ECN 106 Macroeconomics 1

Lecture 8

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Roadmap for this lecture

- The short run equilibrium effect of supply shocks
- Stabilization policy
- Banks and money creation
  - The money supply multiplier
  - Outside and inside money
- Mankiw Chapter 19.1

Recapping: equations

(Y, r) space	Short run	Long run
Labour market	-	LRLE $Y = \bar{Y}(\bar{z}, \mu)$
Goods market	IS $Y = \bar{C} + c(Y - \bar{T}) + a - br + \bar{G}$	
Money market	LM $\frac{\bar{M}}{P} = YL(r + \pi^e)$	

(Y, P) space	Short run	Long run
Labour market	SRAS $P = \bar{P}$	LRAS $Y = \bar{Y}(\bar{z}, \mu)$
Money market	AD $Y = Y^{AD}\left(\frac{\bar{M}}{P}, \bar{Z}, \pi^e\right)$	

Only difference is the labour market.

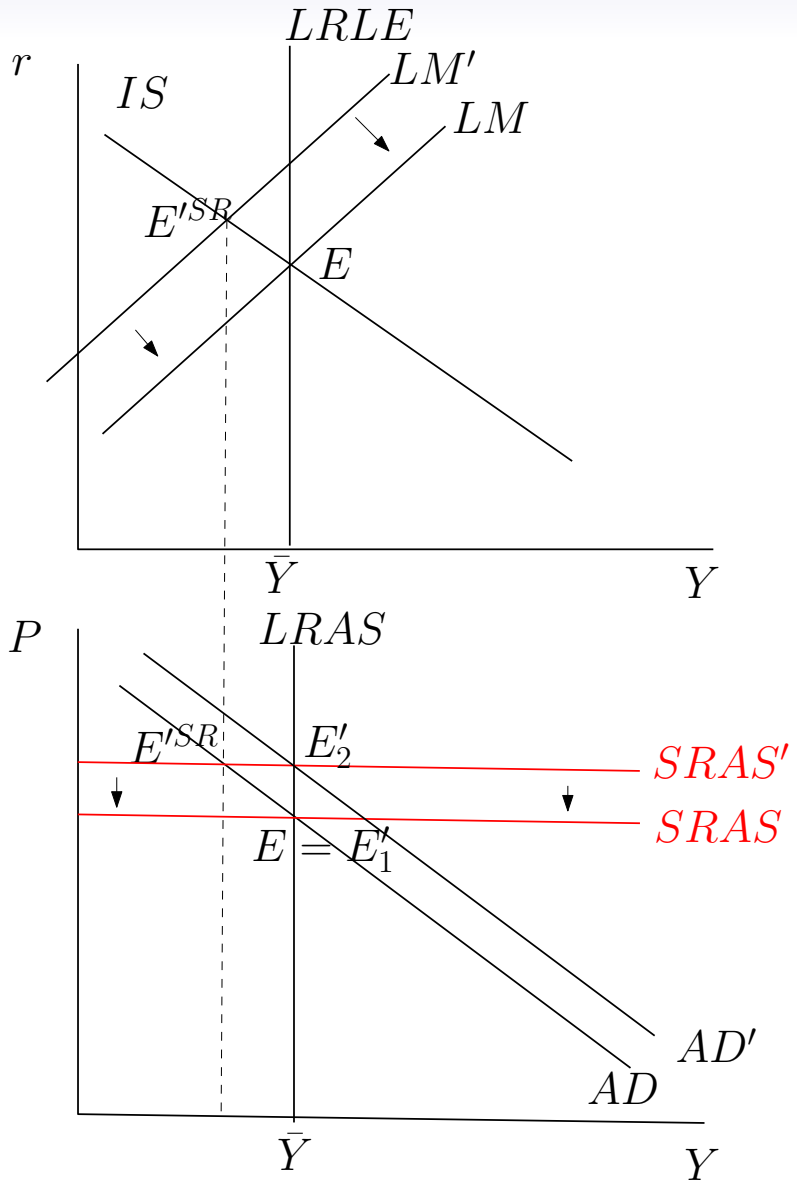
Supply shocks

- Shocks that alter the cost of producing goods and services
- Alter the price that firms charge.
- E.g. shocks to price of raw materials, oil.
- We consider two types of shocks:
  - Shocks to SRAS: change in $\bar{P}$
  - Shocks to LRLE/LRAS: change in $\bar{\mu}$ or $\bar{z}$.

