Introductory Macroeconomics

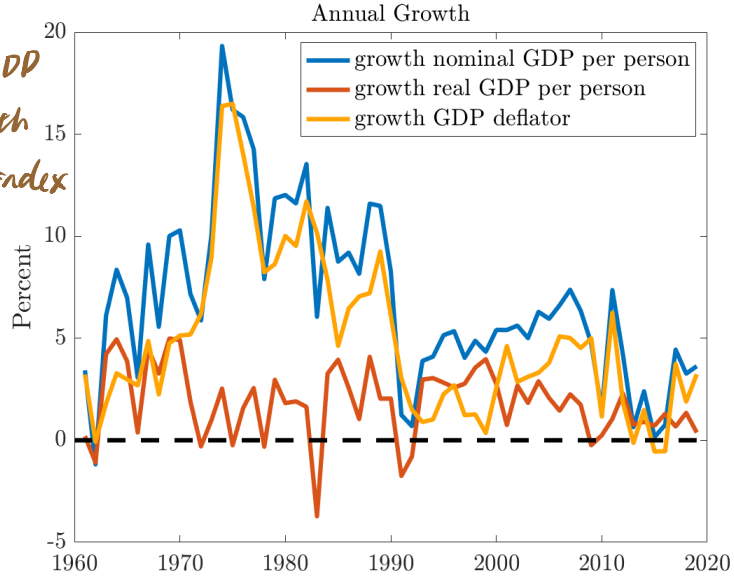
Lecture 3: fundamental macro concepts, part two

Bruce Preston & Daeha Cho

1st Semester 2021

Australian Inflation

discrepancy between nominal GDP growth and real GDP growth reflected changes in price index



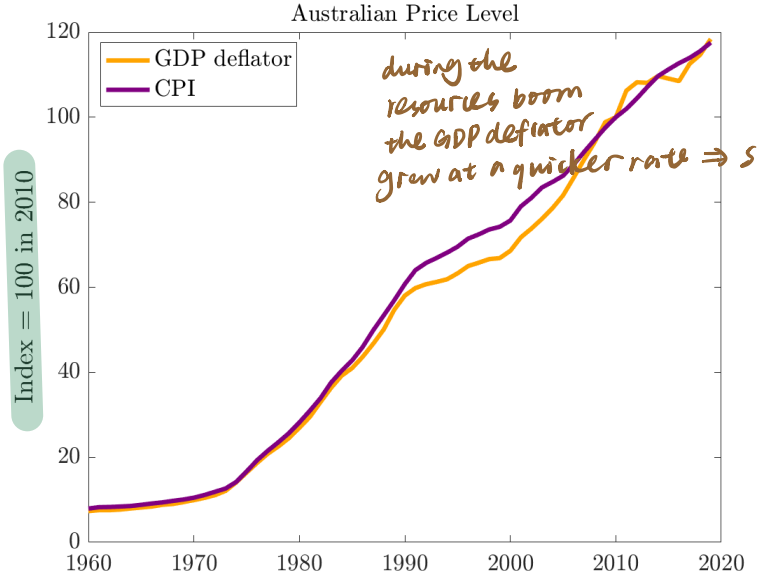
This Lecture

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

Alternative Price Index Measures

- *GDP deflator* is an index of prices of *all* goods and services in GDP
- But many of these prices not directly experienced by most people
- For some purposes, *consumer price index* (CPI) is more relevant
- We will use the symbol P_t for both and refer to it as the *price level*. The precise meaning will be clear in context
- They have quite similar trends

Similar Trends in Price Index Measures



Consumer Price Index (CPI)

- Measures the cost of purchasing a given basket of goods and services relative to a base year
- In Australia, calculated on a quarterly basis
  - data on prices collected each quarter
  - data on household expenditure collected each quarter
- Basket of goods gradually updated over time

