LECTURE NOTES IN INTERMEDIATE MACROECONOMICS

Gregor W. Smith

These notes are for use with *Macroeconomics*, Canadian Edition,
(Don Mills: Addison-Wesley, 1995)
by Andrew Abel, Ben Bernanke, and Gregor Smith. They provide lecture outlines for a twelve-week course. They are in no way a substitute for careful reading of the textbook or for work on the review problems.

Part I

1. Introduction to Macroeconomics

1.1 What macroeconomics is about

- ▷ growth
- ▷ business cycles
- ▷ unemployment
- ▷ inflation
- ▷ international links
- ▷ role of government policy

Evidence

- ▷ Canadian growth and its sources (Figure 1.1)
- ▷ APL, productivity slowdown (Figure 1.2)
- ▷ unemployment rate; see Depression for example (Figure 1.3)
- ▷ inflation; see wartime for example (Figure 1.4)
- ▷ imports and exports; define trade surplus and deficit (Figure 1.5)
- ▷ exchange rate; define as value of Canadian dollar; why it matters (Figure 1.6)
- ▷ fiscal policy; more on the provinces and on monetary policy later (Figure 1.7)

Aggregation

1.2 What macroeconomists do

a. macroeconomic forecasting. This is difficult, whether conditional or unconditional. Compare to seismology, cardiology, meteorology.

b. macroeconomic analysis. This is done in international organizations, government, and the private sector. We'll refer to the political environment too.

c. macroeconomic research. Theory, history, and tests. This uses economic theory in economic models. To assess a model we ask:

   i Are its assumptions reasonable?
   ii Is it manageable and understandable?
   iii Can its implications be tested?
   iv Are its implications consistent with data?

d. data development. Sources are given in "In Touch with the Macroeconomy."

1.3 Why macroeconomists disagree

a. positive analysis vs. normative analysis; examples

b. classicals vs. Keynesians (this may be both positive and normative); classicals think prices adjust rapidly to equilibrium values; Keynesians (named for John Maynard Keynes, author of *The General Theory of Employment, Interest, and Money* (1936)) think slow adjustment of wages and prices accounts for unemployment and may suggest a role for macroeconomic policy by government. We'll see both perspectives later, in a unified approach.

æ

2. Measurement and Structure of the Canadian Economy

production, income, and expenditure

(a) product approach

(b) income approach

(c) expenditure approach

AppleInc

wages paid	15,000
taxes paid	5,000
revenue	
apples sold to the public	10,000
apples sold to JuiceInc	25,000
after-tax profit	15,000

JuiceInc

wages paid	10,000
taxes paid	2,000
apples purchased from AppleInc	25,000
juice sold to the public	40,000
after-tax profit	3,000

What is the intermediate product?

What is total income, production, or expenditure?

2.2 Gross Domestic Product

(1) Product Approach.

- Market values, of newly produced final goods (includes capital goods and the change in inventories but not used-up intermediate goods)
- measures government at cost
- does not measure the home sector (25% more), the underground economy (3% more), or the non-priced economy (though there are some green accounts now).
- GDP is produced within a country; GNP is produced by domestic factors.

$$GDP = GNP - NFP.$$

- Net factor payments from abroad. For Canada GDP is about 4% larger than GNP as our NFP is negative due to foreign ownership. In Turkey, for example, GNP is much larger than GDP.

(2) Expenditure Approach

$$Y = C + I + G + NX$$

is the income expenditure identity.
See the values in Table 2.1.
Note that G does not include transfers.

(3) Income Approach

- labour income: wages, salaries, and benefits.
- corporate profits
- interest and investment income
- unincorporated business income
- Sum these four to get NNI. Then

$$NNI + \text{indirect taxes} + \text{CCA} = GDP.$$

It is called gross because it includes depreciation.

See the values in Table 2.2.

- Private and government sector income. For the private sector:

private disposable income =
Y + NFP+TR+INT-T.

For the government,

$$\text{net government income} = T - TR - INT.$$

What do you get when you add these up?

Table 2.2 Income Approach to Measuring GDP in Canada, 1993

	$ billions	% of GDP
Labour income	402.4	56.6
Corporate profits	38.2	5.4
Interest and investment income	50.7	7.2
unincorporated business income	42.9	6.0
Net national income at factor cost	534.5	75.2
PLUS indirect taxes	89.4	12.6
Net Domestic Product at market prices	623.8	87.8
PLUS depreciation	84.5	11.9
PLUS statistical discrepancy	2.4	0.3
GDP	710.7	100.0
PLUS foreign income of Canadians	9.0	1.3
MINUS Canadian income of foreigners	33.7	4.7
GNP	686.0	96.6

2.3 Saving and Wealth

Often we want to study wealth, not just current income. Wealth comes from saving part of past income.

$$\text{private saving} =$$

private disposable income
- consumption.

$$S_{pvt} = (Y + NFP - T + TR + INT) - C.$$

The ratio of S_{pvt} to private disposable income is called the private saving rate (as opposed to the personal saving rate).

For the public sector:

$$\text{government saving} = \text{net government}$$

income - government purchases.

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

These gives us national saving:

$$S = S_{pvt} + S_{govt} = Y + NFP - C - G.$$

We can combine this with our earlier accounting, to see the uses of national saving:

$$S = (C + I + G + NX) + NFP - C - G$$

$$S = I + NX + NFP$$

$$S = I + CA$$

where CA is the current account balance, the sum of NX and NFP.
Thus

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

Here I includes private and public investment, and $-Sgovt$ is the government budget deficit. This is the uses-of-saving identity. If the government deficit increases then one of three things happens ... .

Figure 2.1 in the text shows the uses of saving in Canada.
In 1993, for example, as percentages of GDP:
$S_{pvt} = 19.9$, $I = 18.0$, $CA = -4.3$, and $-S_{govt} = 6.2$.
In the early 1980s the government deficit rose and investment fell, with the current account stable. In the 1990s, the budget deficit rose again and the current account fell. We shall analyze this in Chapter 5.

Remember GDP and saving are *flows* while wealth is a *stock*. National wealth is:

(a) domestic physical assets

(b) net foreign assets.

These can change by changes in value, or by additional saving.

$$S = I + CA.$$

Saving adds to domestic capital (I) or to foreign assets (CA). See Figure 2.2 in the text for these series for G-7 countries.

2.4 Price Indexes, Inflation, and Interest Rates

- Often we want to separately measure real quantities. For example, we distinguish between nominal or current dollar GDP and real or constant dollar GDP. For 1994, to see the notation, $PY = 748$, while $Y = 596$ (base year 1986) in billions of dollars. Usually we work with *real* quantities.

- Prices indexes are either variable-weight or fixed-weight. You can see the detailed discussion in the text.

- An example of a variable-weight index is the GDP deflator:

$$GDP \text{ deflator} = \frac{\text{nominal } GDP}{\text{real } GDP}.$$

  Usually this is multiplied by 100. For 1994 it was 125.6.

- An example of a fixed-weight price index is the CPI, though the basket is changed periodically.

