

A1 Q1

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```
“{r} # Q1
```

```
e_com = read.csv("A1\E-Commerce.csv", header = TRUE, stringsAsFactors = FALSE)
```

Specify the year

```
e_comYear = as.numeric(substr(e_comQuarter, 1,4))
```

Specify the indicator variables

```
e_comQ1 = as.factor(ifelse(substr(e_comQuarter, 7,8)=="1",1,0))
e_comQ2 = as.factor(ifelse(substr(e_comQuarter, 7,8)=="2",1,0))
e_comQ3 = as.factor(ifelse(substr(e_comQuarter, 7,8)=="3",1,0))
e_comQ4 = as.factor(ifelse(substr(e_comQuarter, 7,8)=="4",1,0))
```

Fit the model

```
model_reg = lm(Value ~ Year + Q1 + Q2 + Q3 + Q4 -1, data = e_com)
summary(model_reg)
```

plot results

```
e_comTime <- -1 : nrow(e_com)
e_comFitted <- predict(model_reg)

library(ggplot2)

ggplot(ts(residuals(model_reg))) + ggplot(e_com, aes(x = Time)) + geom_line(aes(y = Value, color = "Actual"), size = 1) + geom_line(aes(y = Fitted, color = "Fitted"), size = 1, linetype = "dashed") + scale_x_continuous(breaks = e_comTime, labels = e_comQuarter) + labs(title = "Actual vs. Fitted Values", x = "Time (Quarterly)", y = "Value") + theme_minimal() + theme(axis.text.x
```

```
= element_text(angle = 45, hjust = 1)) + scale_color_manual(values =  
c("Actual" = "blue", "Fitted" = "red"))
```

plot residuals

```
residuals_df = data.frame(Time = e_com$Time, Residuals = residu-  
als(model_reg))
```

```
ggplot(residuals_df, aes(x = Time, y = Residuals)) + geom_line(color = "blue")  
+ geom_hline(yintercept = 0, linetype = "dashed", color = "red") + ggtitle("Residual Plot of Regression Model") + xlab("Time") + ylab("Residuals") +  
theme_minimal() ““
```