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Measuring the cost of living

(Chapter 24 in Mankiw & Taylor)

In the preceding lecture we looked at how economists use GDP to measure the quantity of goods and services produced by an economy

Today we will consider how economists measure the overall cost of living. Later we will consider what determines inflation

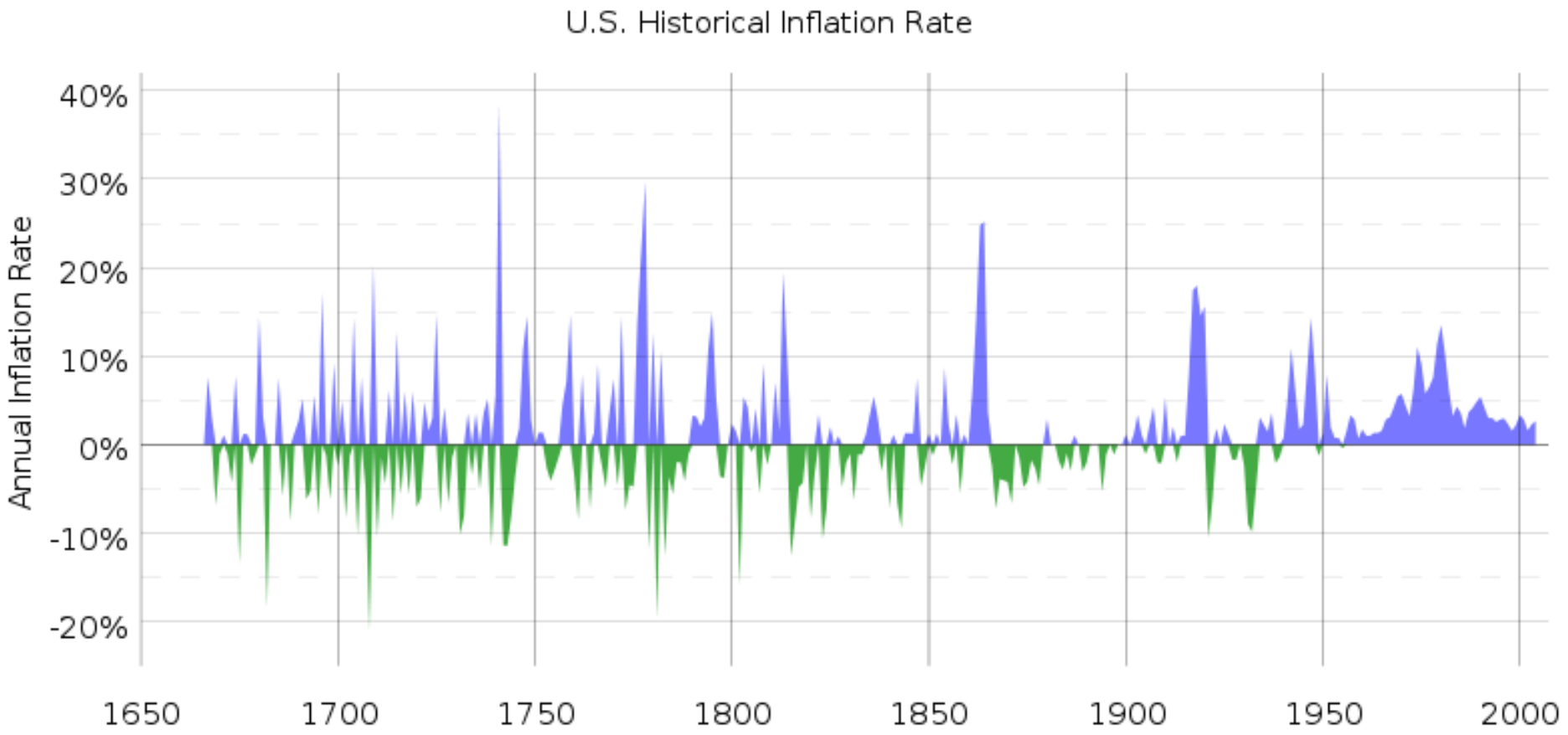
The Consumer Price Index

- Consumer price index (CPI) – or HICP
  - Measure of the overall level of prices
  - Measure of the overall cost of goods and services
    - Bought by a typical consumer
  - Computed by statistical offices.
    - ONS (UK), Eurostat (EU) and BLS (US)…