Shock to SRAS

- Consider a **temporary** increase in the price of oil which firms pass onto customers by raising $\bar{P}$.
- The effect depends on how the Central Bank responds.
- We consider two alternative scenarios.
  1. CB holds the money supply constant.
  2. CB holds the interest rate (and output) constant.
     - No trade-off between constant output and constant interest rate in the face of SRAS shocks.

Shock to SRAS



Shock to SRAS

- If the Central Bank does not accomodate the shock (constant M and AD), the economy undergoes a recession until $\bar{P}$ fall back to original level.
  - Stagflation: higher inflation and higher unemployment.
  - Compare to demand shocks: negative correlation inflation unemployment.
- If the Central Bank raises M and AD to keep the economy at the natural output level, the price level is permanently higher.
- Difficult balancing act for Mervyn King and the MPC!
- Even more difficult, given that the economy has also been hit by negative goods market shocks (fall in private demand and fiscal contraction).

Cheat sheet 3

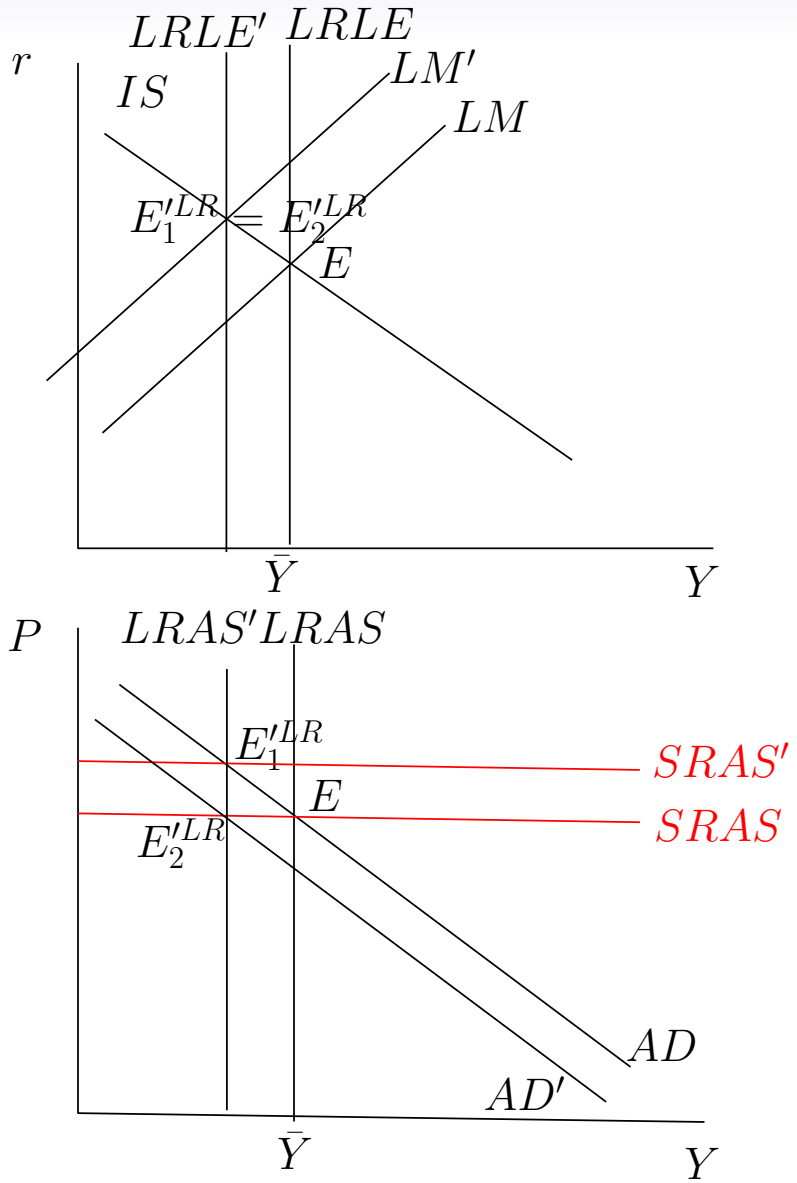
Response to an **inflationary** SR supply shock.

