# ECON 222A
# Macroeconomic Theory I

## THE MEASUREMENT AND STRUCTURE OF THE CANADIAN ECONOMY

## Lecture 4

# Announcements

- PS1: due January 28th
- Midterm test: March 1st 6.30-8.30pm

# Today's Lecture

- Saving and wealth
- Real GDP, Price indexes, and inflation
- Interest rates – real Vs. nominal interest rates

# In the News – FT.com

- *[…] Investors are increasingly snapping up inflation-linked government bonds amid rising expectations that interest rates will jump this year to combat rising prices.[…] In the US, inflation expectations have risen by 35bp to 2.5 per cent annually over 30 years since October […]*
- Economic agents form *expectations*…

# Saving and Wealth

- Often we want to study wealth, not just current income. Wealth comes from saving part of past income.
- Wealth: the difference between assets and liabilities (net worth).
- National wealth: sum of all households', firms', and government's wealth within the nation.
- Saving: current income minus current spending.

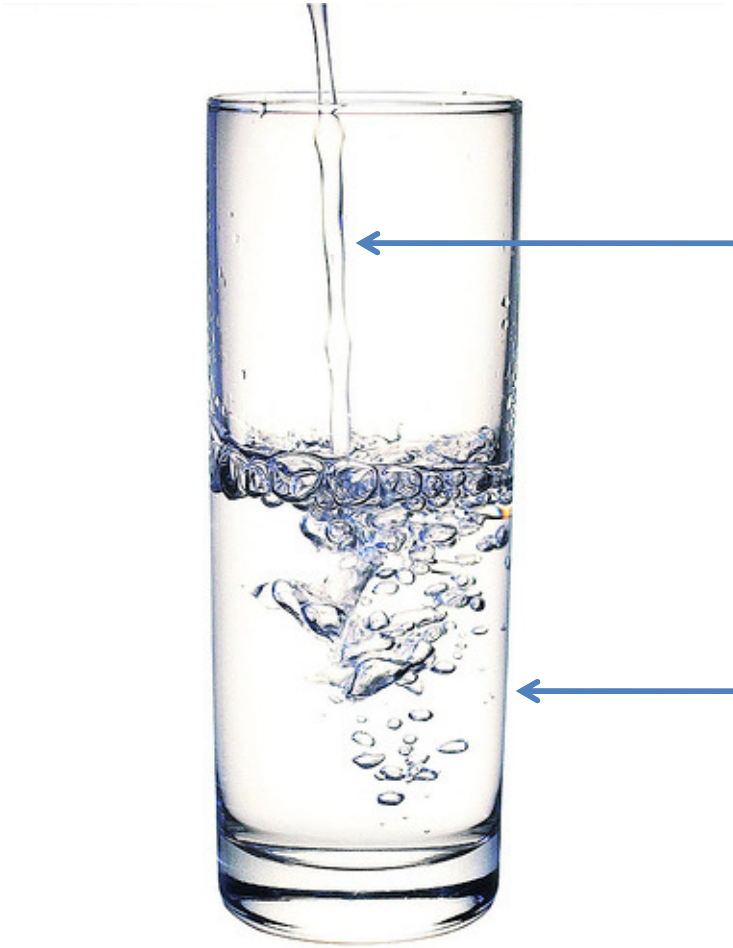
# Relating Saving and Wealth

- Saving is a flow variable – a variable that is measured per unit of time.

- Wealth is a stock variable – a variable that is measured at a point in time.

- Example: water down a river and in a lake.

# Stock and Flow



Flow of water

Stock of water

# Private Saving

- Private saving = private disposable income – consumption
- Private saving: $S_{pvt} = PDI - C$
- or $S_{pvt} = (Y + NFP - T + TR + INT) - C$
- The ratio of $S_p$ to private disposable income is called the private saving rate.

# Government Saving

- Government saving = net government income – government purchases of G&S

- $$S_{govt} = NGI - G$$
$$= (T - TR - INT) - G$$
$$= T - (TR + INT + G)$$

- This is all in terms of current income/spending

# Budget surplus/deficit

- The government budget surplus (deficit) is a positive (negative) difference between government revenue ($T$) and government expenditure ($TR+INT+G$).

