more jobs ⇒ equity imploded

labor ↑ ⇒ wage ⇑
⇒ spend ⇑
⇒ price ↑
⇒ inflation
⇒ interest rate ↑ (expected) ⇒ ⇓ (stagnation)
⇒ corporate profit ⇓
⇒ sell off

Higher rates ⇝ Corporate profits ↓ ⇝ sell off

In which case

#2

GDP: gross domestic product ; "output of economy"
(
final goods

given some period...

① Firm A: 100, −80, net 20 → Firm B: 200, −70, −100, net 30

⇒ "200" final goods Intermediate X
(and services)

"Final output"

② SUM of value added to the economy

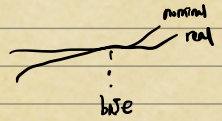
ex) VA of steel 100
VA of car 200−100
⇒ 100+100=200 Sum of (total revenue − intermediate (outsourced) goods & services)

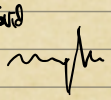
③ Sum of income
wages 70+50 = 120
profit 30+20=50
200

production = income (⇝ micro, economy as a whole is "closed")

[Nominal GDP = P×Q (producing more goods, price ↑) denoted Y_t
Real GDP = constant price × Q denoted Y_t

· We would pick one year as base.

* 

* Card 

* Labor force $E+U$

employed E

unemployed U (look for jobs)

unemployed rate $\frac{U}{E+U}$

participation rate $\frac{E+U}{\#\text{ total working age}}$

inflation rate $\pi_t = \frac{P_t - P_{t-1}}{P_{t-1}}$

deflation $\pi_t < 0$

price level: GDP deflator $P_t = \frac{\$Y_t}{Y_t}$ (high ⇒ inflation)

Consumer price index (CPI)

Core CPI (focus on few goods)

	Expenditure			price		Quantity	
yr 1	100	106		1	1	100	106
yr 2	105 (.517)	98 (.483)		.80	1.05	131.3	93.3
yr 3	103	107		.60	1.10	171.7	94.5
yr 4	99 (low)	100		.40 (low)	1.15	249.5 (high)	87.0

-.318 ↓ -.120

$.517 \times .313 + .483 \times -.120 = .104$

real = $\$206 \times 1.104 = 227.42$

nominal = 203 (same)

#3 Recession: ↓ in aggregate output

Equilibrium output
- short — changes in demand, production, and income
- medium — price
- long — growth

Composition of AD

① C : Consumption

② I : investment (residual, non residual)

③ G : government spending (government gives you a check, etc)

④ X (+exports) ← sold to foreigner

⑤ IM (-imports) ← bought domestically

⑥ Inventory ← figure. wait for

"Z"

$$GDP = C + I + G + (X - IM) + (Inv)$$

most ; why we worry about "consumer sentiment"

In closed economy

$$Z = C + I + G$$

Behavioral assumption

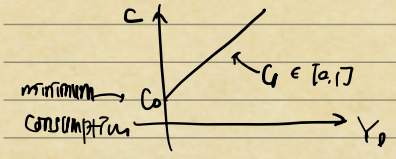
{ Exogenous variables (outside model) — G, T, I (two! investment)

Endogenous variables (within model) — $C = C(Y_D)$ (disposable income)

$C = C_0 + C_1 Y_D$ ($Y - Tr$ + tax)

for example of

$= C_0 + C_1 (Y - T)$



$$Z = C_0 + C_1 (Y - T) + \bar{I} + \bar{G}$$

not a function

True for short term

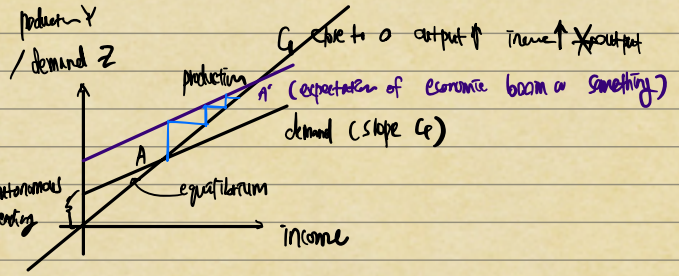
$Y = Z$ (equilibrium condition)

output = real GDP = income (3 different perspectives)

aggregate demand

$$Y = \frac{1}{1 - C_1} (C_0 - C_1 T + \bar{I} + \bar{G})$$

multiplier C_1 close to 1 → income ↑ output ↑ income ↑ output ↑ ...



C_1 close to 0 output ↑ income ↑ ~~output~~

Investment = Saving

$S = Y_0 - C = Y - T - C$) private & public saving

$S^G = T - G$

$I = S + S^G$

$= Y - C - G$ "IS relation"

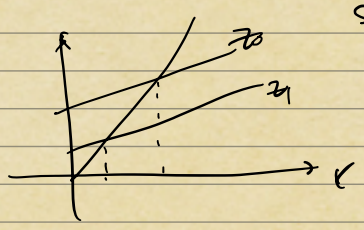
$\hookrightarrow Y = C + G + I$

"paradox of Saving" (counter intuitive nature of micro)

$\bar{I} = S(Y) + \bar{S}^G$

$S(Y) \uparrow$, Y should decline in the short run (saving more $\rightsquigarrow$ recession)
elegance

more saving (curve shift up)



Sometimes you cool off the economy deliberately by saying "economy will go down" maybe due to inflation

$G \downarrow T \uparrow$ "contractional fiscal policy" ($\Rightarrow$ aggregate demand $\Downarrow$)

$\Leftarrow$ expansionary

#4

Jerome Powell - decides interest rate of central bank

Kotsuo Veda - bank of Japan $\rightsquigarrow$ has to do unconventional things!

Central bank - Federal Reserve System

$\rightsquigarrow$ Board of governors (7, one of whom is president)

Federal reserve banks (12 regional banks)

FOMC (7 governors + 4 regional bank presidents)

federal open market committee

rotate (most of them)
NY: exception

(ECB, each country sends one member, other countries similar system)
vs. regional banks

Monetary policy: influencing economic activity in the short run $\rightsquigarrow$ medium/long run: price, inflation
mostly for short run

Fiscal policy $\Leftrightarrow$ Tax $\downarrow$ $G \uparrow$: output $\uparrow$ (i.e. recession)

fastest tool but indirect
(not directly influence output)

automatic stabilizer (rule-based)

discretion $\rightsquigarrow$ might require congress approval

Monetary policy $\Rightarrow$ buy bonds, instruments, etc

two assets { money : for transactions (currency, checkable deposits ⇝ no interest)
bonds : not for transactions but ∃ interest rate

⇓

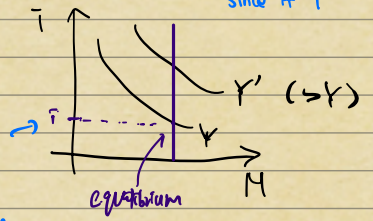
question of decision making

Focus on Money (it suffices to...)
given total wealth

$M^d = \$ Y L(i)$ $L' < 0$

money demand = nominal income, depending on interest rate

nominal income
since if price goes up, you spend more



Central bank
interest rate
given $Y.M

Lets consider simple model (no intermediaries, i.e. banks)

supply $M^s = M$

$M^s = M^d = \$ Y L(i)$

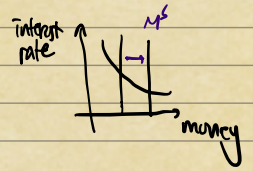
Central bank decides supply of money ⇝ decide ⇝ interest rate

This happens in the past. Not anymore

In practice M^d move all around.

⇒ interest rate changes
if demand ⇑
⇓ interest rate goes up
until excess demand disappears

Now, tell interest rate, and then offer M the market needs for that interest rate

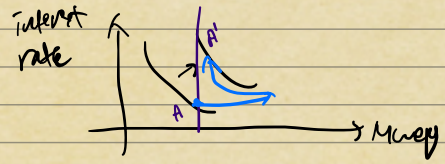


lower interest rate ⇝ demand ⇑ ⇝ equilibrium achieved

"expansionary monetary policy"

In modern scenario declare "cut the rates" and behind the scenes, they increased the money supply.

Suppose nominal income goes up. (under recession, most of the time)



1) inflation 2) output ↑

demand ⇑ ⇒ interest rate ⇑ to compensate

So set interest and supply ⇑ (if not, interest rate will go up)

supply money rate ↘

open market operations

- expansionary : central bank bought bonds
- contractionary : sells bonds

Balance sheet

Assets	Liabilities
Bonds	Money
+	+
/m	/m

(expansionary)

Now it's very huge due to global crisis.

