavior to the Coastal Region of North Carolina. Thirteen models were developed incorporating a combination of these seven explanatory variables for comparison to determine which models worked best to explain tourism behavior in the region.

Discussion of Research Findings

This research was exploratory and significant to the expansion of current quantitative research in tourism. The study was relevant to the tourism industry because it examined the relationship of the push and resistance factors from a holistic perspective, not just from the individual contributions of the explanatory variables that affect tourism behavior to the Coastal Region.

The research findings discuss the results of the study related to the research questions presented in Chapter One. The research questions answered in this section are:

1) Are there significant relationships between climatic and economic conditions (variables)

related to visitation to the coast of North Carolina; 2) Can the relationships found explain and predict tourist behavior; 3) Is multiple regression analysis a useful tool for forecasting tourism behavior to the Coastal Region of North Carolina; 4) Does the study provide a tool for decision makers to allow for better policy, marketing, and business choices in the North Carolina Coastal Region?

The outcome of my study presented some interesting findings. When climatic and economic conditions were used in multiple regression analysis, they presented correlations that could explain and predict visitation to the Coastal Region. Based on the R square values from the models compared in the study, 75%-80% of visitation to the Coastal Region could be explained. The variation in the amount of visitation explained was dependent on the combination of explanatory variables used in the models. The research can show tourism professionals how these independent variables work together to explain tourist behavior which is significant for future planning. Each one of the variables chosen in the study independently affected visitation to the Coastal Region, but the study showed they explained tourist behavior better when examined together. The results of the study provided empirical data to refine tourism professionals' knowledge regarding tourism to the Coastal Region to allow them to make better decisions regarding future tourism planning.

Multiple regression modeling in this study used past tourist behavior to predict future behavior to the Coastal Region. The outcomes could be used to develop marketing plans that would increase demand and mitigate negative effects of climate and economic conditions on visitation. The models could also be used by policy makers and planners to develop better infrastructure planning and policies for future tourism. Using the models

compared in Chapter Four the findings could be used to present consistent and unique tourist behavior.

A review of all the models indicated that Maximum and Minimum Temperature had the greatest explanatory power over any other variables incorporated into the models. This finding confirmed traditional assumptions made by tourism professionals in the Coastal Region that weather is important to visitation. The significance of this finding for tourism professionals is that it provides empirical data to quantify the magnitude of impact that temperature has on visitation. Temperature explained more than 60% of the visitation when combined with multiple climatic and economic variables. While the models supported local professionals' assessments, some unique findings resulted from how the variables interacted with each other.

In all eight models analyzed, temperature variables had a positive impact on visitation as predicted in the study. This finding was anticipated since warmer weather is an essential factor for most vacationers spending time at the beach. Regarding the third climatic variable entered into the regression models, Precipitation had slightly inconsistent impacts on visitation. Of the eight models, Precipitation negatively affected visitation five times, as predicted. Precipitation had the expected negative impact on visitation when modeled with Average Minimum Temperature. This finding indicated that when weather is cooler and it rains, visitation decreases. This result could indicate that visitors' comfort threshold does not support cooler rainy weather. Precipitation also had the expected negative impact when modeled with Average Maximum Temperature, Gas Prices, and ADR. Marketers and planners can use this information to create vacation specials, promote indoor attractions, and develop indoor recreation activities for visitors to participate.

Based on the variables entered into the regression models to account for weather conditions for the Coastal Region of North Carolina, temperature was the quintessential factor in tourist behavior, whereas precipitation had minimal perceived impact. The minimal impacts of precipitation could be a result of the visitors' ability to anticipate the weather through weather forecasting outlets. Temperature usually remains consistent within the predicted forecast, whereas precipitation possibilities are not always guaranteed. Therefore, tourists may not be as concerned with rain. The lack of overall impact Precipitation had on tourist behavior could also be due to the availability of indoor activities in the Coastal Region.

The economic variables used in the models had mixed affects on visitation to the Coastal Region depending on the combination of explanatory variables. It was expected that increases in the overall cost to travel (TPI) would result in a negative affect on tourist behavior, but results showed that it had a small positive correlation with visitation. While the TPI was anticipated to strongly influence tourist behavior, it had little affect. The outcome may be because the TPI values represented National Averages and was compared to the other explanatory variables, which were represented by local and regional data.

In all eight models, Supply had a positive impact on visitation as expected. Based on the results, supply had a minimal impact on the number of tourists who traveled to the area and had little impact on predicting future tourism. This finding may indicate that the population of tourists remained constant year after year. Marketers may use this information to expand their research efforts to examine the current market segments visiting the Coastal region and consider targeting other market segments.

