Notes for Econ 4 Sect. 2, Fall 2005 Instructor:

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Chapter 2 NIPA
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2 NIPA

A Guide to NIPA's

- National Income and Product Accounts
- It is how we measure economic activity.
- When did it begin? Role of Simon Kuznets and Stone:

  1. Noble Prize in Economics 1971.

  2. Prof. at Penn during the key years of NIPA creation.

- Elaborated by the Bureau of Economic Analysis and published in the *Survey of Current Business*. `http://www.bea.gov/`

2.1 The Measurement of Economic Activity

Question: How are macroeconomic aggregates measured?

Gross Domestic Product (GDP)

Can be measured in three different, but equivalent ways:

1. Production Approach.
2. Expenditure Approach.
3. Income Approach.

Computing GDP through Production

- Calculate nominal GDP by adding value of production of all industries: production surveys.
- Problem of double-counting: i.e. USX and GM.
- Value Added=Revenue−Intermediate Goods.
- Nominal GDP=Sum of Value Added of all Industries.

Composition of GDP

Industries	Val. Add.	in % of GDP
Total Nom. GDP	10,082.2	100.0%
Agr., Forestry, Fish.	140.7	1.4%
Mining	139.0	1.4%
Construction	480.0	4.8%
Manufacturing	1,423.0	14.1%
Transp., Publ. Ut.	819,5	8.1%
Wholesale Trade	680,7	6.8%
Retail Trade	931.8	9.2%
Fin., Insur., Real Est.	2,076.9	20.6%
Services	2,226.6	22.1%
Government	1,281.3	12.7%
Stat. Disc.	-117.3	-1.2%

Nominal GDP

- For 2001, nominal GDP was $\$10,082,200,000,000$
- Population, July 2001 was 285,317,559
- Nominal GDP per capita is roughly $\$35,300$

Computing GDP through Expenditure

$$
\begin{aligned}
C &= \text{Consumption} \\
I &= \text{(Gross Private) Investment} \\
G &= \text{Government Purchases} \\
X &= \text{Exports} \\
M &= \text{Imports} \\
Y &= \text{Nominal GDP}
\end{aligned}
$$

$$Y \equiv C + I + G + (X - M)$$

Consumption (C)

- Durable Goods: 3 years rule.
- Nondurable Goods.
- Services.

Gross Private Investment (I)

- Nonresidential Fixed Investment.
- Residential Fixed Investment.
- Inventory Investment.

Stocks vs. Flows

Investment and the Capital Stock

- Capital Stock: total amount of physical capital in the economy
- Depreciation: the part of the capital stock that wears out during the period
- Capital Stock at end of this period=Capital Stock at end of last period+Gross Investment in this period−Depreciation in this period
- Net Investment=Gross Investment−Depreciation=Capital Stock, end this period − Capital Stock, end of last period.

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Inventory Investment

- Why included in GDP
- Inventory Investment=Stock of Inventories at end of this year− Stock of Inventories at the end of last year
- Final Sales=Nominal GDP−Inventory Investment

Government Purchases (G)

- Sum of federal, state and local purchases of goods and services.
- Certain government outlays do not belong to government spending: transfers (SS and Interest Payments).
- Government Investment.

Exports (E) and Imports (M)

- Exports: deliveries of US goods and services to other countries.
- Imports: deliveries of goods and services from other countries to the US.
- Trade Balance=Exports−Imports
- Trade Deficit: if trade balance negative.
- Trade Surplus: if trade balance positive

Composition of GDP - Spending	in billion $	in % of GDP
Total Nom. GDP	10,082.2	100.0%
Consumption	6,987.0	69.3%
Durable Goods	835.9	8.3%
Nondurable Goods	2,041.3	20.2%
Services	4,109.9	40.8%
Gross Private Investment	1,586.0	15.7%
Nonresidential	1,201.6	11.9%
Residential	444.8	4.4%
Changes in Inventory	-60.3	-0.6%
Government Purchases	1,858.8	18.4%
Federal Gov.	628,1	6.2%
State & Local Gov.	1,229.9	12.2%
Net Exports	-348.9	-3.5%
Exports	1,034.1	10.2%
Imports	1,383.0	13.7%
Gross National Product	10,104.1	100.2%

Computing GDP through Income

•National Income: broadest measure of the total incomes of all Americans

Gross Domestic Product (10,082.2) + Factor Income from abroad (316.9) – Factor Income to abroad (295.5) = Gross National Product (10,104.1)=

Depreciation (1,329.3)+ Net National Product (8,774.8) =

Indirect Taxes (774.8)- Other Adjustments (-152.0) + National Income (8,122.0)

Distribution of National Income

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5. Net interest: interest paid by domestic businesses plus interest earned from foreigners.