- If there is a budget surplus:

$$T-(TR+INT+G)>0 \text{ and } S_{govt}>0$$

- Vice-versa, if there is a budget deficit:

$$T-(TR+INT+G)<0 \text{ and } S_{govt}<0$$

# Government Saving

- Government saving = government budget surplus = government receipts – government outlays
- Government outlays = government purchases of goods and services ($G$) + transfers ($TR$) + interest payments on government debt ($INT$)
- Government budget deficit = $-S_{govt}$

# National Savings

- Remember: Macro is about the aggregate so...
- National saving = private saving + gov. saving
- $S = S_{pvt} + S_{govt} = (PDI - C) + (NGI - G)$

$$= Y + NFP - C - G$$

$$= (Y + NFP - T + TR + INT - C) + (T - TR - INT - G)$$

# National Savings

- Remember: Macro is about the aggregate so...
- National saving = private saving + gov. saving
- $S = S_{pvt} + S_{govt} = (PDI - C) + (NGI - G)$

$$= Y + NFP - C - G$$

$$= (Y + NFP + TR + INT - C) + (-TR - INT - G)$$

# National Savings

- Remember: Macro is about the aggregate so...
- National saving = private saving + gov. saving
- $S = S_{pvt} + S_{govt} = (PDI - C) + (NGI - G)$

$$= Y + NFP - C - G$$

$$= (Y + NFP + INT - C) + (-INT - G)$$

# National Savings

- Remember: Macro is about the aggregate so...
- National saving = private saving + gov. saving
- $S = S_{pvt} + S_{govt} = (PDI - C) + (NGI - G)$

$$= Y + NFP - C - G$$

$$= (Y + NFP - C) + (\quad - G)$$

# Uses of Savings

- Where do savings go?
  - New capital investment
  - Borrow/lend with foreign countries
  - Help with government deficits
- $S$ can be re-written to capture all of these channels

# Uses of National Savings

$$\begin{aligned} S &= (C + I + G + NX) + NFP - C - G \\ &= I + (NX + NFP) \\ &= I + CA \end{aligned}$$

- $CA$ is the current account balance – payments received from abroad ($NFP$ included) for exports minus payments made to foreigners for imports. $CA = NX + NFP$.

# Uses of Private Savings

- One is missing: the government…
- Since $S = S_{pvt} + S_{govt}$ we have that:

$$S - S_{govt} = I + CA - S_{govt}$$

$$S_{pvt} = I + (-S_{govt}) + CA$$

- This is called the Uses of Savings Identity
- If the government surplus falls then one of three things happens…

