Quantifying the Art of Retail Site Selection – A Retail Case Study

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Submitted to the Department of Urban Studies and Planning and the Department of Architecture in Partial Fulfillment of the Requirements for the Degree of Master of Science in Real Estate Development

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QUANTIFYING THE ART OF RETAIL SITE SELECTION – A RETAIL CASE STUDY

BY

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ABSTRACT

Although there have been great strides in attempting to identify the locations that will yield the highest sales, the opinion among retailers remains that once the demographic, market, and sub-market analysis is complete, the choice of where to open a store within a sub-market is a matter of "feeling". Science can help a retailer pinpoint an optimal intersection that will enable it to place its goods and/or services in front of the largest number of potential customers, but it is the "art" of site selection that will enable a retailer to choose the best of the available locations surrounding the targeted intersection. There are invariably a number of appropriate alternative sites within a qualified trade area. Choosing the best location among these alternative sites is subjective. This "feeling" or "art" of selecting the relatively better location is something that is usually refined through years of developing the intuition for what will work the best.

The purpose of this paper is to look at and then quantify the real estate variables that affect the relative attractiveness of available locations that exist within a delineated trade area. This is in an attempt to replace the subjectivity or "art" of selecting the best location with that of quantifiable results that prove that one site will result in higher sales than that of another.

The results of the analysis show that the independent variables fail to predict sales per square foot with a requisite statistical significance. While the data failed to prove the hypothesis that the "art" of selecting retail locations can be replaced with quantitative analysis, the authors believe that with a larger sample size real estate factors can provide valuable insight into sales per square foot forecasts.

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INTRODUCTION

The purpose of this paper is to look at and then quantify the real estate variables that affect the relative attractiveness of available locations that exist within a delineated trade area. This is in an attempt to replace the subjectivity or "art" of selecting the best location with that of quantifiable results that prove that one site will yield higher sales than that of another.

A good location will not guarantee a store's success, but a bad location will kill it. This has been a common saying among retailers for many years. Knowing that a poor location can have a very harmful impact on a particular location's sales and subsequent profitability, there has been considerable research completed on the subject of retail outlet location to help improve the chances of opening a successful outlet. Most of this research has been built off of the foundation of the retail gravitation theory developed by W. J. Rielly in the early 1930's. As retailers began to appreciate the competitive advantages that good locations afforded them, the search to identify what made one location better than another intensified. For many years the locational decision for firms was easy. They located on established retailing streets within a city. But as inner cities began to decline and the population began to migrate towards the outlying suburbs, the need for more scientific analysis arose. The product of this continued research came in the form of location-allocation and spatial interaction models. These are very complicated models that attempt to help a retailer identify potential markets and then to understand how a new location will affect the chains existing stores. [The history and

current trends of retail outlet location research will be discussed in greater detail in the literature review section of this paper.]

Although there have been great strides in attempting to identify the locations that will yield the highest sales, the opinion among retailers remains that once the demographic, market, and sub-market analysis is complete, the choice of where to open a store within a sub-market is a matter of "feeling". Science can help a retailer pinpoint an optimal intersection that will enable it to place its goods and/or services in front of the largest number of potential customers, but it is the "art" of site selection that will enable a retailer to choose the best of the available locations surrounding the targeted intersection. Invariably, there are a number of appropriate alternative sites within a delineated trade area. Choosing the best location among these alternative sites is subjective. This "feeling" or "art" of selecting the relatively better location is something that is usually refined through years of developing the intuition for what will work the best.

An example of the "art" of site selection is illustrated by a story about developer Edward J. DeBartolo. He would cruise over the countryside in his orange-and-white Learjet several times a week to identify new locations and check up on projects under construction. One time while flying over a site in Florida with a *New York Times* writer on board, DeBartolo exclaimed, "My God, what a growth pattern. Boy, that's beautiful. All those people down there...And *there we are*, sitting right there with Sears! Penney's! Jordan Marsh!—and with that Interstate weaving right through there, nice road, no tolls....Boom! We got 'em. We can write our own ticket down there."

The question that this paper seeks to answer is this: Is it possible to quantifiably predict the relative attractiveness of one site to another based upon the physical characteristics that exist at each competing location? Some of these characteristics include: access, visibility, signage, co-tenancies, number of parking spaces, age of center, to name a few.

In some cases when comparing available sites within a delineated trade area, the original decision to locate retail at a particular intersection was chosen by a shopping center developer long ago. Although the decision to place retail to serve that demographic base was made sometime earlier, a retailer that is new to the area must now make the decision to locate within that original center, build its own facility on a nearby piece of ground, or locate in another center that is situated a short distance away. Whether it is a new development or a rehab of an old one, all of the options presented have different real estate attributes associated with them that will ultimately affect the retailer's sales. This paper will shed more light on the correlation of these characteristics with sales and aid in the comparative decision-making process that all retailers face.

The authors will endeavor to quantify the "art" of site selection through the use of regression analysis. A Mountain States retailer, that wishes to remain anonymous for certain competitive reasons, has graciously offered to supply the necessary data for this analysis. The data is derived from their existing locations and will be used to unmask the reoccurring real estate variables that contribute to a store's success.

Retailer's Background

The data for the research comes from a leading specialty retailer of the "category-killer" type. The Company has locations that are primarily concentrated in the Mountain States region of the United States. Thirty-three of The Company's stores qualified for the study.

According to The Company's website, the first location was founded in the late 1960's. The Company became public in the early 1990's. The Company has opened sixteen new 30,000 to 52,000 square foot stores and has relocated and/or expanded seven of its existing stores to this larger format in the past couple of years. The current prototypical store generally ranges in size from 30,000 to 36,000 square feet, with approximately 55% to 60% of square footage devoted to selling space. [For the purposes of this paper, all of the sales per square foot data are based upon the area within the store that is devoted to selling space. This is different than that of Gross Leasable Area (GLA), which is much larger and is typically what sales figures are reported against. As such, the sales per square foot numbers used in this paper appear to be abnormally high compared to that of the International Council of Shopping Center's Monthly Mall Index, which is a survey of 500 locations of similar retailers that report the average sales per square foot to be $376 in 2000.] The remaining space is dedicated to a store warehouse, general office space and, in selected stores, a service facility. The Company expects to relocate and/or expand the smaller stores within the chain as opportunities become available. They appeal to a wide range of customers with an emphasis on selling mid to upscale products. The Company's stores enable it to differentiate itself from its competitors by providing a

comprehensive selection of name-brand consumer products, with an emphasis on limited distribution upscale brands, as well as by offering an extensive range of customer services and by having display and demonstration rooms. These factors, together with its open and uncrowded merchandise displays and its policy of matching the lowest prices of its competitors, make it an attractive alternative to other superstores and mass merchants selling the same type of products.

The Company is considering entering new trade areas to increase their market share and continue their growth. Proper site selection of their stores will be critical for their success.

The Company uses a consultant to analyze what markets are most advantageous for them to enter. The consultant will produce a comprehensive market study that will narrow the analysis down to a targeted intersection within a specified sub-market. Once these targeted intersections are identified through their consultant's sophisticated spatial-analysis and geocoding modeling that help forecast sales, it is then the responsibility of The Company's real estate representatives to research the available sites at or near the target intersection. This is where the science portion of the site selection process ends and the "art" of the process begins.

LITERATURE REVIEW

Selecting the best location or site for a retail outlet is a fundamental decision for any retail business. Location affects customer patronage, market share, sales revenue, and profit and consequently the long-term performance and viability of the business itself. A well-located retail center can be successful even in a weak economic environment or an overbuilt market, while a poorly located outlet may eventually fail. Therefore, understanding how location affects a retail business is paramount to the success of individual outlets, retail chains, and investors. (Ownbey, Davis & Ownbey, 1994)

Thousands of years ago, enterprising merchants began to set up shops in central bazaars, near temples, and along major trading routes. All of this was an attempt to place their goods or services in front of as many potential customers as possible. They realized early on that when selling goods or services, the choice of outlet locations was and is perhaps the most important decisions a retailer has to make. Good locations allow easy access, attract large numbers of customers, and increase the potential number of sales of a particular outlet. In today's extremely competitive retail environment, even a slight difference in certain locations can cause a significant impact on sales and market share. Because the placement of a store is usually a long-term commitment, the disadvantages of a poor location are difficult to overcome. As retail marketing experts Jain and Mahajan (1979) note: "In the development of competitive strategies, prices can be matched, services can be extended and improved, merchandise may be duplicated, and

promotion can be imitated, but a retailer's locational advantages are difficult to assail or neutralize" (p. 219).

In their book, "Location Strategies for Retail and Service Firms" Ghosh & McLafferty review several key location concepts that they have gleaned from many years of research and analysis of the topic. They explain that the purpose of a store-location strategy is to determine the spatial pattern of outlets that best meets the corporate goals and strategy. In selecting store locations, a balance is achieved when the availability of desirable sites coincides with the needs of the marketplace and the requirements of corporate marketing objectives. The store-location decision is not merely a question of choosing sites. It also involves the juxtaposition of the spatial characteristics of a market with the overall corporate and marketing goals of the firm.

Opening a new location is inherently risky. With rising land and construction costs, the risks of developing new locations have increased. Perhaps the most risky element of opening a new outlet is the possibility that it will never achieve its sales potential or be profitable.

Given the importance of a location decision, a number of analytical procedures have been developed for location analysis and site selection. The origins of store-location research can be traced to the practices of numerous entrepreneurs and managers who, based on their judgment and intuition, made location decision for their firms. The wisdom underlying these decisions eventually were codified into rules of thumb and checklists

which others could follow. These checklists included information necessary to evaluate the relative attractiveness of a site compared with other potential sites in the area. It listed various factors that are likely to impact sales and costs at a site. The checklists were the first attempt to develop a systematic basis for site selection.

While subjective judgments and managerial experience in site selection continue to be important, these developments led to a much greater reliance on systematic and objective bases for location decision making. The result was an array of techniques that focused both on finding optimal sites for retail stores and forecasting sales and profits for the outlets based upon objective criteria. Methods for forecasting sales of retail outlets are distinctly different from other sales forecasting techniques and this difference lies at the heart of all store location analysis methods. The sales potential of a retail outlet depends on the quality and price of the merchandise it carries, its physical characteristics, the characteristics of customers, the level of competition, and the relative accessibility of competing stores. The relative location of the outlet is a critical determinant of store patronage since it affects accessibility to consumers and ultimately the level of expected sales. Modeling the variability of sales potential at different location is a central concern in location analysis. (Ghosh & McLafferty, 1987)

Evolution of Store Location Strategy

In order for a sales forecasting model to be successful, an important component is for the retailer to be able to define the trade area for its outlets. To forecast sales, a trade area from which a retailer's customers will emerge must be defined. There are some

exceptions to this such as resort or tourist regions that rely on a continuous stream of visitors that reside outside of a trade area. For most outlets though, the sales potential for a location is limited by the number of potential customers that reside within a delineated trade area. There are some exceptions such as resort or tourist regions that rely on a continuous stream of visitors that reside out side Information on trade area size and composition is also useful for obtaining a profile of customers, determining the special pattern of patronage, and planning advertising.

One of the researchers to first approach this trade area delineation was W. J. Rielly in his book "The Law of Retail Gravitation". Using the Newtonian law of gravity, Reilly's formula predicts the retail trade area of competing towns, cities, and shopping centers using information on population size and distance. The law argues that the proportion of retail trade attracted from intermediate towns by two competing urban areas is in direct proportion to their populations and in inverse proportion to the square of the distances from those cities to the intermediate towns. This can be expressed mathematically as: $R(A)/R(B) = P(A)/P(B) \times [D(B)/D(A)]^2$ where R(A) and R(B) are the proportions of retail trade from the intermediate town attracted by cities A and B, respectively; P(A) and P(B) are the populations of the two cities; and D(A) and D(B) are the distances from the intermediate town to the two cities. This equation expresses the relative powers of the two cities to attract shoppers from the neighboring rural areas. It can, therefore, be used to estimate the relative retail potentials of the two cities. Rielly's formula was one of the first attempts at developing an analytical approach to distinguish retail trade areas. His

formula was extensively investigated and further extended by a number of researchers. (Reilly, 1931)

Building upon the work of Rielly, more recent approaches to retail sales forecasting rely on surveys of customer shopping patterns. William Applebaum pioneered the foundation of this type of retail trade delineation. Using his experience in the supermarket industry, Applebaum established "customer spotting". Customer spotting utilizes customer surveys to figure the sales performance of a chain's existing or sample of stores. The geographic origins of each sampled customer are plotted on a map. Concentric circles representing different distances from the store are drawn on the map using the location of the analog store as the center. The pattern of customer origins and the relationship between the level of market penetration and distance can be seen from the map. To define the trade area of the outlet, the cumulative proportion of customers in each zone is calculated starting from the innermost zone. The circle containing 75 to 80 percent of the customers is used to demarcate the spatial extent of the trade area of the outlet. Using these estimates, the retail analysts can choose optimal locations for new outlets that cater to its customers' shopping preferences. The "analog" method of site selection first proposed by Applebaum was the first attempt at a formal quantitative approach to retail site location and sales forecasting. (Applebaum, 1968) The work of Applebaum and his coworkers has been very influential in establishing a system of data collection including information on consumer travel patterns, expenditure potentials, competitive conditions, and site characteristics. The analog procedure, now refined and extended by many researchers, has been used extensively by many retail firms. (Rogers & Green, 1978)

Beyond the primarily descriptive focus of the analog method are spatial-interaction models. These models look at the factors that affect retail consumer behavior and in turn predict the shopping patterns that will emerge within an area. David Huff laid the foundation of spatial-interaction models. Huff's model provided, for the first time, an approach that made it possible to look at the complex interactions within the total systems of retail trade areas in a market. Huff suggested that a trade area was much more than the simple non-overlapping areas proposed by the earlier "gravity" formulations (Reilly 1931). He suggested that trade areas should be viewed as continuous and probabilistic.

Huff, as Applebaum, stressed the importance of surveying consumers to find out shopping patterns and preferences in order to estimate trade areas and potential outlet sales. (Huff, 1966) Huff's work has played an important role in the development of store choice and retail forecasting models. His probabilistic "revealed preference" approach to modeling store choice has been extended further by the multiplicative competitive interactive (MCI) model of Nakanishi and Cooper (Nakanishi & Cooper, 1974) and by the application of multinomial logit (MNL) techniques. (Arnold, Roth & Tigert, 1981) Like the analog model, spatial allocation models are used by retail firms to forecast sales and estimate the impact of changes within the market on individual store performance. These models constitute a major element of contemporary store-location research. (Ghosh & McLafferty, 1987)

Recent Advances in Location Modeling

"Today's site-selection process is much more sophisticated than it has been in the past," said Gary Hawkins, a preferred developer for a number of retail chains. "While I was analyzing the Salt Lake City market for Circle K convenience stores in the early 70's, the site-selection process was much more simple that it is today. Back then I would have the president of the company in the front seat and the head of real estate in the back seat of my car. We would then drive to potential locations. The demographic and site-selection research consisted of driving ½ mile down the major streets in either direction looking for tricycles in the yards and people walking their dogs. After the short tour, the president and the real estate person would then each write on a piece of paper what they thought the site was worth. As an example, the president would unveil his price at $18,000 and then the real estate person would reveal a price of $20,000. They would then turn to me and ask the price. If it was less than their average, we had a deal. It was that simple. Nowadays I spend more than those site acquisition costs on consultancy fees for demographic and traffic studies just to get a retailer's attention." (Hawkins, 2001)

Although some retail chains' site-selection process was as rudimentary as those described above, for many retailers and demographers the work of Applebaum, Huff, and their coworkers represented the state-of-the-art in retail store-location theory. In more recent years though, store-location and sales forecasting models have entered a new phase of sophistication and refinement. This transformation has been instigated by new technology, increased competition in a market that is considered overstored, the speed to market of a new retail concept, and a highly fragmented consumer marketplace. Added to that is the relatively recent advent of the e-commerce variable. Although the

technology and retailing landscape has changed since Rielly published his pioneering work on trade areas, the fundamentals of retail site selection remain relatively constant. The difference today is that technology is able to locate consumers faster and more accurately than ever before. Speed-of-light information sharing and data mining are helping retailers in their quest to find locations that will cater to a targeted subset of a larger demographic area.

One of these technological tools that is helping redefine the way retailers look at potential locations is geographic information systems (GIS). The widespread use of GIS has redefined the competition for local sites. GIS is a collection of tools that allows for the mining, analysis, and graphic expression of relation data applied to a particular location. These tools give practitioners the ability to take national studies and trends and extrapolate the viability of street-level sites. (Blazer, 2001) As individual retail chains operate in an increasingly competitive and global environment, their marketing programs have become more sophisticated and expansion costs are higher. One of the most important things they can do is see how a new local location fits into their ever-increasing network of stores. GIS allows retailers to have this intimate look. This type of application is designed to provide retail real estate professionals with the tools and hard facts they need to back up their natural instincts.

