Econ 110A: Lecture 1

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UCSD, Spring 24

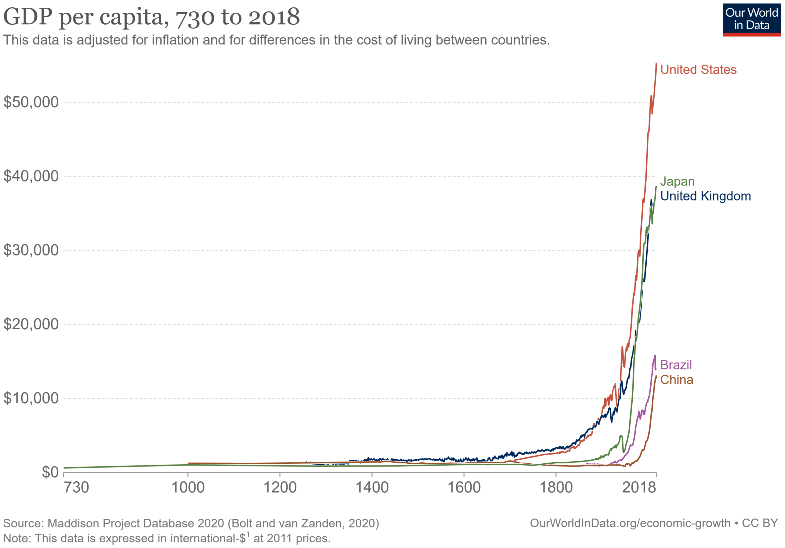
A little introduction about me and the course

About me

I'm originally from Brazil...

- Education:
  - Ph.D. Candidate (final year) & M.A., Economics - UCSD
  - M.A., Dual Degree: Int'l Econ, Int'l Relations, Johns Hopkins
- Professional:
  - Senior Economic Advisor, President of Brazil
  - Consultant, World Bank
  - Research Economist, World Trade Organization
- Misc:
  - Econ Columnist, O Globo (Newspaper, Brazil)
  - Twitter: @goescarlos
  - Website: www.carlosgoes.com
- Research: Macro & International Trade

Why study macroeconomics? “The most important picture in economics”



Macroeconomics studies **economic growth**

1880: $5,000*

2016: $53,000*

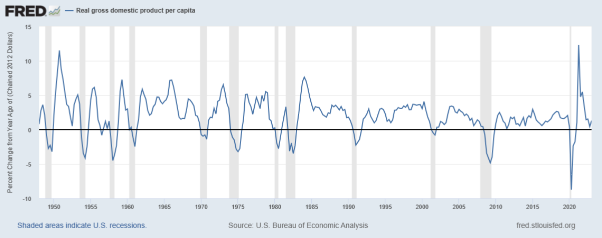
*median income in 2011 dollars, source: Maddison Project Database

Macroeconomics studies **distribution** across groups and people

San Diego, 2023

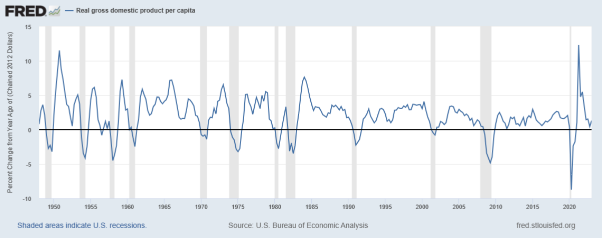
San Diego, 2023

Macroeconomics studies the differences between **cycles** and **long-run trends**

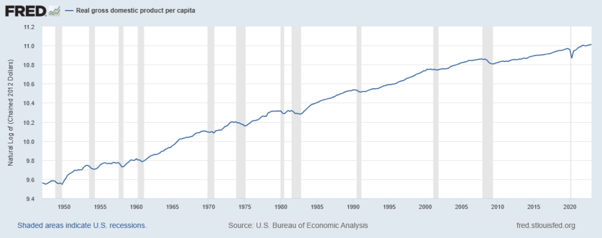


Can you spot the many recessions?

Macroeconomics studies the differences between **cycles** and **long-run trends**



Can you spot the many recessions?



What about now?