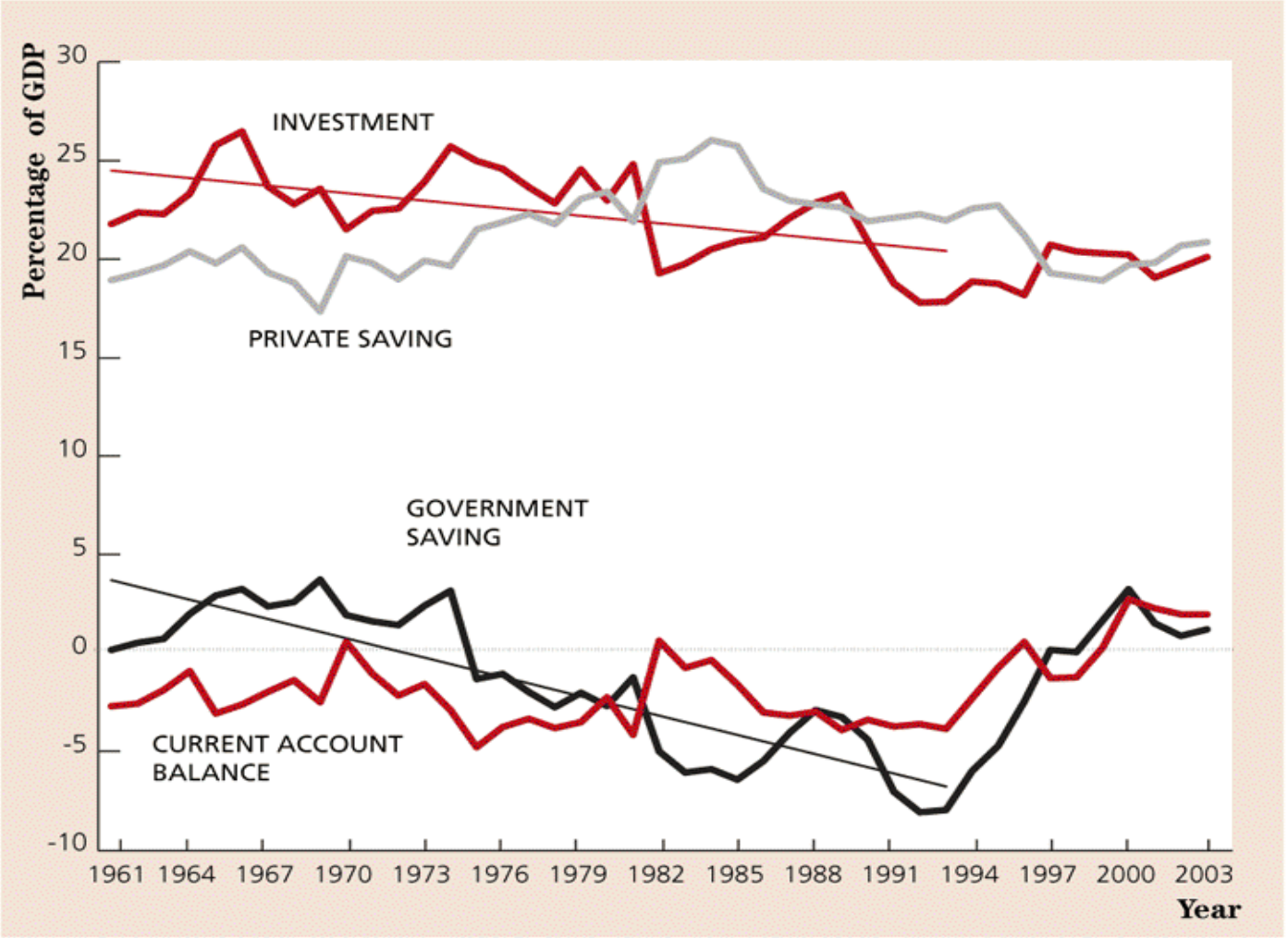
# Uses of Canadian Savings

**FIGURE 2.1**

**THE USES-OF-SAVING IDENTITY IN CANADA, 1961–2003**

The figure illustrates the uses-of-saving identity—which states that private saving equals the sum of investment, the government budget deficit, and the current account balance—for Canada over the period 1961–2003. Each variable is measured as a percentage of GDP, and government saving is the combined saving of the federal, provincial, and municipal governments.

Sources: Statistics Canada, CANSIM II series v113713, v498342, v498343, v498095, v498100, v498086, and v498315.



# Savings and Wealth

- Stocks – variables defined at a point in time
  – water in the bathtub, assets, debt, WEALTH

- Flows – variables measured per unit of time
  – running water, wage, interest, SAVINGS

# National Wealth

- Has two parts:

1. Domestic physical assets (capital goods, land)
2. Net foreign assets
   - foreign assets: foreign stock, bonds, factories owned domestically

   minus

   - foreign liabilities: domestic physical assets and financial assets owned by foreigners

# Changes in National Wealth

- Over time, we have two ways this changes:

1. Changes in value of existing assets and liabilities (change in price of financial assets, or depreciation of capital goods)
2. National savings ($S = I + CA$) raises wealth

- Canada: $CA > 0$
- U.S.: $CA < 0$

# Inflation, Price Indices, and GDP

- Changing topic: from wealth to inflation
- Look at the price level in the economy, and its rate of change over time
- Does it matter that you pay $12 for a movie, while grandparents paid $0.15?