This new technology is readily available. There are a number of web-sites where all one must do is type in an address or intersection, create a few trade areas, drive times, or boundaries, and a customized site report can be generated. This instant access to

information has created a quality hierarchy. "Accurate information has the effect of killing a bad deal faster than ever before. Because better data is available...technology is raising the bar in what can, and should, get approved," says Juan Muzquiz, president of Investment Realty Resources in Middletown, Ohio. (Blazer, 2001)

Consistency in consumer behavior is also playing a part in the site-location decision process, as cluster analysis, which identifies similar behavior patterns within similar demographic tracts, becomes prevalent. Psychographics—adding psychology, behavior, and lifestyles to demographics is becoming increasingly important. For example, the shopping patterns in the Midwest are not the same as those in the New York City metropolitan area when parking, road access, and visibility are considered. (Rose, 1996)

The Buxton Company, a leading retail site-location consultant located in Dallas, is using technology to aid in the construction of a sales forecasting model that seeks to have a 10% failure rate. This means that 100% of the time they aim to forecast a retail outlet's future sales within 10% above or below their projection. "We used to say the mantra was 'location, location, location,'" commented David Rambie, executive vice president of The Buxton Company. "In today's retail environment, that is extremely dated. Now it's 'customer, customer, customer.'" The first step in developing a forecasting model is to look at the performance (total revenue) of every outlet in a retailer's chain. They then study what every customer has purchased within the last couple of years. They call this geocoding. It shows them what every customer purchased and exactly where they live. Once Buxton has geocoded their client's customers, they place a dot on a map that

represents every customer's location. This enables a retailer to exactly identify their current trade area. Buxton then uses a drive-time gravity model to approximate how many households will shop a future location. Customers are then coded according to their shopping habits. There are 50 possible customer categories. Using this information, Buxton can then build a model that forecasts sales for a 10% failure rate. According to Rambie, "You can never estimate sales 100% because of the management variable. If the Son of Sam is running the store, all estimates go out the window." (Rambie, 2001)

Importance of Good Site-Selection

Like a highly recruited ball player who never lives up to his potential, some stores just don't perform. The cost of a store's nonperformance is great. "If you make a mistake on advertising or merchandising, it can easily be fixed. You can't fix a mistake on a 10- or 15-year lease," commented Mark Zygmontowicz, executive vice president of Thompson Associates, a retail site-location consultant. (Watterson, 2000)

Adding to the maelstrom of complexity for many retailers, a recent survey of retail real estate conducted by Ernst & Young has found that retailers plan to aggressively pursue expansion. This is in spite of all the talk of America's over stored environment and economic storm clouds elsewhere in the world. What's more, a sizable number are banking on financial growth achieved through increases in sheer footage or via the mergers and acquisitions route rather than by bolstering the productivity of current operations. With this type of competitive market, retailers cannot afford to make site-selection mistakes. "A good location won't guarantee a store's success; but a bad location

will kill it." (Gentry, 1998) "Within a chain of stores, one in ten of the new openings will fail. The value of research is to avoid making those decisions that lead to failed locations", says David Rambie, executive vice president at The Buxton Company. "The idea is not finding the great site, but rather it is not finding the real looser." (Rambie, 2001)

In addition to the retail saturation in the U.S. market, retail real estate strategies must also account for shifting demographic trends. The growth of per capita retail sales has declined at a far faster rate than has per capita GDP growth during the past three decades. (E&Y, 1999) "This underscores the aging of the population and the maturing of the U.S. retail market," notes Richard Green, associate professor of real estate and urban land economics at the University of Wisconsin's Madison School of Business. "Retailers will have to work harder to achieve incremental sales growth." (Anonymous, 1999)

In conclusion, retailers are taking the recent sales forecasting and site-selection advances with a dose of caution. At a recent conference that focused on site-selection, Mr. Robert Shern, a real estate representative for Home Depot, commented, "They're all tools (geographic information systems). The technology is a tool and local-market knowledge is a tool. It's probably dangerous to rely on one more than the other. You must have the whole package and have it complete before you are satisfied you have the right site." Adding to that, a Cole's real estate representative said that, "There will always be an important role in the site-selection process for business judgment; but computer-based modeling is a tool to balance against that more subjective business judgment. There will

be cases where an individual's judgment of a site's sales potential may be better or worse than what the model described," he concludes. "That has to be taken into consideration. Ultimately, someone has to own the sales projections and that should be the person responsible for delivering on them when the store opens." (Sunil, 1999)

THE DATA

As stated previously, The Company examined in this paper has 33 locations that qualified for the study and as such will be the basis for the analysis. The amount of data that can be generated from 33 stores, while statistically significant, does not allow for as many independent variables as would be desired for an exhaustive study.

To compensate for the limited number of independent variables, the authors surveyed nearly 100 retailers to discover what variables they thought were the most vital to the success of their stores. The retailers that were sampled were selected on the basis of having more than 10 stores in excess of 15,000 square feet. The questions asked in the survey were derived by telephone interviews with leading retailers and developers. Some of those that helped with the formation of this survey are: Gary Brockman who is the real estate manager for Tricon Global Restaurants, Richard Hearn who is the head of leasing for the big-box developer Vestar, Ron Fullam who is director of leasing for CBL & Associates, and Mark Wheeler who has been a retail real estate representative, a broker, and most recently a developer of retail projects. (Brockman, Fullam, and Hearn 2001) The survey, which the authors distributed via e-mail said the following:

Retail Questionnaire

We are graduate students at MIT's Center for Real Estate. We are currently writing a thesis on comparative retail site location. We are attempting to evaluate the relative importance of site attributes between competing sites that are located within the ***same***

qualified trade area. As a result, we are not going to use demographics or other factors that we are assuming would be constant between the competing sites.

We have received data from a retailer that will allow us to use regression analysis to determine the relative importance of these attributes. We would like your help in determining what attributes we will include in the regression analysis. The following survey should take less than 1 minute to complete.

Instructions:

If you would be willing to help us, the easiest way for you to do this is to hit the reply button on the e-mail and rank the below listed site factors 1-12 (1 being the most important in your opinion - use a number only once) in the brackets following the factor.

Thank you for your help. If you are interested in the results of our thesis, we would be happy to e-mail you a copy when we are finished in August. Because we must be finished by August, your timely reply would be appreciated.

I. Competition in a 1-mile radius { }
II. Co-Tenancy { }
III. Format: (Mall, Power center, Freestanding or other) { }
IV. Freeway Pylon Sign (or primary street if not on Freeway) { }
V. Primary Street(s) Monument Sign(s) { }
VI. Site Location (Mid block or Intersection) { }
VII. Store Access from Primary St. { }
VIII. Store Design (ie Prototype or Not) { }
IX. Store Proximity to Freeway/Highway Off-ramp { }
X. Store Visibility (from Freeway, Highway, etc.) { }
XI. Store Visibility (from Primary St.) { }
XII. Other/Additional { } **Please Name/Describe*

Other Comments:

Thank you,

Chris Foulger and Matt Hawkins

The results of our survey indicated the following ranking of variables in importance. (The lower the average score, the more important the variable is.)

Survey Results

Ranking	Variable	Average
1	Store Access	**2.88**
2	Store Visibility from Primary St.	**3.75**
3	Site Location (Mid block or intersection)	**4.63**
4	Competition in a 1 Mile Radius	**4.88**
5	Store Visibility from Freeway	**6.00**
6	Co-Tenancy	**6.50**
7	Store Design	**7.38**
8	Format:(Mall, Power Center, Freestanding)	**7.50**
9	Primary Street Monument Sign	**7.75**
10	Freeway Pylon Sign	**8.00**
11	Store Proximity to Freeway Off ramp	**8.13**
12	Other / Additional	**10.63**

This survey will manifest itself in the study in two ways. First, it will allow the authors to know which variables to focus on given The Company's relatively small sample size. Second, the results of the multiple regression analysis can then be compared to the results of this retailer survey to see if the ensuing data supports the retailers' ranking of the variables.

Once a better understanding of the variables the respondent retailers perceived to be important were ascertained, a final list of questions to The Company could be assembled. The answers to the following questions contain both the independent and dependent variables analyzed in the study. The following Excel spreadsheet was sent to the real estate director at The Company with instructions to fill out one sheet for every store.

Specific Site Attribute Form

Independent Variable

Sales Per Square Foot

Place a "1" in the yellow box that corresponds with the site

Dependent Variables

1 Format
1. Powercenter
2. Stripcenter
3. Freestanding

2 Visibility (from Freeway, Highway, etc.)
1. Excellent
2. Limited
3. None

3 Visibility (from Primary St.)
1. Excellent
2. Limited
3. None

4 Proximity to Freeway/Highway Off-ramp
1. <.25 miles
2. <.5 miles
3. < 1 mile
4. < 2 miles
5. None

5 Access from Primary St.
1. Signaled entrance
2. Full access, no signal
3. Left & right in, right out
4. Right in, right out only
5. Right in, right out only - Access Road

6 Access from Adjacent St.
1. Signaled entrance
2. Full access, no signal
3. Left & right in, right out
4. Right in, right out only
5. None

7 Parking-Spaces per 1,000 square feet of improvements
1. Less than 2
2. 2-3
3. 4

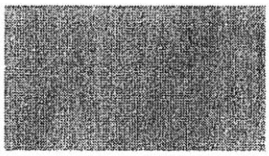
4. 5
5. more than 5

8 Site Location

1. Located at intersection
2. Located mid-block

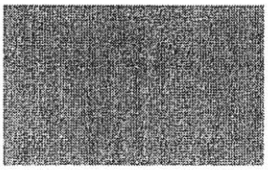
9 Signage - Pylon Sign

1. None
2. Less than 100sf
3. 100-200 sf
4. More than 200sf



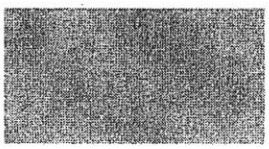
10 Main Street(s) Monument Sign(s)

1. None
2. Less than 100sf
3. 100-200sf
4. More than 200sf



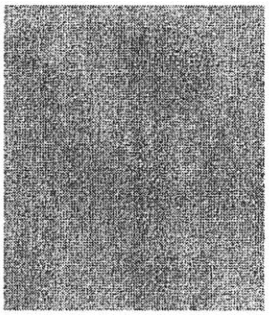
11 Competition in a one-mile Radius

1. 3 or more
2. 2
3. 1
4. None



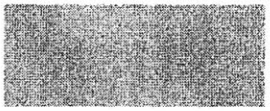
12 Co-Tenancy

Department Store
Grocery
Home Improvement
Mass Discounter
Membership Club
Sports
Office Supply
Pet Supply
Entertainment



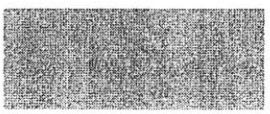
13 Shopping Center/Mall Curb Appeal

Excellent
Average
Poor



14 Store Curb Appeal

Excellent
Average
Poor



15 Year Ultimate Occupied Space

16 Year Building was Built 

The data was gathered in this manner because of the sensitive nature of sales information in the retail world. Having The Company's real estate director fill out the forms ensured that tracing back sales data to individual store locations would be nearly impossible.

The final questionnaire to The Company contained 16 variables. The authors wanted as much data from The Company as possible so that they could set up the regression analysis in a way that would be most meaningful.

Whenever possible, questions were phrased to be as objective as possible. Given the time constraint, it is inevitable that certain questions will have to remain subjective in nature. The following three pages detail the variables used in the analysis and includes a summary chart of the complete raw data for all the variables at each store location.

Regression Variables

1		Store Format
Variable	1	1. Powercenter
Variable	2	2. Stripcenter
Variable	3	4. Freestanding

2		Visibility (from Freeway, Highway, etc.)
Variable	4	1. Excellent
Variable	5	2. Limited
Variable	6	3. None

3		Visibility (from Primary St.)
Variable	7	1. Excellent
Variable	8	2. Limited
Variable	9	3. None

4		Proximity to Freeway/Highway Off-ramp
Variable	10	1. <.25 miles
Variable	11	2. <.5 miles
Variable	12	3. < 1 mile
Variable	13	4. < 2 miles
Variable	14	5. None

5		Access from Primary St.
Variable	15	1. Signaled entrance
Variable	16	2. Full access, no signal
Variable	17	3. Left & right in, right out
Variable	18	4. Right in, right out only
Variable	19	5. Right in, right out only - Access Road

6		Access from Adjacent St.
Variable	20	1. Signaled entrance
Variable	21	2. Full access, no signal
Variable	22	3. Left & right in, right out
Variable	23	4. Right in, right out only
Variable	24	5. None

7		Parking-Spaces per 1,000 square feet of improvements
Variable	25	1. Less than 2
Variable	26	2. 2-3
Variable	27	3. 4
Variable	28	4. 5

Regression Variables

Variable	29	5. more than 5

8	Site Location
Variable 30	1. Located at intersection
Variable 31	2. Located mid-block

9	Signage - Pylon Sign
Variable 32	1. None
Variable 33	2. Less than 100sf
Variable 34	3. 100-200 sf
Variable 35	4. More than 200sf

10	Main Street(s) Monument Sign(s)
Variable 36	1. None
Variable 37	2. Less than 100sf
Variable 38	3. 100-200 sf
Variable 39	4. More than 200sf

11	Competition in a one-mile Radius
Variable 40	1. 3 or more
Variable 41	2. 2
Variable 42	3. 1
Variable 43	4. None

12	Co-Tenancy
Variable 44	DepartmentStore
Variable 45	Grocery
Variable 46	HomeImprovement
Variable 47	MassDiscounter
Variable 48	MembershipClub
Variable 49	Sports
Variable 50	OfficeSupply
Variable 51	PetSupply
Variable 52	Entertainment
Variable 53	Small Shops
Variable 54	Furniture
Variable 55	None

13	Shopping Center/Mall Curb Appeal
Variable 56	Excellent
Variable 57	Average
Variable 58	Poor

Regression Variables

14			Store Curb Appeal
	Variable	59	Excellent
	Variable	60	Average
	Variable	61	Poor
15	Variable	62	Year The Company Occupied Space*
16	Variable	63	Year Building was Built*

Compiled Data for all Locations

Properties		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Sales PSF		723	902	1,281	809	663	1,161	1,133	785	1,162	1,245	637	655	1,037	608	1,294	828	689	1,062	818	953	630	599	823	1,007	878	1,192	651	1,833	1,172	828	877	765	369
Variable	1	0	0	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0
Variable	2	1	0	0	0	0	1	0	1	0	0	1	0	0	0	1	1	1	1	1	0	1	1	0	0	0	1	0	1	0	1	0	1	0
Variable	3	0	1	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	1
Variable	4	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Variable	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Variable	6	1	1	0	1	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	0
Variable	7	1	0	0	1	0	0	1	1	1	1	0	0	1	0	1	1	1	1	1	0	1	0	0	1	1	1	1	1	1	0	0	1	1
Variable	8	0	1	1	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	0	0
Variable	9	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	10	0	0	1	0	1	0	1	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Variable	11	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Variable	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Variable	13	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	14	1	0	0	1	0	1	0	0	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	1	1	1	0	1	0	1	1	0
Variable	15	0	0	1	0	1	0	1	1	1	0	0	1	1	0	1	1	1	0	1	1	0	1	1	1	0	1	1	0	1	1	1	0	1
Variable	16	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	1	0
Variable	17	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	18	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0
Variable	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Variable	21	0	1	1	0	1	1	1	1	0	1	0	1	0	0	1	0	0	1	0	1	1	1	1	0	1	1	1	0	0	1	1	0	0
Variable	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Variable	23	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Variable	24	1	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	1	0	0	0	0	1	0	0	1	1	0	0	0	1
Variable	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	26	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Variable	27	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	1	0
Variable	28	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	0	1	1	1	1	0	0	1	0	0	0	1	0	0
Variable	29	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Variable	30	0	0	1	0	0	1	1	1	0	1	1	0	1	0	1	0	1	1	1	0	0	0	1	0	0	1	1	0	0	1	1	1	1
Variable	31	1	1	0	1	1	0	0	0	1	0	0	1	0	1	0	1	0	0	0	1	1	1	0	1	1	0	0	1	1	0	0	0	0
Variable	32	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	1
Variable	33	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Variable	34	0	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	1	0	1	1	0	0	0	1	1	0	0	0	0	0	1
Variable	35	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Variable	36	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0
Variable	37	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0
Variable	38	0	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1
Variable	39	0	0	0	0	0	0	0	1	1	0	0	1	1	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	1	0
Variable	40	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	1	1	1	1	0	0
Variable	41	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	1
Variable	42	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Variable	43	1	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	44	0	0	1	1	1	0	0	0	0	0	0	1	0	0	1	0	1	1	0	1	1	0	1	1	0	0	0	0	0	1	0	1	0
Variable	45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Variable	46	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Variable	47	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	49	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0
Variable	50	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	1	0	0	1	1	0	0	0	0	0	1	0	0	0
Variable	51	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Variable	52	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
Variable	53	1	0	0	0	0	1	0	1	0	0	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Variable	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
Variable	55	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
Variable	56	0	0	1	1	1	1	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	0
Variable	57	0	0	0	0	0	0	1	1	1	1	1	0	0	1	1	0	0	1	0	1	1	0	0	0	0	0	0	0	1	0	1	0	1
Variable	58	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1	1	0	0	0	0	0	1	0
Variable	59	0	0	1	1	1	1	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	1	1	0	0	1	0	0	1	0	0	1
Variable	60	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0	0	1	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0
Variable	61	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	1	0
Variable	62	1991	1994	1997	1996	1997	1996	1996	1990	1989	1991	1993	1993	1994	1995	1994	1995	2000	1994	1995	1995	2000	2000	2000	2000	1994	1996	2000	1995	1995	1995	1995	1990	1999
Variable	63	1956	1894	1997	1996	1997	1996	1996	1995	1989	1991	1993	1980	1894	1985	1985	1983	2000	1980	1995	1995	1980	1975	2000	2000	1994	1976	2000	1995	1976	1982	1981	1980	1980

*Key to Variables on Preceding Pages

THE METHODOLOGY

Statistical Methods of Comparing Real Estate Characteristics

A simple and direct means of determining the relative importance between real estate variables is to compare the sales per square foot of particular locations with certain real estate attributes of those locations.