...**but what is the long run**?

- definition based on time: any macro phenomenon that persists more than 20-25 years
- definition based on “adjustment:” any macro phenomenon that persists once prices and quantities have had the chance to adjust

What are our Learning Objectives in Econ 110A?

- **measure**
- **model**
- **understand/predict**

What is different from Macro Principles (Econ 3)?

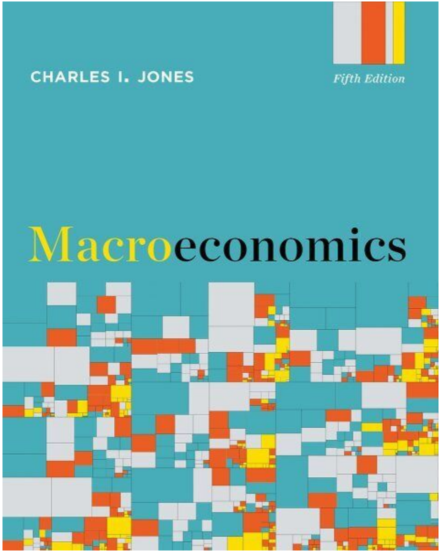
- **measure**: advanced understanding of critical issues with measurement of macroeconomic variables
- **model**: advanced practice of how to build and analyze macroeconomic models
- **understand/predict**:
  - quantitative predictions due to mathematical structure
  - sophisticated and nuanced analysis of economic mechanisms advanced critical
  - understanding of power and limits of macroeconomic analysis

Housekeeping

Lectures, Recordings, and Material

- in person, Mondays and Wednesdays, MOS 0204 - 75, 5-6:20p
- Attendance is very much encouraged but **not** mandatory.
- Slides are available on Canvas and on my website (`www.carlosgoes.com`).
- Grades are based on midterm + final + weekly problem sets.

Textbook



- Title: Macroeconomics
- Author: Charles I. Jones
- Edition: 5th
- Canvas: Redshelf (opt-out system)

TAs and Discussion Sessions

- TAs: Samuel Mayfield
- UIA: Quan Nguyen
- Discussions: Discussion sessions every Wednesday 4:00p-4:50p at PETER 104
- Review important material
- Work on problems from old exams + PSETs
- This week: review of math needed for Econ 110A (asynchronous, posted on Canvas)

Important dates

All exams will take place in person. Please mark your calendar as follows:

- **Midterm, May 2st, 5:00 pm to 6:20 pm;**
- **Final, June 13thth, TBD pm;**

Problem Sets

- There are weekly problem sets, 5 in total
- These are long but graded only on completion
- If you submit every problem set you are very likely to get a good grade in this class
- They are meant to be an incentive for you to learn the material and also a hedge against high stakes exams
- Each problem set is worth 20 points but you can only get a maximum 100 points
- This means that if you fail to submit one of the problem sets you will have suffer not consequences

Grade system

There are 550 points up for grab in this course. Your final grade will be determined according to the following points

Problem Sets	100 pts
Midterm	200 pts
Final Exam	250 pts

Office hours

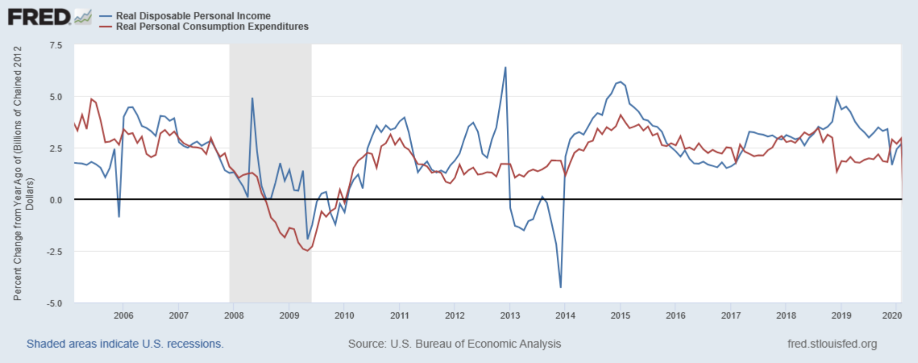
- Mine:
  - Wednesdays: 11am-12pm, through Zoom
  - `https://ucsd.zoom.us/my/goescarlos`
- TAs:
  - TBD, check canvas

How to think like a macroeconomist (or like most scientists)?