While Supply did not have strong predictive ability, ADR did. Surprisingly, ADR has a positive affect on visitation. On the other hand, the correlation of ADR and visitation rates could be reflective of tourism behavior driving ADR. As tourism goes up, so do the room rates. This point of view is more consistent with supply and demand behavior. Hoteliers and property managers, as well as other tourism professionals, may consider rolling back rates significantly during off peak months to generate demand. It would also be beneficial for public officials to work with community programs, event planners, and local business to create activities during cooler months to attract more visitors to the region. Unlike ADR, Gas Prices had negative affects on visitation.

In all models where Gas Prices were incorporated, as expected, visitation decreased as gas prices increased. The influence of gas prices varied greatly depending on the combination of variables included in the model. When Gas Prices were modeled with ADR, the impacts were more significant than when modeled with Supply. Increasing room rates and gas prices created significant decreases in visitation to the Coastal Region. This finding could indicate to tourism professionals that plans for augmenting the cost of travel should be developed to offset the negative effects of increasing gas and room rental price.

A review of the Model Summaries, Table 4.13, provided an overview of the model(s) that provided the best strength association between the rooms rented and the explanatory variables. For each model examined, the explanatory variables collectively had a statistically significant affect on visitation (i.e., rooms rented) to the Coastal Region of North Carolina. The results of the model comparison presented some consistency among the models, which helped in determining the model(s) that were a good fit for the Coastal Region.

The models using Average Monthly Maximum Temperature performed better than the models incorporating Average Monthly Minimum Temperature. A possible explanation for this finding is that tourists visiting the Coastal Region are more concerned with how warm the weather is in the region versus how cool it might get during their visit. Another possibility that could be considered by the regression model for the increase in visitation during the warmer months is that when tourists take their vacation and the amount of leisure time available during those months.

An analysis of the eight models in chapter four indicated that Models 5 and 11 had the best distribution of explanatory variables to explain and predict tourism to the Coastal Region of North Carolina. Model 5 had the larger predictive ability when forecasting tourism to the Coastal Region of North Carolina compared with Model 11's. Model 11 had a better distribution of contributions made by the explanatory variables to explain tourism to the Coastal Region of North Carolina. The major difference between the two models was that Model 5 incorporated Average Maximum Temperature and Model 11 incorporated Average Minimum Temperature. However, a potential issue could exist with multicollinearity if a new set of data were applied. A review of the models indicated that ADR was highly correlated with Supply and Gas Prices. Since Supply had already been modeled with ADR and Gas Prices separately, Supply was removed from the models resolving the issue with multicollinearity. Adjusted Model 5 and Adjusted Model 11 explanatory and predictive ability improved once Supply was removed. Depending on the objective, tourism professionals could use either Adjusted Model 5 or Adjusted 11 for explaining and predicting tourism to the Coastal Region.

The use of multiple regression analysis can provides tourism professionals with a tool for applying the quantitative data collected in the tourism industry to better understand tourist consumer behavior and predict future visitation. The eight models explained from 74.7% to 79.7% of why rooms were rented in the Coastal Region of North Carolina. The research approach used a variation of model comparison not typically used in multiple regression analysis. In summary the findings were exploratory but encouraging to understanding tourist behavior.

Limitations of Study

The research conducted in this study furthers the use of statistical data collection in North Carolina. However, limitations within the study need to be considered. A primary limitation for the study was the use of secondary data. Potential issues related to using secondary data were the reliability of the data collected, how often the data were collected, and how accessible the secondary data may be in the future. When using secondary data it is difficult to know if the data is being collected consistently and at the same frequency is difficult. Depending on the secondary data source the information may not be available at a future data.

The study only examined hotel/motel visitation to the Coastal Region. This approach was a limitation because it only presented findings for one segment of visitation to the region. The inability to incorporate attraction visitation, beach visitation, travel arrivals (e.g., air, ground, and sea), vacation property rentals, and outdoor recreation activities was due to the limited availability and frequency of data.

Availability of data overall was a limitation for the study. Tourism organizations and organizations related to tourism collect data differently. Since no standardized method of collecting quantitative visitation data exists, collecting data for all the potential dependant and explanatory variables that could have been incorporated into the study was impossible. Many times attraction visitation data collected has missing data making it difficult to find suitable variables to incorporate into multiple regression modeling. Determining if the data collected is reliable is also a challenge. Often attractions will change the way they collect data over time, because no standard approach for collecting visitation data exists.

Another limitation to the study was the frequency of data collection. It was impossible to collect data for all the potential explanatory variables that could have been incorporated into the study because of the frequency of data collection. The frequency of data collection varied from organization to organization, which limited the availability to collect data at more frequent intervals (e.g., weekly or daily). Most economic variables (i.e. disposable income and GDP) were compiled annually. Therefore, the pool of plausible explanatory variables was limited for the purposes of this study.