	Constant M		Constant Y	
	Short run	Long run	Short run	Long run
Y	$\downarrow$	$=$	$=$	$=$
r	$\uparrow$	$=$	$=$	$=$
P	$\uparrow$	$=$	$\uparrow$	$\uparrow$

Shock to LRLE/LRAS

- Consider an increase in μ (could be due to a **permanent** increase in the price of oil) or an increase in union power (higher $\bar{z}$).
- Suppose that initially firms keep $\bar{P}$ constant.
- The effect depends again on how the Central Bank responds.
- We consider two alternative scenarios.
  1. CB holds the money supply constant.
  2. CB holds the price level constant.

Shock to LRLE/LRAS



Shock to LRLE/LRAS

- Output falls in the LR.
- If the Central Bank keeps M constant, output falls but is above its new LR value in the SR.
- If the Central Bank cuts M and AD to keep P constant the economy moves immediately to the new natural output level.
- No trade-off between price and output stabilization in the face of shocks to the natural output level.

Cheat sheet 4

Response to an **inflationary** LR supply shock

	Constant M		Constant P	
	Short run	Long run	Short run	Long run
Y	$=$	$\downarrow$	$\downarrow$	$\downarrow$
r	$=$	$\uparrow$	$\uparrow$	$\uparrow$
P	$=$	$\uparrow$	$=$	$=$

First and second Opec oil shocks

- 1973-74: Yom Kippur war
- 1979: Iran revolution

Year	Change in oil price	Inflation (CPI)	Unemployment rate
1973	11 %	6.2 %	4.9 %
1974	68 %	11	5.6 %
1975	16 %	9.1	8.5 %
⋮	⋮	⋮	⋮
1979	25.4 %	11.3 %	5.8 %
1980	47.8 %	13.5 %	7 %
1981	44.4 %	10.3 %	7.5 %
1982	-8.7 %	6.1 %	9.5 %

Stabilization Policy

Stabilization policy

- To what extent a change in the fiscal or monetary policy can affect the level of output and stabilize it around its full-employment equilibrium value.
- In the long run, neither fiscal nor monetary policy affect output at all.
  - Monetary policy affects only the price level.
  - Fiscal policy affects the price level and, through the interest rate, the composition of demand.

How effective can policy be?

Our analysis has implied that in the SR fiscal and monetary policy can achieve the desired objectives perfectly. Reality is less simple.

1. We have implicitly assumed that our policy changes are permanent (e.g. government expenditure G or the money supply M are changed and kept at their new level forever).
2. We have abstracted from the dynamics of adjustment and implicitly assumed that policy is immediately effective (no lags).
3. We have not considered ongoing uncertainty (shocks).