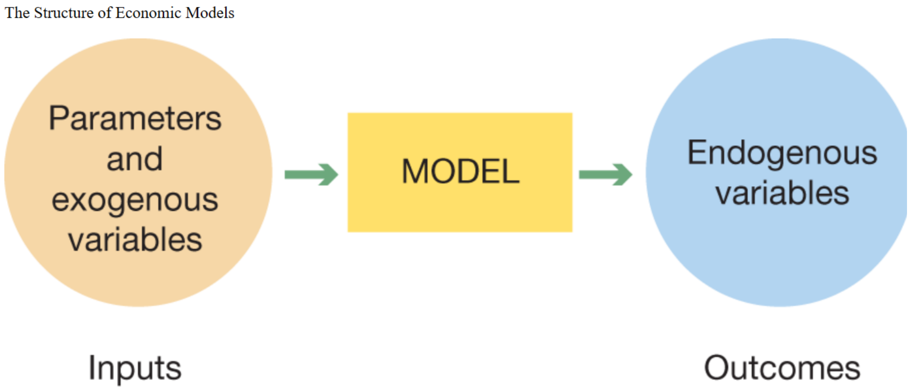
- Document the facts
- Develop a simplified a model
- Compare the predictions of the model with the original facts (i.e., test the model)
- Use the model to make other predictions that may eventually be tested (i.e., run counterfactual experiments with the model).

Document the facts

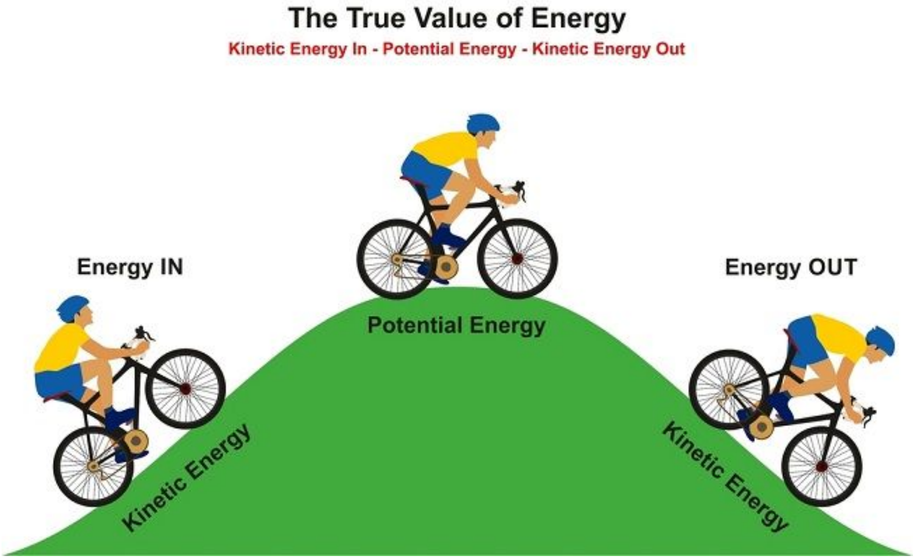
Consumption is much less volatile than income...



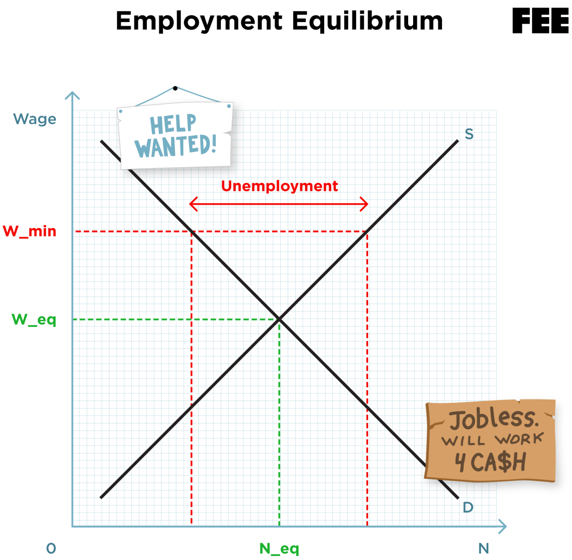
Develop a model



A model in HS physics



A model in Econ 1



Can the model explain reality?