$i = \frac{101 - P_B}{P_B}$ so bond price tells us interest rate

expansionary : buy bond ⇝ price ⇑ ⇝ interest rate ↓

open market

In reality, banks = financial intermediaries

liability for banks: deposit

liability for central bank: deposit ⇐ "reserves"

people → banks → central bank

↳ buy financial instruments

Central Bank

Bonds	Central bank money (high power money)
	= Reserves + Currency

Banks

Reserves	Checkable deposits
Loans	
Bonds	

Assume people hold no cash

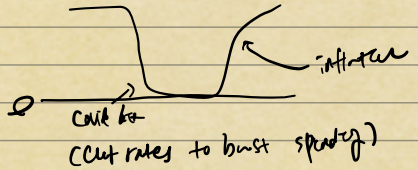
$M^d = \$Y\, L(i)$

$H^d = \theta\, \$Y\, L(i)$ ← reserve ratio

demand for high power money

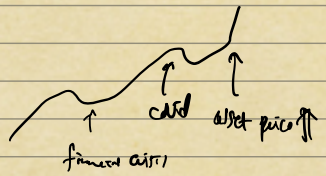
$H = H^d = \theta\, \$Y\, L(i)$ ← supply of central bank money ⇒ amount they can control

"Federal funds rate"

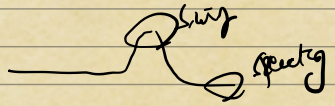


#5

Net worth for household



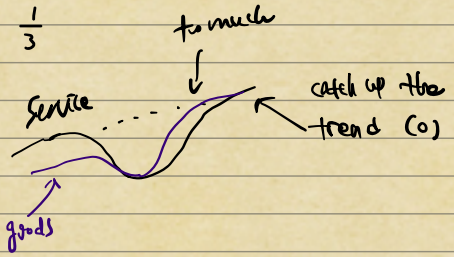
lots of savings in COVID ⇝ started spending post COVID (inflation)



lower income segments: excess saving is already gone

IS-LM model

{ Service $\frac{2}{5}$
Goods $\frac{1}{3}$



[Monetary policy: anti-cyclical
Fiscal policy: more targeted

goods market - financial market

$I = S$ Supply: M

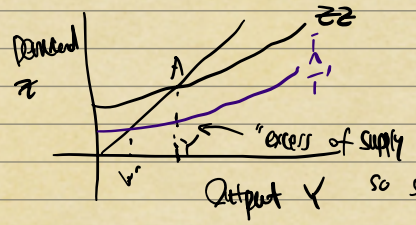
Demand: $\$Y\ L(i)$

"borrowing cost"

$I = I(Y, i)$ $I_Y > 0$ $I_i < 0$

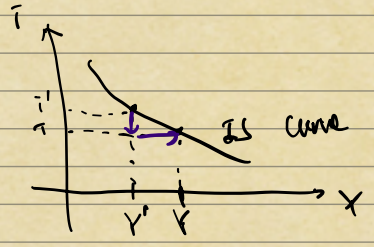
increasing decreasing

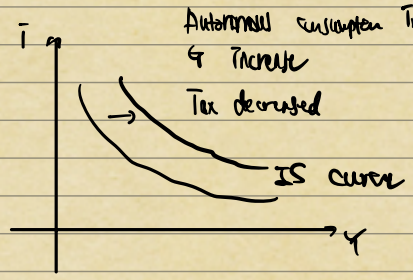
$Y = C(Y-T) + I(Y,i) + G$ ⇝ output & interest rate relation "IS relation"



- ZZ steeper (marginal propensity to invest)
- ZZ depends on $\bar{i}$

and tend to decrease a lot
↑ due to slope





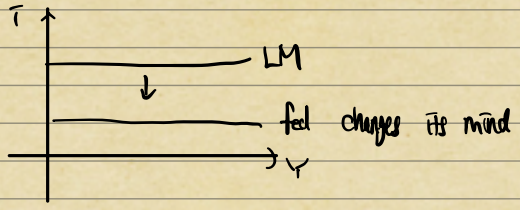
Equilibrium in finance

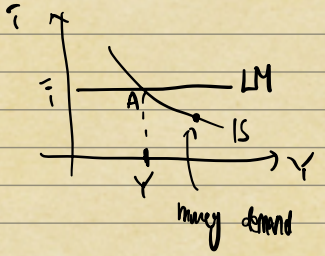
$M = \$Y L(i)$

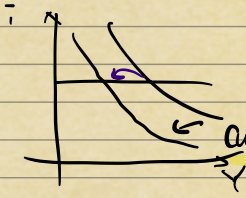
$\frac{M}{P} = Y L(i)$ Equilibrium: real money supply = real money demand

deflation ↑ upward

Central bank tells us what $\bar{i}$ they use.



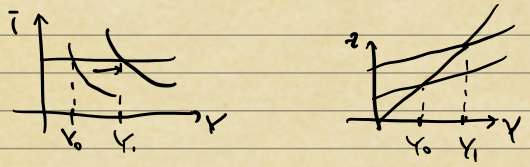




Contractional fiscal policy (Why we call contractionary)

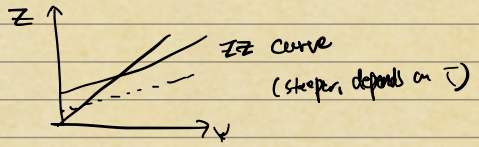
G ↓ T ↑

Fiscal expansion?



#6

$IS \Rightarrow \quad Y = Z = I(Y, \bar{i}) + C(Y) + G$

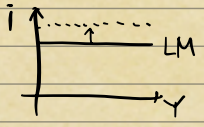


$T \Uparrow \Rightarrow Z \Downarrow \Rightarrow Y \Downarrow \Rightarrow I, C \Downarrow \Rightarrow Z \Downarrow \Rightarrow \ldots$

$LM \Rightarrow \quad M = \$Y L(\bar{i})$

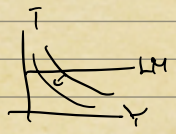
$\frac{M}{P} = YL(i)$

real money supply = real money demand



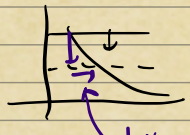
Contractionary Fiscal policy: (RS) $T \Uparrow$, $G \Downarrow$

net policy: $C \Downarrow$, wealth $\Downarrow$



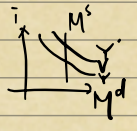
Expansionary Monetary policy: $\bar{i} \downarrow$ (Money supply $\Uparrow$)

excess of aggregate demand

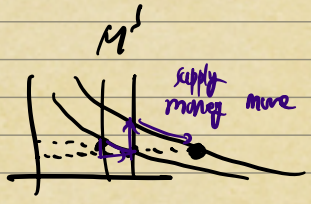


both need supply of money

recall...



$\bar{i} \Downarrow \Rightarrow Y \Uparrow \Rightarrow$



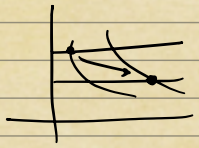
Monetary policy takes Effects

Fiscal → IS (o)

→ LM (x)

Mnetary → LM(↓)

→ IS (↑)

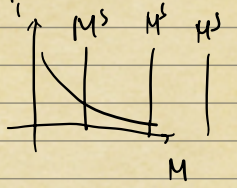
1) 

"All in"

⇒ both expansionary

Q. when? Recession (↓↓ immediate G↑ more targeted)

↳ indifferent (Japan, so they did extensive fiscal policy instead)



monetary policy is ineffective if you reach zero lower bound

"Unconventional monetary policy" there are diff. kinds of bonds in reality

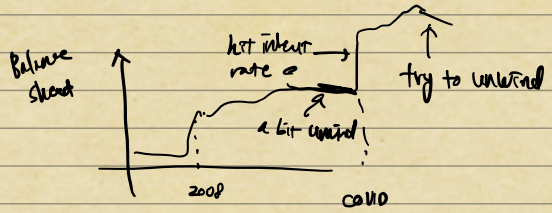
even can cost stock market

Expansionary ⇝ expansion of balance sheet

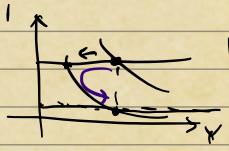
bonds	currency
+	+
Im	Im

QE1 (quantitative easing) : Federal went out buying short term & long term bonds

all sorts of bonds

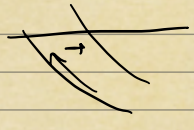


Fiscal policy : a lot during COVID ↺ what you see in a war

2) 

what G↓↓ & ward off recession : "consolidation of the fiscal deficit"

(unless the economy is overheating)

3) 

Government spending↑ : fiscal expansion, monetary contraction

but worried about inflation

↖ reason why central bank is tight

2021: Fiscal expansion. Central bank did not react ⇝ why we have inflation

(maybe thought transitory

though supply catch up fast...)