- The inflation rate is the percentage change in a price index:

$$\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}} \cdot 100.$$

  Figure 2.3 graphs the GDP deflator for Canada.

- We also need to distinguish real and nominal interest rates. Simply adjust interest rates for inflation: $i - \pi$, where i is the nominal interest rate.

- But decisions cannot be based on this, 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:

$$r = i - \pi^e.$$

We can try to estimate the expected inflation rate using our own forecasts or surveys. See the nominal and real rates in Figure 2.4.

æ

Part II

3. Productivity, Output, and Employment

Now we turn from measurement to analysis ...

3.1 Production Function

The notation is:

$$Y = AF(K, N)$$

For Canada, approximately:

$$Y = AK^{0.3}N^{0.7}$$

	Y	K	N	A
1991	556	493	12.3	14.94
1992	560	500	12.2	15.08

We calculate A by division. For these two years, productivity growth was 0.87%. This rate varies a lot from year to year, and has slowed over time also.

To graph the production function, hold one factor constant, and graph output versus the other factor.

- *e.g.* For 1992 $N = 12.2$ so $Y = 86.87K^{0.3}$.
- This slopes up and opens down.
- The slope is the marginal product of capital, MPK.
- The MPK is positive, declines as K increases: diminishing marginal productivity.
- The same logic gives us the MPL: For 1992, $Y = 97.29N^{0.7}$.

Supply shocks are changes in A, which change Y for given K and N.

- Examples are inventions, weather, or changes in factors other than K and N. The best example is an oil price shock.
- Usually we assume that a decline in A reduces the slope of the production function at each point. This is important for the predictions.

[see Figure 3.4]

6.1 Economic Growth

- We also can use the production function to track economic growth.
- Small differences in growth rates lead to large differences in levels, when compounded over time. In Canada, real GDP grew 5% per year during 1947–1973. The rate since then has been 2.8%.
- Suppose the high growth had continued: real GDP would have been 50% higher now, a bonus of more than $12,000 per person. Is this also the source of government debt?
- To see the sources of growth, first differentiate the production function w.r. to time, denoted t.

$$\begin{aligned} \mathrm{dY} &= \frac{dA}{dt} K^{0.3} N^{0.7} \\ &+ \mathrm{A\ N}^{0.7} 0.3 K^{-0.7} \frac{dK}{dt} \\ &+ \mathrm{A\ K}^{0.3} 0.7 N^{-0.3} \frac{dN}{dt}. \end{aligned}$$

- Then divide by Y, and remember that $Y = AK^{0.3}$ $\mathrm{N}^{0.7}$.

$$\mathrm{dY/dt} = Y = \frac{dA/dt}{A} + 0.3 \frac{dK/dt}{K} + 0.7 \frac{dN/dt}{N}.$$

- For larger changes in time, we can approximate:

$$\frac{Y_t - Y_{t-1}}{Y_{t-1}} \approx$$

$\mathrm{A}\frac{t-A_{t-1}}{A_{t-1}+}$
$0.3\ \mathrm{K}\frac{t-K_{t-1}}{K_{t-1}+}$
$0.7\ \mathrm{N}\frac{t-N_{t-1}}{N_{t-1}.}$

- To do growth accounting, we measure the growth of Y, K, and N, estimate the coefficients (here 0.3 and 0.7), then find growth in A by subtraction.
- Growth is A is sometimes called growth in total factor productivity (TFP) or the Solow residual – the part of output growth not explained by input growth.

Table 6.3 Sources of Economic Growth in Canada (% per year)

	1891–1910	1910–1926	1926–1956
Labour	1.8	1.0	0.6
Capital	0.8	0.3	0.6
TFP	0.8	1.2	2.7
Output	3.4	2.5	3.9

	1962–1973	1974–1979	1980–1986
Labour	2.8	2.8	1.4
Capital	0.6	0.4	0.8
TFP	2.0	1.0	0.5
Output	5.4	4.2	2.7

The entry for labour, for example, coincides with $0.7\Delta N/N$.

Much of the slowdown in output growth is due to a slowdown in productivity growth. This is worldwide ...

Table 6.4 Productivity Growth Before and After 1973

	1960–1973	1973–1990
United States	1.6	0.0
Japan	5.9	1.8
EU	3.2	1.3
OECD	2.8	0.7

The slowdown in growth (largely due to slower TFP growth) has enormous

implications. How do we explain it?

(a) Measurement

(i) quality. See the air conditioner example.
Are there unmeasured improvements in output quality or declines in input quality (such as labour)?

(ii) sectoral shift. From manufacturing to services.
But the slowdown is even within manufacturing. And not all manufacturing has higher productivity growth that all services (*e.g.* airline reservations, banking).

(iii) Is measurement worse since 1973?

(b) Technological Depletion

(i) Has innovation slowed? This is not apparent in patents or R and D spending.

(ii) Possibly this is a return to normal. The puzzle to explain may be the fast, 'catch-up' growth of the 1950s and 1960s.

(c) Oil prices.

(i) The timing seems right. So does the worldwide effect.
Recall that A reflects other inputs, such as oil.

(ii) This may have made technologies obsolete.
But then shouldn't capital goods prices have declined?

(iii) Why didn't productivity growth surge when oil prices fell in the late 1980s?

3.2 Labour Demand

- In macroeconomics we usually assume that
  workers are all alike, that firms are wage-taking (competitive),
  and that firms maximize profits.

- Recall that MPN declines as N rises.
  To maximize profits, firms hire workers until:

$$MPN = \frac{W}{P} = w,$$

  so that the benefit equals the cost. We call w the real wage.

- A rise in w raises the MPN at which the equality
  holds, and so lowers N. Think of the MPN as the labour demand curve.

[see Figure 3.5]

- A change in w is a movement along the labour demand curve.

- A supply shock shifts the curve. So does an increase
  in capital.

[see Figure 3.6]

3.3 Labour Supply

- Consider a labour supply curve which slopes up.
  (We could derive this with indifference curves and a budget line: see Chapter 8).

- This shifts back with higher:

  (i) wealth, or

  (ii) expected future real wages (imagine a medical student who does not seek a summer job).

[see Figure 3.8]

- The *aggregate* labour supply curve slopes up for two reasons:

  (i) each person may supply more hours as her/his wage rises,

  (ii) people may enter the labour force.

- Thus aggregate labour supply rises if

  (i) wealth falls

  (ii) expected future real wages fall

  (iii) the adult population rises

  (iv) participation in the labour force rises

We have begun to assemble catalogues of these effects, found in Summary Tables in the textbook. We shall use these later as we see how markets fit together and are affected by policy.

3.4 Labour Market Equilibrium

- If w adjusts, then demand equals supply.
  This then determines w, and defines the *full-employment* level of employment, $\overline{N}$.

[see Figure 3.9]

- In classical models demand equals supply and there is no involuntary unemployment. Keynesian models account for that by slow adjustment of wages, or by slow matching in the labour market.
- Factors that shift either curve affect w and $\overline{N}$.
- For example, a temporary adverse supply shock (which does not affect wealth or expected real wages) reduces w and $\overline{N}$, by shifting the labour demand curve.