Inflation rate

- Change in price level
- Inflation rate = $100 * [p_t - p_{(t-1)}]/p_{(t-1)}$
  - or logarithmic approximation of growth rates
    - $100 * [\ln(p_t) - \ln(p_{(t-1)})] = \Delta \ln(p_t)$
    - valid for small changes
- CPI inflation target of 2% @ Bank of England
  - Preferred inflation rate has changed over time, given they measure different things

US Inflation rate



International Inflation Rates, vary

- Japan 0.4% (2011)
- Switzerland 0.4%
- France 2%
- EU 2.9%
- UK 4.5%
- Turkey 7.8%
- Russia 8.9%
- Vietnam 19%
- Belarus 41%

Calculating the CPI

1. Fix the basket
   - Which prices are most important to the *typical* consumer? To find out, the ONS surveys what the typical consumer buys
     - If people buy more apples than pears, then the price of apples should receive a higher weight in the index
2. Find the prices
   - At each point in time
3. Compute the basket's cost (price x quantity)
   - Same basket of goods
   - Isolate the effects of price changes

Calculating CPI

4. Chose a base year and compute the CPI

- Base year = benchmark
  - Price of basket of goods & services in current year
  - Divided by price of basket in base year
  - Times 100

5. Compute the inflation rate

$$\text{Inflation rate in year 2} = \frac{\text{CPI in year 2-CPI in year 1}}{\text{CPI in year 1}} \times 100$$

Table 1

Calculating the Consumer Price Index and the Inflation Rate: An Example

Step 1: Survey Consumers to Determine a Fixed Basket of Goods

Basket = 4 hot dogs, 2 hamburgers

Step 2: Find the Price of Each Good in Each Year

Year	Price of Hot Dogs	Price of Hamburgers
2010	$1	$2
2011	2	3
2012	3	4

Step 3: Compute the Cost of the Basket of Goods in Each Year

2010	($1 per hot dog × 4 hot dogs) + ($2 per hamburger × 2 hamburgers) = $8 per basket
2011	($2 per hot dog × 4 hot dogs) + ($3 per hamburger × 2 hamburgers) = $14 per basket
2012	($3 per hot dog × 4 hot dogs) + ($4 per hamburger × 2 hamburgers) = $20 per basket

This table shows how to calculate the consumer price index and the inflation rate for a hypothetical economy in which consumers buy only hot dogs and hamburgers.

Table 1

Calculating the Consumer Price Index and the Inflation Rate: An Example

Step 4: Choose One Year as a Base Year (2010) and Compute the Consumer Price Index in Each Year	
2010	($8 / $8) × 100 = 100
2011	($14 / $8) × 100 = 175
2012	($20 / $8) × 100 = 250

Step 5: Use the Consumer Price Index to Compute the Inflation Rate from Previous Year	
2011	(175 – 100) / 100 × 100 = 75%
2012	(250 – 175) / 175 × 100 = 43%

This table shows how to calculate the consumer price index and the inflation rate for a hypothetical economy in which consumers buy only hot dogs and hamburgers.