Although comparing sales per square foot from individual stores can be instructive, it can also be deceptive. Real estate attributes for some locations will certainly differ from others. These variances affect the sales of particular locations. Several differences might include visibility, access, and year of construction, to name a few. If these differences in attributes are not accounted for, a direct comparison of sales per square foot could be deceptive.

Correlation

To control for differentials in attributes, it is necessary to use sophisticated statistical tools, the first of which is utilized is called correlation. The first stage of the analysis is to determine the interdependence of the data. Correlation was used to determine the strength of the connection between the variables. Correlation measures the relationship between two data sets that are scaled to be independent of the unit of measurement. The population correlation calculation returns the covariance of two data sets divided by the product of their standard deviations.

Correlation analysis can be used to determine whether two ranges of data move together — that is, whether large values of one set are associated with large values of the other (positive correlation), whether small values of one set are associated with large values of the other (negative correlation), or whether values in both sets are unrelated (correlation near zero).

The following page yields the results of the variables correlation with each other, followed by a ranking of the independent variables as they relate to sales per square foot.

Correlation Analysis - All Variables

		1	2	3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
1	Sales PSF	1																															
2	1. Powercenter	-0.04811	1																														
3	2. Stripcenter	0.0381226	-0.52	1																													
4	4. Freestanding	0.0035575	-0.37	-0.6	1																												
5	Highway Visibility Excellent	-0.047127	0.35	-0.39	0.09	1																											
6	Highway Visibility Limited	0.2792038	-0.14	0.02	0.11	-0.11	1																										
7	Highway Visibility None	-0.121627	-0.23	0.32	-0.14	-0.81	-0.49	1																									
8	Primary St. Visibility Excellent	0.2588199	-0.27	0.11	0.13	-0.01	-0.06	0.04	1																								
9	Primary St. Visibility Limited	-0.205547	0.16	-0.06	-0.09	0.03	0.07	-0.07	-0.94	1																							
10	Primary St. Visibility None	-0.160937	0.31	-0.16	-0.12	-0.07	-0.04	0.09	-0.22	-0.13	1																						
11	1. <.25 miles	-0.090074	0.16	-0.23	0.09	0.75	0.15	-0.74	-0.12	0.16	-0.1	1																					
12	2. <.5 miles	-0.031296	0.07	0.13	-0.21	-0.13	-0.08	0.16	0.04	-0.02	-0.06	-0.18	1																				
13	3. < 1 mile	0.5790979	-0.1	0.19	-0.12	-0.07	0.7	-0.34	0.14	-0.13	-0.03	-0.1	-0.06	1																			
14	4. < 2 miles	-0.046199	-0.14	0.02	0.11	-0.11	-0.06	0.13	-0.06	0.07	-0.04	-0.14	-0.08	-0.04	1																		
15	5. None	-0.062244	-0.09	0.04	0.03	-0.49	-0.3	0.6	0.06	-0.12	0.15	-0.66	-0.37	-0.21	-0.3	1																	
16	1. Signaled entrance	-0.36664	0.23	-0.14	-0.06	0.22	-0.28	-0.03	-0.11	0.06	0.16	0.09	0.29	-0.19	-0.02	-0.17	1																
17	2. Full access, no signal	0.3117671	-0.19	0.12	0.04	-0.07	0.41	-0.18	0.22	-0.18	-0.11	0.13	-0.19	0.29	-0.16	-0.03	-0.67	1															
18	3. Left & right in, right out	-0.064192	0.31	-0.16	-0.12	-0.07	-0.04	0.09	0.14	-0.13	-0.03	-0.1	-0.06	-0.03	-0.04	0.15	-0.19	-0.11	1														
19	4. Right in, right out only	0.1526016	-0.24	0.12	0.09	-0.18	-0.11	0.22	-0.18	0.21	-0.07	-0.24	-0.13	-0.07	0.25	0.19	-0.46	-0.26	-0.07	1													
20	1. Signaled entrance	0.0601942	-0.1	-0.16	0.27	-0.07	-0.04	0.09	-0.22	0.23	-0.03	-0.1	-0.06	-0.03	-0.04	0.15	-0.19	0.29	-0.03	-0.07	1												
21	2. Full access, no signal	1.959E-05	0.16	-0.03	-0.11	0.1	-0.25	-0.06	-0.35	0.28	0.18	-0.16	-0.1	-0.17	0.26	-0.15	0.28	-0.18	-0.17	-0.07	-0.17	1											
22	3. Left & right in, right out	-0.052256	-0.1	0.19	-0.12	-0.07	-0.04	0.09	-0.22	0.23	-0.03	-0.1	0.56	-0.03	-0.04	-0.21	0.16	-0.11	-0.03	-0.07	-0.03	-0.17	1										
23	4. Right in, right out only	-0.004529	0.01	-0.22	-0.24	-0.16	-0.09	0.19	-0.11	-0.08	-0.07	-0.21	0.21	-0.07	-0.09	0.13	-0.22	-0.02	-0.07	0.36	-0.07	-0.36	-0.07	1									
24	5. None	0.0002284	-0.1	-0.13	0.23	0.06	0.36	-0.26	0.44	-0.4	-0.13	0.05	-0.22	0.25	-0.18	0.09	-0.13	0.14	0.25	-0.12	-0.13	-0.69	-0.13	-0.26	1								
25	2. 2-3	0.1678417	-0.16	-0.08	0.25	-0.13	-0.08	0.16	-0.04	-0.02	-0.06	-0.16	0.27	-0.06	-0.08	0.06	0.08	0.04	-0.06	-0.15	-0.06	-0.1	0.56	-0.12	-0	1							
26	3. 4	0.2762226	-0.19	0.12	0.04	-0.26	0.13	0.15	0.08	-0.16	0.29	-0.35	0.04	0.29	0.13	0.11	-0.26	-0.07	-0.11	0.5	-0.11	-0.05	-0.11	0.19	-0	-0.19	1						
27	4. 5	-0.288172	0.09	0.2	-0.3	-0.19	-0.22	0.3	-0.19	0.24	-0.15	-0.2	-0.27	-0.15	0.04	-0.36	0.17	-0.11	0.21	-0.19	0.21	0.16	-0.15	-0.13	-0.09	-0.27	-0.53	1					
28	5. more than 5	-0.084629	0.23	-0.32	0.14	0.61	0.18	-0.64	0.11	-0.08	-0.09	0.74	0.09	-0.09	-0.13	-0.6	0.03	0.18	-0.09	-0.22	-0.09	-0.06	-0.09	0.03	0.1	-0.16	-0.32	-0.45	1				
29	1. Located at intersection	0.0531439	-0.05	0.22	-0.19	-0.06	-0.28	0.12	0.14	-0.07	-0.19	-0.05	0.29	-0.19	-0.02	-0.04	0.14	-0.12	-0.19	0.06	-0.19	0.28	0.16	0.34	-0.52	0.08	-0.12	0.04	0.03	1			
30	2. Located mid-block	-0.053144	0.05	-0.22	0.19	-0.05	0.28	-0.12	-0.14	0.07	0.19	0.05	-0.29	0.19	0.02	0.04	-0.14	0.12	0.19	-0.05	0.19	-0.28	-0.16	-0.34	0.52	-0.08	0.12	-0.04	-0.03	-1	1		
31	1. None	0.2650637	0.09	-0.07	-0	0.09	0.11	-0.14	-0.14	0.19	-0.12	-0.07	0.02	0.27	-0.17	0.03	-0.19	0.19	-0.27	-0.09	0.27	0.02	0.27	-0.04	-0.19	0.25	0.04	-0.03	0.18	0.07	-0.07	1	
32	2. Less than 100sf	-0.046763	0.01	0.03	-0.04	-0.16	-0.09	0.19	0.11	-0.09	-0.07	-0.21	0.21	-0.07	-0.09	0.13	-0.03	-0.02	-0.07	0.1	-0.07	0.01	-0.07	-0.14	0.13	-0.12	0.19	0.06	-0.19	-0.03	0.03	-0.24	1
33	3. 100-200 sf	-0.336822	-0.17	0.14	0.01	-0.17	0.06	0.11	-0.11	0.04	0.22	0.12	-0.04	-0.14	0.32	-0.19	0.11	-0.22	-0.14	0.18	-0.14	-0.04	-0.14	0.27	-0.04	-0.25	0.06	-0.06	0.19	-0.01	0.01	-0.53	-0.3
34	4. More than 200sf	0.1529793	0.1	-0.11	0.03	0.24	-0.12	-0.14	0.22	-0.19	-0.08	0.1	-0.15	-0.08	-0.12	0.09	0.11	0.06	-0.08	-0.2	-0.08	0.01	-0.08	-0.18	0.17	0.12	-0.29	0.07	0.14	-0.04	0.04	-0.31	-0.18
35	1. None	0.1171187	-0.03	0.12	-0.11	-0.07	0.13	-0.02	0.08	-0.04	-0.11	-0.19	-0.19	0.29	0.41	-0.03	-0.12	0.08	-0.11	0.12	-0.11	0.09	-0.11	-0.23	0.14	-0.19	0.06	0.16	-0.15	-0.12	0.12	-0.11	0.4
36	2. Less than 100sf	-0.315346	0.01	0.03	-0.04	-0.16	-0.09	0.19	-0.08	0.11	-0.07	0.01	-0.12	-0.07	-0.09	0.13	0.15	-0.23	0.48	-0.16	-0.07	0.2	-0.07	-0.14	-0.07	-0.12	-0.23	0.43	-0.19	-0.22	0.22	0.16	-0.14
37	3. 100-200 sf	0.0613597	-0.07	-0.07	0.14	-0.27	-0.11	-0.3	-0.28	0.32	-0.12	-0.24	0.02	-0.12	-0.17	-0.1	-0.06	-0.11	-0.12	0.27	-0.12	0.02	-0.27	0.16	-0.19	0.25	-0.11	-0.17	0.14	0.47	-0.47	0.14	-0.24
38	4. More than 200sf	0.0590924	0.09	-0.07	-0	-0.09	-0.17	0.18	0.26	-0.36	0.27	-0.07	0.25	-0.12	-0.17	0.03	0.07	0.19	-0.12	-0.28	0.27	-0.24	-0.12	0.16	0.09	0.02	0.19	-0.3	0.14	-0.19	0.19	-0.15	-0.04
39	1. 3 or more	0.2636209	-0.25	-0	0.23	-0.3	0.09	0.21	-0.09	0.13	-0.13	-0.4	-0	0.25	0.09	0.22	-0.13	-0.14	-0.13	-0.42	0.25	-0.43	0.25	-0.13	0.16	0.22	0.29	-0.09	-0.37	-0.13	0.13	-0.05	-0.07
40	2. 2	-0.232523	0.45	-0.42	0.04	0.5	-0.16	-0.35	-0.2	0.1	0.29	0.29	-0.19	-0.11	-0.16	-0.03	0.29	-0.07	-0.11	-0.26	-0.11	0.36	-0.11	-0.23	-0.14	0.04	-0.22	0.03	0.18	0.01	-0.01	0.19	-0.02
41	3. 1	0.0491732	-0.03	0.4	-0.4	-0.26	-0.16	0.32	0.22	-0.16	-0.11	-0.03	0.04	-0.11	0.13	-0.03	-0.12	0.08	0.29	-0.07	-0.11	0.09	-0.11	0.19	-0.14	-0.19	-0.07	0.16	0.02	-0.15	-0.15	0.04	-0.23
42	4. None	-0.130572	-0.21	0.03	0.16	0.1	0.29	-0.26	0.11	-0.09	-0.07	0.22	0.21	-0.07	-0.09	-0.24	-0.03	0.19	-0.07	-0.16	-0.07	0.01	-0.07	-0.14	0.13	-0.12	-0.02	-0.13	0.26	-0.03	0.03	-0.24	0.43
43	DepartmentStore	-0.085151	0.41	0.01	-0.4	0.18	-0.2	-0.04	-0.24	0.16	0.22	0.27	-0.04	-0.14	-0.2	-0.06	-0.01	-0.2	0.22	-0.34	0.22	0.09	-0.23	-0.11	-0.18	-0.04	-0.22	0.19	0.04	-0.01	-0.01	0.28	-0.11
44	Grocery	-0.011458	0.01	0.22	-0.24	-0.16	-0.09	0.19	-0.08	-0.09	0.48	0.01	-0.12	-0.07	-0.09	0.13	-0.03	0.19	-0.07	-0.16	-0.07	0.38	-0.07	-0.14	-0.26	-0.12	-0.02	0.06	0.03	-0.03	0.03	-0.24	-0.14
45	HomeImprovement	0.1819647	0.31	-0.08	-0.21	-0.16	-0.08	-0.09	-0.18	-0.2	-0.06	0.07	-0.1	-0.06	-0.06	0.06	0.08	-0.04	-0.06	-0.13	-0.06	0.33	-0.06	-0.12	-0.22	-0.1	-0.19	0.37	-0.16	-0.29	-0.29	0.02	0.21
46	MassDiscounter/Membership	0.0503839	-0.14	0.02	0.11	-0.11	-0.06	0.13	0.2	-0.19	-0.04	-0.14	-0.08	-0.04	-0.06	0.22	-0.02	0.13	-0.04	-0.11	-0.04	0.01	-0.04	-0.09	0.09	0.36	-0.16	0.04	-0.13	0.23	-0.23	0.11	-0.09
47	Sports	0.2003895	0.4	-0.18	-0.18	0.19	0.18	-0.27	-0.19	0.22	-0.09	0.05	-0.16	0.34	-0.13	-0.1	-0.12	0.18	0.34	-0.22	0.34	-0.06	-0.09	-0.19	0.1	-0.16	-0.15	0.3	-0.09	-0.27	-0.27	0.46	0.26
48	OfficeSupply	-0.045416	0.55	-0.2	-0.29	0.27	-0.17	-0.14	-0.14	0.19	-0.12	0.09	0.25	-0.12	-0.17	-0.1	0.2	-0.11	0.27	-0.28	0.27	-0.24	0.27	-0.04	0.09	0.02	-0.4	0.23	0.14	-0.06	0.06	0.28	-0.04
49	PetSupply	0.1857803	0.45	-0.23	-0.17	0.6	-0.06	-0.49	-0.06	0.07	-0.04	0.45	-0.06	-0.04	-0.06	-0.3	-0.02	0.13	-0.04	-0.11	-0.04	0.01	-0.04	-0.09	0.09	-0.06	-0.16	0.04	-0.18	-0.02	-0.02	0.11	-0.09
50	Entertainment	-0.028784	0.47	-0.27	-0.14	0.46	-0.12	-0.33	-0.42	0.46	-0.08	0.28	-0.15	-0.08	-0.12	-0.07	-0.04	0.06	-0.08	0.02	0.38	0.01	-0.08	0.07	-0.17	-0.15	-0.29	0.23	0.14	-0.04	0.04	0.2	0.07
51	Small Shops	-0.07333	-0.25	0.65	-0.47	-0.3	-0.18	0.37	-0.04	-0	-0.13	-0.25	0.22	-0.13	-0.09	-0.09	-0	-0	-0.13	0.06	-0.13	0.09	0.25	-0.07	-0.09	-0	-0.14	0.3	-0.21	0.39	-0.39	-0.19	0.13
52	Furniture	0.2777442	0.07	0.13	-0.21	0.16	0.36	-0.35	0.25	-0.24	-0.06	0.07	-0.1	0.56	-0.08	-0.16	-0.13	0.28	-0.06	-0.13	-0.06	-0.31	-0.06	-0.12	0.45	-0.1	0.04	-0.06	0.09	-0.13	0.13	0.02	-0.12
53	None	-0.10369	-0.27	-0.43	0.71	0.24	-0.12	-0.14	0.22	-0.19	-0.08	-0.1	-0.15	-0.08	0.21	-0.07	0.27	-0.29	-0.08	0.02	-0.06	0.01	-0.06	-0.16	0.17	0.12	0.06	-0.25	0.14	-0.04	-0.04	0.14	-0.18
54	Shopping Center Curb Appeal - Excellent	-0.056196	0.35	-0.13	-0.19	0.06	-0.18	0.05	-0.22	0.27	-0.13	-0.1	0.22	-0.13	-0.18	0.09	0.26	-0.29	0.25	-0.12	0.25	-0.04	0.25	-0.07	-0.09	-0	-0.29	0.3	-0.05	0.13	-0.13	0.51	-0.07
55	Shopping Center Curb Appeal - Average	0.2166445	-0.2	-0.04	0.23	0.15	-0.3	-0.3	0.19	-0.14	-0.15	-0.32	-0.06	0.21	-0.22	-0.26	-0.2	0.3	-0.15	-0.02	-0.16	0.03	-0.15	-0.13	0.17	0.16	-0.11	-0.24	0.3	0.04	-0.04	-0.3	0.06
56	Shopping Center Curb Appeal - Poor	-0.190337	-0.16	0.19	-0.07	-0.24	-0.14	0.29	0.02	-0.13	0.31	-0.32	-0.18	-0.1	0.45	0.2	-0.05	-0.03	-0.1	0.16	-0.1	0.02	-0.1	0.22	-0.1	-0.16	0.45	-0.06	-0.29	-0.19	0.19	-0.22	0.01
57	Store Curb Appeal - Excellent	-0.124822	0.27	-0.24	0.01	-0.35	-0.2	-0.19	-0.11	0.16	-0.14	0.12	-0.16	-0.14	-0.2	-0.06	0.36	-0.35	0.22	-0.17	-0.22	-0.04	0.22	-0.11	-0.04	-0.04	-0.35	0.19	-0.19	-0.24	-0.24	0.41	-0.11
58	Store Curb Appeal - Average	0.1548722	-0.28	0.32	-0.09	-0.14	0.34	-0.07	0.09	-0.05	-0.13	0.16	-0.02	0.23	0.07	-0.24	-0.2	0.39	-0.13	-0.14	-0.13	0.15	-0.13	-0.09	0	0.2	-0.18	-0.01	0.07	-0.07	0.07	-0.22	-0.09
59	Store Curb Appeal - Poor	-0.031525	0.01	-0.09	0.09	-0.24	-0.14	0.29	0.02	-0.13	0.31	-0.32	-0.18	-0.1	0.15	0.34	-0.19	-0.03	-0.1	0.35	-0.1	-0.12	-0.1	0.22	0.05	-0.18	0.61	-0.2	-0.29	-0.19	0.19	-0.22	0.22
60	Year Ultimate Occupied Space* >1994 = 1	-0.047194	0.13	-0.07	-0.05	0.32	0.19	-0.39	-0.22	0.31	-0.23	0.28	-0.2	0.13	-0.07	-0.14	0.2	-0.24	0.13	-0.03	0.13	-0.02	0.13	-0.3	0.13	-0.2	-0.24	0.27	0.08	-0.06	0.06	0.22	-0.11
61	Building Built 1990 or Later = 1	0.1140225	0.17	-0.26	0.13	0.17	0.2	-0.27	-0.14	0.22	-0.22	0.02	0.25	0.14	0.2	-0.32	0.01	-0.06	0.14	-0.01	0.14	0.04	0.14	-0.08	-0.09	0.04	-0.06	-0.06	0.11	0.14	-0.14	0.4	-0.08