[see Figure 3.10]

- If we use $\overline{N}$ in the production function, we get full-employment output, sometimes also called potential output:

$$\overline{Y} = AF(K, \overline{N}).$$

- An adverse supply shock reduces $\overline{N}$ *and* A: so $\overline{Y}$ falls for two reasons.

Application: Y, N, and W in oil price shocks

[see Figure 3.11]

- Shocks occurred in 1956 (Suez), 1973 (OPEC),

1979 (Iran), and 1990 (Kuwait). These adverse supply shocks had a large effect on Canada directly, and via the output of other countries.

- The model predicts that w, N, and Y decline. There were recessions in 1957, 1974, 1980, and 1990. We could collect data for each episode.

Application: Technical change and wage inequality

- Several trends in real wages in Canada:
  - (i) slower wage growth
  - (ii) wages more unequal
  - (iii) wages of women have risen relative to those of men (less inequality in this sense)

Table 3.4 Wage Inequality Since 1967

Earnings in 1990 dollars	1967	1975	1985	1990
percentage of women < $20,000	86.6	73.1	67.9	63.2
percentage of men < $20,000	44.7	35.1	42.3	39.5
percentage of women > $40,000	0.6	2.6	5.3	6.4
percentage of men > $40,000	9.9	23.3	24.5	25.3
90–10 ratio women	45.8	47.9	46.4	40.1
90–10 ratio men	30.7	35.4	43.5	40.6

- The same trends are apparent in some other developed countries.

- Fact (i) reflects the productivity growth slowdown.
  Recall that the real wage is equal to the MPN in our model.

- Do you think the change in relative wages reflects labour supply or labour demand? Is there relatively low supply of skilled workers or relatively high demand?

- Most evidence suggests that fact (ii) reflects technical change that is skill-biased, which shows up in labour demand.

  For example, many jobs now require basic computer skills.

3.5 Unemployment

More on unemployment in Chapter 14. For now, begin with some facts ...

- Unemployment is measured using the monthly *Labour Force Survey* of persons older than 15 in 62 thousand households. People are classified as:
  - (i) E: employed full or part time, on strike, sick leave, or vacation
  - (ii) U: unemployed and searching for work in the past four weeks
  - (iii) N: not in the labour force; students, retirees, homemakers

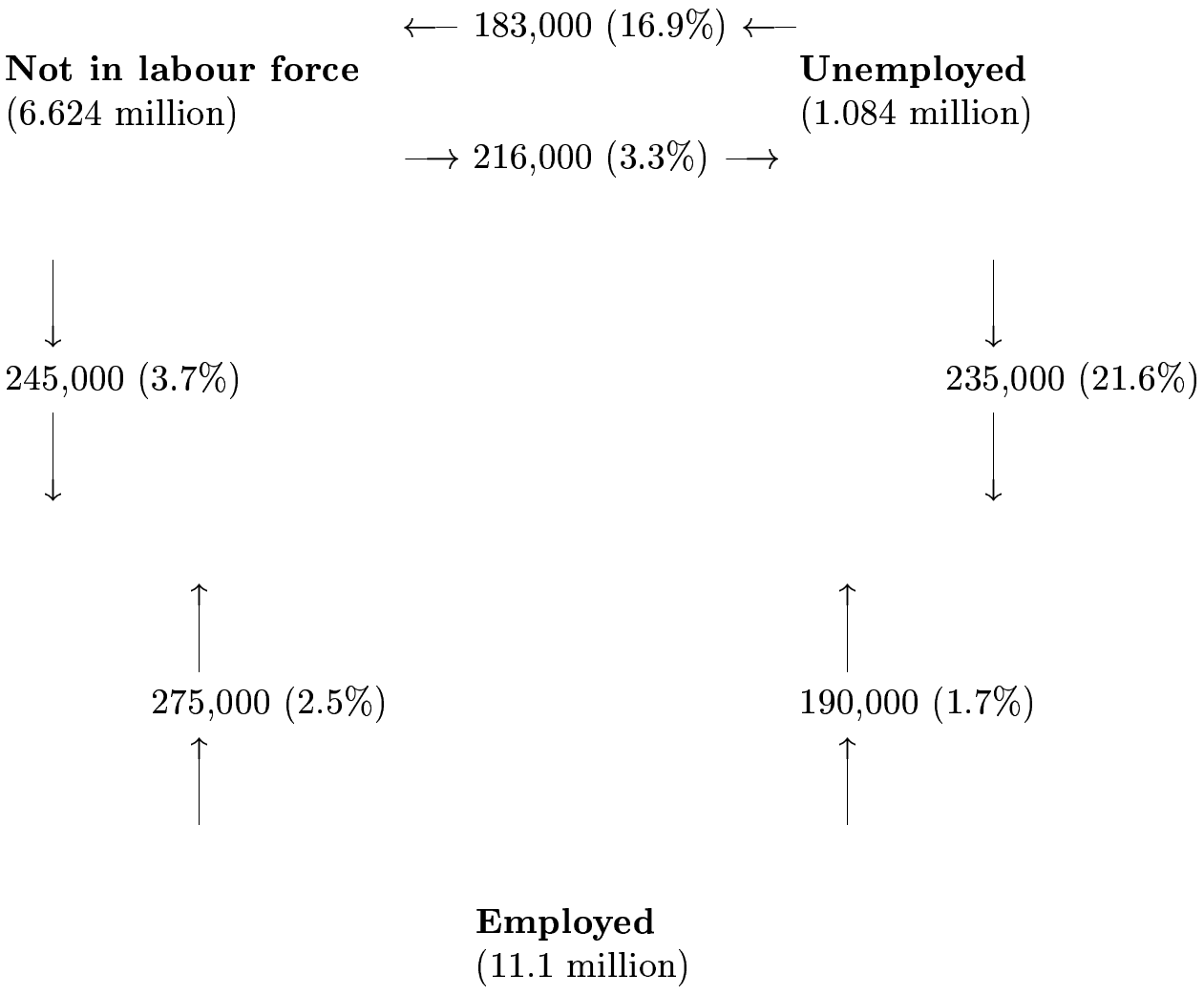
Table 3.5 Employment Status, May 1994

	Number (millions)	% Labour Force	% Adult Population
Employed	12.6	89.2	58.1
Unemployed	1.5	10.6	6.9
Labour Force	14.1	100.0	65.0
Not in Labour Force	7.6		35.0
Adult Population	21.7		100.0

unemployment rate	10.6
employment ratio	58.1
participation rate	65.0

- Note that E and U can both rise at once.
- For the large gross flows between these three categories:

Figure 3.13 Changes in Employment Status in a Typical Month



- How long are people unemployed?

  (i) An unemployment episode is called a *spell* and its length is called *duration*.

  (ii) Most spells are short, roughly two months.

  (iiii) At any moment, most of those who are unemployed are experiencing long spells.

- Why is there unemployment?

