

Project Description

from

University of Pennsylvania, The Wharton School
Statistics 621 Statistics for Managers Quarter 1, 1999

Introduction

The vice president of a rapidly growing, information systems company has hired you to help her plan for a new branch office in a Midwestern U.S. city. At your meeting with her, the vice president explained the problem:

“We’re planning a major expansion in the Midwest. We are committed to one particular city, primarily because several of our most important people want to live there and might quit unless we open our office there. We have gotten information on office costs for new rentals in that city during the last two years. The real estate market there is pretty flat, so the numbers should be representative. We are at the wish list stage now. I know lots about computer networks, but almost nothing about real estate. Obviously, square footage is going to affect the rental cost, but there are other things that I can’t price out. For example, can I save money by going to a longer lease? I know you can’t pinpoint costs to the last dollar, but give me some cost ranges on the features.

“We have several possible candidates in mind. They differ substantially in location, lease length, and various features. For example, there are a central city office in a building without new wiring, and a suburban office in a new building with the latest wiring, an exercise facility, and enough close-up parking for all of our top executives. Some of the people in the company want an exercise facility, but I don't want to spend a lot on it. The downtown building has a restaurant. And so on.

“The big problem I have now is to get a handle on what a reasonable rental range would be for some candidate rentals which appeal to us. Naturally, the real estate brokers want to get top money for rentals, so I don’t trust their initial quotes. Please use this data to give me some feedback about what we can expect to pay for office space in this city. To help you appreciate our concerns, my secretary will give you a list of specific issues that we would like for you to address. I am sure you will learn other things during your analysis, but be sure to address specific concerns as well. Some of these issues were raised in a recent meeting of my senior staff, and we’d like to know what you can learn from this data.”

Write-up: Summary Memo

Prepare your summary for the client in the form of a memo that can be passed on to senior management. The first page of this memo should offer an executive summary that can be read as a stand-alone document. The executive summary should present what you consider to be the most important findings of your analysis and should contain your recommendations for the client. The next five pages should address the specific concerns that are listed further below, explicitly addressing each item. The total length of this memo, with both executive summary and supplemental concerns, is *six double-spaced pages*. The emphasis of this memo should be on what you've found, not on how you found it. The senior managers are intelligent people but do not have much if any statistical training and don't like jargon. Be precise, but do not use technical jargon that would not be understood by managers who have not recently taken a course such as this. If you do decide to use a technical term, be sure to define it within the context of the issue that you are addressing. Also, if you have any reservations about your findings, state them in straightforward terms.

In addition to the executive summary, complete your memo by considering the following questions. These supplemental questions come in two groups. The first group of questions requires a model that uses only a few characteristics of the desired property. The second group of questions requires an extended model that considers a more extensive list of the characteristics of the property. (You should document the details of these and perhaps other models in the technical appendix described further below.)

The first phase of management's decision-making process is to decide where to site the new office, broadly speaking. The first group of specific questions focuses upon this context. Because of some of the clients of this firm are located in the downtown area, it would be advantageous for them to also locate downtown, all other things being equal. However, senior management is concerned that all other things are not equal; in particular, they are concerned that properties are too expensive in the city center. During this phase of the decision-making process, management has settled upon only a few necessary characteristics of the chosen property. In particular, the company knows that they need 50,000 square feet of space with 20 executive parking slots. Because of the computing technology to be used in the office, they require new wiring, and in keeping with the company's modern image, they require a newly renovated building – say, renovated one year ago. The employees who will move are also accustomed to having a restaurant and exercise center on site, so the company wants these in the new location as well. The employees have these conveniences at their current locations, and don't want to sacrifice them when the move occurs. Without these, they might leave for a rival firm.

1. What *total* cost should the company expect to pay for the desired space if it chooses to locate in the city or in the old or new suburbs? Give your estimate for each site as a range, and note as part of your analysis what sort of premium, if any, will be required to locate in the city.
2. Everyone knows that parking comes at a premium in densely populated urban areas. In considering the comparison of the three sites (city, old suburb, new suburb), how much could the company save by reducing its parking needs in half (i.e., reduce to 10 parking spots)? In particular, what is the cost for a parking spot at each site? Would this change in parking needs alter the choice of a site identified in #1?
3. As noted in the overview, the company would like a building with new wiring, restaurant and exercise center. How much more per square foot does each of these features contribute to the costs of leasing office space in this city?
4. Because of the desire to have a modern appearance, the company has opted to find a location that has been very recently renovated (within a year). This choice will keep the time required before the move occurs minimal. If, however, the cost for such recent renovations is quite high, it might be worthwhile to consider doing with space that is not quite so modern. How much can the company save by obtaining a property that was renovated 5 years ago rather than last year?
5. Do other fixed costs affect the cost of a lease? These other fixed costs might include, for example, certain legal fees or management costs associated with processing and handling the lease agreement. The company has heard that such costs are particularly high for properties leased within the city. Do you find any evidence of such fixed expenses, aside from those specifically noted previously (e.g., parking)? If so, describe the size of the effect and offer an interpretation.

