Introductory Macroeconomics

Lecture 2: fundamental macro concepts, part one

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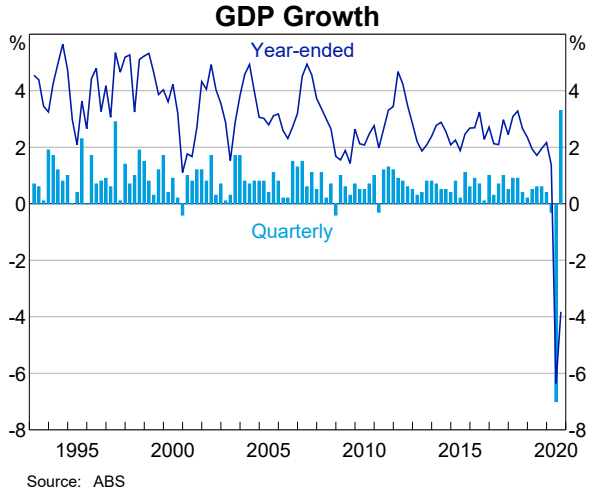
Australian GDP Growth



This Lecture: All About GDP

1- Measuring GDP, circular flow of income

2- National income accounting

3- Nominal vs. real GDP

4- GDP levels vs. GDP growth

Reading: BOFAH chapters 1 and 2

Aggregate Economic Activity

- Want a summary measure of *aggregate economic activity*
- Most common measure is *gross domestic product* (GDP)
  - **G:** *gross* i.e., does not subtract depreciation
  - **D:** *domestic* i.e., activity in an economy regardless of ownership
  - **P:** *product* refers to one way to measure GDP, as value of production of final goods and services

If we subtract depreciation ⇒ net domestic product

Market Value

- Uses *market prices* to add up over many goods and services
- Because of this, *non-market* economic activity not in GDP
  - home production: childcare, cleaning, cooking
  - blackmarket economy
- Government production often has no market price, valued at cost
  - defense, public education, public health

eg. building cost
cost to hire teachers

Final Goods and Services

- GDP is the sum of *final* goods and services
- Avoids double-counting of *intermediate* goods used in production

  wheat (farmer) → flour (miller) → bread (baker)

- Measures economic activity per period (e.g., per year, per quarter)
  - does not count purchases of goods produced in previous periods (e.g., second-hand cars, second-hand houses)
  - does not count purchases of things that are not good or services (doesn't count purchases of financial assets, e.g., stocks and bonds)

$ of bread reflect the value of intermediate good

final sale price reflect the economic value of all the intermediate step

National Income Accounts

- In fact, three ways to measure GDP per period

  1- market value of production of all final goods and services (*production approach*)

  2- sum of all domestic expenditures (*expenditure approach*)

  3- sum of all domestic income (*income approach*)

- By accounting construction, all three approaches give the same answer (up to a statistical discrepancy)

- Details recorded in each country's *national income accounts*

National Income Accounts

- Main idea
  - output *produced* sold at market prices so must equal *expenditure*
  - *expenditure* on output becomes *income* to producers (either capital income or labour income)

profit wage

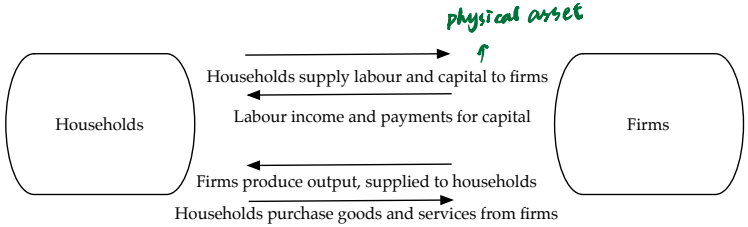
- What about goods produced but not sold?

unsold good

  - treated as *inventory accumulation*, a form of expenditure

the firm sell good to itself

Circular Flow of Income



- Households own *factors* of production, e.g., labour and capital.
  They receive *income* from supplying labour and capital to firms.

- Firms use factors of production to *produce* goods and services.
  They receive *revenue* from selling goods and services to households.

Aggregate Income

- Traditional to use the symbol Y to represent *aggregate income*
- Income approach to GDP

  $Y = wL + rK$

  where wL denotes labour income and rK denotes capital income

  wage x hour x number.
- Every final good purchase transfers money from household to firm
- Firm revenues paid to factors of production (labour and capital)

Example: Production and Income

Steel Company (Firm #1)		Car Company (Firm #2)	
Revenue	\$100	Revenue	\$210
Inputs		Inputs	
labour	\$80	labour	\$70
capital	\$20	capital	\$40
		steel	\$100

addition value generated 110

What is GDP in this example?