The Consumer Price Index

- Inflation rate
  - Percentage change in the price index
    - From the preceding period
- Producer price index, PPI
  - Measure of the cost of a basket of goods and services bought by firms
  - Changes in PPI are often thought to be useful in predicting changes in CPI
    - As firms pass on their costs, eventually, to consumers in the form of higher prices

The CPI aggregate

- Looks at more than hot dogs and hamburgers!
- Given that the representative consumer, at least, buys other goods and services
  - But disaggregated CPI series are published too (e.g. CPI minus food expenditure)– and can be useful too
  - They recover “trend” inflation by stripping out of the index volatile components

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The Typical Basket of Goods and Services in the UK

Table 2: Allocation of items to CPI divisions in 2011

		CPI weight (per cent)	Observed variation in price changes[1]	Representative items[2] (per cent of total)
1	Food & non-alcoholic beverages	11.8	High	23
2	Alcohol & tobacco	4.2	Low	3
3	Clothing & footwear	6.2	High	11
4	Housing & household services	12.9	High	5
5	Furniture & household goods	6.1	Medium	11
6	Health	2.4	Low	3
7	Transport	15.9	High	6
8	Communication	2.6	High	1
9	Recreation & culture	14.7	High	17
10	Education	1.8	High	1
11	Restaurants & hotels	12.0	Low	8
12	Miscellaneous goods & services	9.4	High	11

[1] Based on an analysis of variation in price changes between the individual items chosen to represent each division in the period 2004-2008.

[2] These figures should be treated as providing only a broad indication of the allocation of items to the 12 CPI divisions. For example, the sample of prices underpinning an existing item might easily be stratified in some way to form two or more distinct items; conversely, items could be merged to form a single item representing a wider, more heterogeneous, spending category. A specific example of this is the item "University tuition fees". This is classified as one item but the index takes into account prices for several hundred courses, including undergraduate, postgraduate, part-time etc.

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ONS surveys over 120,000 prices each month to see if they are changing, from randomly selected outlets (incl. the internet) – picks up regional variations in price (why do these persist?)

and the weight of a given price in the basket reflects its share of the *representative* consumer's shopping basket (based on surveys of households)

Question

- Q. What has a greater effect on the CPI: a 10% increase in the price of chicken or a 10% increase in the price of caviar?

- A. 10% increase in the price of chicken has a greater effect on the consumer price index than a 10% increase in the price of caviar - because chicken is a bigger part of the average consumer's market basket

The Consumer Price Index

- Problems in measuring the cost of living

1. Substitution bias
   - Prices do not change proportionately
     - some prices rise by more than others; and some fall
   - and consumers then substitute toward goods that have become relatively less expensive
     - but the index assumes a fixed basket of goods and so overstates inflation
     - Think of apples and pears, again
     - In base year ONS has a higher weight on apples as more apples bought. Suppose the price of pears then ↓. People then buy more pears and fewer apples. But when computing inflation ONS assumes a fixed basket still with more applies – so overstates inflation

Problems with the CPI (cont.)

2. Introduction of new goods (eg smartphone)
   - Greater variety of goods makes a £ more valuable, so the cost of living has declined; but the basket of goods in the index is updated only at a lag
3. Unmeasured quality change
   - Need to adjust prices to reflect quality changes
     - when a good becomes *better* its price has effectively fallen as your £ goes further
   - ONS tries to keep up with this via hedonic pricing improvements and deteriorations in quality

Problems with the CPI (cont.)

4. My spending patterns are not typical of the average consumer

   and so *my* inflation rate may be higher or lower than the published (average) CPI rate

Students: more sensitive to prices of beer or books?

Personal Inflation Calculator:

http://news.bbc.co.uk/1/hi/business/7669072.stm

GDP deflator versus CPI

- GDP deflator (discussed in previous lecture)
  - Ratio of nominal GDP to real GDP
  - Reflects prices of all goods & services produced domestically
- CPI
  - Reflects prices of goods & services bought by consumers
- should also mention, the Retail Price Index
  - Used in UK before 2003. Differs from CPI mainly in terms of the basket of goods/services considered
    - CPI excludes council tax & mortgage interest payments

GDP deflator versus CPI

- GDP deflator
  - Compares the price of currently produced goods & services
    - To the price of the same goods and services in the base year
- CPI
  - Compares price of a fixed basket of goods and services
    - To the price of the basket in the base year
    - So unlike the deflator the basket of goods is not updated automatically over time
      - This matters when some goods are rising in price faster than others; how we weight them then matters

Explaining differences (cont.)