Once the company's directors choose a site (city, old or new suburbs), they will need some help identifying a specific property. The second group of questions that follow addresses other factors that may or may not affect costs, and thus affect the specific siting decision. Since the directors have yet to reach their conclusion, we cannot be sure where the building will be located. Nonetheless, we need to be prepared to answer certain follow-up questions. To answer the following questions, you should develop a single, more elaborate model that can address questions that involve more specific features of a building and its location than the model used above for the first five questions.

6. If the company locates in the city, the distance to the airport is pretty well determined. However, if the company locates in the suburbs, it can be relatively near or far from the airport. The company expects that it would have lower travel costs (taxi cabs, limos to and from the airport) and lost time in transit if it were closer to the airport, either in distance or time. How does the cost per square foot depend on how far the building is located from the airport? Give an estimate (with a range) of the premium in terms of the impact of this factor on the cost of office space in dollars per square foot.
7. This office will be the first location for this company in this area. The company might expand if all goes well, but it might also need to close up shop promptly if the business does not develop as it would like to see. How much extra (if any) will the company have to pay for having a renewable lease? On the other hand, can the company save much by opting for a 10 year lease term rather than a 3 year term? Again, give your estimates as ranges in terms of dollars per square foot.
8. Like most people, the staff of this company hate to have to wait on the elevator, so the company would like a building with lots of elevators. Is this an easily affordable option, or will it drive costs farther upward? What is your estimate of the *difference* in cost (again, in terms of dollars per square foot) of being in a building with 4 elevators as opposed to being in one with 8?
9. If the company identifies a building which is already highly occupied, it fears that the cost of the lease will be higher than otherwise. Is this true? Do occupancy rates affect the cost of the lease in dollars per square foot? If so, how?
10. A rental agent whom the company had contacted offered a five-year renewable lease for the required space in a business office building that is in the heart of downtown, currently with 80% occupancy. The space is located starting on the 20th floor in a building with 6 elevators, 30 floors, and 20,000 square feet of office space per floor. The lease includes 20 executive parking spots. The building is 40 years old, but was renovated one year ago (including the desired new wiring). It also has the sought amenities: restaurant and exercise center. The annual cost of this lease is \$1.25 million. Assuming we have chosen to be downtown, is this a good offer?

Write-up: Technical Appendix

As a supplement, the memo requires a technical appendix that details the models and claims presented in the summary memo. This appendix should be written for a technical expert who is very familiar with regression analysis and will serve as an additional consultant to the company that is seeking a lease. Thus, you can use technical language in this section that would be inappropriate elsewhere. The technical expert can interpret computer output quite easily, as long as the use of that output in the analysis is clear. This appendix can be up to 10 pages in length, including all tables, figures, and output. A suggested format (not mandatory) is:

- A summary of the models you have used, perhaps with some alternatives you found useful. This summary might be presented in the form of a compact table.
- An explanation of why you did what you did. Document any unusual actions (transformations, identification and treatment of outliers, etc.) and the reasons for your actions.
- Evaluation of the plausibility of important assumptions, backed up by any necessary plots.
- Any graphs, charts, or whatever from the computer, labeled, highlighted, and neatly included.

Any computer output that you feel is appropriate to include should be interesting enough to warrant at least a paragraph of discussion. If not, leave it out. Also remember that you have been looking over these graphs for hours if not days. What is now obvious to you will not be immediately obvious to the client. Any method of help would be appreciated, such as:

- highlighting the important lines in a table
- annotating graphs
- labeling points of interest

You can assume that the firm's ultimate evaluation of your work will depend on the quality of your analysis, not on whether you found a model that agrees with someone's preconceived notion of the true model. The client values clarity and conciseness highly.

The Data

The data set includes information on rental contracts for 225 offices over the last two years. The following variables are included in the data base:

Renttotal	total rent paid per year
Sqft	square feet of office space in the rental
Renovation	years since last building renovation
Leaselength	length of time (in years) of the lease
Age	age of the building (in years)
Distcity	distance (in miles) to the central point of the city center
Distairport	distance (in miles) to the airport main passenger terminal
Drive	average driving time (in minutes) to airport main terminal
Location	which of three areas, city center, old suburban, or new suburban
Occupancy	fraction of space in building which is occupied
Floorbldg	number of floors in the building
Sqftbldg	average square footage per floor in the building
Elevators	number of elevators in the building
Restaurant	is there a restaurant in the building?
Wiring	is there up-to-date wiring?
Exercise	is there an exercise facility in the building?
Disthosp	distance (in miles) to the nearest hospital
Firm	type of firm renting the space: business/government/legal/medical/other
Floor	lease the lowest floor of the lease
Renewable	is the lease renewable?
Parking	number of executive parking places