# Nominal vs. Real

- So far we have worked with just nominal variables (in dollar terms)
- Useful because we can add up market value of various goods
- But, compare GDP in 1900 vs. 2000: Change in quantities or in prices?
- Real variables: economic value measured in terms of a base year, to adjust for price changes and reflect only changes in quantity

# Nominal Vs. Real GDP

- Nominal GDP: value of production in terms of current market prices (or GDP in current dollars)
- Real GDP: volume of production in terms of a base year's prices (or GDP in constant dollars)
- The distinction can be very important in practice. Between 1981 and 1982 nominal GDP rose by 5.2%, but real GDP fell by 3.2%.
- Statistics Canada measures real GDP using chain weighting. This uses the prices from the previous quarter in measuring real GDP. Please read Boxes 2.3 and 2.4

# Example

| | Year one | Year two | Δ% |
|---|---|---|---|
| **Product (qty)** | | | |
| Computers | 100 | 101 | 1 |
| Televisions | 200 | 201 | 0.5 |
| **Price ($)** | | | |
| Computers | 1 000 | 1 100 | 10 |
| Televisions | 500 | 400 | -25 |
| **Value** | | | |
| Computers | 100 000 | 111 100 | 11.1 |
| Televisions | 100 000 | 80 400 | -19.6 |
| **Total** | 200 000 | 191 500 | -4.3 |

# Computing real output

| | Quantities | Base price | Total ($) |
|---|---|---|---|
| **Year 1** | | (year 1) | |
| Computers | 100 | 1 000 | 100 000 |
| Televisions | 200 | 500 | 100 000 |
| **Year 2** | | (year 1) | |
| Computers | 101 | 1 000 | 101 000 |
| Televisions | 201 | 500 | 100 500 |
| **Year 1** | | (year 2) | |
| Computers | 100 | 1 100 | 110 000 |
| Televisions | 200 | 400 | 80 000 |
| **Year 2** | | (year 2) | |
| Computers | 101 | 1 100 | 111 100 |
| Televisions | 201 | 400 | 80 400 |

# Computing real output

| | Total |
|---|---|
| **Year 1 (p1)** | 200 000 |
| **Year 2 (p1)** | 201 500 |
| **Δ%** | 0.75 |
| **Year 1 (p2)** | 190 000 |
| **Year 2 (p2)** | 191 500 |
| **Δ%** | 0.78 |

# Nominal Vs. Real Interest Rates

- Start with $100 and invest it for a year at nominal interest rate $i$.
- Then in real terms (board)

  Start: $100/P_t$ End: $100(1+ i)/P_{t+1}$

- The numerator grows at rate $i$ while the denominator grows at rate $\pi_{t+1}$, so the ratio (the real value) grows by approximately $i - \pi_{t+1}$.
- This is how we adjust interest rates for inflation.

# Price Indexes

- Price Index ($P$): is a measure of the average price level for a specified set of G&S, relative to prices from a given (base) year
- Note that base year $P = 1$ or $P = 100$
- GDP deflator = nominal GDP/real GDP
- CPI: measures the prices of consumer goods, based on a representative basket
- CPI is computed as the ratio of the value of the basket at different points in time

# CPI and Inflation

- The rate of inflation $\pi$ is the percentage rate of change in the price index (usually CPI) per a period of time.

