Lecture 4: Allocation
(2nd half of chapter 3)

1) Demand

a) Introduction

Now we look at the demand side of the goods market. Goods are demanded for several types of uses: consumption, investment, government purchases.

\[ Y = C + I + G \]

(We will ignore the category of net exports (NX) for now.) So this is a...

**closed economy:** Not trade with countries outside the model, so all output produced must be used domestically, and all demand must be satisfied by domestic output.

Recall that it is useful to break up total demand into these several categories, because the different components respond differently to economic events. We now look at some simple theories of what determines each of these components. Later chapters in the text discuss more detailed theories.

b) Consumption

Households face a decision: they receive a certain amount of income, and they must decide whether to spend it (consumption) or not (saving).

We represent income by \( Y \). Not all of income is at the disposal of households to use. Government collects taxes of various types. Lump these together under variable \( T \). Recall disposable income:

Disposable income: \( Y_d = Y - T \).

How much disposable income household has affects how much it will spend. In general, if have more income, will consume more. This is summarized in a consumption function: \( C = C(Y_d) \)

**Marginal Propensity to Consume (MPC).** How much consumption rises in response to extra unit disposable income. Slope of consumption function.

So is derivative of the function. Write \( MPC = C_{Yd}(Y_d) \)

Must be between zero and one. One extra $ increases \( C \), but not by full amount. Part will be saved. Example: if \( MPC = 0.7 \), spend 70 cents, save 30 cents.

This saving becomes part of the supply side in the financial market.
c) **Investment**

Discussed before how capital can be rented in factors market. Can also buy capital rather than rent. (Perhaps buy it then rent it to someone else.)

Investment: Purchasing goods to create new capital.
Is part of demand in the goods market.

Is also part of demand in the financial market - market for loanable funds. Typically to new cookie factory firm will go to a bank and borrow the funds it needs to buy the goods and services it needs to build the factory.

Let's consider a simple story of the decision of the developer about whether to build the factory. This is a simplified version of a more complete story we will consider in ch. 17.

Main idea is that the level of investment is affected by the real interest rate – the real cost of borrowing money from the bank.

Compare revenue to cost to see if is profitable:
Say revenue is what can rent to bakery: say 10 thousand 1992 $ a year (real terms).
The cost this year is not the cost of the goods to build the factory, but whatever the developer has to pay the bank for borrowing the money. Call this the real interest rate, r. Small r - use R for rental rate of capital. (Note this is the real interest rate: discuss this later.) Say need to borrow 100 thousand $ to build.

\[
\text{Profit} = \text{payment from renters} - \text{payments to the bank} \\
= $(92)10 \text{ thousand} - r \times $(92)100 \text{ thou}
\]

If \( r < 10\% \), will be profitable to build the factory will borrow in the financial market and will purchase the goods for investment.
If \( r \) is higher, will not invest.

Distinction between nominal and real interest rate:
If go to bank, rate quoted is nominal, say 8%. So number of dollars firm owes bank rises by 8% every year. But say inflation is 5% a year, then the number of goods each dollar can buy falls by falls 5% every year. Real cost of borrowing money is only 3%, if measure in terms of what dollars buy, not dollars themselves, i.e. Real terms, real interest rate.
Write "r" for real interest rate, adjusted for inflation.
What if developer has the wealth to purchase the goods and services without borrowing? Decision is basically the same - choice between keeping its wealth in the bank, where earns interest rate \( r \), or using it to build mini-mall where earns rent of bakery. Will build if revenue each year exceeds the interest rate.

Point is that real interest rate is the cost of financing the investment. Low \( r \) leads to more investment, high \( r \) leads to less investment. Write this in a function: \( I = I( r ) \).

This investment is a part of demand in goods market. But borrowing that finances investment is demand for loanable funds in the financial market.

d) Government purchases.

Government purchases of are a third component of demand in the goods market. If government purchases bricks to build military base, those bricks can’t be used to build factory, or if buy bread to feed soldiers, cant be purchased by you or me.

Will assume for now that level of government spending is constant at some fixed level: assume constant: \( G = Gbar \).

Also consider taxes. Taxes affect disposable income, \( Yd = Y - T \).

Assume for now that \( T \) is constant at some fixed level: assume \( T = Tbar \).

If \( G = T \), then say that government budget is in balance,

If \( G > T \), then \( G-T \) is the government budget deficit. Must borrow in the financial market to finance this. Usual way to do this is for government to sell bonds issued by the Treasury, paying interest.

This is another part of demand in the financial market for loanable funds.

Can refer to \( T-G \) as public saving, so government deficit is negative of government saving. A deficit can be called public dissaving.
2a) **Equilibrium in good market:**

Look at demand side of goods market:

\[ Y = C + I + G \]

\[ C = C(Y-T) \]

\[ I = I(r) \]

\[ G = G_{bar} \]

\[ T = T_{bar}. \]

Look at supply-side of goods market:

\[ Y = F(K_{bar}, L_{bar}) = Y_{bar} \] (assuming factors constant at fixed levels for now.)

Want supply = demand in the goods market:

\[ Y_{bar} = C(Y_{bar}-T_{bar}) + I(r) + G_{bar} \]

Everything here is fixed, except for investment, which is a function of \( r \). Real interest rate plays important role here - it will adjust so as to make supply equal demand. Does this by changing the level of investment.

If interest rate is too high, investment will be too low, demand less than supply. If interest rate too low, investment too high and demand exceed supply.

b) **Equilibrium in financial markets:**

We can see how \( r \) changes to bring about equilibrium by looking at financial market. Here \( r \) acts to equate supply and demand of loanable funds, reflection of what going on in goods market.