Correlation Analysis - Ranking

Ranking	Variables Correlated With Sales PSF	Correlation	# in Sample
1	Freeway Access < 1 mile	0.57909789	1
2	Primary Street Access - Full access, no signal	0.31176707	9
3	Highway Visibility Limited	0.27920379	2
4	Furniture	0.27774419	3
5	Parking - 4	0.27622259	9
6	Pylon Sign - None	0.26506367	9
7	Competition in 1 Mile Radius - 3 or more	0.26362090	11
8	Primary St. Visibility Excellent	0.25881988	20
9	Shopping Center Curb Appeal - Average	0.21864452	14
10	Sports	0.20038952	7
11	Parking - 2-3	0.18784171	3
12	PetSupply	0.18578027	2
13	HomeImprovement	0.16199474	3
14	Store Curb Appeal - Average	0.15487218	12
15	Pylon Sign - More than 200sf	0.15297931	6
16	Primary Street Access - Right in, right out only	0.15260161	5
17	Monument Sign - None	0.11711873	9
18	Building Built After 1989	0.11402260	21
19	Adjacent St Access - Signaled entrance	0.06019420	1
20	Monument Sign - More than 200sf	0.05909239	10
21	Located at intersection	0.05314387	18
22	Monument Sign - 100-200 sf	0.05135968	10
23	MassDiscounter/Membership	0.05038387	2
24	Competition in 1 Mile Radius - 1	0.04917316	9
25	Located in a Stripcenter	0.03812281	15
26	Freestanding Building	0.00355747	10
27	Adjacent St Access - None	0.00022844	11
28	Adjacent St Access - Full access, no signal	0.00001959	16
29	Adjacent St Access - Right in, right out only	-0.00452936	4
30	Grocery	-0.01145838	4
31	Entertainment	-0.02878356	6
32	Freeway Access <.5 miles	-0.03129560	3
33	Store Curb Appeal - Poor	-0.03152486	8
34	OfficeSupply	-0.04541636	10
35	Freeway Access < 2 miles	-0.04619889	2
36	Pylon Sign - Less than 100sf	-0.04676341	4
37	Highway Visibility Excellent	-0.04712657	5
38	Occupied After 1994	-0.04719429	21
39	Located in a Powercenter	-0.04810967	8
40	Adjacent St Access - Left & right in, right out	-0.05225588	1
41	Located mid-block	-0.05314387	15
42	Shopping Center Curb Appeal - Excellent	-0.05619648	11
43	Primary Street Access - Left & right in, right out	-0.06419192	1

Correlation Analysis - Ranking

Ranking	Variables Correlated With Sales PSF	Correlation	# in Sample
44	Small Shops	-0.07332956	11
45	Freeway Access - None	-0.08224425	19
46	Parking - more than 5	-0.08462913	7
47	DepartmentStore	-0.08515130	13
48	Freeway Access <.25 miles	-0.09007428	8
49	Co-Tenants - None	-0.10388988	6
50	Highway Visibility None	-0.12162743	26
51	Store Curb Appeal - Excellent	-0.12482179	13
52	Competition in 1 Mile Radius - None	-0.13057159	4
53	Primary St. Visibility None	-0.16093667	1
54	Shopping Center Curb Appeal - Poor	-0.19033703	8
55	Primary St. Visibility Limited	-0.20554652	12
56	Competition in 1 Mile Radius - 2	-0.23252289	9
57	Parking - 5	-0.28817181	14
58	Monument Sign - Less than 100sf	-0.31534554	4
59	Pylon Sign - 100-200 sf	-0.33882203	13
60	Primary Street Access Signaled entrance	-0.36663962	18

Estimating Sales Per Square Foot Using Regression Analysis

Another tool that is used to analyze the data is regression. Regression analysis provides a quantitative tool to test the importance of real estate attributes. The application of regression is referred to as the hedonic price model. The results of regression analysis allow researchers, developers, planners, and appraisers to draw conclusions through statistical relationships.

Regression analysis measures the relationship between one economic variable, the "dependent variable," and one or more explanatory variables, the "independent variables." The sales per square foot of a retail outlet (the dependent variable) is *dependent* upon the attributes of that location (the independent variables). The value of each attribute or independent variable is determined by the utility that customers obtain by patronizing a particular outlet. Thus, the sales per square foot of an outlet can be explained by valuing each of its real estate attributes.

In essence, regression measures the complex nature of customer behavior when selecting a place to shop. Intuitively, all other things between two locations being equal, a customer will frequent a location more often if it is identifiable, easily accessible, and the customer never has to fight for a parking spot.

If all customers have the same opinion of the important attributes in a retail outlet and each of these attributes/preferences could be measured, researchers would be able to predict the sales of a particular outlet with perfect accuracy. While some of the sales per square foot can be explained with regression models, customers do not always have the same preferences, management does not always treat customers the same, and not all the attributes of an outlet can be measured. For instance, an individual who desires to purchase a specific brand of sofa would be willing to drive past other large furniture outlets that are closer, are more visible and accessible, and have plenty of available parking in order to shop at *that exact* outlet although it is tucked away on a side street and is difficult to find. Thus, the sales per square foot will always be measured with some error.

Estimating the sales per square foot of a retail outlet is *dependent* upon the real estate attributes of that specific location. Therefore, the attributes that affect sales per square foot need to be determined. These attributes were determined through telephone interviews and from the retail survey questionnaire.

Important Statistics in Regression Analysis

The validity of a multiple regression analysis relies heavily on three ratios.

F-Statistic

The F-statistic measures the likelihood that results of a regression model are attributable to chance. In other words, the F-statistic measures the probability that the relationship

between the dependent variable and the independent variables can be attributed to luck; the higher the F-statistic, the less likely the relationship is attributable to luck.

R-Squared

R-squared measures the proportion of the variation that is explained by the regression model. R-squared values have a range of 0 to 100 percent, but these extremes are seldom achieved. The higher the R-squared, the better the explanatory power of the model. The complexity of customer behavior, the exclusion of demographic data, the difficulty of converting real estate variables into numeric data (i.e. the store is visible from the freeway 2,540 ft away as opposed to stating that the store's freeway visibility is average), and the inconsistency of management will prevent the authors' models from achieving an explanatory power of greater than 33 percent. (Wheaton, 2001) This is approximately inline with a conjecture by Mr. David Rambie, executive vice president with The Buxton Company, a leading retail consultant. He stated that when forecasting sales three main variables present themselves. The first being the customers, and they account for maybe 75-80%. Real estate attributes influences sales by 15-20%, and finally management has about a 5% influence. (Rambie, 2001)

t-Statistic

The t-statistic measures the importance of individual independent variables in a regression analysis. As a rule of thumb, the greater the t-statistic, either positive or negative, indicates that the independent variable being analyzed provides explanatory power to the model.

While regression analyses involve a range of complex economic relationships, the results of such analyses allow the authors to draw explanatory conclusions from these statistical relationships. The following are the regression results for each variable grouping.

Regression		1		
Variables		1	2	3
		Store Format		
Store	Sales PSF	1. Powercenter	2. Stripcenter	3. Freestanding
1	723	0	1	0
2	902	0	0	1
3	1,261	1	0	0
4	809	1	0	0
5	663	1	0	0
6	1,161	0	1	0
7	1,133	0	0	1
8	785	0	1	0
9	1,152	0	0	1
10	1,245	0	0	1
11	637	0	1	0
12	655	1	0	0
13	1,037	1	0	0
14	608	0	0	1
15	1,294	0	1	0
16	828	0	1	0
17	689	0	1	0
18	1,062	0	1	0
19	818	0	1	0
20	953	1	0	0
21	630	0	1	0
22	599	0	1	0
23	823	1	0	0
24	1,007	0	0	1
25	878	0	0	1
26	1,192	0	1	0
27	651	0	0	1
28	1,833	0	1	0
29	1,172	0	0	1
30	828	0	1	0
31	877	1	0	0
32	765	0	1	0
33	369	0	0	1
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)		

SUMMARY OUTPUT - Regression 1

Regression Statistics	
Multiple R	0.050546969
R Square	0.002554996
Adjusted R Square	-0.097274671
Standard Error	294.7535995
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	6676.375758	2225.458586	0.0256154	0.99433471
Residual	30	2606390.533	86879.68444		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. Powercenter	887.25	104.2111345	8.513965462	1.684E-09	674.42269	1100.08	674.423	1100.08
2. Stripcenter	922.9333333	76.10505215	12.12709679	4.287E-13	767.506242	1078.36	767.506	1078.36
3. Freestanding	912.7	93.20927231	9.791944271	7.449E-11	722.341467	1103.06	722.341	1103.06

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	922.9333333	-199.9333333	-0.71141404
2	912.7	-10.7	-0.038073342
3	887.25	393.75	1.401063412
4	887.25	-78.25	-0.278433554
5	887.25	-224.25	-0.797938972
6	922.9333333	238.0666667	0.847102213
7	912.7	220.3	0.78388386
8	922.9333333	-137.9333333	-0.49080215
9	912.7	249.3	0.887073292
10	912.7	332.3	1.182408564
11	922.9333333	-285.9333333	-1.01742408
12	887.25	-232.25	-0.826405022
13	887.25	149.75	0.532848879
14	912.7	-304.7	-1.08420069
15	922.9333333	371.0666667	1.320350299
16	922.9333333	-94.93333333	-0.33779713
17	922.9333333	-233.9333333	-0.832394754
18	922.9333333	139.0666667	0.494834841
19	922.9333333	-104.9333333	-0.373379693
20	887.25	65.75	0.233955351
21	922.9333333	-292.9333333	-1.042331874
22	922.9333333	-323.9333333	-1.152637819
23	887.25	-64.25	-0.228617966
24	912.7	94.3	0.335543568
25	912.7	-34.7	-0.123471493
26	922.9333333	269.0666667	0.957408158
27	912.7	-261.7	-0.93119567
28	922.9333333	910.0666667	3.238250437
29	912.7	259.3	0.922655855
30	922.9333333	-94.93333333	-0.33779713
31	887.25	-10.25	-0.036472127
32	922.9333333	-157.9333333	-0.561967276
33	912.7	-543.7	-1.934623942

Interpretation – Regression 1

Multiple R – The Multiple R is the linear correlation coefficient when there is only one independent variable, and is therefore irrelevant for multiple regression.

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .0026. In other words, .26% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $295 psf.

df – Degrees of freedom is equal to the number of variables minus 1.

SS and **MS** – These measures are the mean sum of squares and mean of squares which are interim calculations on the way to calculating the F-test=(MS for regression / MS for residual)

F-test = Tests if the population means for the independent variables are significantly different. This test is irrelevant given the format of the data.

Significance F = .994 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

t-stats = Assuming normal distribution (can be assumed with 'large sample'), the t-stat is a test statistic for a hypothesis test of whether or not there is any slope to the distribution

of an independent variable when plotted against the dependent variable. If there is not much slope, than a one-unit change in the independent variable will not make much of a difference in the dependent variable. As a rule of thumb, when t-stats are greater than +2 or less than -2, then there's a slope. In the preceding regression, normal distribution cannot be assumed because of the small sample size.

Residual output – Residual output is the difference between the predicted sales per square foot for each observation and actual sales per square foot. This is useful in finding extreme observations that may hinder the model's accuracy.

Comments: While statistically insignificant, the analysis appears to give evidence that a stripcenter should be the most desirable location, followed by freestanding, and then a powercenter.