$$\pi_{t+1} = \frac{(P_{t+1} - P_t)}{P_t} = \frac{\Delta P_{t+1}}{P_t}$$

$P_t$ is the price level in period $t$

$P_{t+1}$ is the price level in period $t+1$

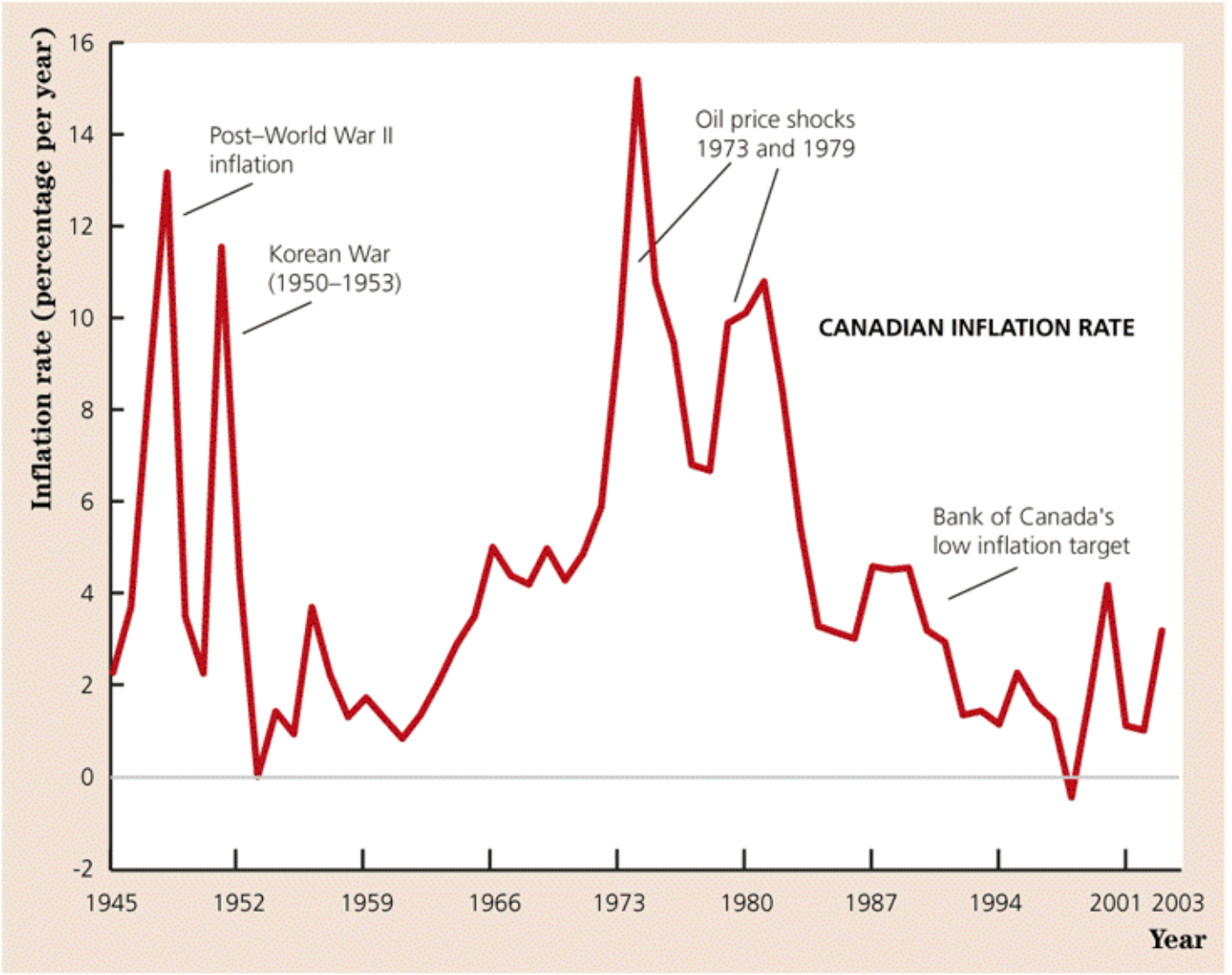
$\Delta P_{t+1}$ is change in the price level between $t$ and $t+1$

## FIGURE 2.2

### THE INFLATION RATE IN CANADA, 1945–2003

Here, inflation is measured as the annual percentage change in the GDP deflator. Inflation fell after the Korean War, then rose during the 1960s and 1970s, before falling sharply in the 1980s and again in the 1990s.

Source: 1945–1960: *Historical Canadian Macroeconomic Dataset 1871–1994*, compiled by R. Marvin McInnis, Queen's University, 2001. 1960–2003: Adapted from the Statistics Canada CANSIM database <http://cansim2.statcan.ca>, Series V1997756.