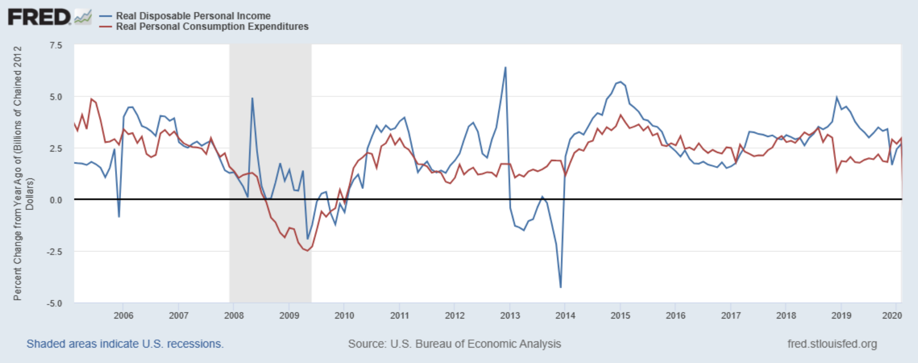
- If so, in what circumstances?
- If not why?
- In the real world, neither model fully generalizes.
- It depends on the particular context: friction, air resistance, temperature; pressure... economic frictions, market power, government policy, migration, international trade, etc...
- But they both can explain the world *under certain assumptions*...

Counterfactual experiment

- What happens if we change a parameter in the model?
- Gravity, temperature, altitude...?
- Taxes, government expenditure, inflation, elasticities, etc...?
- How would our predictions change? How does that align with reality? Which of these parameters can we observe? Which of them do we have to calibrate indirectly?

Let’s go back to our fact...

Why is consumption smoother than income?



Two-Period Neoclassical Growth Model

- The economy consists of a representative consumer who only lives for two periods: today (period 1), and the future (period 2).
- The consumer earns income in both periods; can save (or borrow) and receives (or pays) some interest.
- Y_1: income in period 1, Y_2: income in period 2
- C_1: consumption in period 1, C_2: consumption in period 2
- $S > 0$: savings; $S < 0$: borrowing
- $1 + R$ gross interest rate

Two-Period Neoclassical Growth Model

- Period 1:

$$Y_1 = C_1 + S \tag{1}$$

- Period 2:

$$Y_2 + S(1 + R) = C_2 \tag{2}$$

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- Solve for S in (2):

$$S = \frac{C_2 - Y_2}{1 + R}$$

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- Period 2:

$$Y_2 + S(1+R) = C_2 \tag{2}$$

- Solve for S in (2):

$$S = \frac{C_2 - Y_2}{1+R}$$

- Replace in (1):

$$\underbrace{Y_1 + \frac{Y_2}{1+R}}_{\text{lifetime value income of income today}} = \underbrace{C_1 + \frac{C_2}{1+R}}_{\text{lifetime value income of consumption today}} \tag{3}$$

Two-Period Neoclassical Growth Model

Intertemporal Budget Constraint (IBC)

$$\underbrace{Y_1 + \frac{Y_2}{1+R}}_{\text{lifetime value income of income today}} = \underbrace{C_1 + \frac{C_2}{1+R}}_{\text{lifetime value income of consumption today}}$$

- So $\frac{1}{1+R}$ is the price of consumption in the future in terms of price of consumption today.

- Why?

- If deposit \$1 in the bank today, how much will you get tomorrow?

- Are \$1 today and \$1 tomorrow worth the same amount?