① product approach: revenue of final goods and service \$210

② income: input of product: labour + capital = 210
80+70 40+20

③ value-add: value of steel 100 value added \$210 − 100 = 110 → total value 210

Example: Production and Income

- Value of production of all *final* goods and services
  - steel is used to produce cars
  - steel is intermediate good
  - here, value final goods (just cars) is \$210
- Also sum of all *value-added*
  - value of steel production \$100
  - value-added of cars \$210 − 100 = \$110
  - total value-added \$100 (steel) + \$110 (cars) = \$210
- And also sum of all income
  - labour \$80 (steel) + \$70 (cars) = \$150
  - capital \$20 (steel) + \$40 (cars) = \$60
  - total income \$150 (labour) + \$60 (capital) = \$210

Aggregate Expenditure

- Expenditure approach to GDP written

$$Y = C + I + G + (X - M)$$

where

$$\begin{aligned} Y &= \text{aggregate income } (= \text{GDP}) \\ C &= \text{private consumption} \\ I &= \text{private investment} \\ G &= \text{government purchases} \\ X - M &= \text{net exports} = \text{exports} - \text{imports} \end{aligned}$$

- Consumption of new durable (eg. car.) and nondurable (eg. food) goods and services
- Investment includes structures, equipment, R&D, software
- Government purchases of goods and services, not transfers (from one part of economy to another) eg. job-keeper

National Income Accounting Identity

- National income accounting says

$$Y = C + I + G + X - M$$

- Important to note what this does and does not say
- An *accounting identity.* It is always true because of how its components are defined
- Does not mean that an increase in C *causes* GDP to increase. Does not mean that an increase in M *causes* GDP to decrease.
- We '$-M$' to avoid double-counting imported goods and services.

no causal relationship from one part of identity to another

National Income Accounting Identity

- Given this, a better way to write the same accounting identity

$$\underbrace{Y + M}_{\text{sources}} = \underbrace{C + I + G + X}_{\text{uses}}$$

with *sources* and *uses* of goods and services

$$\text{sources} = \text{domestic production} + \text{imports}$$
$$\text{uses} = \text{domestic purchases} + \text{exports}$$

GDP Caveats

- GDP is a measure of average income at *market prices*
  - it leaves out non-market activity
  - we may want to value things at other than market prices

- GDP does not account for resources used up, e.g., *natural resources*
- GDP per person tells us nothing about the *income distribution*
  - two countries may have very similar GDP per person but very different amounts of inequality
- Put simply, GDP is *not* a measure of national well-being
- No need to treat it like it's the only thing worth caring about

Comparisons Over Time and Across Countries

- So far, have looked at GDP for one time period and one country
- For this can express GDP in dollars (or some other currency)
- This is known as *nominal GDP*
- But to make comparisons over time, need to adjust for the changing purchasing power of currency units
- And to make comparisons across countries, need to adjust for changing value of domestic currency relative to foreign currency

Nominal GDP vs. Real GDP

- **Goal:** separate nominal GDP into *quantity index* and *price index*

$$\text{nominal GDP} = \underbrace{(\text{real GDP})}_{\textit{quantity index}} \times \underbrace{(\text{GDP deflator})}_{\textit{price index}}$$

- We refer to the quantity index as *real GDP*
- We refer to the price index as the *GDP deflator*
- Indexes summarise complex distributions of quantities and prices
- Real GDP then gives measure of aggregate quantity controlling for changing purchasing power of currency

Constructing Real GDP

- **Traditional Approach**
- Use *base year* prices to calculate value of output in given year
- Pros: simple, captures changes in economic activity over time
- Cons: base year prices may not reflect changing economy
  - innovation: new types of goods
  - innovation: new qualities or varieties of exisiting goods ⇒ eg innovation of computer
  - changing tastes, demographics

50 year ago, computer is expensive

Constructing Real GDP

- There are goods $i = \{1, 2, 3, \ldots, I\}$
- We wish to measure GDP over time periods $t = \{0, 1, 2, \ldots, T\}$
- Prices p_{it} and quantities q_{it} for each i and t
- Value of GDP in *base year* $t = 0$

$$\text{GDP}_0 = \sum_{i=1}^{I} p_{i0} q_{i0} = p_{10} q_{10} + p_{20} q_{20} + \cdots p_{I0} q_{I0}$$

- Uses period $t = 0$ prices to value $t = 0$ output

Constructing Real GDP

- Real GDP in period t using base year $t = 0$

$$\text{Real GDP}_t = \frac{\sum_i p_{i0} q_{it}}{\sum_i p_{i0} q_{i0}}$$

⇒ index

in the initial year real GDP = nominal GDP

- Another way of writing the above, say at $t = 4$

$$\text{Real GDP}_4 = \frac{\sum_i p_{i0} q_{i4}}{\sum_i p_{i0} q_{i3}} \times \frac{\sum_i p_{i0} q_{i3}}{\sum_i p_{i0} q_{i2}} \times \frac{\sum_i p_{i0} q_{i2}}{\sum_i p_{i0} q_{i1}} \times \frac{\sum_i p_{i0} q_{i1}}{\sum_i p_{i0} q_{i0}}$$

