180.101 Elements of Macro - TA Section - Week 6

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Slides on https://github.com/QingyuanFang/TA_ElementsOfMacro

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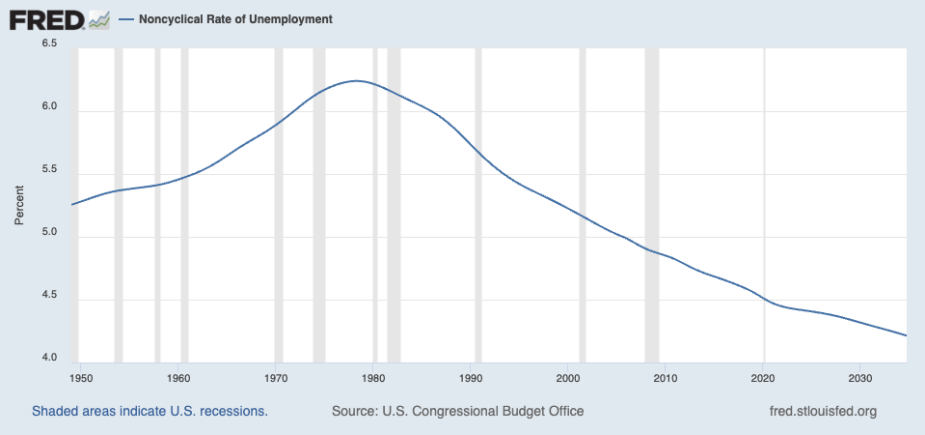
Types of Unemployment

1. **Frictional UE**: Short-term, from the process of matching workers with jobs
2. **Structural UE**: Persistent mismatch between workrs' skills and job requirements.
3. **Cyclical UE**: Business cycle recession

Q: what does it mean for the economy to be at full employment?

Natural (Noncyclical) rate of unemployment



Source: https://fred.stlouisfed.org/series/NROU

Nominal vs Real

- **Q**: Why do we make the distinction?
  A: Comparing the monetary value at different periods of time requires that the **units** remain the same. We cannot say \$100 in 2019 and \$100 in 1979 have the same value.
- Example: nominal/real GDP, wage, interest rate, etc.
- **Q**: How can we compare GDP of different years in a meaningful way?
  A: Use the price of the **base year** to compute the GDP of different years

Nominal vs Real - Example

Use 2022 as the base year when calculating real variables

		2022		2024	
Product	CPI weight	Quantity	Price	Quantity	Price
Pizza	20	30	10	35	8
Cars	40	50	200	55	205
Bread	30	20	5	25	6
Beer (Imports)	10	10	7	50	14

- $GDP_{Nom}^{(22)} = \sum p_i^{(22)} \cdot q_i^{(22)} = \$10400$, $GDP_{Nom}^{(24)} = \sum p_i^{(24)} \cdot q_i^{(24)} = \$11705$
- $GDP_{Real}^{(22)} = \sum p_i^{(22)} \cdot q_i^{(22)} = \$10400$, $GDP_{Real}^{(24)} = \sum p_i^{(22)} \cdot q_i^{(24)} = \$11475$
- GDP Deflator$^{(22)} = \frac{GDP_{Nom}^{(22)}}{GDP_{Real}^{(22)}} = 1$, GDP Deflator$^{(24)} = \frac{GDP_{Nom}^{(24)}}{GDP_{Real}^{(24)}} \approx 1.02$

Inflation

- Price index: weighted average of a basket of goods
  - Weights are fixed so that the price levels at different points of time are comparable.
  - Once for a while, weights need to be adjusted by the statistical agency to reect the underlying change in the composition of households consumption.
  - CPI, PCE, GDP Deflator, etc.
- Inflation: percentrage change in the price index

