

BUS 735: Business Decision Making and Research

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Take Home Exam 1

1. Suppose you work for a for-profit university called Spherical-Map University that sells easy, low-workload 1-year and 2-year college degrees in Hospitality Management. To determine what tuition to charge its students, your boss would like you to investigate the total earnings Wisconsin workers make in the leisure and hospitality industry. The dataset `leisure_wages.xls` contains the actual total earnings made in the Leisure and Hospitality industry in the state of Wisconsin for every quarter from 2001 through 2009. This data was obtained from the *Bureau of Labor Statistics*, <http://www.bls.gov>.
 - (a) Does the data appear to have a seasonal component? If so, what time of year are earnings in the industry the highest? Which are the lowest? If you were in charge of setting up the academic calendar, during what time of year would you like your students to graduate?
 - (b) Does the data appear to have a trend? If so, describe the trend.
 - (c) Generate Adjusted Exponential Smoothing (AES) forecasts for the data using a smoothing constant equal to 0.2 and a trend smoothing constant equal to 0.3. What is the root mean squared error? How does this compare to the naive forecast?
 - (d) Generate a regression model to predict wage earnings that uses time and seasonal dummies as explanatory variables. What is the root mean squared error? How does this compare to the AES forecast and the naive forecast?
 - (e) Using the results from your regression model in your previous answer, is there statistically significant evidence of a time-trend in earnings? On average how much do wage earnings increase or decrease by over the course of one year?
 - (f) Of the models you examined, use the best fitting model to generate forecasts for earnings in the leisure and hospitality for each quarter of the next two years.

2. A moving company, I-Haul, noticed the superior analysis you conducted for Spherical-Map University, and hired you away for a substantial raise. Your new boss at I-Haul needs you to estimate how many hours of labor will be required for each upcoming move. Being able to accurately predict this will allow you to schedule the right number of employees for each move. If he sends too many employees, he wastes his resources. If he sends too few, his customers are likely to get upset. He collects data from 100 past moves and records how many labor hours the move required, how large the residence was (in square feet), how many bedrooms the residence had, how many exceptionally large items needed to be carried, and whether or not the residence was an apartment (=1 for apartment, =0 for house). The data is given in `moving.sav`
- (a) Estimate the regression equation and write down the estimated equation.
 - (b) Suppose the moving company's next customer has a 3 bedroom house (not an apartment) that is 1800 square feet, has two large items that need to be moved. What is your prediction for how many labor hours will be required?
 - (c) What percentage of the variability in labor hours is explained by your explanatory variables?
 - (d) Does it matter whether or not the residence is part of an apartment building or not when determining labor hours for moving? Test the appropriate hypothesis and clearly state your conclusion.
 - (e) Test the hypothesis that at least one of your explanatory variables in your regression model helps explain labor hours for moving.
 - (f) Think about this example. Is there any reason why any of the explanatory variables might be correlated? Which ones? For these variables, compute the Pearson Correlation Coefficient and test whether the correlation is different from zero.

3. Even after your excellent work at I-Haul, they laid you off due to poor economic conditions. Spherical-Map University offered you your old job back, but at only half the salary. Reluctantly you accepted. Spherical-Map University wants to heavily advertise one of their programs of “study” and they want you to figure out which program to advertise, based on which program generates the most income for students during the first five years after they graduate. The question is not so simple, because the expected income for each field depends on economic conditions over the next five years. Suppose the expected average 5-year gross salary for their four main programs are given below,

Degree	Recession	Slow Growth	Expansion
Graphic Design	\$145,000	\$175,000	\$220,000
Hospitality	\$130,000	\$200,000	\$250,000
Legal Assistant	\$175,000	\$200,000	\$190,000

- (a) Suppose you want to make a choice that yields the maximum possible income. What criterion is this called? What is your decision?
- (b) Suppose you are very pessimistic about the future. What criterion should you use? What is your decision?
- (c) You have worked for your particular boss at Spherical-Map for a long time. You know that he is absolutely clueless when it comes to making decision and understanding his own job. Furthermore, he convinces himself that he always had knowledge that he only learns in hindsight. As a consequence, he will blame you for any decision that turns out not to be the best decision after economic conditions are already known. What criterion should you choose? What is your decision?
- (d) Suppose the an economic research firm estimates probabilities for each economic condition is given in the table below. Using this information, what criterion should you use? What is your decision?

Economic Condition	Probability
Recession	15%
Slow Growth	50%
Expansion	35%