Regression Data

Regression		2A			2B		
Variables		4	5	6	7	8	9
		Visibility (from Freeway, Highway, etc.)			Visibility (from Primary St.)		
Store	Sales PSF	Highway Visibility Excellent	Highway Visibility Limited	Highway Visibility None	Primary St. Visibility Excellent	Primary St. Visibility Limited	Primary St. Visibility None
1	723	0	0	1	1	0	0
2	902	0	0	1	0	1	0
3	1,281	1	0	0	0	1	0
4	809	0	0	1	1	0	0
5	569	1	0	0	0	1	0
6	1,161	0	0	1	0	1	0
7	1,133	1	0	0	1	0	0
8	785	0	0	1	1	0	0
9	1,162	0	0	1	1	0	0
10	1,245	0	0	1	1	0	0
11	697	0	0	1	0	1	0
12	655	0	0	1	0	0	1
13	1,037	0	0	1	1	0	0
14	608	0	1	0	0	1	0
15	1,294	0	0	1	1	0	0
16	828	0	0	1	1	0	0
17	689	0	0	1	1	0	0
18	1,062	0	0	1	1	0	0
19	818	0	0	1	1	0	0
20	953	1	0	0	1	0	0
21	630	0	0	1	0	1	0
22	599	0	0	1	0	1	0
23	823	0	0	1	0	1	0
24	1,007	0	0	1	0	1	0
25	878	0	0	1	1	0	0
26	1,192	0	0	1	1	0	0
27	651	0	0	1	1	0	0
28	1,833	0	1	0	1	0	0
29	1,172	0	0	1	1	0	0
30	828	0	0	1	0	1	0
31	847	0	0	1	0	1	0
32	765	0	0	1	1	0	0
33	369	1	0	0	1	0	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)					

SUMMARY OUTPUT - Regression 2A

Regression Statistics	
Multiple R	0.27973665
R Square	0.078252594
Adjusted R Square	-0.016530567
Standard Error	283.3482925
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	204479.263	68159.7543	0.848959195	0.478482964
Residual	30	2408587.65	80286.2549		
Total	33	2613066.91			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Highway Visibility Excellent	879.8	126.717209	6.9430191	1.03513E-07	621.0092015	1138.591	621.0092	1138.591
Highway Visibility Limited	1220.5	200.357499	6.09161127	1.07958E-06	811.3158197	1629.684	811.3158	1629.684
Highway Visibility None	893.4230769	55.569172	16.0776748	2.73441E-16	779.9358044	1006.91	779.9358	1006.91

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	893.4230769	-170.42308	-0.6308181
2	893.4230769	8.57692308	0.03174733
3	879.8	401.2	1.48503492
4	893.4230769	-84.423077	-0.3124906
5	879.8	-216.8	-0.8024815
6	893.4230769	267.576923	0.99043139
7	879.8	253.2	0.93721546
8	893.4230769	-108.42308	-0.4013262
9	893.4230769	268.576923	0.99413288
10	893.4230769	351.576923	1.30135595
11	893.4230769	-256.42308	-0.9491456
12	893.4230769	-238.42308	-0.8825189
13	893.4230769	143.576923	0.53144752
14	1220.5	-612.5	-2.2671583
15	893.4230769	400.576923	1.48272861
16	893.4230769	-65.423077	-0.2421624
17	893.4230769	-204.42308	-0.7566685
18	893.4230769	168.576923	0.62398459
19	893.4230769	-75.423077	-0.2791772
20	879.8	73.2	0.27094855
21	893.4230769	-263.42308	-0.975056
22	893.4230769	-294.42308	-1.089802
23	893.4230769	-70.423077	-0.2606698
24	893.4230769	113.576923	0.42040303
25	893.4230769	-15.423077	-0.0570883
26	893.4230769	298.576923	1.10517736
27	893.4230769	-242.42308	-0.8973249
28	1220.5	612.5	2.26715825
29	893.4230769	278.576923	1.03114771
30	893.4230769	-65.423077	-0.2421624
31	893.4230769	-16.423077	-0.0607897
32	893.4230769	-128.42308	-0.4753558
33	879.8	-510.8	-1.8907174

SUMMARY OUTPUT - Regression 2B

Regression Statistics	
Multiple R	0.279983596
R Square	0.078390814
Adjusted R Square	-0.016383132
Standard Error	283.327047
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	204840.44	68280.147	0.85058629	0.477654707
Residual	30	2408226.5	80274.216		
Total	33	2613066.9			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Primary St. Visibility Excellent	969.9	63.353854	15.30925	1.018E-15	840.5143029	1099.286	840.5143	1099.286
Primary St. Visibility Limited	834.6666667	81.789473	10.205062	2.8457E-11	667.6304499	1001.703	667.6304	1001.703
Primary St. Visibility None	655	283.32705	2.311816	0.02783598	76.36957178	1233.63	76.36957	1233.63

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	969.9	-246.9	-0.9139646
2	834.6666667	67.333333	0.2492519
3	834.6666667	446.33333	1.6522191
4	969.9	-160.9	-0.5956133
5	834.6666667	-171.66667	-0.6354689
6	834.6666667	326.33333	1.2080078
7	969.9	163.1	0.6037571
8	969.9	-184.9	-0.6844555
9	969.9	192.1	0.7111082
10	969.9	275.1	1.0183543
11	834.6666667	-197.66667	-0.7317146
12	655	0	0
13	969.9	67.1	0.2483881
14	834.6666667	-226.66667	-0.8390657
15	969.9	324.1	1.1997406
16	969.9	-141.9	-0.5252798
17	969.9	-280.9	-1.0398245
18	969.9	92.1	0.3409321
19	969.9	-151.9	-0.5622974
20	969.9	-16.9	-0.0625598
21	834.6666667	-204.66667	-0.757627
22	834.6666667	-235.66667	-0.8723815
23	834.6666667	-11.666667	-0.0431872
24	834.6666667	172.33333	0.6379367
25	969.9	-91.9	-0.3401918
26	969.9	222.1	0.822161
27	969.9	-318.9	-1.1804914
28	969.9	863.1	3.1949894
29	969.9	202.1	0.7481258
30	834.6666667	-6.6666667	-0.0246784
31	834.6666667	42.333333	0.1567079
32	969.9	-204.9	-0.7584907
33	969.9	-600.9	-2.2243878

Interpretation – Regression 2A&B

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analyses both have an R Square of .078. In other words, 7.8% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regressions to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $283 psf.

Significance F = 0.478 and 0.477 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The analysis suggests that visibility from the primary access street is very important, whereas highway visibility is not nearly as critical. In fact, limited highway visibility has a higher coefficient than excellent highway visibility.

Regression Data

Regression		3				
Variables		10	11	12	13	14
		Proximity to Freeway/Highway Off-ramp				
Store	Sales PSF	1. <.25 miles	2. <.5 miles	3. < 1 mile	4. < 2 miles	5. None
1	723	0	0	0	0	1
2	902	0	0	0	1	0
3	1,281	1	0	0	0	0
4	809	0	0	0	0	1
5	663	1	0	0	0	0
6	1,161	0	0	0	0	1
7	1,133	1	0	0	0	0
8	785	0	1	0	0	0
9	1,162	0	0	0	0	1
10	1,245	0	0	0	0	1
11	687	0	0	0	0	1
12	655	0	0	0	0	1
13	1,037	0	1	0	0	0
14	608	1	0	0	0	0
15	1,294	1	0	0	0	0
16	828	0	0	0	0	1
17	689	0	0	0	0	1
18	1,062	0	0	0	0	1
19	818	0	0	0	1	0
20	953	1	0	0	0	0
21	630	1	0	0	0	0
22	599	0	0	0	0	1
23	823	0	0	0	0	1
24	1,007	0	0	0	0	1
25	878	0	0	0	0	1
26	1,192	0	0	0	0	1
27	651	0	0	0	0	1
28	1,833	0	0	1	0	0
29	1,172	0	0	0	0	1
30	828	0	1	0	0	0
31	877	0	0	0	0	1
32	765	0	0	0	0	1
33	369	1	0	0	0	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)				

SUMMARY OUTPUT - Regression 3

Regression Statistics	
Multiple R	0.580606235
R Square	0.3371036
Adjusted R Square	0.206689829
Standard Error	248.7247939
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	880874.2622	176174.8524	2.8477756	0.03430256
Residual	28	1732192.647	61864.0231		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. <.25 miles	866.375	87.93749421	9.852168381	1.336E-10	686.243007	1046.51	686.243	1046.51
2. <.5 miles	883.3333333	143.6013267	6.151289501	1.219E-06	589.17902	1177.49	589.179	1177.49
3. < 1 mile	1833	248.7247939	7.369590989	5.028E-08	1323.50978	2342.49	1323.51	2342.49
4. < 2 miles	860	175.8749884	4.889836854	3.748E-05	499.736013	1220.26	499.736	1220.26
5. None	891.3157895	57.06138113	15.62029821	2.359E-15	774.430718	1008.2	774.431	1008.2

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	891.3157895	-168.3157895	-0.734655498
2	860	42	0.183319289
3	866.375	414.625	1.809732389
4	891.3157895	-82.31578947	-0.359287429
5	866.375	-203.375	-0.887680011
6	891.3157895	269.6842105	1.177102805
7	866.375	266.625	1.163750131
8	883.3333333	-98.33333333	-0.429199923
9	891.3157895	270.6842105	1.18146755
10	891.3157895	353.6842105	1.543741384
11	891.3157895	-254.3157895	-1.110023567
12	891.3157895	-236.3157895	-1.031458157
13	883.3333333	153.6666667	0.670715813
14	866.375	-258.375	-1.127740985
15	866.375	427.625	1.866474074
16	891.3157895	-63.31578947	-0.276357275
17	891.3157895	-202.3157895	-0.883056827
18	891.3157895	170.6842105	0.744993052
19	860	-42	-0.183319289
20	866.375	86.625	0.378096034
21	866.375	-236.375	-1.031716596
22	891.3157895	-292.3157895	-1.275883876
23	891.3157895	-68.31578947	-0.298180999
24	891.3157895	115.6842105	0.504932078
25	891.3157895	-13.31578947	-0.058120025
26	891.3157895	300.6842105	1.3124099
27	891.3157895	-240.3157895	-1.048917137
28	1833	0	0
29	891.3157895	280.6842105	1.225115
30	883.3333333	-55.33333333	-0.241515889
31	891.3157895	-14.31578947	-0.06248477
32	891.3157895	-126.3157895	-0.551336209
33	866.375	-497.375	-2.170915037

Interpretation – Regression 3

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .337. In other words, 33.7% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $249 psf.

Significance F = .034 = This is the area at the tail end of the curve, preferably .05 or lower. This is below .05, therefore, the independent variables are significantly different.

Comments: The results of this analysis are somewhat opaque. The regression model gives evidence that having highway access less than one mile away is very important. However, highway access closer than .5 or .25 miles away is worse than having no freeway access within a two-mile radius. A possible explanation of this paradox could be that unless the shoppers are absolutely clear on the exit to take, he or she cannot quickly and easily negotiate lane changes in time to access the outlet.

Regression Data

Regression		4			
Variables		15	16	17	18
		Access from primary St.			
Store	**Sales PSF**	**1. Signaled entrance**	**2. Full access, no signal**	**3. Left & right in, right out**	**4. Right in, right out only**
1	723	0	1	0	0
2	902	0	0	0	1
3	1,231	1	0	0	0
4	809	0	0	1	0
5	683	1	0	0	0
6	1,161	0	0	0	1
7	1,139	1	0	0	0
8	785	1	0	0	0
9	1,162	1	0	0	0
10	1,245	0	1	0	0
11	637	0	0	0	1
12	655	1	0	0	0
13	1,037	1	0	0	0
14	608	0	1	0	0
15	1,294	0	1	0	0
16	828	1	0	0	0
17	689	1	0	0	0
18	1,062	0	1	0	0
19	818	1	0	0	0
20	953	0	1	0	0
21	630	1	0	0	0
22	599	1	0	0	0
23	823	1	0	0	0
24	1,007	0	1	0	0
25	878	1	0	0	0
26	1,192	0	0	0	1
27	851	1	0	0	0
28	1,833	0	1	0	0
29	1,172	0	0	0	1
30	828	1	0	0	0
31	877	1	0	0	0
32	765	0	1	0	0
33	369	1	0	0	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)			

SUMMARY OUTPUT - Regression 4

Regression Statistics	
Multiple R	0.394394069
R Square	0.155546682
Adjusted R Square	0.033706683
Standard Error	275.8443478
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	406453.8869	101613.4717	1.3354361	0.28139636
Residual	29	2206613.022	76090.10421		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. Signaled entrance	817	65.01713629	12.56591795	2.934E-13	684.024953	949.975	684.025	949.975
2. Full access, no signal	1054.444444	91.94811593	11.46782002	2.705E-12	866.38933	1242.5	866.3893	1242.5
3. Left & right in, right out	809	275.8443478	2.932813402	0.0064982	244.834655	1373.165	244.8347	1373.165
4. Right in, right out only	1012.8	123.3613426	8.210027378	4.723E-09	760.497588	1265.102	760.4976	1265.102

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	1054.444444	-331.4444444	-1.281753835
2	1012.8	-110.8	-0.428483045
3	817	464	1.794369431
4	809	0	0
5	817	-154	-0.595545027
6	1012.8	148.2	0.573115409
7	817	316	1.222027458
8	817	-32	-0.123749616
9	817	345	1.334175547
10	1054.444444	190.5555556	0.736911776
11	1012.8	-375.8	-1.453284552
12	817	-162	-0.626482431
13	817	220	0.85077861
14	1054.444444	-446.4444444	-1.726479017
15	1054.444444	239.5555556	0.926403375
16	817	11	0.04253893
17	817	-128	-0.494998464
18	1054.444444	7.555555556	0.029218659
19	817	1	0.003867175
20	1054.444444	-101.4444444	-0.39230347
21	817	-187	-0.723161818
22	817	-218	-0.843044259
23	817	6	0.023203053
24	1054.444444	-47.44444444	-0.183475993
25	817	61	0.235897705
26	1012.8	179.2	0.692997849
27	817	-166	-0.641951133
28	1054.444444	778.5555556	3.010810969
29	1012.8	159.2	0.615654339
30	817	11	0.04253893
31	817	60	0.23203053
32	1054.444444	-289.4444444	-1.119332464
33	817	-448	-1.732494624

Interpretation – Regression 4

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .156. In other words, 15.6% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $276 psf.

Significance F = .281 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The outcome of this regression also has some unsettling results. According to the analysis, having a signaled entrance into the store from a primary street will have a negative impact on sales. The analysis predicts that having full access with no signal will be very beneficial for sales psf. These contradictory results seem to negate any insight into this regression analyses.

Regression Data

Regression		5				
Variables		19	20	21	22	23
		Access from Adjacent St.				
Store	Sales PSF	1. Signaled entrance	2. Full access, no signal	3. Left & right in, right out	4. Right in, right out only	5. None
1	723	0	0	0	0	1
2	902	0	1	0	0	0
3	1,281	0	1	0	0	0
4	809	0	0	0	0	1
5	663	0	1	0	0	0
6	1,161	0	1	0	0	0
7	1,133	0	1	0	0	0
8	785	0	1	0	0	0
9	1,162	0	0	0	0	1
10	1,245	0	1	0	0	0
11	637	0	0	0	1	0
12	655	0	1	0	0	0
13	1,037	0	0	0	1	0
14	608	0	0	0	0	1
15	1,294	0	1	0	0	0
16	828	0	0	0	0	1
17	699	0	0	0	0	1
18	1,062	0	1	0	0	0
19	818	0	1	0	0	0
20	953	0	0	0	0	1
21	630	0	1	0	0	0
22	599	0	1	0	0	0
23	823	0	1	0	0	0
24	1,007	1	0	0	0	0
25	878	0	0	0	0	1
26	1,192	0	0	0	1	0
27	651	0	1	0	0	0
28	1,833	0	0	0	0	1
29	1,172	0	0	0	0	1
30	828	0	0	1	0	0
31	877	0	1	0	0	0
32	765	0	0	0	1	0
33	369	0	0	0	0	1
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)				

SUMMARY OUTPUT - Regression 5

Regression Statistics	
Multiple R	0.078610022
R Square	0.006179536
Adjusted R Square	-0.171509102
Standard Error	304.5441189
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	5	16147.53977	3229.507955	0.0348206	0.9992862
Residual	28	2596919.369	92747.12033		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. Signaled entrance	1007	304.5441189	3.306581666	0.0025964	383.168951	1630.831	383.169	1630.831
2. Full access, no signal	911.1875	76.13602972	11.96788831	1.587E-12	755.229738	1067.145	755.2297	1067.145
3. Left & right in, right out	828	304.5441189	2.718817894	0.0111199	204.168951	1451.831	204.169	1451.831
4. Right in, right out only	907.75	152.2720594	5.961369429	2.031E-06	595.834476	1219.666	595.8345	1219.666
5. None	911.2727273	91.82350676	9.924176928	1.138E-10	723.180589	1099.365	723.1806	1099.365

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	911.2727273	-188.2727273	-0.671143133
2	911.1875	-9.1875	-0.03275104
3	911.1875	369.8125	1.31828504
4	911.2727273	-102.2727273	-0.364575579
5	911.1875	-248.1875	-0.88472366
6	911.1875	249.8125	0.890516361
7	911.1875	221.8125	0.790703669
8	911.1875	-126.1875	-0.449825502
9	911.2727273	250.7272727	0.893777287
10	911.1875	333.8125	1.189954436
11	907.75	-270.75	-0.965153083
12	911.1875	-256.1875	-0.913241572
13	907.75	129.25	0.460742515
14	911.2727273	-303.2727273	-1.081088118
15	911.1875	382.8125	1.364626647
16	911.2727273	-83.27272727	-0.296845538
17	911.2727273	-222.2727273	-0.792344259
18	911.1875	150.8125	0.5376072
19	911.1875	-93.1875	-0.332189115
20	911.2727273	41.72727273	0.148746836
21	911.1875	-281.1875	-1.002360047
22	911.1875	-312.1875	-1.112866955
23	911.1875	-88.1875	-0.31436542
24	1007	0	0
25	911.2727273	-33.27272727	-0.118608588
26	907.75	284.25	1.01327706
27	911.1875	-260.1875	-0.927500528
28	911.2727273	921.7272727	3.285717153
29	911.2727273	260.7272727	0.929424677
30	828	0	0
31	911.1875	-34.1875	-0.121869514
32	907.75	-142.75	-0.508866492
33	911.2727273	-542.2727273	-1.933060738

Interpretation – Regression 5

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .006. In other words, 0.6% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $305 psf.

Significance F = .999 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The results of this analysis support conventional wisdom. The regression model predicts that when an adjacent street has a signaled access, sales psf will be higher, than if there is limited or no access. It would be interesting to do further research on how various types of access affect corresponding sales when evaluating the success of non-retail property.

