

Precept 4

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POL 345

Agenda

- Check in/share
- Logistics
- Review- logic in R & linear regression
- Precept Questions

Check In

- This class is challenging & is moving very fast
- Some of what you guys are learning is graduate level
- I will help as best as I can, but I don't know all the material off the top of my head (especially if I haven't read a problem or paper yet)
- Most academics who are really good at stats aren't good at teaching it
 - Prof. Ratkovic is one of the few exceptions, get as much out of lecture as you can!

Share

1. Hardest part of the quiz
2. One thing that made you smile this week

Logistics

- This week's precept assignment
 - Upload under "Precept 4"
 - I'm lax since you had the quiz this week- until Mon to hand in
- Problem set regrade policy (see syllabus)
 - Email w/ detailed explanation & copy of your assignment
 - Send to Prof. Ratkovic before class 10/7
 - Only official requests will be considered for regrades!
- Office hours: Wednesdays 12-2PM eastern

Logic in R (*TRUE/FALSE*)

- Logical vectors = vectors of *TRUE/FALSE* values
- Frequently you will need to tell R to do one thing if a function returns a *TRUE* value, & something else if it returns a *FALSE* value
 - ie subsetting
 - Want to subset vector *A* by if vector *B > 0*
 - Keep value if vector *B > 0* is *TRUE*, drop value if vector *B > 0* is *FALSE*

```
2 data <- data.frame(A = c(2, 3, 4, 6, -2), B = c(1, 5, -2, -9, 3))
3
4 logic.vector <- data$B > 0
```

```
> logic.vector
[1] TRUE TRUE FALSE FALSE TRUE
```

```
> data$A[logic.vector]
[1] 2 3 -2
```

Linear Regression

Assumed model: $Y_i = \alpha + \beta X_i + \varepsilon_i$

Fitted model/line of best fit: $\hat{Y}_i = \hat{\alpha} + \hat{\beta} X_i$

Intercept = $\hat{\alpha}$, *slope* = $\hat{\beta}$

In R: `lm(y ~ x)`

Precept Questions

Context

- Debt & Economic Growth
- [Original paper](#)
- [Reply](#)
- Data: RR.handout.csv

Variables

- **Country:** Country name
- **Year:** Year of observation
- **dRGDP::** Percent difference in real GDP (i.e. inflation-adjusted) from last year to the *current* year
- **debtgdp:** Debt-to-GDP ratio for the *current* year
- **lag.dRGDP:** Percent difference in real GDP (i.e. inflation-adjusted) from last year to the *previous* year
- **lag.debtgdp:** Debt-to-GDP ratio for the *previous* year

Question 1

Create a figure similar to that in the previous section exploring the relationship between debt and GDP. You are going to make a figure with one row and two columns. The two figures will plot:

- a) Current debt ratio versus current growth for countries with increasing growth and high previous debt
- b) Current debt ratio versus current growth for countries with increasing growth and low previous debt

Question 1 hint

- Refer to the following but replace increasing debt & high/low growth with increasing growth & high/low debt

```
> par(mfrow = c(1,2))
> growdebt1<-((RR$debtgdp - RR$lag.debtgdp > 2)) & (RR$lag.dRGDP > 2)
> plot(RR$debtgdp[growdebt1], RR$dRGDP[growdebt1], xlab = "Debt to GDP",
+ ylab = "Change in GDP, %", main = "Debt versus Growth, High Growth", pch = 19,
+ ylim = range(RR$dRGDP), xlim = range(RR$debtgdp))
> abline(lm(RR$dRGDP[growdebt1] ~ RR$debtgdp[growdebt1]))
```

```
> growdebt2<-((RR$debtgdp - RR$lag.debtgdp > 2)) & (RR$lag.dRGDP <= 2)
> plot(RR$debtgdp[growdebt2],RR$dRGDP[growdebt2], xlab = "Debt to GDP",
+ ylab = "Change in GDP, %", main = "Debt versus Growth, Low Growth", pch = 19,
+ ylim = range(RR$dRGDP), xlim = range(RR$debtgdp))
> abline(lm(RR$dRGDP[growdebt2] ~ RR$debtgdp[growdebt2]))
```

- Create logical vectors for:
 - Increasing growth ($\geq 2\%$) & high previous debt ($> 70\%$)
 - Increasing growth ($\geq 2\%$) & low previous debt ($< 70\%$)

Question 2

What is the difference in slopes between the lines in the left and right figures in the example (Section 3)? In the left and right hand figures from Question 1 (in section 4)?

1. Create objects for the two linear regressions in section 3 & the two linear regressions in section 4
2. Select the 2nd element in from the coefficients vector from these objects
3. Find the difference

Question 3

Is the relationship between debt and GDP more sensitive to changes in previous growth rates (Section 3) or previous shifts in the debt ratio (Section 4/Question 1)?

Does this suggest

- debt ratios have a causal effect on growth rates
- growth rates have a causal effect on debt ratios
- neither
- both

Question 4

The cutoffs we selected, 70% for debt and 2% for growth, were arbitrary. Are the results robust to different values for the debt cutoff and growth cutoff?