  (i) *frictional* unemployment occurs because of the time and search needed for matching by skill and location

  (ii) *structural* unemployment is chronic and occurs even in booms; it is associated with low skills and with declining regions or industries.

- Natural rate of unemployment, $\overline{u}$.

  (i) When $N = \overline{N}$ and $Y = \overline{Y}$ then $u = \overline{u}$. This can be thought of as an average rate.

  (ii) Estimates suggest that $\overline{u}$ was 5% in the 1960s and now is roughly 8%.

  (iii) $u - \overline{u}$ is called *cyclical* unemployment.

æ

4. Consumption, Saving, and Investment

Now we turn to the goods market.
We'll catalogue things which affect the goods market, just as we did for the labour market.
To begin with, we ignore net
exports, and we focus on savings or consumption decisions.

4.1 Consumption and Saving

(a) Consumption and saving both rise when *current income* rises. In aggregate, and in a closed economy:

$$S = Y - C - G.$$

▷
Economists used to describe consumption by a linear function:

$$C = c_0 + c_Y Y,$$

where c_Y is called the marginal propensity to consume, and is a positive fraction;
but this leaves out the effects below.

(b) consumption rises, saving falls, if *expected future income* rises.

▷ We cannot directly measure expected future income, but we can deduce some things about it from the
survey-based index of consumer attitudes, from
the Conference Board of Canada.

[see Figures 4.1a and 4.1b]

(c) consumption rises, saving falls if *wealth* rises

▷ We can study this effect using the
1987 stock market crash. In the crash, stock prices fell by about 15% and Canadian wealth fell by about $100 billion.

There are two channels to consumption: wealth and expected future income.

▷ The actual effect seems to have been
very small. This may have been because (i) households hadn't been aware of the earlier run-up in stock prices, (ii) most people hold stocks indirectly (if at all) through pension funds, or (iii) monetary policy lowered interest rates after the crash (see below).

(d) consumption falls, and saving rises if the
expected real interest rate rises

▷ This effect is quite weak,
because the substitution and income effects are offsetting (see Chapter 8 for details).

▷ The key variable is the expected,
after-tax real interest rate:

$r_{at} = (1 - t)i - \pi^e$.
For example,

1.5% = (1-0.3)5.0% - 2.0%.

▷ Cutting the tax rate t (as in RRSPs)
may raise saving, but the effect is quite small empirically.

▷ In macroeconomics we speak of 'the'
interest rate, because interest rates on different financial investments tend to move together. But rates do vary by default risk, by maturity, and by country of issue.

Fiscal Policy

We can see the effects of fiscal policy on consumption and saving by using the catalogue (a) to (d) that we've just discussed.

(i) temporary increases in G.

▷ the effect on C is through *taxes*;
if taxes rise now, household income falls,
and C falls

▷ S falls because the decrease in C is typically
less than the increase in G:

$$S = Y - C - G.$$

(Note that Y is national income, not household disposable income.)

▷ what if taxes rise later? If the government
borrows to finance the increase in G then future taxes will be higher.
With expected future income lower, C falls.

(ii) tax cuts

▷ imagine a lump sum tax cut, which does not
affect r_{at}; it *raises* current income but *lowers* future income

▷ these changes have offsetting effects
on C but both act to increase S

▷ if these effects on C exactly cancel,
we have *Ricardian Equivalence* which says that tax and debt
finance are equivalent in their effects on consumption

▷ under Ricardian equivalence, postponing
taxes or other changes in tax timing affect private saving, but
not consumption or national saving

▷ if there is some myopia, then a tax cut may
increase consumption and therefore decrease national saving
(private saving does not rise as much as government saving falls)

4.2 Investment

Now we examine the investment decision, made mainly by firms. I is important because

- ▷ it varies a lot during business cycles
- ▷ it determines growth

- User cost of capital
  - ▷ The user cost of capital is defined as:

$$uc = (r + d)p_K,$$

    where d is the proportion of capital that depreciates each period. Imagine you must borrow funds to purchase equipment ...
  - ▷ The benefit of an extra unit of capital is MPK so add capital until

$$MPK = (r + d)p_K.$$

    The intersection gives the desired capital stock.

[see Figures 4.2, 4.3, and 4.4]

  - ▷ If r rises the desired capital stock falls. And positive supply shocks raise the desired capital stock by raising the MPK.

- Tax.
  - ▷ If there is a tax on revenue, then

$$(1 - \tau)MPK = uc; \qquad MPK = \frac{(r + d)p_k}{(1 - \tau)}$$

  - ▷ In fact the tax system is more complex, with profits taxes and tax credits for certain investments. The effect of tax laws on particular investment is summarized in the *effective tax rate.*

[see Table 4.2]

- ETRs vary over time, across different types of capital, and across countries.

Application: ETRs on equipment and structures

- Group capital goods into 'machinery and equipment' and 'structures'. Structures had a tax advantage which was removed with tax reform in 1986-1987.

[see Figure 4.5]

- It appears that investment in machinery and equipment grew rapidly for this reason.
- But in fact the ETR relative to that on structures was lower in 1985 than in 1990.
- And the U.S. tax reform removed an advantage of machinery and equipment; yet their pattern of investment is similar. Other factors must be important too.

• Gross and net investment.

- Net investment is gross investment minus depreciation:

$$K_{t+1} - K_t = I_t - dK_t$$

[see Figure 4.6]

Similar logic applies to investment in inventories or housing.

The main influences are: r, ETR, and the expected future MPK.

4.3 Goods Market Equilibrium

- Equilibrium occurs when $S^d = I^d$
  (as opposed to $S = I$, which is an identity for a closed economy).

[see Figure 4.7]

- This is reached by adjustment in r.

- The factors we've listed which affect desired
  S or I thus change r too.
- *e.g.* an increase in G shifts the S^d
  curve back and so raises r

[see Figure 4.8]

Application: Wars, investment and interest rates

▷ a temporary increase in G, as in a
  war, is predicted to raise r and lower I

▷ What happened to Canadian I during wartime?

[see Figure 4.9]

▷ A natural test comes from Britain in the
  eighteenth century.

▷ In an open economy war may affect the
  current account (rather than the interest rate) as we'll see in Chapter 5.

- an increase in the expected future MPK

shifts the I^d
curve out and so raises r

[see Figure 4.10]

- can you think of an example?

æ

5. Saving and Investment in the Open Economy

In an open economy spending need not equal production in every year. A country can borrow internationally, for example.

5.1 Balance of Payments Accounting

- a flow of money to Canada is a credit; a flow out is a debt

-

$$CA = NX + NFP.$$

[see Table 5.1]

- NX have been negative recently; the deficit in services is larger than the merchandise trade balance (sometimes called simply the trade balance)

- NFP is negative, due to income paid on foreign investment in Canada

- The CA deficit is roughly 4% of Y. This is worrying because Canada must borrow to finance this. External debt means that output growth may not show up in advances in living standards.

- On the capital account, KA, the increase in Canadian-owned foreign assets is an outflow. The increase in foreign-owned assets in Canada is an inflow.

$$CA + KA = 0.$$

- The current account and capital account always balance.