Regression Data

Regression	6			
Variables	24	25	26	27
	Parking Spaces per 1,000 square feet of Improvements			
Store	Sales PSF	2. 2-3	3. 4	4. 5	5. more than 5
1	723	0	0	1	0
2	902	0	1	0	0
3	1,281	0	0	1	0
4	809	0	0	1	0
5	883	0	0	0	1
6	1,161	0	1	0	0
7	1,133	0	0	0	1
8	785	0	1	0	0
9	1,162	1	0	0	0
10	1,245	1	0	0	0
11	637	0	0	1	0
12	655	0	1	0	0
13	1,037	0	0	0	1
14	608	0	0	0	1
15	1,294	0	0	0	1
16	828	0	0	1	0
17	689	0	0	1	0
18	1,062	0	0	1	0
19	818	0	0	1	0
20	953	0	0	0	1
21	630	0	0	1	0
22	599	0	0	1	0
23	823	0	0	1	0
24	1,007	0	0	1	0
25	878	0	1	0	0
26	1,192	0	1	0	0
27	651	0	0	1	0
28	1,833	0	1	0	0
29	1,172	0	1	0	0
30	828	1	0	0	0
31	877	0	0	1	0
32	765	0	1	0	0
33	369	0	0	0	1
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)			

SUMMARY OUTPUT - Regression 6

Regression Statistics	
Multiple R	0.375529544
R Square	0.141022439
Adjusted R Square	0.017679932
Standard Error	278.2064379
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	368501.0678	92125.26696	1.190267	0.33674257
Residual	29	2244565.841	77398.82211		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
2. 2-3	1078.333333	160.6225618	6.713461179	2.297E-07	749.823129	1406.84	749.823	1406.84
3. 4	1038.111111	92.73547931	11.19432518	4.808E-12	848.445656	1227.78	848.446	1227.78
4. 5	816.7142857	74.35379811	10.98416364	7.526E-12	664.643611	968.785	664.644	968.785
5. more than 5	865.2857143	105.1521497	8.228892293	4.505E-09	650.225303	1080.35	650.225	1080.35

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	816.7142857	-93.71428571	-0.359332579
2	1038.111111	-136.1111111	-0.521896488
3	816.7142857	464.2857143	1.780230003
4	816.7142857	-7.714285714	-0.029579206
5	865.2857143	-202.2857143	-0.775632518
6	1038.111111	122.8888889	0.471197972
7	865.2857143	267.7142857	1.026508008
8	1038.111111	-253.1111111	-0.970514449
9	1078.333333	83.66666667	0.320806576
10	1078.333333	166.6666667	0.639056924
11	816.7142857	-179.7142857	-0.689085952
12	1038.111111	-383.1111111	-1.46897885
13	865.2857143	171.7142857	0.65841122
14	865.2857143	-257.2857143	-0.986521303
15	865.2857143	428.7142857	1.643836997
16	816.7142857	11.28571429	0.043273283
17	816.7142857	-127.7142857	-0.489700192
18	816.7142857	245.2857143	0.940509205
19	816.7142857	1.285714286	0.004929868
20	865.2857143	87.71428571	0.33632653
21	816.7142857	-186.7142857	-0.715926343
22	816.7142857	-217.7142857	-0.834790931
23	816.7142857	6.285714286	0.024101575
24	816.7142857	190.2857143	0.72962042
25	1038.111111	-160.1111111	-0.613920685
26	1038.111111	153.8888889	0.59006256
27	816.7142857	-165.7142857	-0.63540517
28	1038.111111	794.8888889	3.047875491
29	1038.111111	133.8888889	0.513375729
30	1078.333333	-250.3333333	-0.9598635
31	816.7142857	60.28571429	0.231156019
32	1038.111111	-273.1111111	-1.04720128
33	865.2857143	-496.2857143	-1.902928933

Interpretation – Regression 6

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .141. In other words, 14.1% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $278 psf.

Significance F = 0.337 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: This analysis implies that having 2,3, or 4 parking spaces per 1,000 square feet of improvement is best for sales. Anything over 4 stalls per 1,000 will negatively affect sales. If true, this would support the idea that a large parking lot, typically designed to handle the final days of the year-end holiday shopping, is unappealing to customers.

Regression		17	
Variables		28	29
		Site Location	
Store	Sales PSF	1. Located at intersection	2. Located mid-block
1	723	0	1
2	902	0	1
3	1,281	1	0
4	809	0	1
5	663	0	1
6	1,161	1	0
7	1,133	1	0
8	785	1	0
9	1,162	0	1
10	1,245	1	0
11	637	1	0
12	655	0	1
13	1,037	1	0
14	608	0	1
15	1,294	1	0
16	828	0	1
17	689	1	0
18	1,062	1	0
19	818	1	0
20	953	0	1
21	630	0	1
22	599	0	1
23	823	1	0
24	1,007	0	1
25	878	0	1
26	1,192	1	0
27	651	1	0
28	1,833	0	1
29	1,172	0	1
30	828	1	0
31	877	1	0
32	765	1	0
33	1,369	1	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of s	

SUMMARY OUTPUT - Regression 7

Regression Statistics	
Multiple R	0.053143871
R Square	0.002824271
Adjusted R Square	-0.061600753
Standard Error	289.9213965
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	7380.009091	3690.004545	0.0439002	0.95711084
Residual	31	2605686.9	84054.41613		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. Located at intersection	924.8333333	68.33512848	13.5337908	1.493E-14	785.462842	1064.204	785.4628	1064.204
2. Located mid-block	894.8	74.85738268	11.95339682	3.843E-13	742.127276	1047.473	742.1273	1047.473

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	894.8	-171.8	-0.611390962
2	894.8	7.2	0.025622904
3	924.8333333	356.1666667	1.267503382
4	894.8	-85.8	-0.305339608
5	894.8	-231.8	-0.824915163
6	924.8333333	236.1666667	0.84045498
7	924.8333333	208.1666667	0.740810353
8	924.8333333	-139.8333333	-0.497630013
9	894.8	267.2	0.950894442
10	924.8333333	320.1666667	1.139388862
11	924.8333333	-287.8333333	-1.024323042
12	894.8	-239.8	-0.853385057
13	924.8333333	112.1666667	0.399171631
14	894.8	-286.8	-1.020645681
15	924.8333333	369.1666667	1.313766959
16	894.8	-66.8	-0.237723611
17	924.8333333	-235.8333333	-0.839268735
18	924.8333333	137.1666667	0.488140049
19	924.8333333	-106.8333333	-0.380191702
20	894.8	58.2	0.207118475
21	894.8	-264.8	-0.942353474
22	894.8	-295.8	-1.052674311
23	924.8333333	-101.8333333	-0.362398019
24	894.8	112.2	0.399290256
25	894.8	-16.8	-0.059786776
26	924.8333333	267.1666667	0.950775817
27	924.8333333	-273.8333333	-0.974500729
28	894.8	938.2	3.338806757
29	894.8	277.2	0.986481809
30	924.8333333	-96.83333333	-0.344604336
31	924.8333333	-47.83333333	-0.170226238
32	924.8333333	-159.8333333	-0.568804747
33	924.8333333	-555.8333333	-1.978064474

Interpretation – Regression 7

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .0028 In other words, 0.28% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $290 psf.

Significance F = .957 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The results of this regression suggest that a store, either freestanding or within a larger center, positioned at an intersection will generate higher sales psf than if it is located mid-block. In fact, locating mid-block will negatively affect sales.

Regression Data

Regression		8A				8B			
Variables		30	31	32	33	34	35	36	37
		Signage - Pylon Sign:				Main Street(s) Monument Sign(s)			
Store	Sales PSF	1. None	2. Less than 100sf	3. 100-200 sf	4. More than 200sf	1. None	2. Less than 100sf	3. 100-200 sf	4. More than 200sf
1	723	0	1	0	0	1	0	0	0
2	902	0	0	1	0	1	0	0	0
3	1,281	1	0	0	0	0	0	1	0
4	809	1	0	0	0	0	1	0	0
5	653	1	0	0	0	1	0	0	0
6	1,161	1	0	0	0	0	0	1	0
7	1,133	0	0	0	1	0	0	1	0
8	785	0	1	0	0	0	0	0	1
9	1,152	0	0	0	1	0	0	0	1
10	1,245	1	0	0	0	0	0	1	0
11	647	0	0	1	0	0	0	1	0
12	655	0	0	1	0	0	0	0	1
13	1,037	0	0	1	0	0	0	0	1
14	608	0	0	1	0	0	0	1	0
15	1,294	0	0	1	0	0	0	0	1
16	828	0	0	0	1	0	0	0	1
17	689	0	0	1	0	1	0	0	0
18	1,062	0	0	0	1	1	0	0	0
19	818	0	0	1	0	1	0	0	0
20	953	0	0	0	1	0	0	0	1
21	630	0	0	1	0	0	1	0	0
22	599	0	0	1	0	0	1	0	0
23	823	0	1	0	0	1	0	0	0
24	1,007	1	0	0	0	0	0	0	1
25	878	0	0	1	0	0	0	0	1
26	1,192	0	0	1	0	0	0	1	0
27	651	1	0	0	0	0	1	0	0
28	1,833	1	0	0	0	1	0	0	0
29	1,172	0	1	0	0	1	0	0	0
30	828	1	0	0	0	0	0	1	0
31	877	0	0	0	1	0	0	1	0
32	765	1	0	0	0	0	0	0	1
33	369	0	0	1	0	0	0	1	0

Average 911 *Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)

SUMMARY OUTPUT - Regression 8A

Regression Statistics	
Multiple R	0.373649012
R Square	0.139613584
Adjusted R Square	0.016125334
Standard Error	278.4344951
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	364819.636	91204.909	1.176446378	0.342501414
Residual	29	2248247.273	77525.76804		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. None	1024.3	88.04871835	11.63333231	1.91827E-12	844.220053	1204.38	844.2201	1204.3799
2. Less than 100sf	875.75	139.2172475	6.290528046	7.20084E-07	591.0186033	1160.481	591.0186	1160.4814
3. 100-200 sf	792.9230769	77.22383452	10.26785424	3.61092E-11	634.9825153	950.8636	634.9825	950.86364
4. More than 200sf	1002.5	113.6704066	8.819357913	1.05275E-09	770.0177881	1234.982	770.0178	1234.9822

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	875.75	-152.75	-0.585215946
2	792.9230769	109.0769231	0.417895612
3	1024.3	256.7	0.983469285
4	1024.3	-215.3	-0.824857566
5	1024.3	-361.3	-1.384212905
6	1024.3	136.7	0.523725171
7	1002.5	130.5	0.499971725
8	875.75	-90.75	-0.347681487
9	1002.5	159.5	0.611076552
10	1024.3	220.7	0.845546051
11	792.9230769	-155.9230769	-0.597372641
12	792.9230769	-137.9230769	-0.528411024
13	792.9230769	244.0769231	0.935107741
14	792.9230769	-184.9230769	-0.708477469
15	792.9230769	501.0769231	1.919726386
16	1002.5	-174.5	-0.668544567
17	792.9230769	-103.9230769	-0.398150192
18	1002.5	59.5	0.227956457
19	792.9230769	25.07692308	0.096074732
20	1002.5	-49.5	-0.189644447
21	792.9230769	-162.9230769	-0.624191048
22	792.9230769	-193.9230769	-0.742958277
23	875.75	-52.75	-0.20209585
24	1024.3	-17.3	-0.066279777
25	792.9230769	85.07692308	0.325946789
26	792.9230769	399.0769231	1.528943889
27	1024.3	-373.3	-1.430187316
28	1024.3	808.7	3.098292212
29	875.75	296.25	1.134993283
30	1024.3	-196.3	-0.752064747
31	1002.5	-125.5	-0.48081572
32	1024.3	-259.3	-0.993430408
33	792.9230769	-423.9230769	-1.624134497

SUMMARY OUTPUT - Regression 8B

Regression Statistics	
Multiple R	0.31880593
R Square	0.101637221
Adjusted R Square	-0.025779618
Standard Error	284.5130171
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	265584.8591	66396.21477	0.820236401	0.523252642
Residual	29	2347482.05	80947.6569		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. None	965	94.83767237	10.17528136	4.44311E-11	771.0350755	1158.9649	771.03508	1158.9649
2. Less than 100sf	672.25	142.2565085	4.725618581	5.43568E-05	381.3026132	963.19739	381.30261	963.19739
3. 100-200 sf	933.1	89.9709158	10.37112929	2.86877E-11	749.0887157	1117.1113	749.08872	1117.1113
4. More than 200sf	936.4	89.9709158	10.40780781	2.64453E-11	752.3887157	1120.4113	752.38872	1120.4113

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	965	-242	-0.907342379
2	965	-63	-0.236208966
3	933.1	347.9	1.304398404
4	672.25	136.75	0.512723431
5	965	-302	-1.132303299
6	933.1	227.9	0.854476563
7	933.1	199.9	0.7494948
8	936.4	-151.4	-0.567651389
9	936.4	225.6	0.845853061
10	933.1	311.9	1.169421851
11	933.1	-296.1	-1.110182142
12	936.4	-281.4	-1.055066717
13	936.4	100.6	0.377184477
14	933.1	-325.1	-1.218913254
15	936.4	357.6	1.340767086
16	936.4	-108.4	-0.406429396
17	965	-276	-1.034820234
18	965	97	0.363686821
19	965	-147	-0.551154255
20	936.4	16.6	0.062239188
21	672.25	-42.25	-0.158409981
22	672.25	-73.25	-0.27463979
23	965	-142	-0.532407512
24	936.4	70.6	0.264704016
25	936.4	-58.4	-0.218961963
26	933.1	258.9	0.970706372
27	672.25	-21.25	-0.079673659
28	965	868	3.254434649
29	965	207	0.776115175
30	933.1	-105.1	-0.394056546
31	933.1	-56.1	-0.210338461
32	936.4	-171.4	-0.642638363
33	933.1	-564.1	-2.115007587

Interpretation – Regression 8A&B

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analyses have an R Square of 0.14 and 0.10 respectively. In other words, 14% and 10% of the variance of sales per square foot is attributable to the independent variables used in the regression models. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regressions to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $278 and $285 psf.

Significance F = 0.343 & 0.523 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The results of this analysis are unusual. According to the first analysis, it is best to either have no pylon sign or to have a very large one. A small or a medium sized pylon sign will negatively affect sales. The results of the second analysis are equally strange. The analysis indicates that it is best to either have a large monument sign or to have no monument sign at all. Again, small or medium sized signs will negatively affect sales. The results do not follow conventional wisdom.

Regression Data

Regression		9			
Variables		38	39	40	41
		Competition in a one-mile Radius			
Store	Sales PSF	1. 3 or more	2. 2	3. 1	4. None
1	723	0	0	0	1
2	902	1	0	0	0
3	1,281	0	1	0	0
4	809	0	0	1	0
5	663	0	1	0	0
6	1,161	0	0	1	0
7	1,133	0	0	0	1
8	785	0	0	0	1
9	1,162	1	0	0	0
10	1,245	0	1	0	0
11	837	1	0	0	0
12	655	0	1	0	0
13	1,037	0	0	1	0
14	608	0	0	0	1
15	1,294	0	0	1	0
16	828	0	0	1	0
17	689	1	0	0	0
18	1,062	0	0	1	0
19	818	0	0	1	0
20	953	0	1	0	0
21	630	0	0	1	0
22	599	0	1	0	0
23	823	0	1	0	0
24	1,007	1	0	0	0
25	878	1	0	0	0
26	1,192	1	0	0	0
27	651	0	1	0	0
28	1,833	1	0	0	0
29	1,172	1	0	0	0
30	828	1	0	0	0
31	877	1	0	0	0
32	765	0	0	1	0
33	369	0	1	0	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)			

SUMMARY OUTPUT - Regression 9

Regression Statistics	
Multiple R	0.319989023
R Square	0.102392975
Adjusted R Square	-0.024945683
Standard Error	284.3933177
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	267559.6944	66889.92361	0.8270313	0.51920716
Residual	29	2345507.215	80879.55913		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
1. 3 or more	1016.090909	85.74781159	11.84975908	1.23E-12	840.716847	1191.46	840.717	1191.46
2. 2	804.3333333	94.79777255	8.484728192	2.386E-09	610.450013	998.217	610.45	998.217
3. 1	933.7777778	94.79777255	9.850208002	9.284E-11	739.894458	1127.66	739.894	1127.66
4. None	812.25	142.1966588	5.712159531	3.518E-06	521.42502	1103.07	521.425	1103.07

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	812.25	-89.25	-0.334770213
2	1016.090909	-114.0909091	-0.427946643
3	804.3333333	476.6666667	1.787941752
4	933.7777778	-124.7777778	-0.468032305
5	804.3333333	-141.3333333	-0.530130981
6	933.7777778	227.2222222	0.852293912
7	812.25	320.75	1.203109756
8	812.25	-27.25	-0.102212754
9	1016.090909	145.9090909	0.547294312
10	804.3333333	440.6666667	1.652908389
11	1016.090909	-379.0909091	-1.421942232
12	804.3333333	-149.3333333	-0.560138395
13	933.7777778	103.2222222	0.387178995
14	812.25	-204.25	-0.766126789
15	933.7777778	360.2222222	1.35116717
16	933.7777778	-105.7777778	-0.396764696
17	1016.090909	-327.0909091	-1.226894041
18	933.7777778	128.2222222	0.480952164
19	933.7777778	-115.7777778	-0.434273964
20	804.3333333	148.6666667	0.557637777
21	933.7777778	-303.7777778	-1.139448193
22	804.3333333	-205.3333333	-0.770190293
23	804.3333333	18.66666667	0.070017299
24	1016.090909	-9.090909091	-0.034099334
25	1016.090909	-138.0909091	-0.517968885
26	1016.090909	175.9090909	0.659822115
27	804.3333333	-153.3333333	-0.575142102
28	1016.090909	816.9090909	3.064166163
29	1016.090909	155.9090909	0.58480358
30	1016.090909	-188.0909091	-0.705515223
31	1016.090909	-139.0909091	-0.521719812
32	933.7777778	-168.7777778	-0.633073082
33	804.3333333	-435.3333333	-1.632903446

Interpretation – Regression 9

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .102 In other words, 10.2% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $284 psf.

