PSET 1: Applied International Macroeconomics

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In this problem set we will alleviate some of the assumptions we have used in our models and see how our results change. Moreover, we will use R to empirically address the relationship between savings and investment. What I expect as a delivery is a PDF file with your handwriting for the math section of the PSET, and the output tables from your R code for Section 3. Moreover, please attach your R code as evidence. I do not expect you guys to be international macroeconomics' or R gurus. As such, I do not mind the use of AI like ChatGPT as long as you attach on an appendix the prompts you used and rewrite the answers to read *human-like*.

1 Consumption Tilting

Consider the basic model without investment of Lecture 1. Assume that household preferences are given by the following equation:

$$W = log(c_1) + \beta log(c_2),$$

with the usual budget constraints and $\beta \equiv \frac{1}{1+\delta}$. In this case, **do not assume** $\beta(1+r) = 1$.

1 Derive the reduced forms of c_1, c_2, TB_1, and TB_2 as functions of β, r, and $\bar{y}$.

2 Verify that with $\beta(1+r) = 1$ we obtain the results of the model in class. That is, $c_1 = c_2 = \bar{y}$, and $TB_1 = TB_2 = 0$.

3 Show what happens to our reduced-form solutions when $\beta(1+r) < 1$, which means households are *impatient* (this implies $\delta > r$).

4 Show what happens to our reduced-form solutions when $\beta(1+r) > 1$, which means households are *patient* (this implies $\delta < r$).

2 Intertemporal Elasticity of Substitution

Now suppose the utility function has the following form:

$$W = \frac{c_1^{1-\frac{1}{\sigma}} - 1}{1 - \frac{1}{\sigma}} + \beta \left(\frac{c_2^{1-\frac{1}{\sigma}} - 1}{1 - \frac{1}{\sigma}} \right),$$

with our usual budget constraints. Again, **do not assume** $\beta(1+r) = 1$. Moreover, assume $y_1 = y_2 = \bar{y}$.

1 Derive the Euler equation.

2 Using the Euler of (1), consider the behavior of $\frac{c_2}{c_1}$ as a function of σ for different values of $\beta(1+r)$. Show:

- If $\beta(1+r) < 1$, $\frac{c_2}{c_1}$ is a decreasing function of σ.
- If $\beta(1+r) > 1$, $\frac{c_2}{c_1}$ is an increasing function of σ.

Explain the intuition behind these results.

3 Derive a reduced form for c_2 and c_1.

4 Use R to plot c_1, c_2, and $\frac{c_2}{c_1}$ as a function of σ in two cases:

- $\delta = 0.03$, and $r = 0.01$
- $\delta = 0.03$, and $r = 0.05$

Assume $\bar{y} = 1$. Explain the intuition behind each plot.

3 The Feldstein-Horioka Puzzle

Feldstein and Horioka (1980) show that capital does not flow freely between countries such that investment and savings are not correlated, like a standard theoretical model would have predicted. Quite the contrary, their work shows empirical evidence of a high correlation between domestic savings and investment. In this section, you will use R to understand more of the Feldstein-Horioka Puzzle.

1 Using the World Bank World Development Indicators database, download annual time series for Gross Savings, Gross Capital Formation (Investment), Households and NPISHs Final Consumption Expenditure, GDP in real 2015 USD, and Trade as % of GDP for all countries possible for the period 1960-2019.

2 Calculate correlations for Savings vs Investment, Savings vs Output, Investment vs Output, Consumption vs Investment. Compute this for the total sample of countries, and separate by economy type (use my database from class).

3 Now calculate the correlations separating by time periods (1960-1980, 1981-2000, and 2001-2019) Do the results change? Why or why not?

4 Compute the correlations of (2) separating by degree of openness (use as cutoff the median of trade as % of GDP). How would you interpret any differences in the correlations? Use as justification the models from class.

4 Extra Credit: The Feldstein-Horioka Puzzle

Recall the first estimated equation on Feldstein and Horioka (1980):

$$\left(\frac{I}{Y}\right)_{i,t} = \alpha + \beta \left(\frac{S}{Y}\right)_{i,t} + \epsilon_{i,t},$$

1 Estimate the equation using your WB WDI data from the previous section only for the LAC-6 countries (use the *lac6* identifier of my dataset) for the period 2000-2019.[1] Use the *stargazer* package to show the regression results and interpret the coefficients.

2 Latin American economies have slowly become much more integrated with world financial markets. Yet, this was not always the case. Estimate the model now for the period 1980-2000. Do the results change? Comment on the coefficients.

3 Are these models free from any econometric issues? Comment what can be done to improve them. Use Feldstein and Horioka (1980) and Kronmal (1993) as guidance.

References

Feldstein, Martin and Charles Horioka, "Domestic saving and international capital flows," *The economic journal*, 1980, *90* (358), 314–329.

Kronmal, Richard A, "Spurious correlation and the fallacy of the ratio standard revisited," *Journal of the Royal Statistical Society Series A: Statistics in Society*, 1993, *156* (3), 379–392.

[1] Tip: Since we are working with panel data, you will need to use the xtreg package of R, assume fixed effects.