Lec 7

two realistic dimensions

1) nominal vs. real

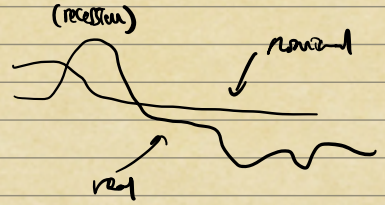
2) risk premium

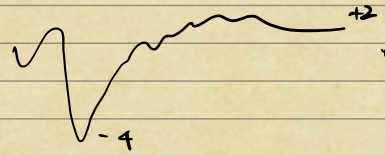
- Nominal rate $\$$ ↓ inflation (+ other things)

  real rate good

- $r = i - \pi^e$
- physical investment depends on real rate
- Investment decision does not depend on inflation

$$1+r = \frac{1+i}{1+\pi^e} \simeq 1+i-\pi^e \quad \left(\frac{1}{1+\pi^e} = 1-\pi^e+\pi^{e2}-\dots \text{ take first order}\right)$$





- $r_t^F = r_t + x_t$ (r_t^F: firm bond interest rate)

  $x_t \uparrow$ economic recession

  moves a lot during business cycle

  ① probability of default

  ② degree of risk aversion of bond holders

(private sector decisions ⇜ depend on risk adjusted real interest rate)

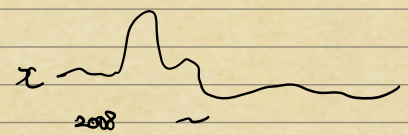
Ignoring ② and only according for ①, (but you can think risk aversion = exaggerating p_t)

$$1+r_t = (1-p_t)(1+r_t^F) = (1-p_t)(1+r_t+x_t) \quad \text{:"risk neutral"}$$

(p_t: risky)

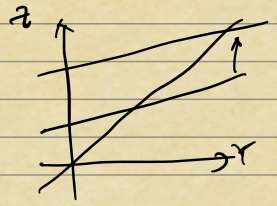
$$x_t = \frac{p_t(1+r_t)}{1-p_t}$$ this dominates in recession

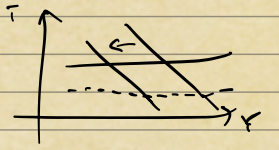
Equilibrium: indifferent btwn treasury & risky bond



IS: $Y = C(Y-T) + I(Y, \bar{i} - \pi^e + \pi) + G$

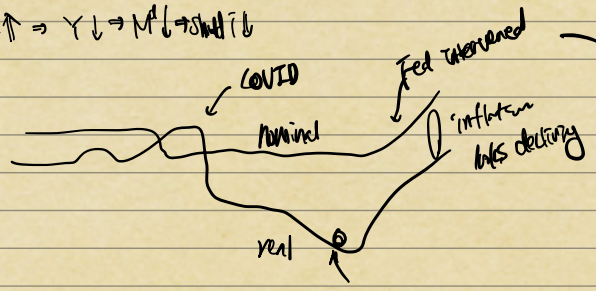
LM: $\bar{i} = \bar{i}$ ← nominal





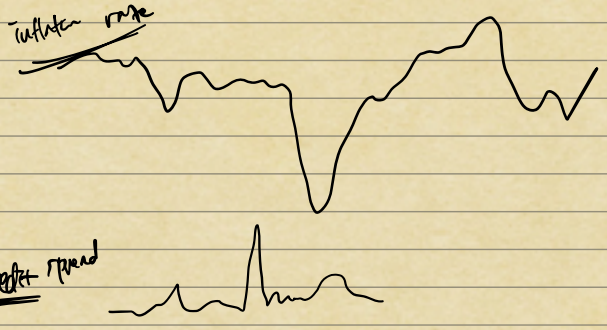
Central bank cuts interest rate
↑ "effectively increased" so..

$\pi \uparrow \Rightarrow Y \downarrow \Rightarrow M^d \downarrow \Rightarrow$ shift $i \downarrow$



Actually inflation didn't decrease as much

2021 inflation ↑↑ ← bottleneck in supply side



Everyone buy bonds, stocks to intervene

x stock ⇒ I ↓↓ ⇒ Central bk buy corporate bonds, long term treasury bonds, even equity
(especially when 0 lower bound)

Bank 6-3

Bank	
Asset	liability: deposit 80
loan, reserves (in)	Capital (own investment) 20

leverage ratio = $\frac{\#\text{Asset}}{\#\text{capital}}$

(risk)

Asset < liability ⇒ insolvent

Expect return of asset 5% 100

liability 4% 80

$\rightsquigarrow 5 - 3.2 = 1.8$ $\quad \frac{\text{profit}}{\text{capital}} = \frac{1.8}{20}$

risk vs. $\frac{\text{profit}}{\text{capital}}$

"Bank ↓" deposit ↓ ⇝ Asset ↓ hard { sell / call
↳ fire sale
↳ "Bank runs"

liquidity of liabilities ↑ ⇝ problem
asset ↓

cf 8 high inflation high unemployment rate

i ↑ ⇉ Y ↓ ⇝ employment ↓
↳ M ↓ ⇝ inflation ↓

months, quarters

Limitation
1) price fixed
2) output = aggregate demand

⇒ not possible if company can't find workers.

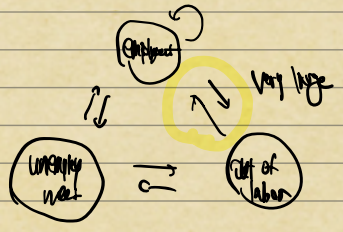
price fixed × table

↑ employment ↓ unemployment

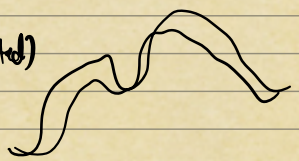
civil labor force ↑

① $\frac{\text{unemployed}}{\text{Civilian labor}}$ = unemployment rate

② $\frac{\text{employed}}{\text{non-institutionalized Civilian}}$ = employment rate



unemployed finding a job (inverted)
vs. unemployment rate



↳ ① employed workers higher prob of losing job
② hard to get out of it if you are employed

Wage determination (union x in the US)
↳ collective bargaining

typically, wage > reservation wage (indifferent if you're employed or unemployed)
"equilibrium"

bargaining power
1) how easy for firms to find workers
2) how hard for workers to find a job if they leave unemployed (can transfer to other firms)

Wage setting equation — workers' strength in the bargaining position / employment protection law, firing costs ⋮ ← more in Europe

$W = P^e F(u, z)$ $F_u < 0$ $F_z > 0$

u: unemployment rate

output: $Y = AN$ ← employment; A: labor productivity

one more worker ⇝ one more unit of good

Y set price for goods

marginal cost of production = W

(price) $P = (1+m)W$

$\frac{W}{P} = \frac{1}{1+m}$ $m \uparrow \Rightarrow W \downarrow$

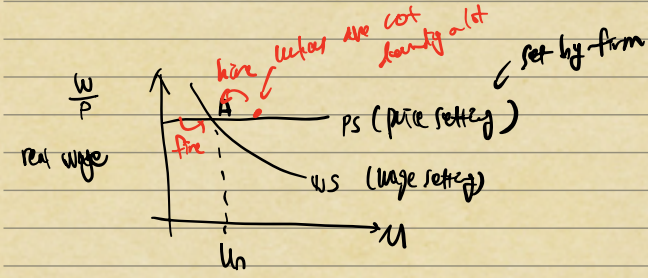
Natural rate of employment

unemployment rate when $P^e = P$

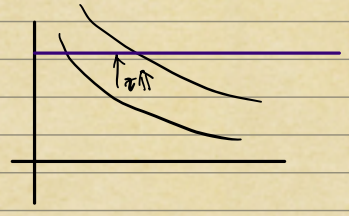
= good proxy for average rate of unemployment in the medium (& long) run

So $\frac{W}{P} = F(u^n, z)$

u^n: natural rate of unemployment / structural rate

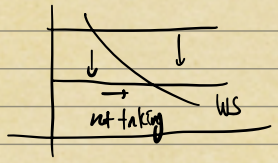


1)



France 1968 ≥ ⇑ wage ↑ but unemployment rate ⇑

2)



Antitrust m⇑ (collusion w. companies)

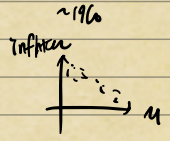
⇒ $\frac{w}{p}$ ⇓

⇒ u⇑ (less unions) (⇐ equilibrium)

next: phillips curve

#9 1958: inflation ⇑ unemployment ⇓

paul: Samuelson & Robert Solow "phillips curve"



$W = P^e F(u,z)$

$P = (1+m) W$

$F(u,z) = 1 - \alpha u + z$ (linear)

P_t → $P = P^e (1+m)(1-\alpha u + z)$ ($u⇑ \Rightarrow W⇓ \Rightarrow P⇓$)

at time t

price & unemployment

need price & inflation rate of change of P

$\frac{P}{P_{-1}} = \frac{P_e}{P_{-1}} (1+m)(1-\alpha u + z)$

$\pi = \frac{P - P_{-1}}{P_{-1}}$ inflation rate $\pi^e = \frac{P^e - P_{-1}}{P_{-1}}$ already know

$1+\pi = (1+\pi^e)(1+m)(1-\alpha u + z)$ $\ln(1+x) \approx x$ in the US, inflation rate is small.