Significance F = 0.519 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: According to this analysis, the more the competitors the higher the sales psf. This result is entirely plausible, as many consumers like to compare prices and products at different stores. Retail tends to cluster in urban and suburban locations. Some of this is related to cross shopping, comparison shopping, and what used to be called "window shopping." For example, Nordstrom's and Macy's are often found in the same shopping center and many customers shop both to compare price and selection of merchandise.

Regression Data

Regression		0										
Variables		42	43	44	45	46	47	48	49	50	51	52
		Co-Tenancy										
Store	Sales PSF	Department Store	Grocery	Home Improvement	MassDisc / Membership	Sports	Office Supply	Pet Supply	Enter tainment	Small Shops	Furniture	None
1	723	0	0	0	0	1	0	0	0	1	0	0
2	902	0	0	0	0	0	0	0	0	0	0	1
3	1,281	1	0	1	0	1	1	1	1	0	0	0
4	809	1	0	0	0	1	1	0	0	0	0	0
5	663	1	0	0	0	1	1	0	1	0	0	0
6	1,161	0	0	0	0	0	0	0	0	1	0	0
7	1,133	0	0	0	0	0	0	0	0	0	0	1
8	785	0	0	0	0	0	0	0	0	1	0	0
9	1,162	0	0	0	0	0	0	0	0	0	0	1
10	1,245	0	0	0	1	0	0	0	0	0	0	0
11	637	0	0	0	0	0	0	0	1	1	0	0
12	655	1	1	0	0	0	0	0	0	0	0	0
13	1,037	0	0	0	0	0	1	0	0	0	0	0
14	608	0	0	0	0	0	0	0	0	0	0	0
15	1,294	1	1	0	0	0	0	0	0	1	0	0
16	828	0	0	0	0	0	1	0	0	1	0	0
17	689	1	0	0	1	0	1	0	0	1	1	0
18	1,062	1	1	1	0	0	0	0	0	1	0	0
19	818	0	0	0	0	0	0	0	0	1	0	0
20	953	1	0	0	0	0	1	1	1	0	1	0
21	630	1	0	0	0	0	0	0	0	0	0	0
22	599	0	1	0	0	0	0	0	0	0	0	0
23	823	1	0	1	0	1	1	0	1	0	0	0
24	1,007	1	0	0	0	1	1	0	1	0	0	0
25	878	0	0	0	0	0	0	0	0	0	0	1
26	1,192	0	0	0	0	0	0	0	0	0	0	0
27	651	0	0	0	0	0	0	0	0	0	0	1
28	1,833	0	0	0	0	1	0	0	0	0	1	0
29	1,172	0	0	0	0	0	0	0	0	0	0	0
30	828	1	0	0	0	0	1	0	0	1	0	0
31	877	0	0	0	0	0	0	0	0	1	0	0
32	765	1	0	0	0	0	0	0	0	0	0	0
33	369	0	0	0	0	0	0	0	0	0	0	1
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)										

SUMMARY OUTPUT - Regression 10

Regression Statistics	
Multiple R	65535
R Square	-2.131436071
Adjusted R Square	-3.600270649
Standard Error	609.867794
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	11	-5569585.067	-506325.9152	-1.3613154	#NUM!
Residual	22	8182651.976	371938.7262		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
DepartmentStore	133.0462032	312.2664038	0.426066338	0.6741992	-514.555377	780.6478	-514.555	780.6478
Grocery	539.8362223	404.7293465	1.33382031	0.1959079	-299.52197	1379.194	-299.522	1379.194
HomeImprovement	-143.5053976	473.5027721	-0.303071927	0.7646824	-1125.4911	838.4803	-1125.49	838.4803
MassDiscounter/Membership	417.0841404	507.923676	0.821155146	0.4203677	-636.286222	1470.455	-636.286	1470.455
Sports	727.4570353	340.2212079	2.138188386	0.0438587	21.880678	1433.033	21.88068	1433.033
OfficeSupply	98.87261736	342.7240415	0.288490463	0.775672	-611.894305	809.6395	-611.894	809.6395
PetSupply	508.4376658	634.8352815	0.80089699	0.4317562	-808.13154	1825.007	-808.132	1825.007
Entertainment	-50.53327987	407.5504093	-0.12399271	0.902447	-895.742005	794.6754	-895.742	794.6754
Small Shops	597.5109494	209.2554987	2.855413373	0.0091982	163.541141	1031.481	163.5411	1031.481
Furniture	270.4019493	466.682053	0.579413645	0.5681965	-697.43843	1238.242	-697.438	1238.242
None	849.1666667	248.9774843	3.410616301	0.002507	332.818413	1365.515	332.8184	1365.515

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	1324.967985	-601.9679847	-1.208880366
2	849.1666667	52.83333333	0.106100625
3	1273.774844	7.225155758	0.014509657
4	959.3758559	-150.3758559	-0.301986857
5	908.842576	-245.842576	-0.493704434
6	597.5109494	563.4890506	1.131606443
7	849.1666667	283.8333333	0.569997994
8	597.5109494	187.4890506	0.376518084
9	849.1666667	312.8333333	0.628236192
10	417.0841404	827.9158596	1.662631988
11	546.9776695	90.02233052	0.180784079
12	672.8824255	-17.88242551	-0.035911732
13	98.87261736	938.1273826	1.883960281
14	0	608	1.220993942
15	1270.393375	23.60662513	0.047407148
16	696.3835667	131.6164333	0.264313927
17	1516.91586	-827.9158596	-1.662631988
18	1126.887977	-64.8879773	-0.130308926
19	597.5109494	220.4890506	0.442789137
20	960.2251558	-7.225155758	-0.014509657
21	133.0462032	496.9537968	0.997989433
22	539.8362223	59.16377768	0.11881351
23	765.3371785	57.66282154	0.115799269
24	908.842576	98.15742397	0.197121086
25	849.1666667	28.83333333	0.057903496
26	0	1192	2.393790754
27	849.1666667	-198.1666667	-0.397961019
28	997.8589846	835.1410154	1.677141645
29	0	1172	2.35362648
30	829.4297699	-1.429769909	-0.002871284
31	597.5109494	279.4890506	0.561273746
32	133.0462032	631.9537968	1.269098285
33	849.1666667	-480.1666667	-0.964277288

Interpretation – Regression 10

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of -2.13 This is a result of the large number or independent variables and the small sample size.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $610 psf.

Significance F = -1.36 = This is the area at the tail end of the curve, preferably .05 or lower This is too high, therefore, the independent variables are not significantly different.

Regression Data

Regression							
				11			
Variables		53	54	55	56	57	58
		Shopping Center/Mall Curb Appeal			Store Curb Appeal		
Store	Sales PSF	Shopping Center Curb Appeal - Excellent	Shopping Center Curb Appeal - Average	Shopping Center Curb Appeal - Poor	Store Curb Appeal - Excellent	Store Curb Appeal - Average	Store Curb Appeal - Poor
1	723	0	0	1	0	0	1
2	902	0	0	1	0	0	1
3	1,281	1	0	0	1	0	0
4	809	1	0	0	1	0	0
5	663	1	0	0	1	0	0
6	1,161	1	0	0	1	0	0
7	1,193	0	1	0	1	0	0
8	785	0	1	0	0	1	0
9	1,162	0	1	0	0	1	0
10	1,245	0	1	0	0	1	0
11	637	0	1	0	0	1	0
12	655	0	0	1	0	0	1
13	1037	1	0	0	1	0	0
14	608	0	1	0	0	1	0
15	1,294	0	1	0	0	1	0
16	828	1	0	0	1	0	0
17	689	1	0	0	1	0	0
18	1,062	0	1	0	0	1	0
19	818	0	0	1	0	1	0
20	953	0	1	0	0	1	0
21	630	0	1	0	0	1	0
22	599	0	0	1	0	1	0
23	823	1	0	0	1	0	0
24	1,007	1	0	0	1	0	0
25	878	0	0	1	0	0	1
26	1,192	0	0	1	0	0	1
27	651	1	0	0	1	0	0
28	1,833	0	1	0	0	1	0
29	1,172	0	1	0	0	0	1
30	828	1	0	0	1	0	0
31	827	0	1	0	0	0	1
32	765	0	0	1	0	0	1
33	369	0	1	0	1	0	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)					

SUMMARY OUTPUT - Regression 11

Regression Statistics	
Multiple R	0.333217859
R Square	0.111034142
Adjusted R Square	-0.094111826
Standard Error	298.9035906
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	290139.6411	48356.60686	0.54124457	0.77198273
Residual	26	2322927.268	89343.35646		
Total	32	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	1018.915205	12453065283	8.18204E-08	0.99999994	-2.5598E+10	2.56E+10	-2.6E+10	2.56E+10
Shopping Center Curb Appeal - Excellent	-57.17597023	9529529389	-5.99987E-09	1	-1.9588E+10	1.96E+10	-2E+10	1.96E+10
Shopping Center Curb Appeal - Average	-194.994152	9529529389	-2.04621E-08	1	-1.9588E+10	1.96E+10	-2E+10	1.96E+10
Shopping Center Curb Appeal - Poor	-440.8888889	9889260006	-4.45826E-08	0.99999996	-2.0328E+10	2.03E+10	-2E+10	2.03E+10
Store Curb Appeal - Excellent	-72.92105263	8189085285	-8.90466E-09	1	-1.6833E+10	1.68E+10	-1.7E+10	1.68E+10
Store Curb Appeal - Average	185.8947368	8189085285	2.27003E-08	1	-1.6833E+10	1.68E+10	-1.7E+10	1.68E+10
Store Curb Appeal - Poor	256	8189085285	3.12611E-08	1	-1.6833E+10	1.68E+10	-1.7E+10	1.68E+10

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	834.0263158	-111.0263158	-0.412081494
2	834.0263158	67.97368421	0.252288813
3	888.8181818	392.1818182	1.455608687
4	888.8181818	-79.81818182	-0.296250447
5	888.8181818	-225.8181818	-0.838139077
6	888.8181818	272.1818182	1.010220772
7	751	382	1.417818197
8	1009.815789	-224.8157895	-0.834418632
9	1009.815789	152.1842105	0.564841736
10	1009.815789	235.1842105	0.87290171
11	1009.815789	-372.8157895	-1.383730394
12	834.0263158	-179.0263158	-0.66446798
13	888.8181818	148.1818182	0.549986592
14	1009.815789	-401.8157895	-1.491365807
15	1009.815789	284.1842105	1.054768442
16	888.8181818	-60.81818182	-0.225730693
17	888.8181818	-199.8181818	-0.741638362
18	1009.815789	52.18421053	0.193685139
19	763.9210526	54.07894737	0.20071758
20	1009.815789	-56.81578947	-0.21087555
21	1009.815789	-379.8157895	-1.409711356
22	763.9210526	-164.9210526	-0.612115365
23	888.8181818	-65.81818182	-0.244288523
24	888.8181818	118.1818182	0.438639614
25	834.0263158	43.97368421	0.16321123
26	834.0263158	357.9736842	1.328642941
27	888.8181818	-237.8181818	-0.882677869
28	1009.815789	823.1842105	3.055302496
29	1079.921053	92.07894737	0.341757087
30	888.8181818	-60.81818182	-0.225730693
31	1079.921053	-202.9210526	-0.753154872
32	834.0263158	-69.02631579	-0.256195724
33	751	-382	-1.417818197

Interpretation – Regression 11

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .111. In other words, 11.1% of the variance of sales per square foot is attributable to the independent variables used in the regression model. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $299 psf.

Significance F = 0.772 = This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The analysis yields results that both support and contradict traditional thinking. According to the regression, poor shopping center curb appeal (a subjective gage of aesthetic interest) will detract from sales while excellent center curb appeal will add to sales. The analysis goes against convention by implying that excellent store curb appeal is a negative attribute.

Regression Data

Regression		12	
Variables		59	60
Store	**Sales PSF**	**Year Ultimate Occupied Space* >1994 = 1**	**Building Built 1990 or Later =1**
1	723	0	0
2	902	0	1
3	1,281	1	1
4	809	1	1
5	663	1	0
6	1,161	1	1
7	1,133	1	1
8	785	0	1
9	1,162	0	0
10	1,245	0	1
11	637	0	1
12	655	0	0
13	1,037	0	1
14	608	1	1
15	1,294	0	0
16	828	1	0
17	699	1	1
18	1,062	0	0
19	818	1	1
20	953	1	1
21	630	1	0
22	599	1	0
23	823	1	1
24	1,007	1	1
25	878	0	1
26	1,192	1	0
27	651	1	1
28	1,833	1	1
29	1,172	1	0
30	828	1	1
31	877	1	0
32	765	0	0
33	369	1	0
Average	911	*Reported on Square Footage Devoted to Selling Space (approx 55%-60% of store)	

SUMMARY OUTPUT - Regression 12

Regression Statistics	
Multiple R	65535
R Square	-2.613024869
Adjusted R Square	-2.761832123
Standard Error	551.8612416
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	-6828008.819	-3414004.409	-11.209966	0.41076333
Residual	31	9441075.728	304550.8299		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Year Tenant Occupied Space* >1994 = 1	518.3303571	164.9000861	3.143299494	0.00366551	182.014227	854.6465	182.0142	854.6465
Building Built 1990 or Later =1	574.21875	168.9723063	3.398300955	0.00187967	229.597267	918.8402	229.5973	918.8402

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*Standard Residuals*
1	0	723	1.351713112
2	574.21875	327.78125	0.61281634
3	1092.549107	188.4508929	0.352325785
4	1092.549107	-283.5491071	-0.530120396
5	1092.549107	-429.5491071	-0.803080443
6	1092.549107	68.45089286	0.127975061
7	1092.549107	40.45089286	0.075626559
8	574.21875	210.78125	0.394074384
9	0	1162	2.172462844
10	574.21875	670.78125	1.254085492
11	574.21875	62.78125	0.117375157
12	0	655	1.224581035
13	574.21875	462.78125	0.865210904
14	1092.549107	-484.5491071	-0.905907858
15	0	1294	2.419248641
16	518.3303571	309.6696429	0.578955072
17	1092.549107	-403.5491071	-0.75447112
18	0	1062	1.985503908
19	1092.549107	-274.5491071	-0.513294091
20	1092.549107	-139.5491071	-0.260899527
21	518.3303571	111.6696429	0.208776377
22	518.3303571	80.66964286	0.150819107
23	1092.549107	-269.5491071	-0.503946145
24	1092.549107	-85.54910714	-0.159941701
25	574.21875	303.78125	0.567946195
26	518.3303571	673.6696429	1.259485601
27	1092.549107	-441.5491071	-0.825515516
28	1092.549107	740.4508929	1.384339116
29	518.3303571	653.6696429	1.222093814
30	1092.549107	-264.5491071	-0.494598198
31	518.3303571	358.6696429	0.67056495
32	0	765	1.430235866
33	518.3303571	-149.3303571	-0.279186448

Interpretation – Regression 12

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of-2.61. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $552 psf.

Significance F = 0.411 - This is the area at the tail end of the curve, preferably .05 or lower. This is too high, therefore, the independent variables are not significantly different.

Comments: The regression suggests the year in which the building was built is more important than when the tenant occupied the space. It further suggests that there is a slight advantage to being in a building built before 1990. Although this paper does not differentiate between the real estate attributes of those locations that are "established" (a store that has become vacant) and that of a brand new location, this regression supports conventional wisdom in that the success of an established location is highly predictive of sales achievement.