Measuring the CPI

- Basket with I goods $i \in \{1, 2, 3, \ldots, I\}$
- Prices p_{it} and quantities q_{it} for each period $t \in \{0, 1, 2, \ldots, T\}$
- Prices in currency per unit of good, e.g., dollars per kg
- Let P_0 denote expenditure on basket in base period

$$P_0 = \sum_i p_{i0} q_{i0}$$

- Let P_t denote expenditure in period t required to consume *base period* quantities q_{i0}, that is

$$P_t = \sum_i p_{it} q_{i0}$$

Measuring the CPI

- This measure of the price level is in currency units, e.g., dollars

$$P_t = \sum_i p_{it} q_{i0}$$

- To create an index, we scale by base period P_0, such as

$$\text{Index}_t = \frac{P_t}{P_0}$$

- With this scaling, index in base period is 1

- Often scaled so index in base period is 100 [see slide 7 above]

Inflation and Deflation

- *Inflation* refers to the price index rising over time $\Rightarrow$

price index ↑ ⇓ the price to purchase the goods is expensive ⇓ purchasing power of currency is falling ⇓ cause more $ to buy the same amount of goods

That is, when purchasing power of currency is falling, i.e., it costs more dollars to buy the same fixed basket of goods and services

- *Deflation* refers to the price index falling over time

purchasing power of currency is rising

Inflation Rate

- Let P_t denote the *price index* (either CPI or GDP deflator)

- Let π_t denote the *inflation rate*

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}} \quad \Leftrightarrow \quad 1 + \pi_t = \frac{P_t}{P_{t-1}}$$

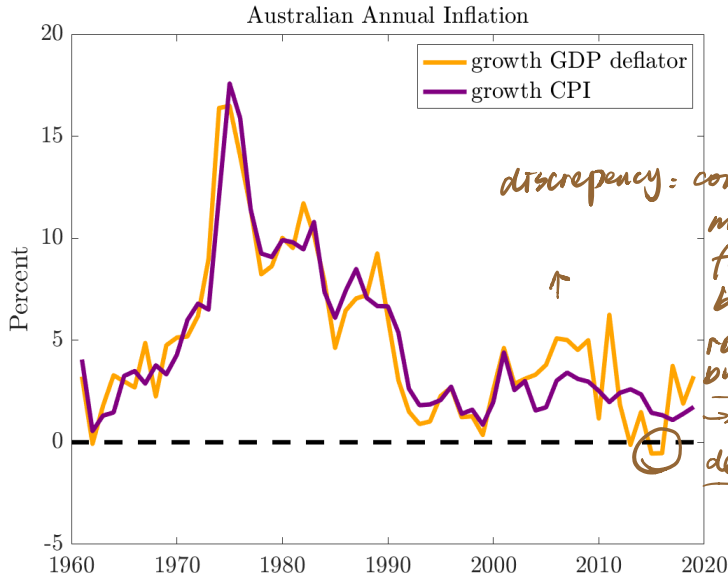
"growth rate."

- **Caution**: It is traditional in economics to use π to denote the inflation rate. This is not 3.1416...

- Inflation is $\pi_t > 0$, price level rising. Deflation is $\pi_t < 0$.

- Often multiplied by 100 to express in percent.

Inflation Measures



discrepancy: consequence of resource booms
massive increasing in demand
for Australian resources
by China & India or ...
raise the price of goods
but are less important for the households
→ no deflation in CPI
deflation in GDP.

Typical consumption basket.

The goods whose price were sensitive to resource demand doesn't appear in the basket of households

Quarterly vs. Annual Rates

- This π_t gives us a measure of inflation from one period to the next

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$$

- If periods t are in quarters then it is the *quarterly inflation rate*
- If periods t are in years then it is the *annual inflation rate*
- If periods t are in quarters then measure annual inflation by

$$\frac{P_t - P_{t-4}}{P_{t-4}}$$

→ one year ago

- Quarterly inflation focuses on recent information. Annual inflation is a smoother (less volatile) moving average of quarterly inflation.

Measurement Issues

- As with GDP, inflation measurement faces various issues

- *Substitution bias* — consumers may substitute away from goods that are becoming relatively more expensive, if so this causes fixed-basket CPI to overstate the consequences of inflation ⇒ consume less good reduce the $ amount to spend

- *Quality bias* — even if notional prices of goods unchanged, rising quality may mean consumers are getting more for their expenditure, again fixed-basket CPI may be misleading eg. iphone improve quality