$\pi = \pi^e + m - \alpha u + z$

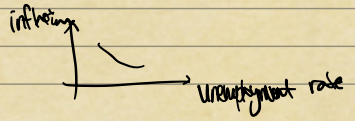
$u↑ \Rightarrow w↓ \Rightarrow \pi↓$

Assume $\pi^e = \bar{\pi}$

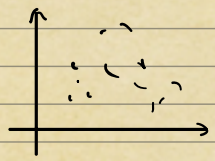
$\pi = \bar{\pi} + (m+z) - \alpha u$

constant

~2%~



initially. unemployment rate ↓ inflation ↑ great deal but inflation ⇑ so started overheating



π^e constant So if $\bar{\pi} + (m+z)$ not constant ⇝ problem

① 1995~ 01 ↑ m↑

② Inflation ↑ "expected inflation became deanchored" Let anyone 2/1

Suppose $\pi_t^e = (1-\theta)\bar{\pi} + \theta\pi_{t-1}$ (~60's, $\theta=0$)

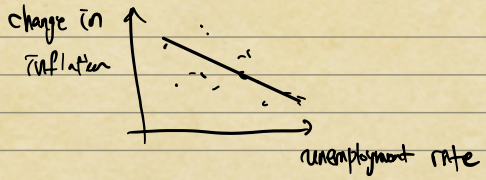
$\pi_t = \pi^e + (m+z) - \alpha u$

$= (1-\theta)\bar{\pi} + \theta\pi_{t-1} + (m+z) - \alpha u$

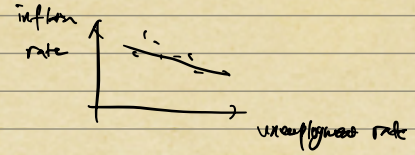
$\theta = 1$: $\pi_t = \pi_{t-1} + (m+z) - \alpha u$

$\pi_t - \pi_{t-1} = (m+z) - \alpha u$

$u \downarrow \Rightarrow \pi_t - \pi_{t-1} \uparrow$ "accelerationist phillips curve"



~mid 90s: reanchored expectations

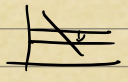


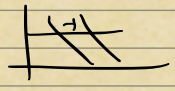
Phillips curve $\overset{\text{relation}}{\underset{?}{\sim}}$ natural rate of unemployment

Well... $p = p^e \Rightarrow \pi = \pi^e$

⇝ $\pi = \pi + (m+z) - \alpha u^n$

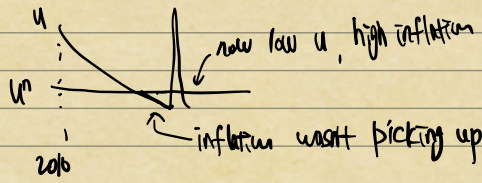
$u^n = \frac{m+z}{\alpha}$

$m \uparrow \Rightarrow u^n \uparrow$  (firms not paying real wage ⇝ $u^n \uparrow$)

$z \uparrow \Rightarrow u^n \uparrow$  ($z \uparrow$ ⇒ workers want higher wage ⇒ $u^n \uparrow$)

$\alpha u^n = \text{const} \Rightarrow \pi = \pi^e - \alpha(u - u^n)$ very important

Powell: "labor market is tight" $\Leftrightarrow u < u^n \Rightarrow \pi > \pi^e \Rightarrow$ pressure on inflation



downward pressure of inflation

Also reason for inflation due to supply side & aggregate demand ↑ (→ low unemployment → inflation)

{ "need recession (↑ unemployment rate) for controlling inflation rate"
"other factors are moving in the right direction"
...

Sig
Very high inflation $\pi\pi_t + (1-\pi)\pi_t^e$

$= \pi\pi_t + (1-\pi)\pi_{t-1}$

$\therefore (1-\pi)(\pi_t - \pi_{t-1}) = \alpha(u^n - u)$

$\pi_t - \pi_{t-1} = \frac{\alpha}{1-\pi}(u^n - u)$

π large (when inflation ↑) : small change in u ~ large change in $\pi_t - \pi_{t-1}$

Very low inflation ① people unwilling to take payout

② u^n ↑ (unlikely)

#11 (Not big systemic banks) Silicon Valley bank went under

Composition of depositors. under 250m okay

not much startups, etc

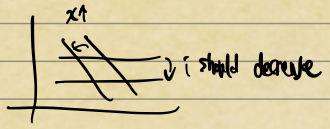
Venture capital

Deposits right into treasury bonds, right before interest rate hikes

(Initially not that big but happened very fast)

VIX : fear index

← regulatory failure (right before threshold)
Didn't diversify funding



{ impact of policy IS-LM
over time IS-LM-PC

Still IS-LM model in the short run

- $Y = C(Y-T) + I(Y, \bar{i} - \pi^e + x) + G$

  $\bar{i}$: "Fed sets it"

- Think central bank sets the real interest rate

  (most of the time CB always thinks about real interest rate, although they can't always control it when i "goes against 0")

Remember $Y = A \underbrace{N}_{\text{capacity}} \underbrace{(1-u)}_{\text{fluctuates}}$

$Y = L(1-u)$ ⇝ coming from $1 - \frac{Y}{N} = \frac{N-Y}{N} = u$

$Y^n = L(1-u^n)$

natural output

potential output

$Y - Y^n = -L(u-u^n)$

output gap

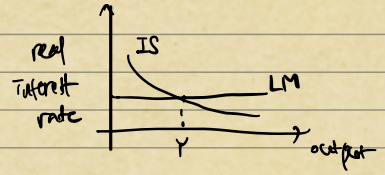
Recall $\alpha(u-u^n) = \pi^e - \pi$

$-\frac{L}{\alpha}(\pi^e - \pi) = Y - Y^n$

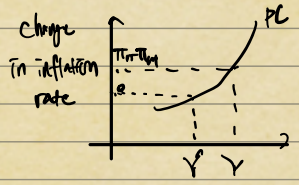
$\pi - \pi^e = \frac{\alpha}{L}(Y - Y^n)$

output gap

Say π^e = lagged inflation $\pi(-1)$



IS curve: function of fiscal policy, consumer confidence, etc



$Y \uparrow\ u \downarrow\ w \uparrow\ p \uparrow\ \pi \uparrow$

$\bar{r}$ too low

↓

$Y > Y^n$

↓

inflationary pressure

⇔ "fed is behind the curve"

$\bar{i}$ too low → $u_n \downarrow$

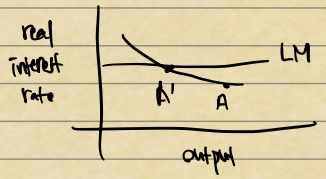
→ policy support (covid) → saving ⇑ : demand ⇑

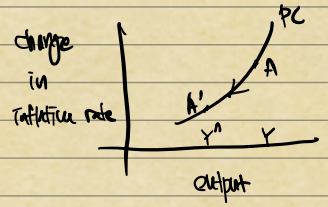
⇒ inflation ⇑ (& lose anchor)

natural, neutral, Wicksellian interest rate, r^*, r^n

$Y^n = C(Y^n - T) + I(Y^n, r^n + x) + G$

$\boxed{\pi - \pi(-1) = \frac{\alpha}{L}(Y - Y^n)}$ inflationary pressure ⇝ CB raise r upto r^n





goal: want u to be u^n

r too low ⇒ inflation ⇑ ⇒ Feb takes it to r^n (but you need to keep inflation further down)

CB want inflation target. Gov not happy about the above

but $Y \downarrow$ means recession

If Gov has credibility. no recession needed when change to r^n

neutrality of money: monetary policy doesn't affect real variable in the medium run

(don't have access to inflation rate)

Chapter 9

Why not adjusting to r^n all at once?

- Fed does not know exactly r^n, u^n, Y^n

  (Ex) $\sim u^n$ $\sim u$ 2018 but inflation rate did not shoot up

- Takes time for economy (i.e. firm) to respond anyway

  Like the investment decision does not change instantly

- Y, π too high

  ⇒ can't decrease Y too fast: may overshoot, etc. (again, due to delayed effect: change in Y takes time)

  too slow: π deanchor

#12

If π^e unanchored ⇒ need to cause a severe recession

"restore in a soft landed manner" : not cause a recession

High inflation (π^e stable) in a lag model

Want: lag model → $\pi^e = \bar{\pi}$ & reduce Y

↑ cb credible

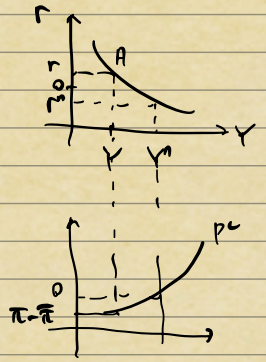
Consider π low (close to 0)

$U^n < 0$

$r = i - \pi$

i = fixed at 0, $-\pi < 0$

$\pi \downarrow$ $r \uparrow$



① "deflationary trap"

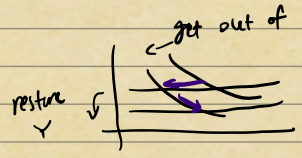
(ex) Similar to great recession (did lower the interest rate, but reaction was slow & already in a deflationary environment)

1929 ~ 1931

Unemployment	Y growth rate	$\bar{r}$	Inflation rate	r
3.2	-9.8	5.3	0	5.3
8.7	-7.6	4.4 ↓ down	-2.5	6.9
15.9	-14.7	3.1	-9.2	12.3
⋮		(low at the time)	didn't crash up	

(need massive fiscal policy to get out of it)

- Fiscal Consolidation

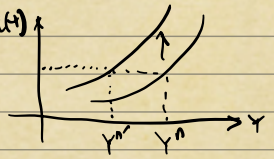


speed at which this happens is imp. (too slow ⇒ painful)

The signal for CB is the drop of inflation (hard to know Y)

② - Supply side shock — Stagflation

oil price ↑ ⇔ m ↑



$F(U^n, z) = \frac{1}{m+1}$

$m \uparrow \Rightarrow U^n \uparrow \Rightarrow \pi - \pi^e \uparrow$

$\alpha(U^n - U) = \pi - \pi^e$

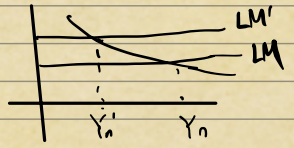
Subtlety: ① IS curve may shift in the short run

② price may come down (or permanent)

π^e may (de)anchor

1990: OPEC cartel

oil ↑↑ since... 2000: China speed ↑↑



oil 2010's: recession
supply ↑
OPEC breakdown

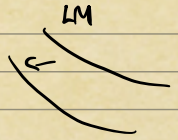
oil shock ⇒ inflation will pick up

If CB thinks this is persistent, ⌐⇑

(w slow.)