Variables - Converted to Continuous Variables

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Store	Sales PSF	PowerCenter	Stripcenter	Freestanding	Freeway Visibility - 2 Excellent - 1 Limited - 0 None	Primary St Visibility - 2 Excellent - 1 Limited - 0 None	Highway Proximity - <.25 = 5 - <.50 = 4 - <1 = 3 - <2 = 2 - None = 1	Parking Per 1,000 s.f.	Located at Intersection	Pylon Sign - 1 None - 2 Small - 3 Average - 4 Large	Building Signage - 1 None - 2 Small - 3 Average - 4 Large	Competition in a one-mile Radius	Center Curb Appeal - 3 Excellent - 2 Average - 1 Poor	Store Curb Appeal - 3 Excellent - 2 Average - 1 Poor	Occupied After 1994 = 1	Building Built After 1989 = 1
1	723.00	0.00	1.00	0.00	0.00	2.00	1.00	5.00	0.00	2.00	1.00	0.00	1.00	1.00	0.00	0.00
2	902.00	0.00	0.00	1.00	0.00	1.00	2.00	4.00	0.00	3.00	1.00	3.00	1.00	1.00	0.00	1.00
3	1,281.00	1.00	0.00	0.00	2.00	1.00	5.00	6.00	1.00	4.00	3.00	2.00	3.00	3.00	1.00	1.00
4	809.00	1.00	0.00	0.00	0.00	2.00	1.00	5.00	0.00	1.00	2.00	1.00	3.00	3.00	1.00	1.00
5	663.00	1.00	0.00	0.00	2.00	1.00	5.00	6.00	0.00	1.00	1.00	2.00	3.00	3.00	1.00	1.00
6	1,161.00	0.00	1.00	0.00	0.00	1.00	1.00	4.00	1.00	1.00	3.00	1.00	3.00	3.00	1.00	1.00
7	1,133.00	0.00	0.00	1.00	2.00	2.00	5.00	6.00	1.00	4.00	3.00	0.00	2.00	3.00	1.00	1.00
8	785.00	0.00	1.00	0.00	0.00	2.00	4.00	4.00	1.00	2.00	4.00	0.00	2.00	2.00	0.00	1.00
9	1,162.00	0.00	0.00	1.00	0.00	2.00	1.00	5.00	0.00	4.00	4.00	3.00	2.00	2.00	0.00	0.00
10	1,245.00	0.00	0.00	1.00	0.00	2.00	1.00	3.00	1.00	1.00	3.00	2.00	2.00	2.00	0.00	1.00
11	637.00	0.00	1.00	0.00	0.00	1.00	1.00	5.00	1.00	3.00	3.00	3.00	2.00	2.00	0.00	1.00
12	655.00	1.00	0.00	0.00	0.00	0.00	1.00	4.00	0.00	3.00	4.00	2.00	1.00	1.00	0.00	0.00
13	1,037.00	1.00	0.00	0.00	0.00	2.00	4.00	6.00	1.00	3.00	4.00	1.00	3.00	3.00	0.00	1.00
14	608.00	0.00	0.00	1.00	1.00	1.00	5.00	6.00	0.00	3.00	3.00	0.00	2.00	2.00	1.00	1.00
15	1,294.00	0.00	1.00	0.00	0.00	2.00	5.00	6.00	1.00	3.00	4.00	1.00	2.00	2.00	0.00	0.00
16	828.00	0.00	1.00	0.00	0.00	2.00	1.00	5.00	0.00	4.00	4.00	1.00	3.00	3.00	1.00	0.00
17	669.00	0.00	1.00	0.00	0.00	2.00	1.00	5.00	1.00	3.00	3.00	3.00	3.00	3.00	1.00	1.00
18	1,062.00	0.00	1.00	0.00	0.00	2.00	1.00	5.00	1.00	4.00	1.00	1.00	2.00	2.00	0.00	0.00
19	818.00	0.00	1.00	0.00	0.00	2.00	2.00	5.00	1.00	3.00	1.00	1.00	3.00	2.00	1.00	1.00
20	953.00	1.00	0.00	0.00	2.00	2.00	5.00	6.00	0.00	4.00	4.00	2.00	2.00	2.00	1.00	1.00
21	630.00	0.00	1.00	0.00	0.00	1.00	5.00	5.00	0.00	3.00	2.00	1.00	2.00	2.00	1.00	0.00
22	599.00	0.00	1.00	0.00	0.00	1.00	1.00	5.00	0.00	3.00	2.00	2.00	1.00	2.00	1.00	0.00
23	823.00	1.00	0.00	0.00	0.00	1.00	1.00	5.00	1.00	2.00	1.00	2.00	3.00	3.00	1.00	1.00
24	1,007.00	0.00	0.00	1.00	0.00	1.00	1.00	5.00	0.00	1.00	4.00	3.00	3.00	3.00	1.00	1.00
25	878.00	0.00	0.00	1.00	0.00	2.00	1.00	4.00	0.00	3.00	4.00	3.00	1.00	1.00	0.00	1.00
26	1,192.00	0.00	1.00	0.00	0.00	2.00	1.00	4.00	1.00	3.00	3.00	3.00	1.00	1.00	1.00	0.00
27	851.00	0.00	0.00	1.00	0.00	2.00	1.00	5.00	1.00	3.00	2.00	2.00	3.00	3.00	1.00	1.00
28	1,833.00	0.00	1.00	0.00	1.00	2.00	3.00	4.00	0.00	1.00	1.00	3.00	2.00	2.00	1.00	1.00
29	1,172.00	0.00	0.00	1.00	0.00	2.00	1.00	4.00	0.00	2.00	3.00	3.00	2.00	1.00	1.00	0.00
30	828.00	0.00	1.00	0.00	0.00	1.00	4.00	3.00	1.00	1.00	3.00	3.00	3.00	3.00	1.00	1.00
31	877.00	1.00	0.00	0.00	0.00	1.00	1.00	5.00	1.00	4.00	3.00	3.00	2.00	1.00	1.00	0.00
32	765.00	0.00	1.00	0.00	0.00	2.00	1.00	4.00	1.00	1.00	4.00	1.00	1.00	1.00	0.00	0.00
33	369.00	0.00	0.00	1.00	2.00	2.00	5.00	5.00	1.00	3.00	3.00	2.00	2.00	3.00	1.00	0.00

SUMMARY OUTPUT - Continuous Variables

Regression Statistics	
Multiple R	0.577223428
R Square	0.333186886
Adjusted R Square	-0.241001091
Standard Error	311.1294195
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	15	870639.6272	58042.64181	0.59960468	0.83747219
Residual	18	1742427.282	96801.51566		
Total	33	2613066.909			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
PowerCenter	1055.764158	556.5818394	1.896871374	0.074009169	-113.5718	2225.1	-113.572	2225.1
Stripcenter	1104.94412	510.9521782	2.162519639	0.044286346	31.47259653	2178.42	31.4726	2178.42
Freestanding	996.7311994	533.1959515	1.869352527	0.077932505	-123.4727939	2116.94	-123.473	2116.94
Freeway Visibility - 2 Excellent - 1 Limited - 0 None	117.3384758	138.255595	0.848706888	0.407190122	-173.1259758	407.803	-173.126	407.803
Primary St Visibility - 2 Excellent - 1 Limited - 0 None	177.4800684	112.9473144	1.571352708	0.133512762	-59.8136175	414.774	-59.8136	414.774
Highway Proximity - <.25 = 5 - <.50 = 4 - <1 = 3 - <2 = 2 - None = 1	13.25603422	52.09298833	0.254468685	0.802017903	-96.1873578	122.699	-96.1874	122.699
Parking Per 1,000 s.f.	-127.1401066	96.04573115	-1.323745523	0.202154346	-328.9248562	74.6446	-328.925	74.6446
Located at Intersection	-3.631279414	121.6439288	-0.029851711	0.976513817	-259.1958884	251.933	-259.196	251.933
Pylon Sign - 1 None - 2 Small - 3 Average - 4 Large	3.85547708	63.90831885	0.060328251	0.952558978	-130.4110224	138.122	-130.411	138.122
Building Signage - 1 None - 2 Small - 3 Average - 4 Large	2.660961459	52.96291118	0.050241979	0.960482888	-108.6100721	113.932	-108.61	113.932
Competition in a one-mile Radius	23.8323177	69.00612622	0.345365245	0.733823003	-121.144286	168.809	-121.144	168.809
Center Curb Appeal - 3 Excellent - 2 Average - 1 Poor	192.5636591	172.1052798	1.118871305	0.277904741	-169.0163963	554.144	-169.016	554.144
Store Curb Appeal - 3 Excellent - 2 Average - 1 Poor	-184.8745898	172.237445	-1.073370484	0.297284619	-546.7323143	176.983	-546.732	176.983
Occupied After 1994 = 1	-13.22299861	152.8313288	-0.08652021	0.932008084	-334.3099542	307.864	-334.31	307.864
Building Built After 1989 = 1	78.99633924	143.1618707	0.551797339	0.587873161	-221.775823	379.769	-221.776	379.769

RESIDUAL OUTPUT

Observation	*Predicted Sales PSF*	*Residuals*	*tandard Residuals*
1	855.520743	-132.520743	-0.576717993
2	864.5726642	37.42733581	0.162880297
3	1043.213082	237.7869175	1.034826629
4	910.1300626	-101.1300626	-0.440108661
5	914.3823324	-251.3823324	-1.093992615
6	907.9997445	253.0002555	1.101033666
7	805.858222	327.141778	1.423690701
8	1113.465966	-328.4659657	-1.429453443
9	1096.467896	65.53210362	0.285189642
10	1133.773246	111.2267542	0.484048527
11	841.7691568	-204.7691568	-0.891136394
12	638.0237481	16.97625193	0.073879075
13	845.382655	191.617345	0.833900928
14	695.69007	-87.69006997	-0.381619058
15	821.1332423	472.8667577	2.057872308
16	897.2020392	-69.20203915	-0.301160861
17	1008.393373	-319.3933729	-1.38997036
18	891.1218047	170.8781953	0.74364607
19	773.7320434	44.26795656	0.192650045
20	1103.722647	-150.7226472	-0.655930993
21	755.8796384	-125.8796384	-0.547816521
22	534.1241602	64.87583983	0.282333643
23	754.0455481	68.95445188	0.300083384
24	726.6035935	280.3964065	1.220259176
25	1036.779583	-158.7795827	-0.69099403
26	1046.480925	145.5190753	0.63328553
27	871.2981418	-220.2981418	-0.958717098
28	1267.61528	565.3847202	2.460501907
29	1125.285542	46.71445752	0.20329699
30	1122.572589	-294.5725891	-1.281952609
31	889.0999242	-12.09992424	-0.052657749
32	1006.989295	-241.9892952	-1.053114987
33	770.6710411	-401.6710411	-1.748035147

Interpretation – Regression 13

R Square -- The R Square represents the proportion of the variance in sales per square foot that is attributable to the variance in the independent variables used. The preceding regression analysis has an R Square of .333. These variables are not a very strong predictor of sales per square foot.

Standard Error – The Standard Error, or average difference, of the predicted value (sales per square foot) from the regression to the actual sales per square foot of the store. Predicted sales per square foot numbers will be off by, on average, $311 psf.

Significance F = 0.837 - This is the area at the tail end of the curve, preferably .05 or lower, This is too high, therefore, the independent variables are not significantly different.

Comments: Regression 13 analyzed in conclusion.

CONCLUSION

The results of the regressions yielded many interesting insights into retail site location analysis. Although some suggestive conclusions can be drawn, the results are suspicious due to a limited number of observations. In the case of this research, it seems as if site selection remains more of an art than it does science. If the number of observations were to increase, it would be possible to really more heavily upon the results.

Of the regression results, the authors were able to draw some explanatory conclusions from the statistical relationships. The group of variables that yielded the highest R-squared value was that of the proximity of a store to a highway. This variable was able to explain approximately 33% of the corresponding location's sales per square foot. The second highest predictor of sales was that of signage. This group of variables had an R-squared value of 25%. Had either of these variables had a greater number of observations they would be significant. However, due to the limited number of observations the standard error for each group is unacceptable.

Using correlation analysis, the authors made some discoveries that appear to go against conventional wisdom. For example, having a signaled entrance into the parking lot does not have a positive relationship with sales. Other surprisingly negative correlations include having a parking lot with greater than 5 spaces per 1,000, and having the store in

a powercenter. Discoveries that seem to reinforce convention wisdom include large signage, locating at an intersection, and the importance of co-tenancy. As stated previously, a great deal of caution must be taken when interpreting the results of this analysis. The correlation analysis is specific to the data (and the stores they represent) and broad conclusions or generalities cannot be made based on this limited database.

Ideally, one regression would be run for all of the variables. Unfortunately, the small sample size and the large number of independent variables restrict this ideal model. This ideal model is what regression 13 represents. In this model the variables were converted into quantifiable continuous variables. This was done to lower the number of variables and thereby limit the loss of degrees of freedom. This was accomplished by giving each variable a specific numerical rating as opposed to the "dummy" (one or zero) inputs that were utilized in the prior 12 regressions. In this manner, the group of variables can be combined into one input. As an example, the variable 'Highway Proximity' initially was separated into five different groups according to distance. If a particular store was located within .25 miles it would receive an input of "1" under the prescribed heading. If another store was located 2 miles from the highway, it would receive a "1" under that heading and a "0" corresponding to the other distances. In order to convert the data to continuous variables, the ratings were changed as follows: $<.25 = 5$, $<.5 = 4$, $<1 = 3$, $<2 = 2$, and none is equal to 1.

The model that regression 13 yielded, using continues variables, resulted in an explanatory power of 33%. The equation for this model is:

Sales Per Square Foot = 1055.76(PowerCenter) + 1104.94(Stripcenter) + 996.73(Freestanding) + 117.34(Freeway Visibility 2=excellent, 1=limited, 0=none) + 177.48(Primary St. Visibility 2=excellent, 1=limited, 0=none) + 13.26(Highway Proximity <.25 miles=5, <.5=4, <1=3, <2=2, none=1) – 127.14(Parking Per 1,000 s.f.) – 3.63(Located at Intersection yes=1) + 3.86(Pylon Sign large=4, average=3, small=2, none=1) + 2.66(Building Signage large=4, average=3, small=2, none=1) + 23.83(Competition in a one-mile Radius 3=3, 2=2, 1=1, none=0) + 192.56(Center Curb Appeal excellent=3, average=2, poor=1) – 184.87(Store Curb Appeal excellent=3, average=2, poor=1) – 13.22(Occupied After 1994=1) + 78.99(Building Built After 1989=1)

Using this model, sales per square foot can be predicted given inputs of the attributes of each location and an estimate of the pricing or contribution to overall sales per square foot of the various attributes represented by the independent variables can be calculated.

Testing the Model

The solution is derived by multiplying the attributes by the corresponding coefficient number and adding the resulting values in order to equal the predicted sales per square foot. The following example is of two stores within the same delineated trade area, each of which have unique real estate attributes.

	Hypothetical Attributes of a Store 1	Hypothetical Attributes of a Store 2	*Coefficients*	Attribute Value - Store 1	Attribute Value - Store 2
Intercept	0	0	0	0	0
PowerCenter	0	1	1055.76	0	1055.76
Stripcenter	0	0	1104.94	0	0
Freestanding	1	0	996.73	996.73	0
Freeway Visibility - 2 Excellent - 1 Limited - 0 None	0	1	117.34	0	117.34
Primary St Visibility - 2 Excellent - 1 Limited - 0 None	2	1	177.48	354.96	177.48
Highway Proximity - <.25 = 5 - <.50 = 4 - <1 = 3 - <2 = 2 - None = 1	1	5	13.26	13.26	66.3
Parking Per 1,000 s.f.	4	4	-127.14	-508.56	-508.56
Located at Intersection	1	1	-3.63	-3.63	-3.63
Pylon Sign - 1 None - 2 Small - 3 Average - 4 Large	4	4	3.86	15.44	15.44
Building Signage - 1 None - 2 Small - 3 Average - 4 Large	3	4	2.66	7.98	10.64
Competition in a one-mile Radius	3	2	23.83	71.49	47.66
Center Curb Appeal - 3 Excellent - 2 Average - 1 Poor	2	3	192.56	385.12	577.68
Store Curb Appeal - 3 Excellent - 2 Average - 1 Poor	2	3	-184.87	-369.74	-554.61
Occupied After 1994 = 1	1	1	-13.22	-13.22	-13.22
Building Built After 1989 = 1	0	1	79	0	79
Predicted Sales Per Square Foot				949.83	1067.28

This example shows that within the same demographic area, store 2 should have higher sales psf than store 1 by approximately $117/psf. Store 2 is predicted to have higher sales due to its more favorable real estate attributes. This type of analysis can be a great help to retailers, especially those that have a large number of stores, as they try to decide on a site within a target market. As an example, a retailer can decide that a site's rent is relatively cheap or expensive based upon how its particular real estate attributes affect the store's sales volume.

Despite the statistically insignificant results, in the authors' estimation if the methodology were applied to a larger sample size the outputs would show significant correlation between the real estate attributes and the sales per square foot of a retail store.

This analysis points to the fact that retailers and developers should not attempt to replace their instinctive reaction to a property with research. But they can no longer afford to depend solely upon that instinct. Effective site selection is neither a science nor an art; it's a transcendental marriage of the factual parameters and intuitive passion that define the two disciplines.

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