# Fisher Equation

- Real interest rate = nominal interest rate – inflation rate

$$\textit{real interest rate} = i - \pi$$

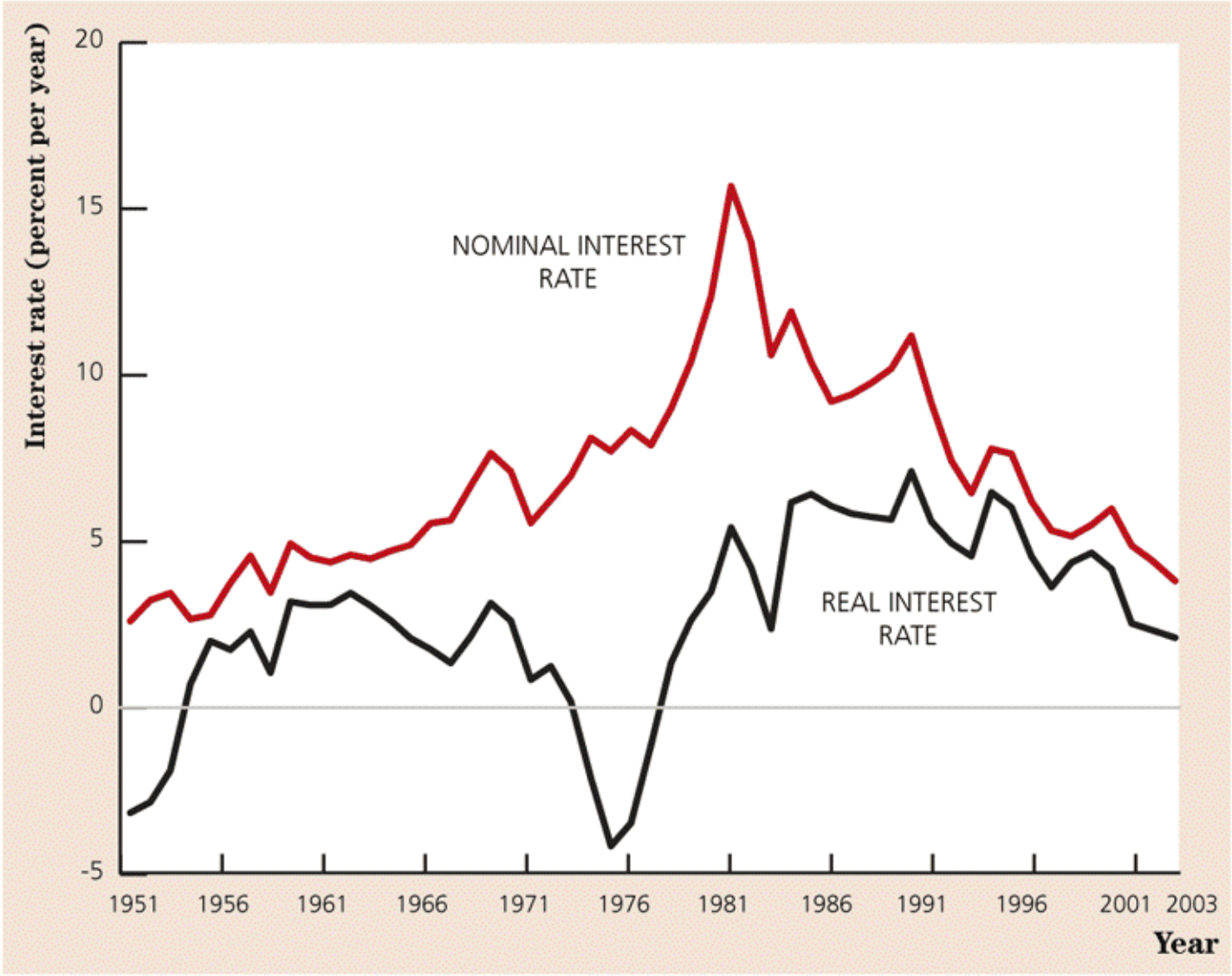
- Data for Canada

## FIGURE 2.3

### NOMINAL AND REAL INTEREST RATES IN CANADA, 1951–2003

The nominal interest rate shown is the interest rate on three-to-five-year Government of Canada bonds. The real interest rate is measured as the nominal interest rate minus the average inflation rate (using the GDP deflator) over the current and subsequent two years. The real interest rate was unusually low (actually negative) in the mid-1970s. In the early 1980s, both nominal and real interest rates were very high. Nominal interest rates did not fall as much as inflation did, so real interest rates were high again in the mid-1990s.

Source: The implicit price deflator for GDP is the same as that in Figure 2.2. The average interest rate on three-to-five-year federal government bonds is adapted from the Statistics Canada CANSIM database <http://cansim2.statcan.ca>, Series V122485.



# Expected Real Interest Rate

- But investment decisions cannot be based on $i-\pi$, because the eventual inflation rate is not known at the time investments are made.
- So a more important variable is the expected real interest rate *(r):*

$$r = i - \pi_e$$

- $\pi_e$ is an expected inflation rate
- If $\pi=\pi_e$ real interest rate = expected one

# Expectations MATTER!