Labor and Capital Share

- Labor share: the fraction of national income that goes to labor income
- Capital share: the fraction of national income that goes to capital income.
- Labor Share$= \frac{\text{Labor Income}}{\text{National Income}}$
- Capital Share$= \frac{\text{Capital Income}}{\text{National Income}}$
- Proprietor's Income?

Distribution of National Income

	Billion $US	% of Nat. Inc.
National Income	8,122.0	100.0%
Comp. of Employees	5,874.9	72.3%
Proprietors' Income	727.8	9.0%
Rental Income	137.9	1.7%
Corporate Profits	731.6	9.0%
Net Interest	649.8	8.0%

Other Income Concepts: Personal Income

- Income that households and noncorporate businesses receive

  Personal Income (8,685.3) =

  National Income (8,122.0)- Retained Earnings (289) - Net Interest (649.8)- Contributions for Social Insurance (726.1) + Personal Interest Income (1,091.3 + Government and Business Transfers (1,137.0)

Other Income Concepts: Disponable Personal Income

- Income that households and noncorporate businesses can spend, after having satisfied their tax obligations

	Personal Income (8,685.3)
	−Personal Tax and Nontax Payments (1,292.1)
=	Disposable Personal Income (7,393.2)

Investment and Saving

- Private Saving (S): gross income minus consumption and taxes plus transfers from the government (TR) and from abroad ($-NFP$).

- From income side $Y = C + S + T - TR + NFP$

- From expenditure side $Y = C + I + G + X - M$

$$\underbrace{I}_{\text{Private Investment}} = \underbrace{S}_{\text{Private Saving}} + \underbrace{T - TR - G}_{\text{Public Saving}} + \underbrace{M - X + NFP}_{\text{Foreign Saving}}$$

Some Nontrivial Issues

- Releases of Information and revisions.
- Methodological Changes.
- Technological Innovation.
- Underground Economy.
- Welfare.

2.2 Price Indices and Growth Rates

Question: How to compute the price level?

Idea: Measure price of a particular basket of goods today versus price of same basket in some *base* period

Example: Economy with 2 goods, hamburgers and coke

$$\begin{aligned} h_t &= \#\text{ of hamburgers produced, period } t \\ p_{ht} &= \text{price of hamburgers in period } t \\ c_t &= \#\text{ of coke produced, period } t \\ p_{ct} &= \text{price of coke in period } t \end{aligned}$$

$(h_0, p_{h0}, c_0, p_{c0})$ same variables in period 0

Laspeyres price index $$L_t = \frac{p_{ht}\, h_0 + p_{ct}\, c_0}{p_{h0}\, h_0 + p_{c0}\, c_0}$$

Paasche price index $$P_t = \frac{p_{ht}\, h_t + p_{ct}\, c_t}{p_{h0}\, h_t + p_{c0}\, c_t}$$

Problems with Price Indices

- Laspeyres index tends to overstate inflation.
- Paasche index tends to understate inflation.
- Fisher Ideal Index: geometric mean: $(L_t \times Pa_t)^{0.5}$.
- Chain Index.

From Nominal to Real GDP

- Nominal GDP: total value of goods and services produced.
- Real GDP: total production of goods and services in physical units.
- How is real GDP computed in practice, say in 2002?

  1. Pick a base period, say 1996
  2. Measure dollar amount spent on hamburgers.
  3. Divide by price of hamburgers in 2002 and multiply by price in 1996. (this equals the number of hamburgers sold in 2002, multiplied by the price of hamburgers in 1996 -the base period).
  4. Sum over all goods and services to get real GDP.

For our example ...

$$\begin{aligned} \text{Nominal GDP in 2002} &= h_{2000}\, p_{h2000} + c_{2000}\, p_{c2000} \\ \text{Real GDP in 1996} &= h_{2000}\, p_{h1996} + c_{2000}\, p_{c1996} \end{aligned}$$

Note that

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} = \frac{h_{2002}\, p_{h2002} + c_{2002}\, p_{c2000}}{h_{2002}\, p_{h1996} + c_{2002}\, p_{c1996}}$$

Measuring Inflation

- $\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$ where P_t is the "Price Level".

- GDP deflator: basket related to current composition of GDP.

