

Writing About Operations Research – Model and Results – Regression

1 Overview

- The purpose of the **model** section is to describe the operations research or statistical model you used to analyze your problem.
- The purpose of the **results** section is to present and interpret your results in a reader-friendly way.
- How you write these sections depends partly on the types of models you used in your study.
- Here, we will focus on Project 1 and regression models.

2 The model section

- Suggested outline:
 1. **Model type.** (1 paragraph)
 - State the type of regression model you are using.
 - State the general model mathematically.
 - Explain why this type of regression model is appropriate for your problem.
 2. **Model variables.** (1+ paragraphs, depending on the number of variables considered)
 - Describe the response variable.
 - Describe the explanatory variables you considered putting into your regression model.
 3. **Variable selection.** (1 paragraph)
 - Describe how you selected which explanatory variables ended up in your final regression model(s).
 - If you used an automated procedure for selecting your regression model (e.g., best subsets regression), state that here.
 4. **Additional model details.** (1 paragraph)
 - Discuss any simplifying assumptions you made.
 - Describe the software and/or programming language you used to run/solve your model.

3 The results section

- Some general guidelines on presenting tables and figures:
 - You should introduce every table or figure to your reader with some text, e.g.

The normal QQ plot in Figure 3 indicates that the residuals appear to be normally distributed.
 - Number each table or figure.
 - Give a descriptive caption for each table or figure.
 - Use a descriptive title for each table column.
 - ◊ e.g., replace raw variable names such as “beer_consumption_us” with reader-friendly names like “US Beer Consumption (in millions of gallons)”

- Label the axes of each graph.
- Suggested outline:
 1. **Fitted models, test statistics, and diagnostics.** (1 table + 2 paragraphs for each model)
 - In a table, report the coefficients, associated p -values, and overall goodness-of-fit statistics (e.g. R^2 , AIC, BIC).
 - In one paragraph, discuss whether the diagnostics indicate that the conditions for the regression model have been reasonably met. Include the diagnostic plots and values you used.
 - In another paragraph, describe what the p -values and goodness-of-fit statistics mean.
 2. **Interpretation.** (1-2 paragraphs for each model)
 - Your interpretation of the results should support the overall goal of your problem.
 - ◇ If you are analyzing a decision problem, you are (likely) using regression as an **explanatory** model, discovering the underlying relationships in the data, e.g.:

Does exercising 30 minutes a day lead to lower blood pressure?
 - ◇ If you are analyzing a prediction problem, then you are using regression as a **predictive** model, using existing data to determine unknown quantities, e.g.:

If I were to exercise 1 hour per day, what will my blood pressure be?
 - Identify the coefficients of interest, and explain what they mean in the context of your problem, e.g.

On average, exercising 30 additional minutes a day is significantly associated with a decrease of 2.4 mmHg in systolic blood pressure, after accounting for the other explanatory variables.
 - Describe how the fitted regression models can be used to solve your decision or prediction problem, e.g.

Our model indicates that there is a statistically significant relationship between more exercise and lower blood pressure.

Our model predicts that a 40-year old male who exercises 1 hour a day will have a systolic blood pressure of 105.5 mmHg.