- *e.g.* You buy a $75 sweater from the U.K.
  The exporter there has $C75. She/he can import from Canada,
  or buy a Canadian asset,
  or sell to the bank, which sells it to someone who will import
  or buy an asset.

- CA indicates the acquisition of foreign assets;
  so a CA deficit means foreign debt is rising.

Table 5.1 Canada's Balance of International Payments, 1993
(billions of dollars)

CURRENT ACCOUNT				
Net exports			-4.3	
Exports		208.2		
Merchandise	181.3			
Services	26.9			
Imports		-212.5		
Merchandise	-171.8			
Services	-40.7			
Net income from assets			-26.7	
Income receipts on investments		9.4		
Income payments on investments		-36.1		
Net transfers			0.3	
Current Account Balance (CA)				-30.7
CAPITAL ACCOUNT				
Increase in Canadian-owned assets abroad (capital outflow)			-20.3	
Canadian official reserve assets		0.6		
Other Canadian assets		-20.9		
Increase in foreign-owned assets in Canada (capital inflow)			57.7	
Capital Account Balance (KA)				37.4
Statistical Discrepancy				-6.7

5.2 Goods Market Equilibrium

•

$$S^d = I^d + CA.$$

• NFP are not very variable, because they reflect past investments, so the textbook approximates:

$$S^d \approx I^d + NX; \qquad NX \approx Y - (C^d + I^d + G).$$

5.3 Saving and Investment in a Small Open Economy

• Now equilibrium does not require $S^d = I^d$ (the intersection); the country takes the world r as given

[see Figures 5.1 and 5.2]

• a temporary adverse supply shock reduces output and so reduces saving and the CA

[see Figure 5.3]

• an increase in the expected future MPK increases investment, raising KA and lowering CA

[see Figure 5.4]

• current account deficits associated with high investment may be natural if a country is growing rapidly

[see Figure 5.5]

• see the textbook for the LDC debt crisis

5.4 Saving and Investment in Large Open Economies

- For example, suppose the world contains only two large economies:

$$CA_1 + CA_2 = 0,$$

except for measurement problems (underreporting of foreign interest income).

[see Figure 5.6]

- Thus world S^d equals world I^d; one country's lending is another's borrowing; this determines the world r

Real Interest Rate

- Imagine that Germany is the home country and the U.S. is the foreign country. Germany has a CA surplus and the U.S. has a CA deficit.

[see Figure 5.7]

- At reunification:
  - ▷ G rises, so the S^d curve shifts left.
  - ▷ expected future MPK rises, so the I^d curve shifts right

- Predictions: r rises, the German current account falls, the U.S. current account rises; there is less investment and more saving in the U.S.

- In fact the German CA has fallen, but the K inflow into the former East Germany has not been very large yet.

5.5 Fiscal Policy and the Current Account

- An increase in the budget deficit will add to the current account deficit only if desired national saving falls.

- *e.g.* consider a small open economy (such as Canada)

[see Figure 5.8]

- the coincidence of budget and current account deficits is sometimes called the *twin deficits*

- Both variables are things we explain ('endogenous'), so let us see what happens under various external shocks. We'll look at the theory and then at the evidence.

(a) Suppose the budget deficit rises because G rises. The theory predicts that S^d falls, and so CA falls.

(b) Suppose the budget deficit rises because of a lump-sum tax cut. If Ricardian Equivalence holds there is no change in national saving, so the CA is unaffected.

(c) Suppose there is a cut in distorting taxes (say the tax on firms' revenue); then I^d rises so CA falls.

- In cases (a) and (c) we predict twin deficits.

- What is the evidence? Twin deficits were observed in Canada 1988-1995, Germany 1990-1993 (case (a)?), and the United States in the early 1980s (refutes case (b)?).

- But Canada ran large budget deficits in the early 1980s without large current account deficits. The same thing occurred during 1940-1945.

[see Figure 5.9]

æ

7. The Asset Market, Money, and Prices

One of our goals is to study a macroeconomic model with markets for labour,

goods, and assets. We'll then be able to see the effects of monetary policy.

7.1 What is money?

• Functions:

▷ medium of exchange

▷ unit of account

▷ store of value

• Measurement: Monetary Aggregates

▷ M1: currency plus chequing accounts plus current accounts ('narrow' money)

▷ M2: M1 plus savings deposits ('broad money')

▷ M1 is about $60 billion; M2 is about $360 billion

▷ Even broader than M2 is M2+: M2 plus deposits at trust companies, credit unions, and caisses populaires

▷ A different way to broaden M2 is M3: M2 plus other bank deposits, namely non-personal fixed term deposits and deposits in foreign currencies

▷ Most money is bank accounts.

• Aggregates are leading indicators of the business cycle and of inflation. They are measured weekly, and revised as data are updated.

• The government, via the Bank of Canada, influences but does not set M – our general notation for the money supply.

• For example, the Bank can influence M through open market operations: sales or purchases of bonds.

• Suppose the Bank buys bonds and pays for them with newly minted currency. This is an open-market purchase, which brings money into circulation. Sales of bonds by the Bank of Canada reduce the money supply.

• We'll see technical details in Chapter 15. For simplicity, meanwhile, we assume that the Bank sets M.

7.2 Portfolio Allocation and the Demand for Assets

• Three features influence choices from a menu of assets:

▷ expected return (actual return is not known in advance)

▷ risk (perhaps summarized by the variance of returns)

▷ liquidity

7.3 Demand for Money

There are three main influences on the demand for money:

- the price level: as P rises M^d rises
- real income: as Y rises M^d rises, because the number of transactions rises
- nominal interest rates: as i rises M^d falls, because i is the opportunity cost of holding money.

  ▷ in fact most money earns some interest, say i^M, so the opportunity cost is $i - i^M$.

- some other factors such as risk and technical change (*e.g.* debit cards) may matter too

We can write the demand for money as

$$\mathrm{M}^d = P \cdot L(Y, i)$$
$$= \mathrm{P} \cdot L(\underset{d}{Y}, r + \pi^e)$$
$$\mathrm{M} \overline{P = L(Y, r + \pi^e)}$$

The elasticities of (narrrow) money demand in Canada are:

- ${}_M\eta_Y \approx 0.8$

- ${}_M\eta_i \approx -0.3$: being careful to calculate the
  percent change in the interest rate and not just the change in percentage points.

- ${}_M\eta_P \approx 1.0$ as we have written above.

Who cares what the elasticities are?

- From 1975–1982 the Bank of Canada followed a policy of gradualism: slowly reducing the growth rate of $M1$ to reduce inflation (we see the rationale in section 7.4 ...)

- They did this by influencing i, and needed to predict the effect of i changes on $M1$. They relied on an estimated money-demand function and its interest-elasticity.

- But the money-demand function was unstable, due to the introduction of DICAs and other new accounts. These now are included in $M1$, but they were not included then.

- With these financial innovations, $M1$ demand was lower than predicted. In 1982 the Bank abandoned explicit $M1$ targets.

- The Bank still uses monetary aggregates as leading indicators, though.