Because of the limitations regarding the availability and frequency of data, my study examined a broad area and the observations were generalized to monthly averages. If visitation data could have been collected on a daily basis for multiple attractions in the region, other variables could have been included to represent leisure time, comfort index, and beach visitation over smaller areas throughout the region. This approach would have allowed for a more thorough representation of how climatic and economic conditions influence tourism behavior in the Coastal Region.

Financial costs of data presented another limitation for this study. Due to limited financial resources for data acquisition, the data collected were provided by organizations was complimentary or it was public record and accessible through public domains. The cost and accessibility of collecting data is a growing issue in tourism research. Often tourism organizations or organizations related to tourism collect data, but do not share it with other tourism related organizations. Lack of available data limits the ability of communities to maximize research and potentially enhance future tourism.

Limitations also were presented with the use of multiple regression analysis. According to Fretchling (2001), the time and money costs of operating regression models can be large. Developing the correct relationships requires substantial skills, and regression analysis assumes that explanatory variables are not affected by the dependent variable. The software necessary to run multiple regression analysis is expensive and the time and personnel needed to collect the data is substantial. To ensure the relationships are examined correctly requires an understanding of how multiple regression works.

Lastly, many other factors can impact tourist behavior such as marketing, competition, special promotions, new attractions, hurricanes, illness, leisure time, and accessibility. These variables are all difficult to incorporate into independent variables for use in multiple regression analysis. However, multiple regression modeling could be used in conjunction with other quantitative forecast analyses to measure these impacts on tourist behavior.

Recommendations for Future Research

Future researchers could include the use of alternative modeling techniques as well as expanding on the current modeling effort. Incorporating time series analysis would allow researchers to examine points in time to determine when the shift in visitation occurs as a result of the climate and economic variables. More complex modeling would allow researchers to examine the impact of the weather forecast on bookings and cancellations. Other research that should be considered in the future is combining qualitative data and quantitative data in doing this type of consumer tourism research.

Future researchers also should incorporate more quantitative variables to improve model performance. More quantitative variables will allow researchers to examine multiple dependent variables to determine if climatic and economic conditions affect visitation to indoor and outdoor attractions, hotel/motel occupancy, arrivals (air, ground, and sea), and special events the same way. The use of social explanatory variables should be considered in future research in combination with climatic and economic variables to create a more holistic research study.

Since the data in this study incorporated an entire region of North Carolina, it generalized to all the communities within the region. Therefore, future research of the modeling should incorporate specific communities and attractions throughout the Coastal Region to refine the accuracy and effects of the modeling for tourism managers and professionals.

Leisure tourism demand is sensitive to acts of terrorism, war, disease outbreaks, and extreme weather conditions. These situations can dissuade tourists from visiting a destination. Therefore, future research incorporating these explanatory variables into

regression modeling in North Carolina should be considered. By identifying the magnitude these explanatory variables have on tourism to the Coastal Region of North Carolina, tourism professionals can mitigate the effects they have on visitation by potentially forecasting these types of events and their impacts on tourism demand and tourist behavior. Further implications of this research could be the reduction of adverse affects on tourist related sales, income, employment, and tax revenue of a location (Fretching, 2001). For example, if travelers want to go to the beach during hurricane season they may be more likely to travel to the west coast versus the east coast to minimize their chances of their vacation being affected by a hurricane.

Conclusion

This study provided a methodological approach to gauge tourist consumer behavior to the Coastal Region of North Carolina despite the limitations of the data. The study produced a set of models that incorporated explanatory variables which explained almost four-fifths of the total variation of tourist behavior in the Coastal Region of North Carolina. The results of the research suggested that weather, presented by Minimum and Maximum Temperature, had a statistically significance impact on tourist behavior. Whereas Precipitation had no statistical significance measured on its own, it did contribute to the regression models to quantify the tourists' behavior related to visitation. Surprisingly, the contributions and significance of the economic variables in a model were dependent on the climatic variables incorporated. Therefore, the statistical significance of the variables was difficult to predict without modeling.

This study provided an argument for better accessibility to proprietary data and the construction of a more unified system of data collection in tourist organizations. For organizations to successfully run this model, data need to be obtainable and collected in the same manner. Given the constant change in weather patterns and the gravity of climate on tourist behavior, collecting data on a daily basis and sharing this information with other professionals within the region would be beneficial for industry leaders.

Considering a shortage of similar research with which to compare this study, this modeling could be effective in specific destinations throughout the Coastal Region. This study showed the importance of the relationship between climatic, economic conditions, and tourist demand and its significance to be used by tourism professionals. This research also provides empirical evidence of the impact weather has on tourist demand. For industry leaders, the outcomes of this study may not be surprising. However the data show to what extent these factors may influence tourist demand. The understanding of the relationships among climatic, economic conditions, and tourist demand can provide a foundation for future research related to tourist consumer behavior patterns and decision making processes using quantitative data and regression modeling.

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