(Europe now: energy shock)

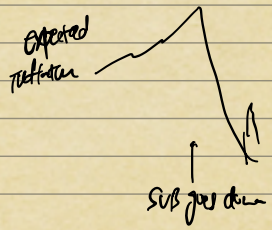
SVB ⇓ : x⇑



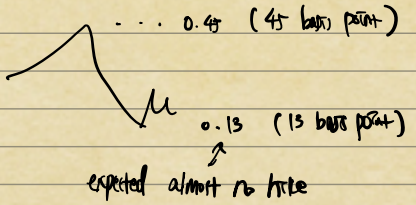
⇒ deflationary forces

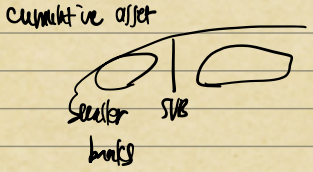
(markets anticipate that ⌐ will go down)

One year inflation breakeven



Market's expected next hike (how traders bet)

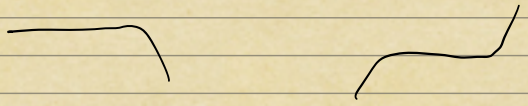




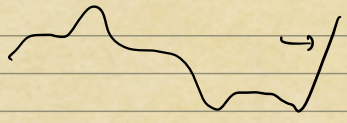
Play a huge role in lending

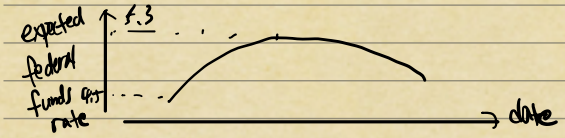
80 % of mortgages ...

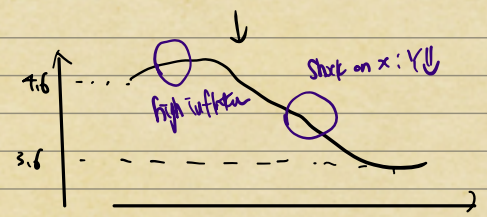
Collapse in Equity stores Credit default swap of the bank (Credit Suisse)



Fear in the market VIX







high inflation ⇒ need to balance
↓
panic

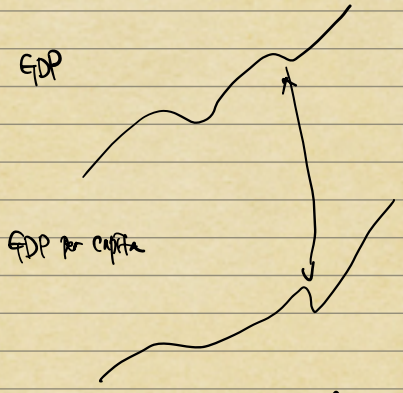
⟹ dominated by contraction of aggregate demand

Lec 13

Inflation vs. Y↓

smoothing brake

bank susceptible due to huge leverage



GDP is not great for comparing cities

PPP (purchasing power parity) adjustment

(ex) car food

1 : $10k 1 : $10k $20k/y

0.09 : 40k rub. 1 : 1k rub 200k rubbles/y

E = 60 rubbles / USD ⇒ Russia spends $2k/y

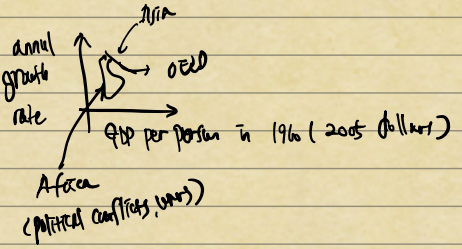
Q. Is Russia 10 times poorer?

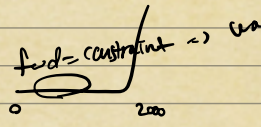
No, If using US price, 10.2k ⇒ 55.5% of US GDP

Reason: food is much cheaper in Russia

Russians replace cars every 10 yrs ⇔ US 1 yr

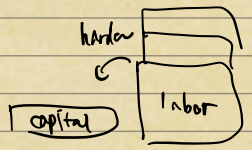
Pattern : poor country had the highest growth rate





Supply depends on capital (before it's fixed during business cycle)

$Y = F(K, N)$ — K: capital, N: labor



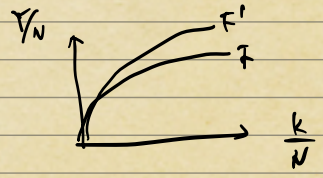
① $xY = F(xk, xN)$

② decreasing increases on k

③ decreasing increases on N

$\frac{Y}{N} = F(\frac{k}{N}, 1)$ Say N = population

capital accumulation ($\frac{k}{N}\uparrow$)
technological progress ($F\uparrow$)



Lecture 14

(mechanism) Capital Stock $\Rightarrow$ output/income

$\Uparrow$ $\Downarrow$

Change in the capital Stock $\Leftarrow$ Saving/investment

Assume population (N) = constant

$\frac{Y_t}{N} = f(\frac{K_t}{N})$ $f' > 0$ $f'' < 0$

Economy is closed (no import/export)

No public deficit ($G = T$)

real... $(T - G)$
$+ (Y - T - C)$
$= I$

$\Rightarrow I_t = S_t$

private investment — private savings

Assume $S_t = sY_t$

$\Rightarrow I_t = sY_t$

previously, C_0 (current) in consumption function so $S = Y - T - C$ hard constant

In the long run, it tends to scale w. output as well

$K_{t+1} = (1-\delta)K_t + I_t$

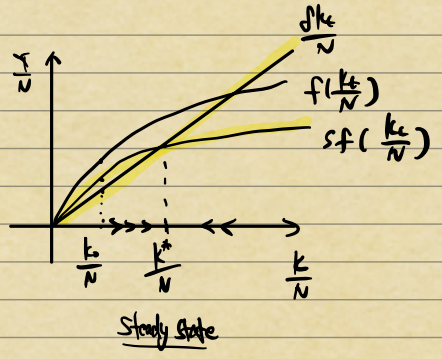
things do break up once in a while

$$\frac{k_{t+1}}{N} = (1-\delta)\frac{k_t}{N} + s\frac{Y_t}{N} \quad \text{(per worker term)}$$

$$\frac{k_{t+1}}{N} - \frac{k_t}{N} = \underset{\text{investment}}{s\frac{Y_t}{N}} - \underset{\text{depreciation}}{\delta\frac{k_t}{N}}$$

$$\frac{k_{t+1}}{N} - \frac{k_t}{N} = \underbrace{sf\left(\frac{k_t}{N}\right)}_{\text{investment/person}} - \underbrace{\delta\frac{k_t}{N}}_{\text{destruction of capital due to depreciation/person}}$$

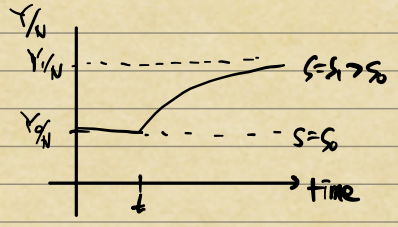
smaller (concave) linear



Steady State

s: saving rate ↑ ⇒ invest more ⇒ steady capital/person ↑ (transitional growth)

(ex) China 20 yrs ago savings rate ↑ capital ↓ ⇐ "easy part of growth"



Why doesn't output jump? $\frac{k}{N}$ does not jump

Intuit. you need savings to invest

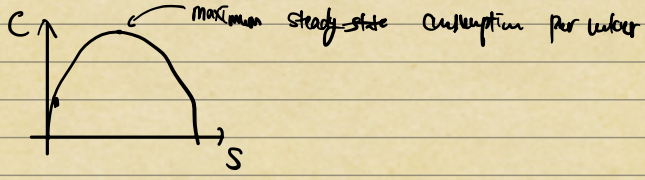
In an open economy, transition can move a lot faster

Q. Consumption wise?

$$\frac{C}{N} = (1-s)\frac{Y}{N} \uparrow$$

↓

$\frac{Y}{N} = f(\frac{k}{N})$ s small capital small ⇒



(Solow capital growth)

low s ⇒ low k : $\frac{Y}{N} = f(\frac{k}{N})$ $f' >> 0$ so C grows

s=0 no Y no C

s=1 no C since all in investment

Suppose $Y = \sqrt{K}\sqrt{N}$

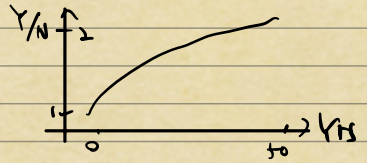
$$\frac{k_{t+1}}{N} - \frac{k_t}{N} = s\frac{k_t}{N} - \delta\frac{k_t}{N}$$

$$\frac{k^*}{N} = \left(\frac{s}{\delta}\right)^2$$

$$\frac{y^*}{N} = \frac{s}{\delta}$$

if s doubles then $\frac{y^*}{N}$ doubles

$\frac{k^*}{N}$ a lot more



"it takes long to reach steady state"