Permanent vs temporary fiscal policy changes

- A permanent increase in government expenditure financed by borrowing implies that the stock of government debt keeps growing unboundedly. To avoid bankruptcy at some point in time the government will have to either cut expenditure or increase taxes.
- The horizontal shift in the IS curve is smaller than $\frac{1}{1-c}\Delta\bar{G}$.
- **Morale: in practice the change in fiscal policy necessary to achieve a given change in output may be significantly higher than in our textbook case.**

The dynamics of adjustment

- If the price level adjusts very fast the effect of policy on output is short lived. The SRAS shifts and the economy quickly goes back to full employment. Prices are likely to adjust more quickly in high inflation environments (the purchasing power loss from non-adjusting is higher)
- In order to forecast the effect of a policy change policymakers need to take into account the effect of the policy change on expectations (Lucas critique).

Lags + uncertainty

- Both monetary and fiscal policy affect output with a lag.
- Fiscal policy suffers from longer implementation lags (inside lags) as it has to be approved by parliament.
- Monetary policy has short implementation lags, but takes 18-24 months to work its way through the economy (outside lag).
- Since the economy can be subject to different unforeseen shocks, the policy change may kick in when the conditions that motivated it have already been reversed.
- Forecasting is very important, exactly to avoid this problem.

Should policymakers engage in active stabilization

We can now go back to this question.

- In the long run, nothing to gain.
- In the short run, if prices adjust quickly, policy is not very effective anyway.
- Even if there is room for short run stabilization, because of uncertainty and policy lags a given policy change may kick in at the wrong time.

Morale: fine tuning the economy is nearly impossible and likely to be counterproductive. But stabilization in the face of large persistent shocks is desirable.

The effectiveness of policy: bottom line

- Fine tuning fallacy: it is unlikely that discretionary policy can be used to fine tune the economy.
- Discretionary policy may rescue the economy from large negative shocks. Exactly what is going on now.
- Monetary policy is believed to be the most effective tool for short run stabilization.
- Announcements have important effects by influencing expectations ("open-mouth operations")
- Fiscal policy should concentrate on ensuring that the appropriate level of automatic stabilization is in place.

Banks and money creation

Money and money supply

- All assets that can readily be used to carry out transactions constitute money. So M^d is demand for $Cu + D$, where Cu is currency and D is checkable deposits.
- Up to now we have considered a world without banks, hence without deposits. In that world, the money supply coincides with the supply of base money (only notes and coins).
- We now want to study how the existence of banks and their role as suppliers of deposits affects the supply of money.

The Central Bank balance sheet

ASSETS	**LIABILITIES**
1. Bonds	4. Notes and coins:
2. Gold	a) held by the public (Cu)
3. Foreign currency	b) held by banks 5. Banks' deposits at CB } (R)
	6. Others + Net worth

Monetary base H: liabilities of the Central Bank that can be used as money. $H = 4 + 5 = Cu + R$

The money supply with banks as a safe store (100% reserve requirement, $D = R$)

- Agents keep no currency ($Cu = 0$) and use only cheques.
- **Reserves R:** notes and coins that banks have received but not lent

Banks as safe store: balance sheets

CB	
Assets	Liabil.
Bonds 100	100 Notes

Public	
Assets	Liabil.
Bonds -100	
Notes 100	
-100	
Deposits 100	

Banking sector	
Assets	Liabil.
Notes 100	100 Deposits

$$Cu = 0 \tag{18}$$

$$M = D \tag{19}$$

$$D = R = H \tag{20}$$

$$M = H = 100. \tag{21}$$

Fractional-reserve banking

- Agents still keep no currency ($Cu = 0$) and use only cheques.
- For every unit of deposits banks can lend a fraction $(1 - \theta)$ but they have to keep θ as reserves. Let $\theta = 10\%$.

Fractional-reserve banking: balance sheets

CB		Public		Banking sector	
Assets	Liabil.	Assets	Liabil.	Assets	Liabil.
Bonds 100	100 Notes	Bonds -100		Notes 100	100 Deposits
		Notes 100		-100	
		-100		Loans 90	90
		Deposits 100		81	81
		90	90 Loans	⋮	⋮
		81	81	Reserves 10	
		⋮	⋮	9	
				⋮	

Fractional-reserve banking: multiplier

$$Cu = 0 \tag{22}$$

$$M = D \tag{23}$$

$$R = H \tag{24}$$

$$D = R/\theta = H/\theta \tag{25}$$

$$M = \frac{1}{\theta} H > 100. \tag{26}$$

- Banks create money by lending against checkable deposit as long as $\theta < 1$.
- The ratio M/H, $(1/\theta)$ is called the money supply multiplier.

