# MAT 303 Module Three Problem Set Report

Second Order Models

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Note: Replace the bracketed text on page one (the cover page) with your personal information.

## **1. Introduction**

*Discuss the statement of the problem with regard to the statistical analyses that are being performed. Address the following questions in your analysis:*

* *What is the data set that you are exploring?*
* *How might your results be used?*
* *What type of analyses will you be running in this problem set?*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

## **2. Data Preparation**

*There are some important variables that you have been asked to analyze in this problem set. Identify and explain these variables. Address the following questions in your analysis:*

* *What are the important variables in this data set?*
* *How many rows and columns are present in this data set?*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

## **3. Quadratic (Second Order) Model with One Quantitative Variable**

### Correlation Analysis

*Visualize and describe the relationships between the variables in the data set. Address the following question in your analysis:*

* *Create a scatterplot of wage growth and unemployment. Comment on the relationship observed from the graph. Do you think a first order or a second order model is appropriate in this case? Explain your reasoning.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Reporting Results

*Report the results of the regression model. Address the following questions in your analysis:*

* *Write the general form* *and the prediction equation of the second-order regression model for wage growth using unemployment as the predictor variable.*
* *Create this second-order regression model for wage growth using unemployment as the independent variable. Write the prediction model equation using outputs obtained from your R script.*
* *What are the values of R-Squared(R-squared) and Adjusted R-Squared (Adjusted R-squared) for the model? Provide your interpretation of these statistics.*
* *Interpret the beta estimates for the terms and 2 (squared).*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Evaluating Model Significance

*Evaluate model significance for the regression model. Address the following questions in your analysis:*

* *Is the model significant at a 5% level of significance? Carry out the overall F-test by identifying the null hypothesis, the alternative hypothesis, the P-value, and the conclusion of the test.*
* *Which terms are significant in the model based on individual T-tests? Use a 5% level of significance.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Making Predictions Using Model

*Make predictions using the regression model. Address the following questions in your analysis:*

* *What is the predicted wage growth if unemployment is 2.54?*
* *What is the 95% prediction interval for the wage growth? Interpret the interval.*
* *What is the 95% confidence interval for the wage growth? Interpret the interval.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

## **4. Complete Second Order Model with Two Quantitative Variables**

### Reporting Results

*Report the results of the regression model. Address the following questions in your analysis:*

* *Write the general form and the prediction equation of the complete second order regression model for wage growth as the response variable, and unemployment and GDP growth as predictor variables.*
* *Create this second order regression model for wage growth as the response variable, and unemployment and GDP growth as predictor variables. Write the prediction model equation using outputs obtained from your R script.*
* *What are the values of R-squared (R-squared) and Adjusted R-Squared (Adjusted R-squared) for the model? Provide your interpretation of these statistics.*
* *Interpret the beta estimates for GDP2 (GDP squared) and unemployment 2 (unemployment squared).*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Evaluating Model Significance

*Evaluate model significance for the regression model. Address the following questions in your analysis:*

* *Is the model significant at a 5% level of significance? Carry out the overall F-test by identifying the null hypothesis, the alternative hypothesis, the P-value, and the conclusion of the test.*
* *Which terms are significant in the model based on individual T-tests? Use a 5% level of significance.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Making Predictions Using Model

*Make predictions using the regression model. Address the following questions in your analysis:*

* *What is the predicted wage growth if unemployment is 2.50 and GDP growth is 6.50?*
* *What is the 95% prediction interval for the wage growth? Interpret the interval.*
* *What is the 95% confidence interval for the wage growth? Interpret the interval.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

## **5. Complete Second Order Model with One Quantitative and One Qualitative Variable**

### Reporting Results

*Report the results of the regression model. Address the following questions in your analysis:*

* *Write the general form and the prediction equation of the complete second order regression model for wage growth using unemployment and economy as predictor variables.*
* *Create this second order regression model for wage growth using unemployment and economy as predictors.* *Write the prediction model equation using outputs obtained from your R script.*
* *What are the values of R-Squared (R-squared) and Adjusted R-Squared (Adjusted R-squared) for the model? Provide your interpretation of these statistics.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Evaluating Model Significance

*Evaluate model significance for the regression model. Address the following questions in your analysis:*

* *Is the model significant at a 5% level of significance? Carry out the overall F-test by identifying the null hypothesis, the alternative hypothesis, the P-value, and the conclusion of the test.*
* *Which terms are significant in the model based on individual T-tests? Use a 5% level of significance.*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

### Making Predictions Using Model

*Make predictions using the regression model. Address the following questions in your analysis:*

* *What is the predicted wage growth if unemployment is 2.50 and the economy is* ***not*** *in recession? (be sure to use single quotes when setting the value for economy)*
* *What is the 95% prediction interval for the wage growth? Interpret the interval.*
* *What is the 95% confidence interval for the wage growth? Interpret the interval.*
* *Why is the prediction interval wider than the confidence interval?*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

## **6. Conclusion**

*Describe the results of the statistical analyses and address the following questions:*

* *Based on the analysis that you have performed and assuming that the sample size is sufficiently large, would you recommend using this model? Why or why not?*
* *Fully describe what these results mean in your scenario using proper statistical terms and concepts.*
* *What is the practical importance of the analyses that were performed?*

Caution sign icon Answer the questions in a paragraph response. Remove all questions and this note before submitting! Do not include R code in your report.

## **7. Citations**

*You are not required to use external resources for this report. If none were used, remove this entire section. However, if you used any resources to help you with your interpretation, you must cite them. Use proper APA format for citations.*

*Insert references here in the following format:*

Author's Last Name, First Initial. Middle Initial. (Year of Publication). Title of book: Subtitle of book, edition. Place of Publication: Publisher.