Diminishing Marginal Utility

- Suppose you are on the beach during a hot summer day... and you are craving ice cream

- You really enjoy the first scoop

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Diminishing Marginal Utility

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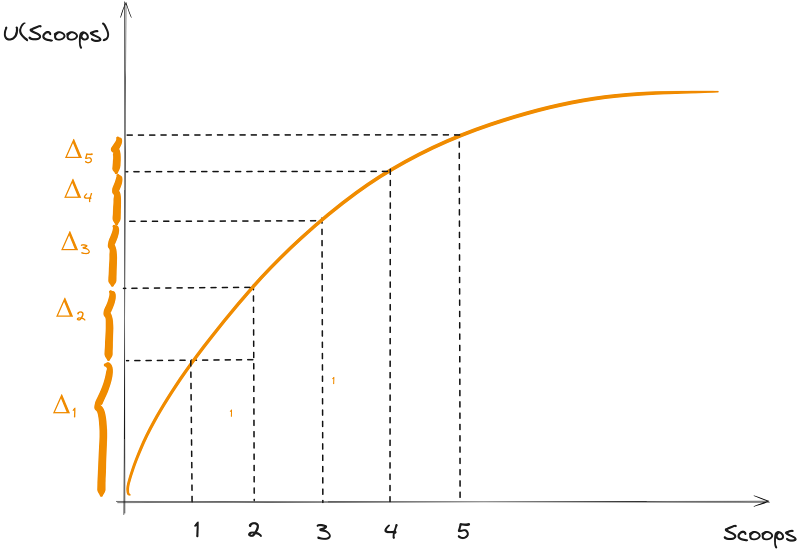
- You really enjoy the first scoop
- The second scoop is still great but not as much
- You struggle to eat the third scoop
- By the fourth scoop, you are barely enjoying it

Diminishing Marginal Utility



Two-Period Neoclassical Growth Model

In each period, consumer receives utility from consumption measured by the utility function $U(C)$, which displays diminishing marginal utility: e.g. $\log(C)$

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Total lifetime utility is the weighted sum of flow utility in both periods

$$\log(C_1) + \beta \log(C_2)$$

- e.g., C_1: gelato today, C_2: gelato tomorrow
- β: degree of impatience
  - $\beta \to 0$: very impatient (your 2-yo baby brother)
  - $\beta \to 1$: very patient (Dalai Lama)

Two-Period Neoclassical Growth Model

The consumer maximizes lifetime utility subject to the intertemporal budget constraint

$$\begin{aligned} \max_{\{C_1, C_2\}} \quad & \log(C_1) + \beta \log(C_2) \\ s.t. \quad & Y_1 + \frac{Y_2}{1+R} = C_1 + \frac{C_2}{1+R} \end{aligned}$$

Two-Period Neoclassical Growth Model

The consumer maximizes lifetime utility subject to the intertemporal budget constraint

$$\max_{\{C_1,C_2\}} \quad \log(C_1) + \beta \log(C_2)$$

$$s.t. \qquad Y_1 + \frac{Y_2}{1+R} = C_1 + \frac{C_2}{1+R}$$

Replace $C_1 = Y_1 + \frac{Y_2}{1+R} - \frac{C_2}{1+R}$, problem becomes:

$$\max_{\{C_2\}} \quad \log\left(Y_1 + \frac{Y_2}{1+R} - \frac{C_2}{1+R}\right) + \beta \log(C_2)$$

Two-Period Neoclassical Growth Model

The consumer maximizes lifetime utility subject to the intertemporal budget constraint

$$
\begin{aligned}
\max_{\{C_1, C_2\}} \quad & \log(C_1) + \beta \log(C_2) \\
s.t. \qquad & Y_1 + \frac{Y_2}{1+R} = C_1 + \frac{C_2}{1+R}
\end{aligned}
$$

Replace $C_1 = Y_1 + \frac{Y_2}{1+R} - \frac{C_2}{1+R}$, problem becomes:

$$
\max_{\{C_2\}} \quad \log\left(Y_1 + \frac{Y_2}{1+R} - \frac{C_2}{1+R}\right) + \beta \log(C_2)
$$

Solution:

$$
\frac{1}{\underbrace{Y_1 + \frac{Y_2}{1+R} - \frac{C_2}{1+R}}_{=C_1}} \times \left(-\frac{1}{1+R}\right) + \beta \frac{1}{C_2} = 0 \tag{4}
$$

Two-Period Neoclassical Growth Model

The Euler Equation (EE) packs a lot of economic intuition. First, note:

$$\underbrace{\frac{1}{C_1}}_{\substack{\text{marginal utility}\\ \text{of consumption today}}} = \underbrace{\beta(1+R)\frac{1}{C_2}}_{\substack{\text{marginal discounted utility}\\ \text{of saving one unit}\\ \text{of consumption today}\\ \text{and consumption earnings tomorrow}}}$$

why must it hold with equality at the optimal? Suppose not? Then what?