You may see monetary developments described with reference to the *velocity* of money:

$$\text{V} = \text{nominal}\frac{GDP}{\text{nominal money}}$$
$$= \text{PY}\frac{}{M}$$

- the quantity theory of money predicts that

changes in M lead to changes in nominal GDP, because velocity is constant; in that case monetary aggregates will be very good leading indicators

- but V is not constant, and can vary substantially when i changes

7.4 Asset Market Equilibrium

- Suppose there are two types of assets: non-monetary (NM) and monetary (M)

- then for equilibrium in asset markets

$$M^d = M$$

- by subtraction, non-monetary assets also are in equilibrium then too

- Thus:

$$\frac{M}{P} = L(Y, r + \pi^e)$$

- We can invert this to give:

$$\mathrm{P} = \mathrm{M}\frac{}{L(Y, r+\pi^e)}$$

- Suppose that in the long-run Y is given by the production function; we'll return to π^e in a moment

- then if M rises, P rises too

- the mechanism: with more money in portfolios there is more spending, which bids prices up

- As an example, suppose that real money demand is given by $L(Y)$, and so does not depend on interest rates.

- Then:

$$\frac{\Delta P}{P} = \frac{\Delta M}{M} - \frac{\Delta L}{L}$$

$$\pi = \frac{\Delta M}{M} - {}_M\eta_Y \frac{\Delta Y}{Y}$$

- For example: 8% = 10% - (2/3)3%.

- Across countries $\Delta L/L$ (or $\Delta Y/Y$ and ${}_M\eta_Y$) do not vary much; but $\Delta M/M$ does

- Can the theory explain cross-country differences in inflation?

[see Table 7.2]

- We've ignored π^e in studying L; if r is given in the goods market, then what determines π^e?

- Suppose that money and income grow at constant rates: then $\pi^e = \pi$.

- We should see this link reflected in i; nominal interest

rates are based on π^e and so should be related to the current inflation rate π

[see Figure 7.3]

Table 7.2 Inflation in Low-Money-Growth and High Money-Growth Countries, 1988–1991

Low-Money-Growth Countries

Country	*Money Growth Rate* (% per year)	*Inflation Rate* (% per year)
1. Côte d'Ivoire	-4.1	2.0
2. Senegal	-0.5	-0.7
3. Switzerland	0.7	4.1
4. Rwanda	1.0	6.7
5. Niger	1.4	-3.2
6. France	2.9	3.2
7. United States	3.6	4.6
8. Czechoslovakia	3.8	15.2
9. Canada	3.8	4.8
10. Burkina Faso	5.2	1.4

High-Money-Growth Countries

Country	*Money Growth Rate* (% per year)	*Inflation Rate* (% per year)
1. Peru	1052.6	1694.3
2. Zaire	207.7	251.4
3. Poland	144.9	184.7
4. Uruguay	78.3	88.3
5. Mexico	67.0	41.4
6. Turkey	57.4	66.2
7. Zambia	56.6	94.7
8. Ecuador	50.8	57.4
9. Sudan	50.8	28.5
10. Nigeria	36.6	29.6

æ

PART III

9. Business Cycle Facts

Read Chapter 9.

Questions:

- What is a business cycle?

  [see Figure 9.1]

- Do business cycles have permanent effects?

  [see box Figure]

- Have business cycles become milder?

- Are business cycles made in Canada?

  [see Figure 9.2]

- Which variables are leading indicators?

æ

10. The IS–LM–FE Model

This chapter combines markets for labour, goods, and assets. The goal is to describe classical and Keynesian approaches to business cycles. We start with a closed economy, then study the open economy in Chapter 11.

10.1 FE Line: Labour Market Equilibrium

- Labour demand equals supply at $\overline{N}$.
  The corresponding value of output is $\overline{Y}$.

- Graphed against r, this is a vertical line.

[see Figure 10.1]

- This line shifts with supply shocks, or anything that changes labour supply (such as tax changes).

10.2 IS Curve: Equilibrium in the Goods Market

- In a closed economy, equilibrium means $S^d = I^d$; hence the name of the curve.

- Imagine that output rises for some reason. At higher Y, S^d is higher. That shifts the saving curve out, which lowers r.

[see Figure 10.2]

- Why does the IS curve slope down? Because of the negative relationship between r and I, which is a component of Y.

- Factors that shift the IS curve:

  ▷ if G rises the IS curve shifts up

  ▷ if T rises the IS curve shifts down or does not shift at all

  ▷ if τ rises the IS curve shifts down

  ▷ if MPK^f rises the IS curve shifts up

[see Figure 10.3]

10.3 LM Curve: Asset Market Equilibrium

- Again imagine Y rises.
  M^d tends to rise. If M^s is fixed then r rises (with π^e unchanged).

  [see Figure 10.4]

- Hence the LM curve slopes up. Increases in r reduce M^d so that $M^d = M^s$.

- Factors that shift the LM curve:

  ▷ if M^s rises the LM curve shifts down

  ▷ if P rises the LM curve shifts up

  ▷ if π^e rises the LM curve shifts down

  ▷ What effect does financial innovation have?

  [see Figure 10.5]

  [see Figure 10.6]

10.4 The Complete IS–LM–FE Model

[see Figure 10.7]

- How do we get to the general or long-run equilibrium at which we are on all three curves?

- Answer: In the long run, the economy is at the intersection of the IS and FE curves. The LM curve shifts to this spot. We'll see the economic mechanism below.

- *e.g.* Consider a temporary adverse supply shock.

[see Figure 10.8]

▷ labour demand declines; $\overline{Y}$ falls because A and $\overline{N}$ fall: the FE line shifts

▷ output changes so we move *along* the IS curve

▷ P will rise, so the LM curve shifts up

▷ Predictions: N and w fall, as we saw in Chapter 3.

▷ Predictions: Now we also predict Y falls, r rises, P rises (a temporary burst of inflation), and C and I fall because r rises. These did occur during oil price shocks.

10.5 Price Adjustment

- Now consider a second experiment: a monetary expansion.

[see Figure 10.9a]

[see Figure 10.9b]

- The economy is not in general equilibrium. In the short run it is at the $IS - LM$ intersection: Point F.

- Economically, the increase in the money supply leads households and firms to rebalance their portfolios. As they buy NM assets they bid up their prices, or bid down their returns.

- [You can see the inverse relationship between asset prices and returns with a T-bill example.]

- With r lower, C and I increase.

- At point F, $Y > \overline{Y}$. Firms raise prices because there is so much demand. Thus the LM shifts up.

[see Figure 10.9c]

- Back at point E, real quantities are where they began, but nominal quantities are higher.

- Try tracing out M, Y, r, and P paths graphed against time. You will see a business cycle.

Important Notes

(a) The example in section 10.5 illustrates a property of the theory called *monetary neutrality*: changes in the money supply can have large effects on output, employment, and real interest rates in the short run (particularly if prices are slow to adjust) but not in the long run.

(b) Classical and Keynesian economists disagree about the speed of price adjustment; Keynesians are more likely to attribute cycles to slow adjustment of prices and wages.