Costs of Inflation

- Costs include
  - noise in the price system, less informative about underlying demand/supply fundamentals
  - *bracket creep*, tax system is nominal
  - redistributes wealth, assets/liabilities often nominal
  - *menu costs*, costs incurred in changing prices and planning
  - *shoe leather costs*, need to manage stocks of money, especially when no electronic payment systems
- Likely to be small for low and stable (predictable) inflation
- Can be substantial for high and volatile (unpredictable) inflation

difficult to work out the difference between changes in price level versus changes in relative price

→ pay more taxes even though the purchasing power of wages doesn't change

RBA Inflation Target

- The Reserve Bank of Australia (RBA) conducts monetary policy
- One of its goals is *price stability*, i.e., low and stable inflation
- Since 1996 this has been formalised as an *inflation target*.
  RBA targets an inflation rate of:

  ‘ 2 to 3% on average over time ’

- RBA conducts monetary policy through changes in *interest rates*

Interest Rates

- Interest rates are a way of expressing a financial return
- Suppose invest \$10,000 principal today and receive \$500 interest payment in a year. The annual interest rate is $i = 0.05$ or 5%.
- This i is a *nominal interest rate*, payment is in currency (dollars)
- But if the price level is rising over time, i.e., if there is inflation, then \$1 in a year is worth less than \$1 today
- Want a measure of the *real interest rate* that accounts for inflation.

Calculating the Real Interest Rate

- Let P_t denote period t price level in dollars
- Sacrificing 1 unit of goods gives P_0 dollars to invest in period $t = 0$
- Gives $(1 + i)P_0$ dollars principal and interest in period $t = 1$
- Each dollar in period $t = 1$ gives $1/P_1$ units of goods
- Each unit of goods sacrificed gives me a *real interest rate*

$$(1 + r) = (1 + i)\frac{P_0}{P_1}$$

Calculating the Real Interest Rate

- Recall that inflation rate is

$$1 + \pi = \frac{P_1}{P_0}$$

- So real interest rate is

$$(1 + r) = \frac{1 + i}{1 + \pi}$$

- When i and π are small, a good *approximation* to this is

$$r \approx i - \pi$$

use log $\quad \log(1+r) = \log(1+i) - \log(1+\pi)$. $\quad \Rightarrow$ when x is small $x \approx \log(1+x)$

$r \approx i - \pi$

- **Example:** if $i = 0.05$ and $\pi = 0.03$ then exact $r = (1.05)/(1.03) - 1 = 0.0194$ and approximation is $r \approx 0.02$.

Expected vs. Realised Real Rates

- This definition of the real rate involves the change in the price level from period t to $t+1$

$$1 + r_t = (1 + i_t)\frac{P_t}{P_{t+1}} \quad \Leftrightarrow \quad r_t \approx i_t - \pi_{t+1}$$

$1 + \pi_{t+1} = \frac{P_{t+1}}{P_t}$

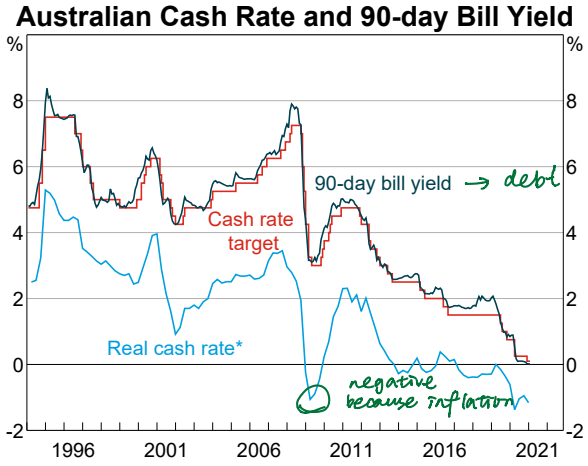
- But we don't usually *know* the price level P_{t+1} in the future
- Should better be thought of as the *expected* real rate
- The *realised* real rate is often measured as

$i_t - \pi_t$ → current inflation

using the change in the price level from period $t-1$ to t

- Expected and realised real rates close when inflation is stable, i.e., $\pi_t \approx \pi_{t+1}$. Part of the reason for the RBA's inflation target.

Nominal and Real Rates



(government borrow fund).

effective zero lower bound

Other Interest Rates

Next Lecture

- More fundamental macro concepts
- Employment and unemployment
  - labour market status
  - labour market transitions
  - hours and wages
- BOFAH chapter 5