- The GDP deflator and CPI inflation can differ
  - GDP deflator reflects prices of all goods and services produced domestically; while the CPI reflects the prices of all (including foreign) goods and services bought by consumers
    - When oil prices rise, CPI inflation in the UK goes up by more than the GDP deflator - as oil is a larger share of consumer spending than of GDP

Another example of the difference between CPI and GDP deflator inflation

- If the price of a Navy submarine rises, there is no effect on the consumer price index, because Navy submarines are not consumer goods. But the GDP price index is affected, because Navy submarines are included in GDP as a part of government purchases

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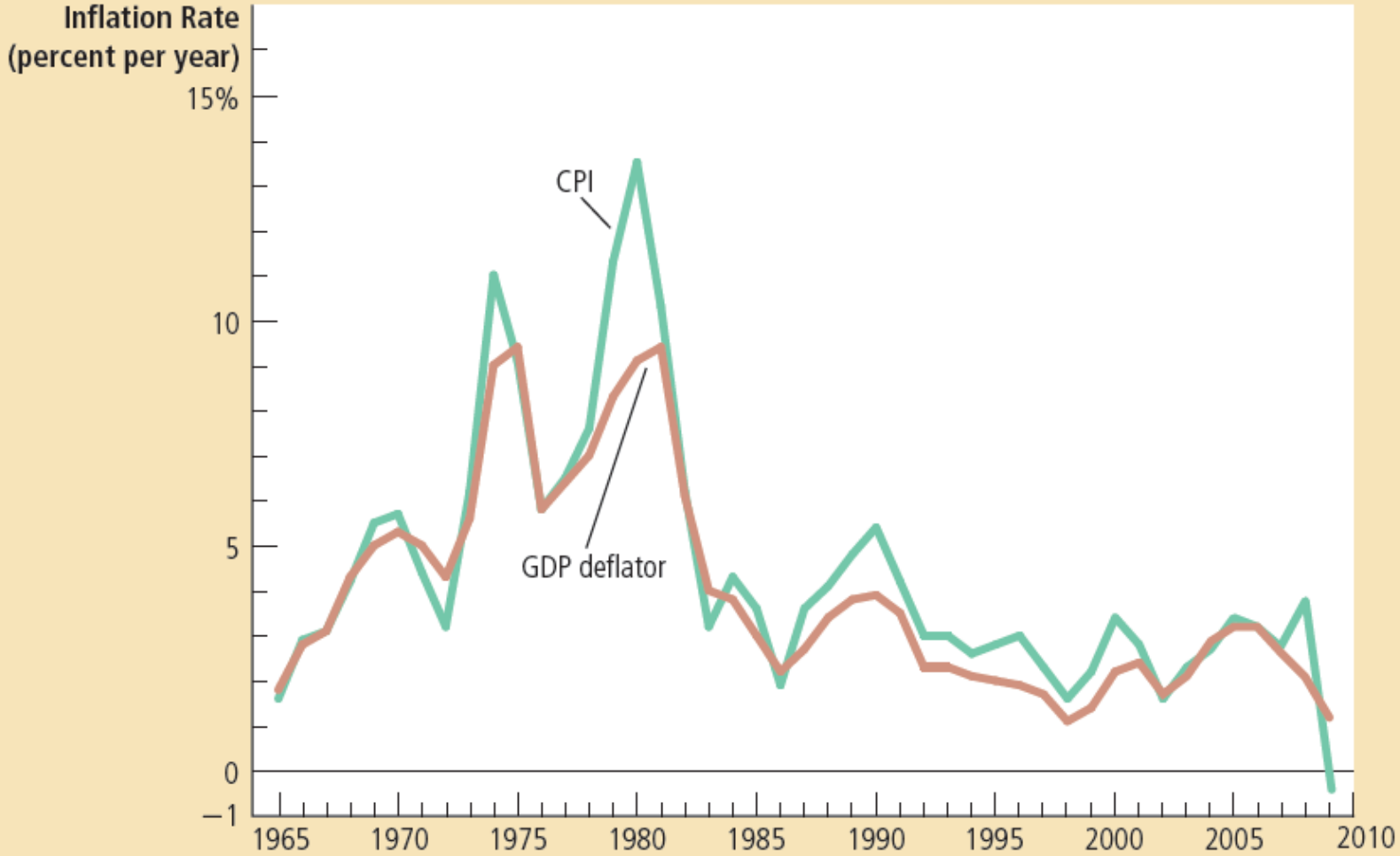
Two Measures of US Inflation



