180.101 Elements of Macroeconomics - Sections

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August 25, 2024

Logistics

- Qingyuan (pronounced as "Ching Yoo-ahn"). He/Him/His
- 3-rd year PhD student in Economics
- Research interest: behaviorial macroeconomics, machine learning
- Email: qfang6@jhu.edu
- TA Material: https://github.com/QingyuanFang/TA_ElementsOfMacro/
- **Office hour: Wednesday, 1:30 - 2:30pm, Wyman Park Building W601D**

Logistics

- You are expected to attend the lectures and the TA sections
- Homework assignments are very important! $\rightarrow$ submit before deadlines
- Have a growth mindset
- Structure of TA sections
  - Review of key concepts
  - Homework questions
    https://forms.gle/4SwezrXyqzeqBGtA8
  - * Extensions

Growth rate

- Many economic variables are expressed in percentage change terms
  - GDP growth rate
  - CPI Inflation (growth rate of price level)
  - Population growth
- The percentage change of X from $t-1$ to t is computed as

$$\frac{X_t - X_{t-1}}{X_{t-1}} \times 100\%$$

- Example: Population, Total for World. $X_{2022} = 7951595433$, $X_{2023} = 8024997028$.
  Percentage change from 2022 to 2023 $\approx 0.92\%$
  Or: world total population grows by 0.92% in 2023.

Question

X is defined as the following

$$X = \frac{D}{Y}$$

If D grows by d% and Y grows by y% in 2023, what is the growth rate of X in 2023?

Compounding growth

- The GDP grows by 2% in the first year and -3% the second year, what is the growth rate over the two years?

$$(1+2\%)(1-3\%)-1=-1.06\%$$

- If $a\%$ and $b\%$ are small, i.e. single-digit percentage growth:

$$(1+a\%)(1+b\%)-1\approx a\%+b\%$$

Annualized growth rate

- Conventionally, economists like to express growth rates for a fixed length of time, one year.
- Example 1: Assume the price of a stock grows by 0.5% each month. By how much would it grow over a year?

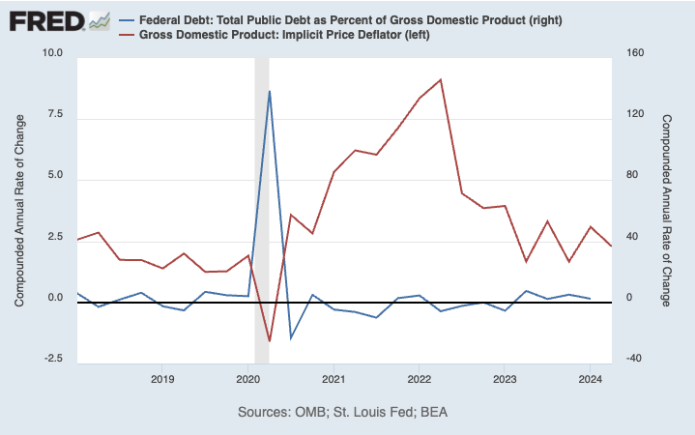
$$\underbrace{(1+0.5\%)}_{\text{month 1}}\underbrace{(1+0.5\%)}_{\text{month 2}}\cdots\underbrace{(1+0.5\%)}_{\text{month 12}}-1=(1+0.5\%)^{12}-1$$

- Example 2. Assume the GDP per capita of an island grows by 4% from June 2021 to December 2023, what is the average annualized growth rate during this period? Assuming the annual growth rate is g, then we have

$$(1+g)^{2.5}=(1+4\%)\Rightarrow(1+g)=(1+4\%)^{\frac{1}{2.5}}\Rightarrow g=(1+4\%)^{\frac{1}{2.5}}-1$$

where 2.5 is the number of years between the two points of the time.

Inflation and Debt-to-GDP ratio

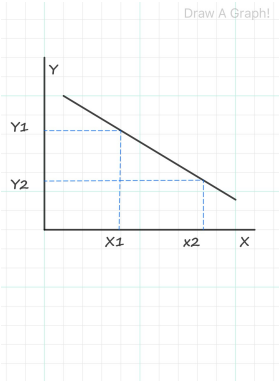


Slope

The slope of a straight line is computed as the following

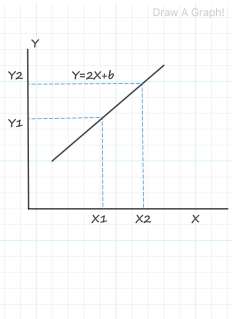
$$\text{Slope} = \frac{Y_2 - Y_1}{X_2 - X_1}$$

"Rise over run"

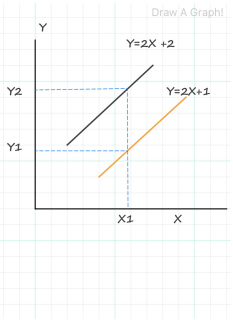


Movement along a curve v.s. shift of a curve

Movement along a curve



Shift of a curve



Appendix

Macroeconomic Data

- Federal Reserve Economic Data (FRED): https://fred.stlouisfed.org/
- IMF
  - World Economic Outlook (WEO): https://www.imf.org/en/Publications/WEO/weo-database/2024/April
  - Other IMF Datasets
- World Bank: https://data.worldbank.org/
- OECD: https://data-explorer.oecd.org/

Geometric sum

- A highly useful formula is the sum of a geometric sequence of numbers

$$a + ar + ar^2 + \ldots + ar^n = a\frac{1 - r^{n+1}}{1 - r}, r \neq 1$$

- If we extend the sequence forever and if $-1 < r < 1$, then the sum is

$$a + ar + ar^2 + \ldots = a\frac{1}{1 - r}$$