Inflation - Example

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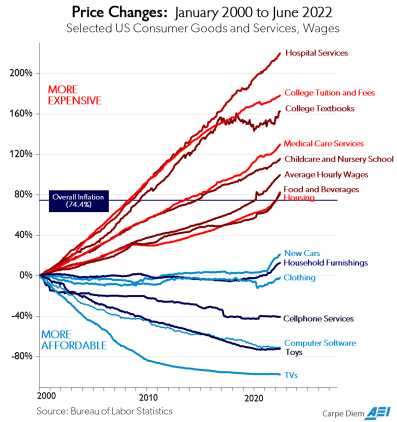
- $CPI^{(22)} = \sum weight_j \cdot p_j^{(22)} = 0.2 * 10 + 0.4 * 200 + 0.3 * 5 + 0.1 * 7 = 84.2$
- $CPI^{(24)} = \sum weight_j \cdot p_j^{(24)} = 0.2 * 8 + 0.4 * 205 + 0.3 * 6 + 0.1 * 14 = 86.8$
- CPI inflation$_{22 \to 24} = \frac{CPI^{(24)} - CPI^{(22)}}{CPI^{(22)}} \times 100\% = 3.09\%$

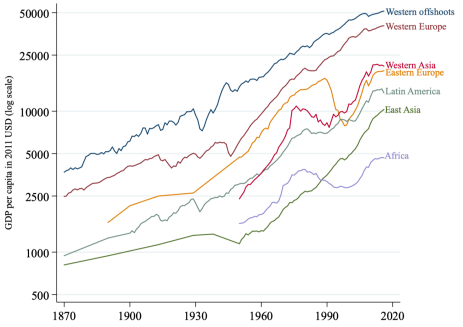
Price Changes of Sub-categories



Source: https://www.aei.org/carpe-diem/chart-of-the-day-or-century-8/

Long Run Economic Growth

Figure 1. Average real GDP per capita across regions, 1870–2015



Notes: Figure shows *CGDPpc* by region, using population to compute a regional GDP per capita level.

Source: https://cepr.org/voxeu/columns/rebasing-maddison-shape-long-run-economic-development

Some Math

If $\%\Delta X$ and $\%\Delta Y$ are very small,

$$\%\Delta(X \cdot Y) \approx \%\Delta X + \%\Delta Y \tag{1}$$
$$\%\Delta(X/Y) \approx \%\Delta X - \%\Delta Y \tag{2}$$

Proof of (1):

$$\begin{aligned}\%\Delta(X \cdot Y) - (\%\Delta X + \%\Delta Y) &= \frac{X_t \cdot Y_t - X_{t-1} \cdot Y_{t-1}}{X_{t-1} \cdot Y_{t-1}} - \left(\frac{X_t - X_{t-1}}{X_{t-1}} + \frac{Y_t - Y_{t-1}}{Y_{t-1}}\right) \\ &= \frac{(X_t - X_{t-1}) \cdot (Y_t - Y_{t-1})}{X_{t-1} \cdot Y_{t-1}} = \%\Delta X \cdot \%\Delta Y \approx 0\end{aligned}$$

Another way to put it: if X grows by x percent and Y grows by y percent, and if x and y are both small, then $(X \cdot Y)$ grows by approximately (x+y) percent.

Long Term Sustainable Growth Rate (LTSG)

- Production with labor input

$$\begin{aligned} Y_t &= E_t \cdot LP_t \\ &= (1-\pi_t) \cdot LF_t \cdot LP_t \\ \Rightarrow \%\Delta Y_t &= \%\Delta(1-\pi_t) + \%\Delta LF_t + \%\Delta LP_t \end{aligned}$$

- When thinking about LTSG, we assume that the economy operates at full employment ($\pi_t = \pi^*$), and the natural rate of unemployment doesn't change ($\%\Delta(1-\pi^*) = 0$).

$$\begin{aligned} LTSG &= \%\Delta LF + \%\Delta LP \\ &= (\%\Delta LFPR + \%\Delta WAP) + \%\Delta LP \end{aligned}$$

- Note: Sometimes we measure LF by **total number of hours** worked instead of the number of workers. The key is that it measures how much labor input is used in the production.

What affects LTSG

$LTSG = \%\Delta LF + \%\Delta L$

- Growth rate of labor force, i.e. more people working brings more output
  - Population growth, especially the population growth in primeage workers (eg. baby boomers).
  - A higher labor force participation rate for a given size of working age population, i.e. womens LFPR increased over the past decades.
  - Immigrant flows.
- Growth rate of labor productivity, i.e. higher efficiency of using the same amount of labor input brings about higher output.
  - Technological progress/innovations.
  - Capital deepening (human capital and physical capital)
  - Better economic institutions that facilitate social cooperation.