(c) The changes we describe with $IS - LM - FE$ are all *relative* to long-run trends in $\overline{Y}$ and P (π) from Part II. So when we find Y falls here with the short-run model, that may mean rather a slowing in growth. And finding P falls may mean a slowing in inflation.

(d) A rule-of-thumb is that to the right of the FE line P rises and to the left of the FE line P falls. That does *not* mean that we only observe inflation in booms. Remember from section 10.4 that supply shocks shift the FE line. With a negative supply shock we observe inflation and a recession – *stagflation*.

Appendix

In addition to understanding the economic reasoning and using the diagrams, we use algebra to derive and remember results. Economists also use mathematical models to make *quantitative* predictions.

Labour Market

Suppose

$$Y = A(f_1 N - \frac{f_2}{2} N^2)$$

is the production function, where f_1 and f_2 are positive parameters.

Then

$$MPN = A(f_1 - f_2 N),$$

and so

$$w = A(f_1 - f_2 ND).$$

Suppose

$$NS = n_0 + n_w(1-t)w.$$

Then, solving the two equations:

$$\mathrm{w} = \mathrm{A}\left[\frac{f_1 - f_2 n_0}{1+(1-t)Af_2 n_w}\right]$$
$$\overline{N} = \frac{n_0 + (1-t)Af_1 n_w}{1+(1-t)Af_2 n_w}$$

Thus

$$\overline{Y} = A[f_1\overline{N} + \frac{f_2}{2}\overline{N}^2].$$

We can use calculus to see the effect on $\overline{Y}$, w, and $\overline{N}$ of shocks – external changes to A or t.

Goods Market

Suppose that in the goods market:

$C^d = c_0 + c_Y(Y - T) - c_r r$
$T = t_0 + tY$
$I^d = i_0 - i_r r$

This is a simple example, which omits some of the shift factors.

Then

$$Y = C^d + I^d + G$$

means that

$[1-(1-t)c_Y]Y = c_0 + i_0 + G - c_Y t_0 - (c_r + i_r)r$
$r = \alpha_{IS} - \beta_{IS} Y$

which gives us a downward-sloping IS curve.

Asset Market

Suppose that

$$\frac{M^d}{P} = l_0 + l_Y Y - l_r(r + \pi^e).$$

In equilbrium:

$$M = M^d$$

so

$$r = \alpha_{LM} + \beta_{LM} Y - \frac{M}{l_r P}.$$

You can see that the LM curve slopes up. And you can see that increases in M shift it out while increases in
P shift it back.

General Equilibrium

Remember that the general equilibrium is at the intersection of the FE line and the IS curve.

Thus

$$N = \overline{N}; \qquad Y = \overline{Y},$$

and

$$r = \alpha_{IS} - \beta_{IS}\overline{Y}.$$

Knowing r and Y, we can then find C and I.

We also can solve for P.

Using calculus, we can find the effects of changes in the policy variables t, M, and G. With specific values for the parameters, we can make quantitative predictions.

æ

11. Exchange Rates and Macroeconomic Policy

- This is probably the most difficult chapter, but also one of the most interesting.
- We use open-economy IS–LM to investigate the effects of integration in goods and asset markets.

11.1 Exchange Rates

- Denote the nominal exchange rate (also called simply the exchange rate) e_{nom}
  - ▷ We measure it in units of foreign currency per C$
  - ▷ It can be floating (also called flexible) ...
  - ▷ .. or it can be fixed, as in the gold standard, Bretton Woods, the EMS.

- The real exchange rate is defined as:

$$e = \frac{e_{nom} P}{P_{for}}.$$

  - ▷ *e.g.* $P = \$2$, $P_{for} = 730$ yen, $e_{nom} = 73$: $e = 73 \cdot 2/730 = 0.20$.
  - ▷ The nominal exchange rate tells you how much foreign currency you can buy with a C$. The real exchange rate tells you how many foreign goods you can buy with domestic goods.
  - ▷ Usually P is measured with the GDP deflator or the CPI.

- An increase in e_{nom}, a rise in the value of the domestic currency, is called an appreciation. A decrease is a depreciation.

- In systems of fixed exchange rates, an increase in the fixed rate is called a revaluation. A decrease is a devaluation.

- An identity:

$$\frac{\Delta e}{e} = \frac{\Delta e_{nom}}{e_{nom}} + \pi - \pi_{for}.$$

  - ▷ Most movements in nominal exchange rates are movements in real exchange rates, too.

  - ▷ If changes in e_{nom} are offset by changes in prices, then the real exchange rate (the relative price) does not change. This is called purchasing power parity.

- The real exchange rate is critical to net exports,
  a key component in GDP in Canada.

  ▷ Generally, higher e leads to lower NX.

  ▷ There may be a lag in this effect as summarized by the
  J-curve. Suppose the C$ appreciates to 80 cents U.S.. Imported fruit
  and vegetables will be cheaper in C$. If the quantity (volume) of
  imports is slow to increase then the value of imports may fall,
  so net exports may rise. Then as volume rises, the value of
  net exports falls.

[see Figure 11.1]

- The Canadian dollar has floated since 1970.

[see Figure 11.2]

- Notice the appreciation of 1986–1989, and the
  depreciation since 1989. NX did not turn up until 1991.

- Is there a 'beachhead effect?'

11.2 How exchange rates are determined

- The exchange rate depends on the demand for and supply of Canadian $.
  - ▷ The demand is to buy Canadian exports or assets.
  - ▷ The supply is to buy imports or foreign assets.

- If export quality rises then the demand for C$ rises, and so e_{nom} rises.
- If Y rises this partly goes to import demand, so e_{nom} falls.
- If Y_{for} rises, then so does export demand, and so e_{nom} rises.
- If r rises relative to r_{for} then there is a capital inflow, and e_{nom} rises.

- From this list, we can see the effects of these changes on net exports. Recall that most movements in e_{nom} are reflected in e.
- If Y rises, then NX falls, because imports rise.
- If Y_{for} rises then NX rises, because exports rise.
- If r rises then NX falls because e rises.
- If r_{for} rises then NX rises because e falls.

11.3 The IS-LM Model For An Open Economy

- Extend the IS–LM model to allow for international trade and lending.
- Use the same LM curve and the same FE line as for closed-economy.
- Inclusion of net exports now implies modifications to the IS curve . . .

  3 Important points.

  - ▷ The IS curve remains a downward sloping relation between output and real interest rates.
  - ▷ Factors that shift the closed-economy IS curve also shift the open-economy IS curve in the same way.
  - ▷ Now factors that change net exports also shift the IS curve.