Two-Period Neoclassical Growth Model

Replace $C_2 = \beta(1+R)C_1$ (from EE) into IBC:

$$Y_1 + \frac{Y_2}{1+R} = C_1 + \frac{C_2}{1+R} = C_1 + \frac{\beta(1+R)C_1}{1+R}$$

Two-Period Neoclassical Growth Model

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$$Y_1 + \frac{Y_2}{1+R} = C_1 + \frac{C_2}{1+R} = C_1 + \frac{\beta(1+R)C_1}{1+R}$$

- Solving for C_1: $C_1 = \frac{1}{1+\beta} \cdot \left[Y_1 + \frac{Y_2}{1+R}\right]$.

Two-Period Neoclassical Growth Model

Replace $C_2 = \beta(1+R)C_1$ (from EE) into IBC:

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- Solving for C_1: $C_1 = \frac{1}{1+\beta} \cdot \left[Y_1 + \frac{Y_2}{1+R} \right]$.

Plug C_1 above into IBC:

$$Y_1 + \frac{Y_2}{1+R} = \frac{1}{1+\beta} \cdot \left[Y_1 + \frac{Y_2}{1+R} \right] + \frac{C_2}{1+R}$$

- Solving for C_2: $C_2 = \frac{\beta}{1+\beta} \cdot (1+R) \cdot \left[Y_1 + \frac{Y_2}{1+R} \right]$

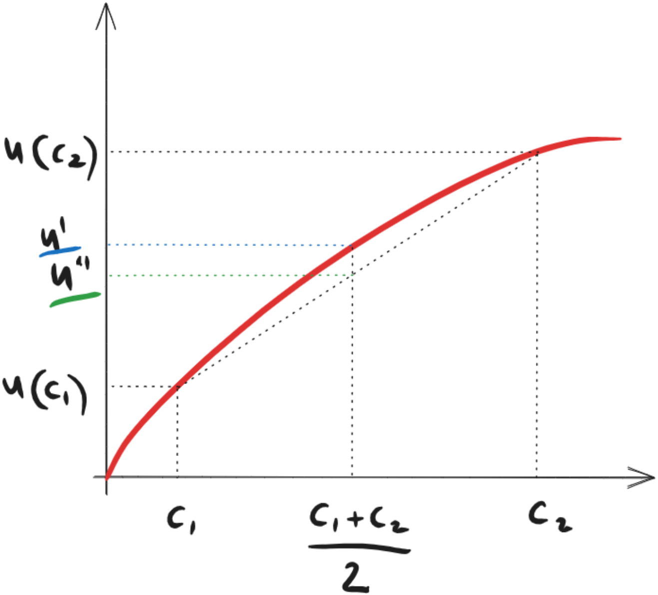
Two-Period Neoclassical Growth Model

Numerical example:.

- $\beta = 1$, $R = 5\%$, $Y_1 = \$30,000$, $Y_2 = \$50,000$
- $C_1 = \frac{1}{1+\beta} \cdot \left[Y_1 + \frac{Y_2}{1+R} \right] = \frac{1}{2} \cdot \left[\$30,000 + \frac{\$50,000}{1.05} \right] = \$38,809.5$
- $C_2 = \frac{\beta}{1+\beta} \cdot (1+R) \cdot \left[Y_1 + \frac{Y_2}{1+R} \right] = \frac{1}{2} \cdot [\$30,000(1.05) + \$50,000] = \$40,750$
- Is it smoother?

- why?

Two-Period Neoclassical Growth Model



$$u' = u\left(\frac{c_1+c_2}{2}\right) > \frac{1}{2}\left(u(c_1) + u(c_2)\right) = u''$$