Final Project Checkpoint 3: Model Adjustment and Residual Analysis

Objective: In this checkpoint, you will adjust your multiple linear regression model by adding a covariate, evaluate whether it improves the model, and analyze residuals to assess model fit.

📌 Task 1: Adjust the Model by Adding a Covariate (7 points)

1. Choose an additional **covariate** to add to your model. A covariate is an explanatory variable that may influence the response variable but is not the primary focus of the study.

Key Difference

Feature	Explanatory Variable	Covariate
Primary Focus?	Yes	No
Expected to have a direct effect on response variable?	Yes	Maybe
Included to adjust/control for external influences?	No	Yes
Changes in this variable are analyzed for their effect on the response?	Yes	No (but they help refine estimates of other variables)

2. Modify your model to include the covariate using the base R `lm()` function: *(use the same number of explanatory variables as checkpoint 2)*

```
Adjusted_Model <- lm(response_variable ~ explanatory_var1 +
explanatory_var2 + covariate, data = dataset)
```

3. ✍️ Which variable(s) did you add as a covariate and why?

📌 Task 2: Compare Models Using ANOVA (7 points)

1. Use an **Analysis of Variance (ANOVA)** test in base R to determine if the covariate significantly improves the model:

   ```
   anova(Original_Model, Adjusted_Model)
   ```

2. ✍️ Record the **F-statistic** and **p-value** from the output.

3. ✍️ Interpret the results: Does the covariate significantly improve the model?

📌 Task 3: Perform Residual Analysis (6 points)

1. Extract residuals from the adjusted model using base R:

   ```
   residuals <- resid(Adjusted_Model)
   ```

2. Summarize the residual variance using:

   ```
   var(residuals)
   ```

3. ✍️ **Interpretation:** If the residual variance is high, what does this indicate about the model's performance?

After all tasks are complete:

📸 Attach the R Script from RStudio that contains your code from Tasks 1-3.

Submit answers on [this Google Form](#)