This figure shows the inflation rate—the percentage change in the level of prices— as measured by the GDP deflator and the consumer price index using annual data since 1965. Notice that the two measures of inflation generally move together.

Correcting Economic Variables for Inflation

- A £ today can be compared with a £ in year T

$$\text{Amount in today's £} =$$

$$= \text{Amount in year T £} \times \frac{\text{Price level today}}{\text{Price level in year T}}$$

  - So £1 in 1900 is worth over £100 today
- Indexation
  - Automatic correction by law/contract of a £ for the effects of rises in the cost of living
    - Pensions rise in line with CPI inflation (but not RPI as previously, which matters as currently RPI>CPI inflation. So the government saves money)

Real and Nominal Interest Rates

- Nominal interest rate
  - Interest rate as usually reported
  - Without a correction for the effects of inflation
- Real interest rate
  - Interest rate corrected for the effects of inflation

    = Nominal interest rate – Inflation rate

It's the real rate that matters when saving/investing; affects whether you really are richer tomorrow if you save/invest £1 today

Interest rates and inflation

- Inflation is variable
  - Real and nominal interest rates do not always move together
  - In periods of deflation, the real interest rate exceeds the nominal interest rate
  - The real rate is negative when inflation > the nominal interest rate
    - Will affect agents' behaviour; e.g. demand will move from savings to investment and consumption