Supply in the financial market is national savings, private plus public saving. Define:

- **Private saving** is what households earn but not spend - what deposit in bank as saving: \( S_{p} = Y_{bar} - T_{bar} - C(Y_{bar}-T_{bar}). \)

- **Government saving** is what government collects in taxes less what spends, negative of government budget deficit: \( S_{g} = T_{bar} - G_{bar}. \)

**Supply of loanable funds** = \( S_{p} + S_{g} = Y_{bar} - C(Y_{bar}-T_{bar}) - G_{bar} = S_{bar} \)

Demand for loanable funds in financial market is borrowing for investment: \( I = I(r) \)

**Equilibrium condition:** \( S_{bar} = I: \)

---

<table>
<thead>
<tr>
<th>r</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>r*</td>
<td>I(r)</td>
</tr>
</tbody>
</table>

S-bar

I,S

What if \( r \) too low: demand for loanable funds exceeds supply, so bid up \( r \) as compete for scarce funds.
See that this is just a reflection of equilibrium in the goods market. Equilibrium conditions for both markets are really same thing. Can rearrange financial market condition:

\[ S_{\text{bar}} = I(r) : \]
\[ Y_{\text{bar}} - C(Y_{\text{bar}} - T_{\text{bar}}) - G_{\text{bar}} = I(r) \] same as goods condition

Main point: The interest rate adjusts to bring about equilibrium in the goods market and the related financial market for loanable funds.

3a) Fiscal Policy - increase G

Use model to analyze a policy experiment. First what if government increases government expenditure.

What will this do:
Increase in government spending not financed by rise in taxes means government is borrowing to finance it – a fall in public saving, so total saving falls:

\[ S_{\text{bar}} = Y_{\text{bar}} - C(Y_{\text{bar}} - T_{\text{bar}}) - G_{\text{bar}} \]

This shifts S-bar line left. At original real \( r \), would be excess demand for loanable funds. Says equilibrium real interest rate must rise. Are less loanable funds, demanders who want to borrow to finance investment will try to outbid each other to get the funds. The \( r \) rises.

Another way to view from goods market: government laying claim to more goods (bricks and bread). Are fewer goods left to be used for investment. Rise in interest rate discourages demand for goods for investment purposes. Call this crowding out of investment by government expenditure.
b) **Use algebra:**

suppose:  
\[ Y = 5000 \]
\[ G = 1000 \]
\[ T = 1000 \]
\[ C = 250 + 0.75(Y-T) \]
\[ I = 1000 - 5000r \]

Here are told value of some variables: \( Y, G, T \)  
Want to use model to find values of others: \( r, C, I \)

First set are called exogenous variables: determined outside the model.  
Second set are called endogenous variables: determined within the model.

Find equilibrium \( r \):
\[ Y = C + I + G \]
\[ 5000 = 250 + 0.75(5000-1000) + 1000 - 5000r + 1000 \]
\[ -250 = -5000r. \]
\[ r = 0.05. \]

and \( I = 1000 - 5000 \times (0.05) = 750. \)

What if \( G \) increase to 1250.  
Know \( I \) must fall 250.  
\[ 5000 = 250 + 0.75(5000-1000) + 1000 - 5000r + 1250 \]
\[ -500 = -5000r. \]
\[ r = 0.10. \]

Means \( I = 1000 - 5000 \times (0.1) = 500. \)

Empirical:

Find some support in looking at UK history, during wars, interest rate rises. Sensible because government expenditure rises during wars. Supports our theory. However, must be careful in test. During wars other variables may change also. For example, rationing may cut consumption.

c) **Decrease in Taxes.**  
Consider a cut in taxes.  
This will:  
Raise disposable income.  
This raises consumption, by amount MPC \(*(-\Delta T)\).  
This lowers total national saving (although private saving rises).  
shifts saving curve left.  
Real interest rate rises.  
Graph is like above.  
Rise in \( C \) lays claim to goods, excess demand for goods if investment stays the same. Rise in \( r \) lowers investment. Crowding out of investment here by consumption.
d) Consider increase in investment demand

Possible reasons:
- new invention: railroad
- special tax breaks by government
- expectations shift for future prospect of profitability

In graph: shift I-curve right: at any given real $r$, want to borrow more for $I$.

Effect is rise in $r$. But this does not increase investment here. Real $r$ rises enough to discourage investors from borrowing any more. But the overall level of investment can’t change, because there is only so much loanable funds provided by savings, and this is fixed.

More realistic of consider how changes in the interest rate affect saving. Real $r$ here is not just cost of borrowing, but is return to saving. A higher $r$ might convince some people to cut back on their consumption and put more funds in the bank.

Draw saving now as a positive function of the real $r$. Rise in $r$ means fall in consumption, or rise in saving.

Now consider rise in investment demand:

Now the rise in real $r$ induces a rise in saving, which allows a rise in investment.
4) Identification problem: discuss in class

5) Conclusion:

Have developed a neoclassical model that explains production, distribution and allocation of economy’s goods.

Because considers interactions between all the markets and agents, is called General Equilibrium model. - Need equilibrium in all the markets at the same time.

Emphasizes how prices equate supply and demand in each market. Factor prices equate supply and demand in factor markets. Real interest rate equates supply and demand for goods in goods market, or equivalently, equates supply and demand for loanable funds in the financial market.

Note the assumptions we have made:
1) Assumed capital stock, labor force and production technology are fixed. Will change this in next two chapters.
2) labor force is fully employed – change in chapter 6
3) Ignored role of money – introduce it in chapter 7
4) Assumed all market clear. But takes time for prices to adjust to do this. Will look at short run when markets don’t clear in second part of course.