- Consumer Price Index (CPI): basket related to consumers

$$\text{CPI} = \frac{h_{1992}p_{h1999} + c_{1992}p_{c1999}}{h_{1992}p_{h1992} + c_{1992}p_{c1992}}$$

- CPI important because of automatic income adjustments (Social Security)

- CPI may overstate inflation (Boskin Commission)

An Interesting Example

- How expensive is to treat a Heart attack? (Cutler *et al.* (1998)).

  1. mid-1980's: \$12,000.
  2. late-1990's: \$20,000.

- Would you say there was a 66% (=20,000/12,000-1) raise in price?

- Let's take a look at life expectancy after treatment (and controlling for other varibles):

  1. mid-1980's: 5 years after heart attack.
  2. late-1990's: 6 years after heart attack.

- Who much is one year of life worth to you?

More on Growth Rates

- Growth rate of Y (GDP) from $t-1$ to t is $g_Y(t-1,t) = \frac{Y_t - Y_{t-1}}{Y_{t-1}}$

- Five year growth rate (between $t-5$ and t) is $g_Y(t-5,t) = \frac{Y_t - Y_{t-5}}{Y_{t-5}}$

- Suppose GDP$= Y_{t-1}$ in $t-1$ and it grows at rate $g_Y(t-1,t)$. How big is GDP in period t?

$$\begin{aligned}
\frac{Y_t - Y_{t-1}}{Y_{t-1}} &= g_Y(t-1,t) \\
Y_t - Y_{t-1} &= g_Y(t-1,t) * Y_{t-1} \\
Y_t &= g_Y(t-1,t) * Y_{t-1} + Y_{t-1} \\
Y_t &= [1 + g_Y(t-1,t)]\, Y_{t-1}
\end{aligned}$$

$$Y_{1999} = \$1000,\ g_Y = 4.\%, \rightarrow Y_{2000} = 1.04 * \$1000 = \$1040$$

- Suppose GDP grows at g and at $t = 0$, GDP$= Y_0$, then $Y_t = (1+g)^t\ Y_0$

• Reverse question: Suppose we know GDP at 0 and at t. Want to know at what constant rate GDP must have grown

$$\begin{aligned} Y_t &= (1+g)^t Y_0 \\ (1+g)^t &= \frac{Y_t}{Y_0} \\ (1+g) &= \left(\frac{Y_t}{Y_0}\right)^{\frac{1}{t}} \\ g &= \left(\frac{Y_t}{Y_0}\right)^{\frac{1}{t}} - 1 \end{aligned}$$

• Eg. $Y_{1900} = \$1,000$, $Y_{2000} = \$15,000$. The constant rate is

$$g = \left(\frac{\$15,000}{\$1,000}\right)^{\frac{1}{100}} - 1 = 0.027 = 2.7\%$$

- How long des it take to double? Since $\log\left(a^b\right) = b * \log(a)$

$$\begin{aligned}
\log\left[(1+g)^t\right] &= \log\left(\frac{Y_t}{Y_0}\right) \\
t * \log(1+g) &= \log\left(\frac{Y_t}{Y_0}\right) \\
t &= \frac{\log\left(\frac{Y_t}{Y_0}\right)}{\log(1+g)} = \frac{\log(2)}{\log(1+g)}
\end{aligned}$$

with $g = 1\%$ it takes 70 years and with $g = 2\%$, 35.

2.3 Transactions with the Rest of the World

Trade Balance=Exports-Imports

Current Acco. Balance=Trade Balance+Net Unilateral Transfers

- Unilateral transfers: include aid to poor countries, interest payments to foreigners for US government debt, and grants to foreign researchers or institutions.
- Net wealth position of the US: difference between what the US is owed and what it owes to foreign countries.
- Capital account balance: equals to the change of the net wealth position of the US

2.4 Unemployment Rate

- Labor force: number of people, 16 or older, that are either employed or unemployed but actively looking for a job.

- Unemployment Rate$= \frac{\text{number of unemployed people}}{\text{labor force}}$

- Unemployment Rate is countercyclical

- What is the current unemployment rate now?

2.5 Interest Rates (The relative price of waiting)

- A loan in t of $\$B_t$ that specifies that in period $t+1$ $\$B_{t+1}$ has to be repayed. The nominal interest rate on the loan $i_t = \frac{B_{t+1}-B_t}{B_t}$

  Relative price of money between today and tomorrow

- Real interest rate $r_t = i_t - \pi_t$

  Relative price of goods between today and tomorrow