Fractional reserve banking with public currency holdings

- Now individual do not deposit all their money but keep a fraction c in the form of notes and coins and deposit the remaining fraction $(1-c)$; i.e. it is $Cu = cM$ and $D = (1-c)\,M$
- Now the monetary base has two uses: part of it is held as currency by the public and part as reserves by banks; i.e.

$$H = Cu + R. \tag{27}$$

- Reserves are a fraction θ of deposits ($R = \theta D$).

The money supply multiplier: general case

The money supply multiplier is

$$\frac{M}{H} = \frac{M}{Cu + R} = \frac{M}{cM + \theta\left(1 - c\right)M} = \frac{1}{c + \theta\left(1 - c\right)}. \tag{28}$$

$$M = \frac{1}{c + \theta\left(1 - c\right)} H = mm \cdot H. \tag{29}$$

- The money supply is affected not only by the central bank change in the monetary base H but also by the credit system behaviour (θ) and the public's decisions (c).
- The central bank controls perfectly the supply of base money, but imperfectly the supply of money M_1.

Money market equilibrium

$$\frac{M}{P} = YL(i) \tag{30}$$

or

$$mm \cdot \frac{H}{P} = YL(i) \tag{31}$$

with $mm = \frac{1}{c+\theta(1-c)}$.
Changes in mm shift LM at unchanged base money H: $c \uparrow$ or $\theta \downarrow$ imply $M \downarrow$ at given H.

Money market eq. implies financial market eq.

- Central bank's open market operations alter the relative supply of bonds B^s and base money H^s.
- Since now the supply of base money (H^s) differs from the supply of M_1 (M^s), does money market equilibrium still implies bond market equilibrium? Yes.

The composition of private sector wealth

- The (net) wealth of the private sector as a whole can only be invested in assets issued by (liabilities of) agents outside the private sector: i.e. the government and the central bank.
- Private loans (and/or bonds) are not net wealth (they are the liability of somebody else in the private sector), nor deposits are.

Aggregate wealth

Government

Assets	Liabil.
	200 Bonds
	-200 Net Worth

CB

Assets	Liabil.
Bonds 100	100 Notes

Public

Assets	Liabil.
Bonds 100	450 Loans
Notes 50	200 Net worth
Deposits 500	

Banking sector

Assets	Liabil.
Loans 450	500 Deposits
Reserves 50	

- That is why base money is called also **outside money** (as opposed to deposits which are **inside money**).
- Because it is a net claim of the private sector.

Money market clearing implies bond market clearing

So the only two assets in which net, private wealth can be invested are government bonds and base money.

$$W = B^d + H^d \tag{32}$$

$$W = B^s + H^s \tag{33}$$

Hence, $H^s = H^d$ implies $B^s = B^d$.
It remains to show that $H^s = H^d$ is fully equivalent to $M^s = M^d$

Demand for base money

$$H^d = Cu^d + R^d = cM^d + \theta D^d \tag{34}$$

$$D^d = (1 - c) M^d \tag{35}$$

$$H^d = cM^d + \theta (1 - c) M^d \tag{36}$$

$$H^d = [c + \theta (1 - c)] M^d = \frac{1}{mm} PY L(i) \tag{37}$$

Equilibrium on the market for base money

Equilibrium requires $H^s = H^d$ or

$$H = \frac{1}{mm} PYL(i) \tag{38}$$

which can be written as

$$mm \cdot H = M = PYL(i) \tag{39}$$

Slippage between H and M : the Great Depression

Year	Base	% ch	M2	% ch
7/1929	7.123	-	55,416	-
7/1930	6.925	-2.8	54,645	-1.4
7/1931	7.321	5.7	52,581	-3.8
7/1932	7.858	7.3	44,833	-14.7
7/1933	7.891	.4	40,897	-8.8