decompose

overall change of index reflect change from year 0...t

Constructing Real GDP

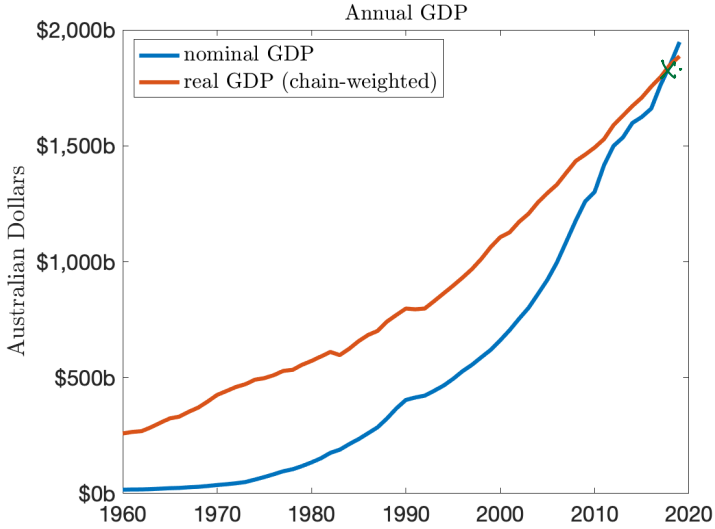
- **Modern Approach**
- Use *chain-weighting* to prevent prices being too outdated

$$\text{Real GDP}_t = \frac{\sum_i p_{it-1} q_{it}}{\sum_i p_{it-1} q_{it-1}} \times \cdots \times \frac{\sum_i p_{i1} q_{i2}}{\sum_i p_{i1} q_{i1}} \times \frac{\sum_i p_{i0} q_{i1}}{\sum_i p_{i0} q_{i0}}$$

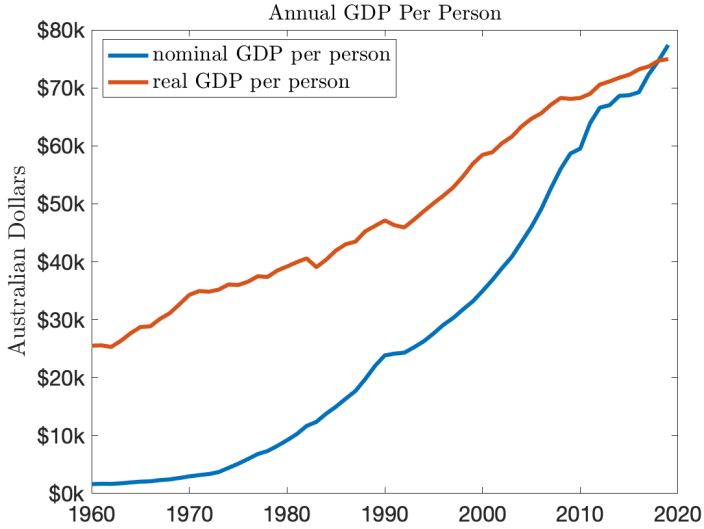
- So for example at $t = 4$

$$\text{Real GDP}_4 = \frac{\sum_i p_{i3} q_{i4}}{\sum_i p_{i3} q_{i3}} \times \frac{\sum_i p_{i2} q_{i3}}{\sum_i p_{i2} q_{i2}} \times \frac{\sum_i p_{i1} q_{i2}}{\sum_i p_{i1} q_{i1}} \times \frac{\sum_i p_{i0} q_{i1}}{\sum_i p_{i0} q_{i0}}$$

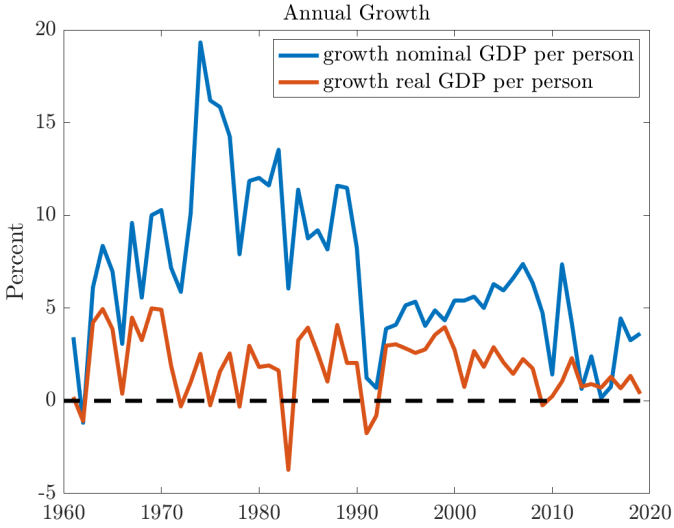
Australian GDP: Nominal vs. Real



Australian GDP Per Person



Australian GDP Growth



Next Lecture

- More fundamental macro concepts
- Inflation and interest rates
  - measurement and costs of inflation
  - nominal vs. real interest rates
- BOFAH chapter 3