(ex) Asian countries

$$\frac{c^*}{N} = \frac{y^*}{N} - \delta\frac{k^*}{N} = \frac{s}{\delta} - \frac{s^2}{\delta}$$

$$= \frac{s(1-s)}{\delta}$$

s	$\frac{k}{N}$	$\frac{y}{N}$	...	$\frac{c}{N}$
0	0	0	...	0
0.1	1	1		0.9
0.2	4	2		1.6
0.3	9	3		2.1
⋮	⋮	⋮		⋮
1	100	10	...	0

$\delta = 0.1$

$$N_{t+1} = (1+g_N)N_t$$

$$\frac{k_{t+1}}{N_{t+1}} = \frac{(1-\delta)k_t}{N_{t+1}} + \frac{sy_t}{N_{t+1}}$$

$$= \frac{N_t}{N_{t+1}}(1-\delta)\frac{k_t}{N_t} + \frac{N_t}{N_{t+1}}\frac{s\,y_t}{N_t}$$

$$\approx (1-g_N-\delta)\frac{k_t}{N_t} + s\frac{y_t}{N_t}$$

$$\frac{k_{t+1}}{N_{t+1}} - \frac{k_t}{N_t} = s\frac{y_t}{N_t} - (\delta+g_N)\frac{k_t}{N_t}$$

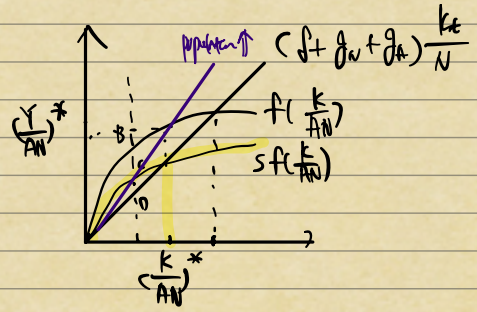
$g_N = 0.01$
s = small $\rightsquigarrow$ drop

$$= sf\left(\frac{k_t}{N_t}\right) - (\delta+g_N)\frac{k_t}{N_t}$$

↖ need to grow capital if population ↑

#15

If N_t is growing very fast, need lots of investment to keep capital labor ratio constant



population↑ = { k grew & $\frac{k}{AN}$ decreased
↳ new filter rate

* Technological growth

TFP (Total factor productivity)

- larger quantities of output for same capital & labor
- better products
- new products (didn't exist before)
- a large variety within products

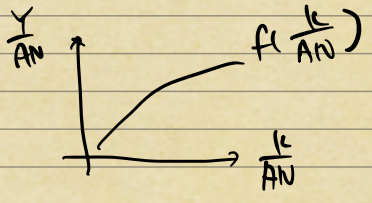
In this course labor — equivalent

$Y = F(k, AN)$
↳ State of technology

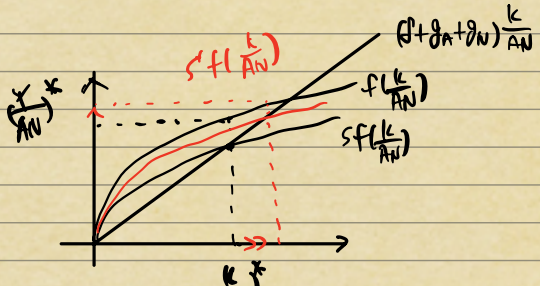
$xY = F(x_t, xAN)$

$\frac{Y}{AN} = F(\frac{k}{AN}, 1)$

$= f(\frac{k}{AN})$
↳ "effective worker"



Similarly as before, $\frac{k_{t+1}}{A_{t+1}N_{t+1}} - \frac{k_t}{A_tN_t} \approx s\frac{Y_t}{A_tN_t} - (\delta + g_{AN})\frac{k_t}{A_tN_t}$



At equilibrium,

$k\uparrow = AN\uparrow = Y\uparrow$
~ true

$\frac{k}{AN}$, $\frac{Y}{AN}$ constant

$\frac{k}{N}$: g_A

$g_{k/N} = g_{k/AN} + g_A = g_A$

$\left(\frac{Y}{AN}\right)$

Growth rate doesn't change

$\frac{Y}{N}$: g_A

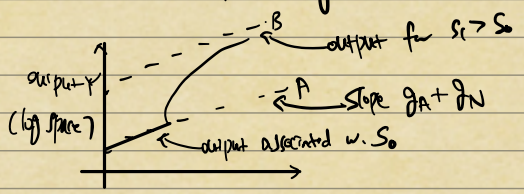
$N : g_N$

$k : g_A + g_N$

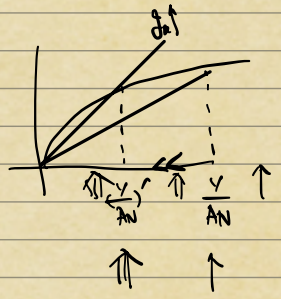
$Y : g_A + g_N$

(world economy g_N ↓)

In USA, $\begin{cases} S \uparrow \\ \text{low capital early on} \end{cases}$



Very fast growth



Think why $\frac{Y}{AN}$ decreased

#16 $Y = K^{1-\alpha}(AN)^{\alpha}$ $\quad (1+g_Y)Y = ((1+g_K)K)^{1-\alpha}\left(AN(1+g_A)(1+g_N)\right)^{\alpha}$

$g_Y = (1-\alpha)g_K + \alpha(g_A + g_N)$

$g_A + g_N = (1-\alpha)(g_A + g_N) + \alpha(g_A + g_N)$ in a steady state

g_N, g_K easy

g_A ? Not easy

$\Delta Y^N = \frac{(\$W)}{(\$P)}\Delta N$

= contribution of 1 person

$\frac{\Delta Y^N}{Y} = \frac{(\$W)N}{(\$P)Y}\frac{\Delta N}{N}$ $\quad \$Y = \$Y$

rate of growth (output) due to employment; labor share; rate of growth of workers

$g_Y^N = \alpha g_N$

$\Delta Y^K = \frac{\$PY - \$wN}{\$K}\Delta K$

contribution of one capital

$\frac{\Delta Y^K}{Y} = \left(1 - \frac{WN}{PY}\right)\frac{\Delta K}{K}$

capital share; growth rate of capital

$g_Y^K = (1-\alpha)g_K$

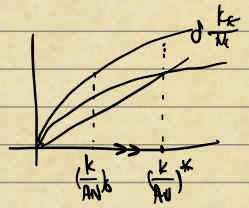
"Solow residual"

"g_A" = residual = $g_Y - [\alpha g_N + (1-\alpha) g_K]$

Steady state: $g_Y = g_N + g_A$

China: (residual = 0.042) + (g_N = 0.017) = 0.059 < g_K = 0.092

g_Y = 0.092 ← not a steady state.



$Y = K^{1-\alpha}(AH)^{\alpha}$ ← human capital

$H = e^{\psi u} N$ u: yrs of acquiring human capital (yrs of schooling) title

$\psi \approx 0.1$: 1yr ⇒ 10%

$\frac{H}{N} = h = e^{\psi u}$

$y = k^{1-\alpha} A h^{\alpha}$ $\quad \frac{Y}{N} = (\frac{K}{N})^{1-\alpha} (A \frac{H}{N})^{\alpha}$ $\quad (1+g_y)(\frac{Y}{N}) = (\frac{K}{N})^{1-\alpha}(1+g_K)^{1-\alpha}(1+g_A)^{1-\alpha} \times (\frac{H}{N})^{\alpha}(1+g_L)^{\alpha}$

$g_y = (1-\alpha) g_K + \alpha g_A + \alpha g_u$

At some point g_A will be 0

So in a steady state, $g_K = g_A = g_y = g_Y - g_N$

$k_{t+1} - k_t = s y_t - (\delta + n) k_t$ ~ g_A since we only consider per capita (population growth rate → $\frac{Y}{N}$)

$\frac{k_{t+1} - k_t}{k_t} = s \frac{y_t}{k_t} - (\delta + n)$

~

In a steady state g_A

$g_A = s \frac{y}{k} - (\delta + n)$ $\quad y = k^{1-\alpha}(Ah)^{\alpha}$

(steady state) capital/effective worker $= s \frac{(Ah)^{\alpha}}{k^{\alpha}} - (\delta + n)$

$\frac{k}{Ah} = (\frac{s}{\delta + n + g_A})^{\frac{1}{\alpha}}$ $\quad y(t) = k(t)^{1-\alpha}(A(t)h(t))^{\alpha}$

$y(t) = A(t) h (\frac{k}{Ah})^{1-\alpha} = A(t) e^{\psi u} (\frac{s}{\delta + n + g_A})^{(1-\alpha)/\alpha}$ in a steady state

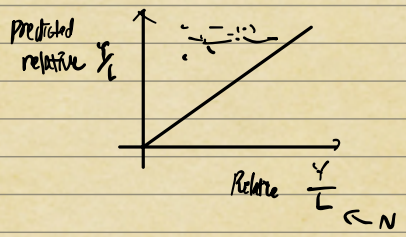
H → Steady state growth (x)
↘ income/capita (o)

Now, $\hat{y}_i := \frac{y_i}{y_{US}}$ y_i: output per worker of country i

Assume g_A same

$$\hat{y}_i = \frac{A_i}{A_{US}} e^{\psi(u_i - u_{US})} \left(\frac{s_i}{s_{US}}\right)^{\frac{1-\alpha}{\alpha}} \left(\frac{\delta + n_{US} + g_A}{\delta + n_i + g_A}\right)^{\frac{1-\alpha}{\alpha}}$$

Assume A_i same. Only depend on $\underline{u}, \underline{s}, \underline{n}$ ...