Figure: Source: Bryan Caplan 1998

- Compare the behaviour of base money in 1931-33 (rising) to that of M_2 (falling dramatically).
- The slippage is due to the dramatic fall in the money multiplier

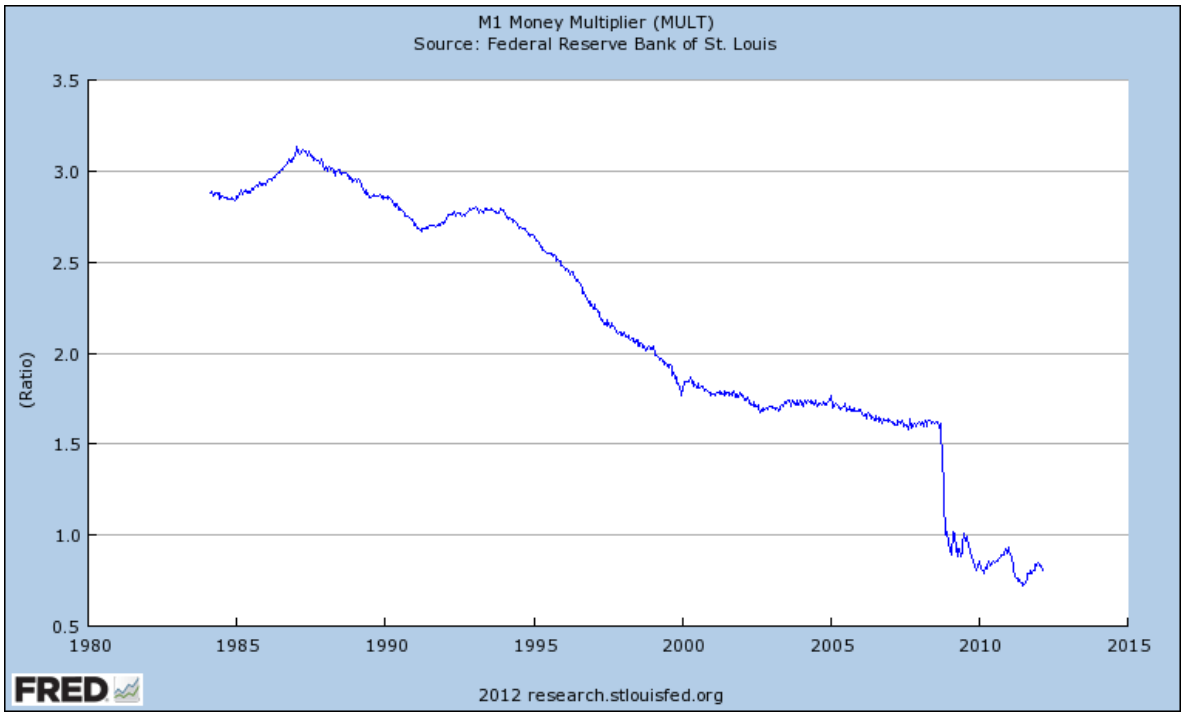
$$mm = \frac{1}{c + \theta (1 - c)}$$

Why the fall in M

- Higher c : people withdrew money from banks for fear of bank failures (e.g. queues outside Northern Rock in 2008).
- Higher θ : banks increased reserves/reduced loans to meet deposit withdrawal and for fear of not being paid bank.
- In the Great Depression the Fed failed to expand H to keep the supply of M from falling.

Money multiplier in the Great Contraction

Same story in the current recession: big fall in the money supply multiplier ...



but central banks have expanded the quantity of base money dramatically to offset the impact on the money supply.