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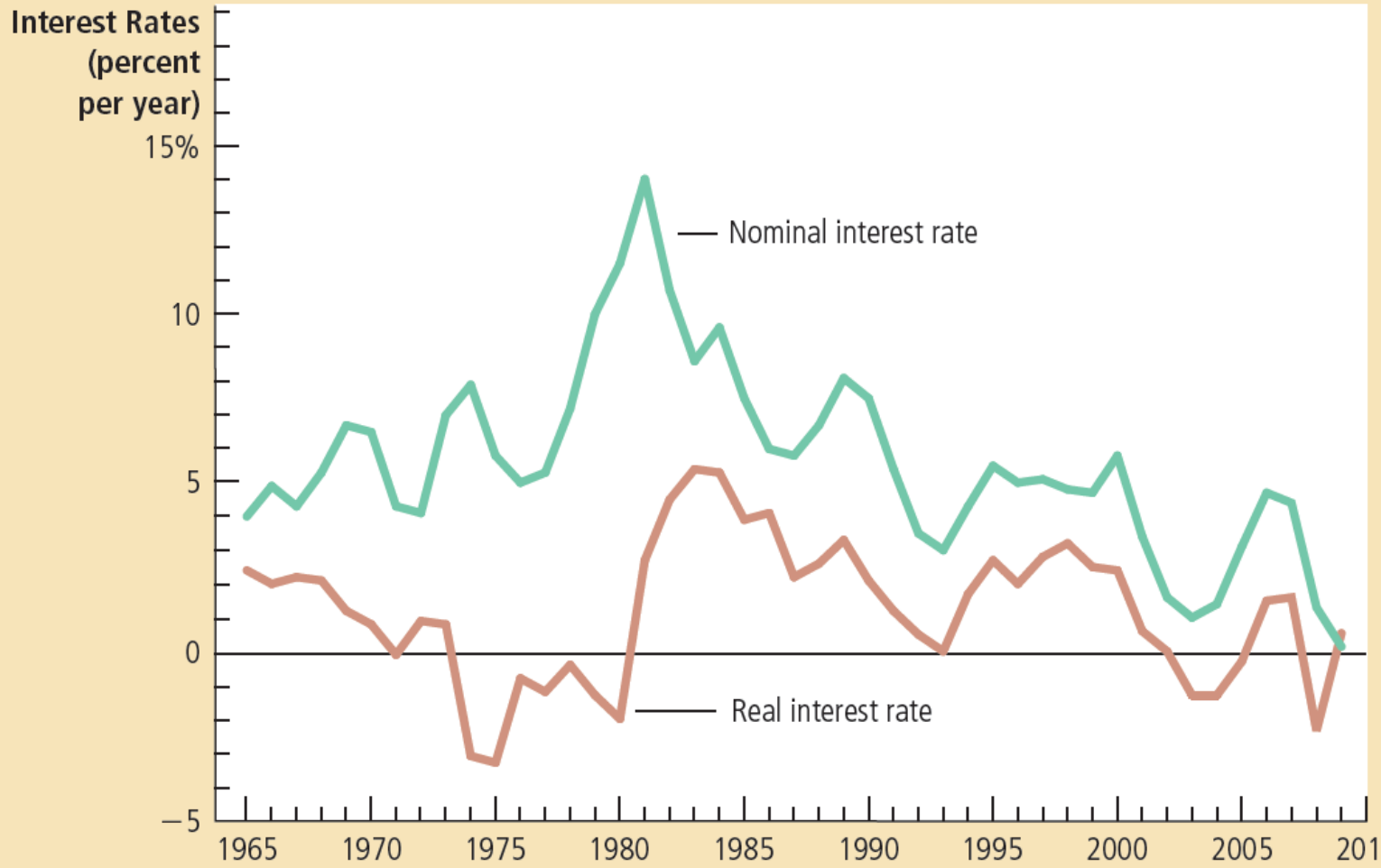
Real and Nominal Interest Rates in the US



This figure shows nominal and real interest rates using annual data since 1965. The nominal interest rate is the rate on a 3-month Treasury bill. The real interest rate is the nominal interest rate minus the inflation rate as measured by the consumer price index. Notice that nominal and real interest rates often do not move together.

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Investors pay to lend money to UK

- In Jan 2012, for only the second time ever, the UK Government sold (35 year) bonds at a negative real interest rate
  - The interest rate offered is less than the (indexed – therefore known *ex ante*, rather than forecasted) inflation rate
    - Volatility in expected inflation is normally a risk for investors
  - So investors will, for sure, lose money on the deal and they knew this when they invested
  - So why did they invest?
    - Afraid of Government default; and losing their original investment (the 'principal')

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The importance of expected inflation

When inflation is higher than was expected, the real interest rate is lower than expected

Because the real interest rate is lower than was expected, the lender loses and the borrower gains. The borrower is repaying the loan with £ that are worth less than was expected

Homeowners in the 1970s who had fixed-rate mortgages from the 1960s benefited from the unexpected inflation, while the banks that made the mortgage loans were harmed

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Fisher equation

- Nominal rate = real rate + inflation
- Determines the relationship between nominal and real inflation and inflation
- *Ex ante* form:
  - Nominal rate = real rate + expected(inflation)
- Real interest rate determines the number of units of future consumption which have to be given up to consume today; typically >1 – so determines consumption/savings trade-off

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How do agents form these inflationary expectations?

- This central to macroeconomics, as we shall see in later lectures
- Rational versus adaptive (learning) expectations
  - Affects the trade-off between inflation and real economic growth
  - And the perceived role of policymakers to influence the economy