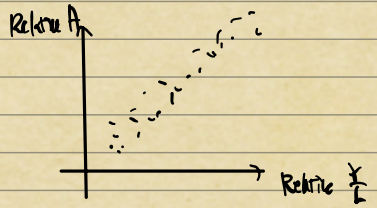
a lot more egalitarian!

"Solow residual"

Well, A_i not same across the country

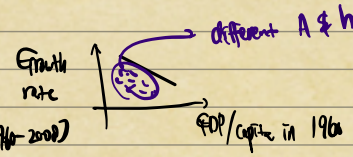
$$y_i = k_i^{1-\alpha} (A_i h_i)^{\alpha} \Rightarrow A_i = \left(\frac{y_i}{k_i^{1-\alpha} h_i^{\alpha}}\right)^{\frac{1}{\alpha}}$$

Compute $\hat{A}_i = \frac{A_i}{A_{US}}$



Differences in A_i explain about $\frac{1}{2}$ to $\frac{2}{3}$ of the differences in output per worker across countries

With similar A and h, GDP per capita seems to converge (UK, Germany, US, Japan...)

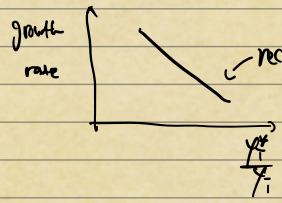


Conditional Convergence

$$y_i^* = A_i e^{\psi u_i} \left(\frac{s_i}{\delta + n + g_A}\right)^{1-\alpha/\alpha}$$

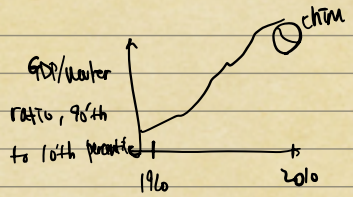
1960 data

A_i, u, s, n variables, same g_A



poor city

Since A_t lower, the steady state low.



#19

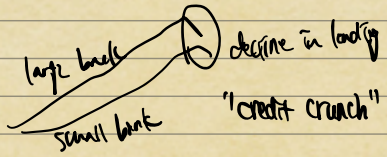
COVID → savings ↑ ⇒ inflation (supply side ×)

⇒ rate ↑ (too late, too abruptly)

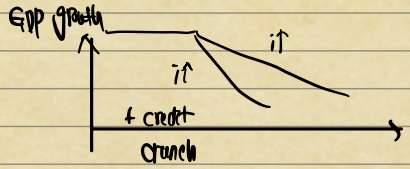
⇒ small bank deposit ↓ (SVB broke) → treasury
↘ large banks

"flight to quality"

students, business, ...



Small businesses : Construction, agriculture, ...



⇒ want to slow down i hike

Good news

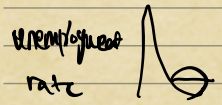
labor market tight

u↑ → w↓ P↓ π↓

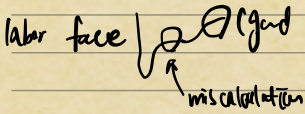
u low. but need low w

wages ↑ → u save : less pressure on wage ⇒ π↓

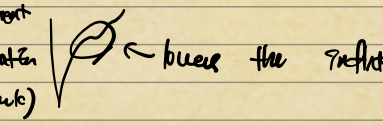
Unemployment

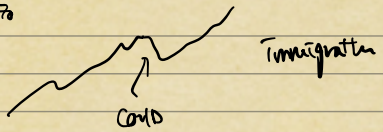


underestimate since many people simply exited labor force

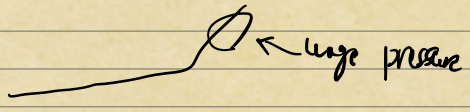


employment to population (working age) ratio

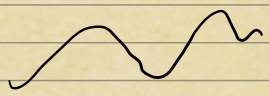




wage



Appreciation of the currency = how strong dollar is



Trade balance of goods and services

⇒ import more largest partner from China than Mexico

openness in...

* Financial market. ∃ Impediments: "capital controls" ↔ "tariffs, quotas" in Goods market

China central bank buys US treasuries

US CB as well

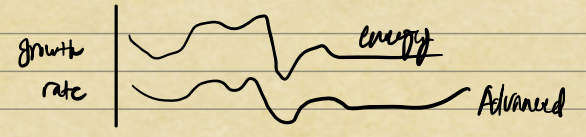
more revenue so they can compensate some trade deficit.

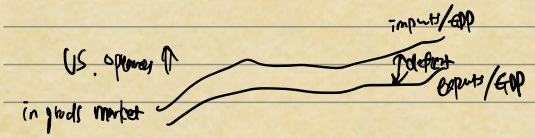
US ⟶ indirectly Rest
⟵ fund to buy fx safety

* Factor market. Firms can choose location of production and workers where to work.

& labor

Strong linkage due to openness





"tradable goods"

(eg)

Import + Export = "measure of openness" But Fund, due to competition, is affected by openness as well, Euro. (closed as a whole tho.) so they're in a way exposed.

Export ratio : US < Japan < Uk < Germany < ... < Netherlands

(smaller ⇝ more ready to be open)

"Currency is appreciating" = "increase in price"

⇕

depreciation

exchange rate

Real exchange rate $\varepsilon = \frac{E P^d}{P^*}$ ← US goods in $; ← Japan goods in yen

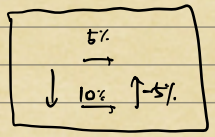
#11

Financial openness

⇒ compare return rate

$1 → $(1+$\bar{i}$)

$1 → €$E_t$ → €$E_t(1+i^*_t)$ → $E_t(1+i^*_t)\frac{1}{E^e_{t+1}}$



Arbitrage implies that $1+\bar{i}_t = E_t(1+\bar{i}^*_t)\frac{1}{E^e_{t+1}}$

⇒ (uncovered) Interest parity condition

$1+\bar{i}^* \approx \frac{1}{1-i^*}$ so

$\bar{i} \approx \bar{i}^* - \frac{E^e_{t+1} - E_t}{E_t}$ even if interest rate (ex. you can compensate it in exchange rate

domestic demand for goods $D = C+G+I$ (part of this goes to foreign goods)

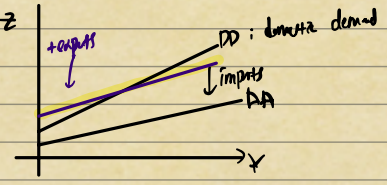
demand for domestic goods $Z = \underbrace{C+G+I}_{D} + X - \frac{IM}{\varepsilon}$ ← real exchange rate

Export ⇒ increasing in foreign output, decreasing in ε

$X = X(Y^*, \varepsilon)$ ← foreign income

$IM = IM(Y, \varepsilon)$ ← domestic income

$IM_\varepsilon, IM_Y > 0$

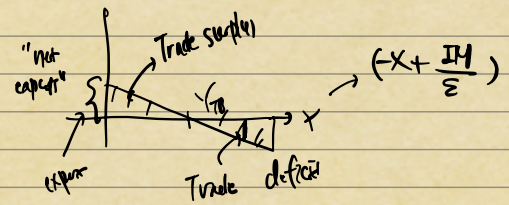


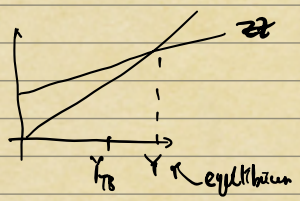
import depends on output (marginal decrease)

export does not depend on output

① Why is curve flatter in open economy? part of consumption come from foreign goods

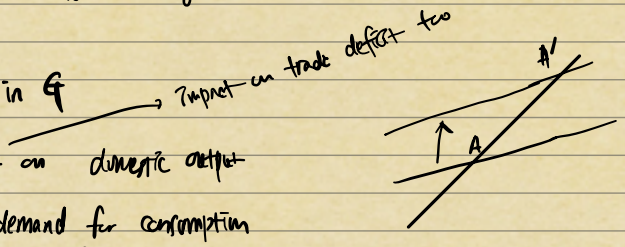
⑧ ↓ foreign Y^*





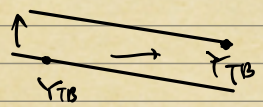
- Increase in G

: less impact on domestic output



since demand for consumption will go to foreign goods.