The Open-Economy IS Curve

- This can be derived with diagrams, or using the algebra in Appendix 11.A
- Consider a numerical example:

$$\begin{aligned}
&\mathrm{C}^d = 100 + 0.9Y \\
&\mathrm{I}^d = 50 - 100r \\
&\mathrm{NX} = 20 \text{ - } 0.2\mathrm{Y} + 0.4\mathrm{Y}_{for} + 40(r_{for} - r) \\
&\mathrm{Y} = \mathrm{C}^d + I^d + G + NX
\end{aligned}$$

- Find the IS curve by substitution:

$$Y = 170 + 0.7Y - 140r + G + 0.4Y_{for} + 40r_{for}$$

or

$$r = 1.21 - 0.0021Y + 0.007G + 0.0028Y_{for} + 0.285r_{for}.$$

- This slopes down, but often is flatter than the closed-economy IS curve. Why? (See the Appendix, (11.A.9).)
- The open-economy IS curve shifts when net exports change for any given domestic output and domestic real interest rate.
- For example . . .
  - ▷ It shifts up if Y_{for} rises.
  - ▷ It shifts up if r_{for} rises.
  - ▷ It shifts up for a shift in world demand towards domestic country goods.

11.4 Macroeconomic Policy in an Small Open Economy with Flexible Exchange Rates

Here we assume that the domestic country is too small internationally to be able to affect foreign economic variables, in particular Y_{for} and r_{for}.

e.g. fiscal expansion

- Suppose that there is a temporary increase in G in the domestic country.
- IS shifts out.
- This tends to raise output and the real interest rate.

[see Figure 11.9]

- Net exports fall, but the effect on the real exchange rates is ambiguous. The increase in r tends to raise e, while the increase in Y tends to lower e.
- Based on empirical evidence, the net effect is probably to raise e.
- In the Long-Run only the second effect persists as prices rise, the LM-curve shifts back and output returns to long-run equilibrium levels.

e.g. monetary contraction

- Now imagine there is a domestic monetary contraction.

[see Figure 11.10]

- As for the closed-economy case, in the short-run output will tend to fall and real interest rates will tend to rise domestically.

- These tendencies put upwards pressure on the exchange rate, e.

- Thus, now the effect on NX is ambiguous as the rise in e tends to reduce NX while the fall in Y tends to increase it.

- Empirically, the effects of changes in e tend to dominate those due to changes in Y, therefore we expect NX to fall.

- In the long-run, the monetary contraction will cause prices and wages to fall, the LM curve shifts back and there are no real effects.

- Monetary policy cannot cause permanent real appreciations or depreciations. This is another example of monetary neutrality.

The Mundell-Fleming Model

- An extreme case of a small open economy where $r = r_{for}$.
- The domestic IS curve is horizontal at $r = r_{for}$.
- Fiscal policy can have no effect on output.
- For monetary policy, in the short run the full effect of changes in the domestic money supply will fall upon output.

[see Figure 11.11]

- Again, monetary neutrality in the long run.

11.5 Macroeconomic Policy in a Large Open Economy with Flexible Exchange Rates

- Now assume that one country's policies can affect real variables in other countries (particularly much smaller ones).

- Need two IS–LM frameworks, one large-country (say the U.S.), one small-country (say Canada).

e.g. foreign fiscal expansion

[see Figure 11.12]

- Decreases NX_{US}, therefore increases NX_{CAN}.

- The U.S. currency tends to appreciate, consequently Canadian currency tends to depreciate.

- Through its effects on net exports in the domestic economy, the foreign fiscal expasion is transmitted to the domestic economy (IS_{CAN} shifts out).

- The appreciation of the U.S. dollar has the same effect.

- In the short run (Keynesian), Y_{CAN}, and r_{CAN} rise. In the long-run (Classical) prices rise and output is unchanged.

e.g. foreign monetary contraction

[see Figure 11.13]

- Increased r_{US} and appreciation of U.S. currency.
- Therefore the domestic currency depreciates, NX_{CAN} rises.
- IS_{CAN} shifts up and right, in the short run Y_{CAN} and r_{CAN} are higher.
- Long-run price level adjustments (P_{CAN} rising, P_{US} falling) restore real exchange rate.
- This is monetary neutrality again, and implies an insulating property of flexible exchange rates.

11.6 Fixed Exchange Rates

Fixing the Exchange Rate

- How do fixed exchange rates affect macroeconomic policy?
  Which system is better?

- The nominal rate is set by governments, and may differ from
  the fundamental rate.

[see Figure 11.14

- What can the central bank do if the currency is overvalued?

  ▷ It can restrict transactions with taxes
  or controls, or even make the currency inconvertible.

  ▷ It can sell foreign exchange (or buy, if undervalued).
  This is called exchange-rate intervention. It happens in floating systems, hence called dirty or managed floats.

  (For example, in Canada the Bank of Canada
  may sometimes buy C$ to slow depreciations, which are passed through into domestic inflation.)

  ▷ Ongoing intervention to resist a depreciation
  (as opposed to smoothing changes) leads to a loss of reserves. When the central bank runs out of reserves it can devalue the currency or let it float. Ultimately, maintaining a currently overvalued exchange rate requires tight monetary policy.

- Suppose that you held investments in a country,
  and you thought that it might devalue. What would you do?

- Sell, and convert the proceeds to your own currency
  now, before the devaluation.

- This is called a speculative run or attack.
  It shifts out the supply of the currency.
  This occurred in Mexico in December 1994.

[see Figure 11.15]

- This becomes a self-fulfilling prophecy.

- The currency also may be undervalued.

[see Figure 11.17]

- This is the main way in which a central bank affects e_{nom},.
  and determines whether a fixed rate is overvalued or not.

- *e.g.* a monetary contraction raises e_{nom}
  in both short-run and long-run.

- If M is too large, the currency will be overvalued.

- So work backwards from fixed e_{nom} to M:
  exchange-rate policy is monetary policy.

[see Figure 11.18]

- A central bank cannot set e_{nom} and M separately.

- But, countries can coordinate changes in M.

[see Figure 11.19]

- Coordination is necessary to maintain fixed
  exchange rates.

  ▷ In the Bretton Woods system a U.S. monetary expansion
  made the US$ overvalued. To avoid increasing M and causing
  inflation, others floated (Canada first in 1970).

  ▷ In the European Monetary System (EMS), German
  interest rates rose in the early 1990s
  (see Chapter 5) and the Bundesbank did not raise M to lower them.
  The DM was undervalued. Other countries, in recession, did not want
  to contract their M. There were speculative runs on the pound and
  lira. Other European central banks raised interest rates sharply,
  but then eventually floated or widened bands.

  ▷ In one of these cases the dominant country
  had loose monetary policy and in the other it had tight
  monetary policy.

Fixed vs. Flexible Exchange Rates

- What are the advantages of fixed exchange rates?

  - ▷ They may promote trade, unlike volatile floating e_{nom}.

  - ▷ If other central banks are following a prudent monetary policy, then fixed exchange rates may import that policy. This could be a low average money growth rate to prevent inflation, or a monetary expansion in a recession or after a stock market crash.

- What are the disadvantages of fixed exchange rates?

  - ▷ They remove some policy independence. The goals of different central banks may conflict.

  - ▷ They require coordination.

  - ▷ Shocks may differ across countries too. Fixed exchange rates preclude appreciations which would avoid importing inflation, or depreciations which would avoid importing recession.