So it won't demand more domestic production



↑ $Y = a + 0.99Y$

need to ↑ by little more

- Y^* ↑↑ (like China)

ZZ goes up

NX goes up

Y_{TB} ↑ (not as much trade deficit)

① So China expansionary policy ⇒ Chile GDP ↑ while not as much trade deficit

② no fiscal deficit

* Net export function

$$NX(Y^*, Y, \varepsilon) = X(Y^*, \varepsilon) - \frac{IM(Y, \varepsilon)}{\varepsilon}$$

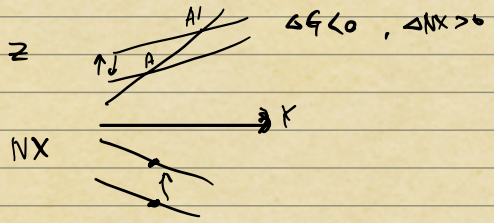
$NX_{Y^*} > 0 \quad NX_Y < 0 \quad NX_\varepsilon = ?$

We ignore the effect of price difference (matters except for very short run)

(ε↑ import ↑ but cheaper)

Assumption: $NX_\varepsilon < 0$

{ Reduce G
Reduce ε



$\Delta G < 0$, $\Delta NX > 0$

($\varepsilon \downarrow$: make your product more attractive)

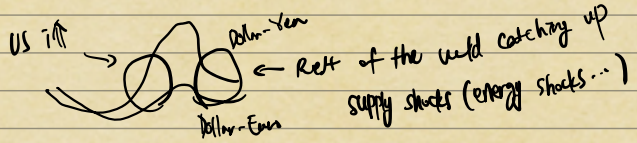
Y stays the same. Simply addressed trade deficit

"Mercantilist policies of China" (fake currency value artificially low) ← ∃ debate

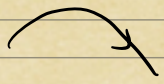
Domestic economy in China ⇒ Save a lot ⇒ Consumption low

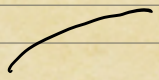
massive export ⇒ drive output ↑↑

20 Mundell-Fleming model



expected policy rate now.

US 

Europe  (more ahead)

Exchange rate depends on what markets think (True or not doesn't matter)

Japan 

Mundell Fleming: policies → exchange rate → real activity (short run)

Start with...

$$Y = C(Y-T) + I(Y,r) + G + NX(Y, Y^*, \varepsilon)$$

Assume domestic & foreign price fixed. ($\pi = \pi^e = 0$)

$$Y = C(Y-T) + I(Y,\bar{r}) + G + NX(Y, Y^*, E)$$

$$\bar{E}_t = \frac{1+\bar{r}_t}{1+i_t^*} E^e_{t+1}$$

Assume $E^e_{t+1} = E^e$ (very unrealistic, fix later)

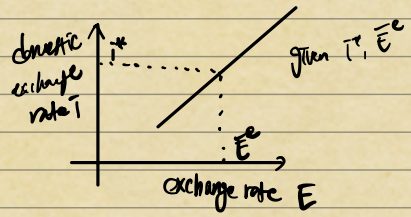
$$E = \frac{1+\bar{r}}{1+r^*} E^e$$

$\bar{r} \uparrow \Rightarrow E \uparrow$

$\bar{r} = r^* \Rightarrow E = E^e$ $\bar{r} \uparrow \underline{E \uparrow}$ has the same effect as $E^e \downarrow$ (depreciate to compensate higher return of i↑↑)

Similarly, $\bar{r} \downarrow \Rightarrow E \downarrow$

$E^e \uparrow \Rightarrow E \uparrow$ (if dollar is expected to appreciate tomorrow, it appreciates today)



IS

$$Y = C(Y-T) + I(Y,\bar{i}) + G + NX(Y, Y^*, E)$$

$$= C(Y-T) + I(Y,\bar{i}) + G + NX(Y, Y^*, \frac{1+\bar{i}}{1+\bar{i}^*} E^e)$$

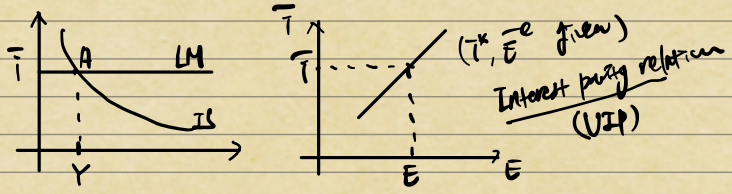
LM

$$\bar{i} = \bar{i}$$

Rmk. $\bar{i}\uparrow$: I⇓, NX⇓

powerful for smaller economy

US cares little



$\bar{i}$ set by central bank

- Contractionary monetary policy $\bar{i}\uparrow$ $E\uparrow$
- Expansionary fiscal policy $G\uparrow$ E stays the same

↗ $Y\uparrow$ smaller due to import

- Expansionary policy ⇒ currency tends to appreciate (Y increased too much. So Fed will react by $\bar{i}\uparrow$)
- $\bar{E}^e\uparrow$ ⇒ $E\uparrow$ (fixed.) or $\bar{i}^*\uparrow$ (fixed.) or $\bar{i}\downarrow$ (no, by CB)

$Y\downarrow$

⇒ move IS to the left

move UIP to the right

- $Y^*\downarrow$ ⇒ $X\downarrow$, $Y\downarrow$, IS to the left (if whole world recession ⇒ US will lower interest rate ⇒ everyone will)
- $\bar{i}^*\uparrow$ ⇒ $\bar{i}\uparrow$ (CB) or $E\downarrow$ or $E^e\uparrow$ (fixed) UIP to the left How about IS? (move right)

#19.2

Fixed rate exchange

Current account

Export

Import

Dividend etc income IN → "133" not very big, sum not 0 across entries (weirdly)

OUT

Financial account

- Foreign holding
- US residents holding

GNP

= GDP + (N2)

#lec21

peg currency - fixed exchange rate to a major currency like dollar.

"fixed"

(HK dollar-dollar, Italy ($\bar{E}_{lira}$) - Germany ($\bar{E}_{euro}$) ...)

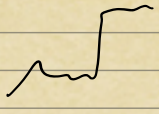
If credible, $E^e = \bar{E} = \overline{E}$

$1 = \frac{1+i}{1+i^*} \Rightarrow i = i^*$

⇒ central bank gives up monetary policy as a policy instrument.

In practice, ∃ hybrid regimes. Very few pure float regimes.

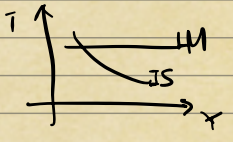
{ normal business cycle - no intervention
too much floating - intervention

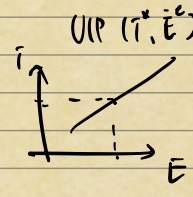
(ex) fixed real exchange rate, but inflation ⇒  (bilateral nominal exchange rate)

(ex) Singapore: pegged against basket of currencies. keep exchange rate in a certain range
⇒ market determines interest rate but they determine exchange rate.

(ex) Argentina too controls exchange rate 2013~2015 okay but due to inflation
it started depreciation ↗ hiking in $\bar{E}$.

Experiment





recession; G↑ ; i↓

reinforcement effect

E↓ ⇒ X further ↑ (even though lose a bit due to import)

Fixed exchange rate regime: expansionary fiscal policy still works

BUT CB can't control i

Depends on the CIS. ⇝ no full control.

- Speculative attacks

⇒ happens in Argentina: believe $E^e \ll \bar{E}$

so $\bar{E} = \frac{1+i}{1+i^*} E^e$ $\quad i \gg i^*$

Two choices { increase i ⇒ recession / decrease E } $\quad \bar{E}$ fixed: no choice but to increase i

European monetary system

Germany expansionary monetary policy ⇝ upward pressure on interests rate (to control inflation)
(due to reunification) ⇝ Big appreciation of West Germany

Other countries tried to fight for narrow bands

got speculative attack

⇒ had to raise interest rate

UK abandoned the system

France stayed for a bit, but cost a lot. (recession)

⇒ rejoined to Euro

What's the reason for them to have fixed rate? (Speculative attack, no monetary policy ...)

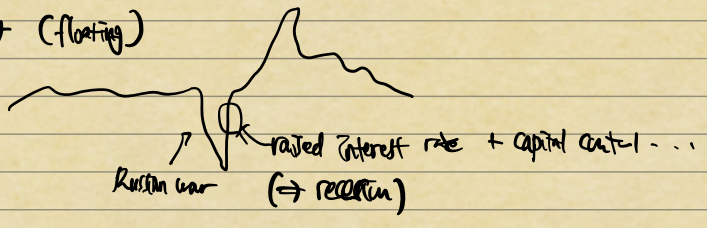
Well it can be very volatile

1) planning complex
2) Inflation unanchored
3) NX unpredictable

$$\bar{E} = \frac{1+i}{1+i^*} E^e$$

$$= \frac{1+i_t}{1+i^*_t} \frac{1+i^e_{t+1}}{1+i^{*e}_{t+1}} \frac{1+i^e_{t+2}}{1+i^{*e}_{t+2}} \cdots \frac{1+i^e_{t+n}}{1+i^{*e}_{t+n}} E^e_{t+n+1}$$

Russian currency (floating)



Fixed: · similar shocks (like US-Mexico, Eurozone)

· strong fiscal capacity (Hong Kong) ← also lots of reserves so not susceptible to speculative attack

· very flexible goods/labor market (HK)

fixed nominal rate

≠ fixed real rate!

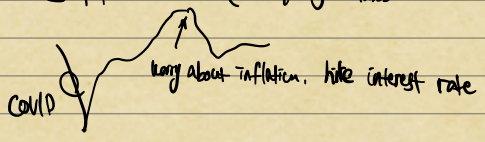
HK built their system first, and then conducted it.

Stability imp if { ① lots of trade ② financial exposure ↑ ③ government credible ✗ (inflation de anchored)

#22 Interest rate ↑ people run deposit from small banks ⇒ Republic bank bought by JP Morgan

↑ "anxiety, expectation"

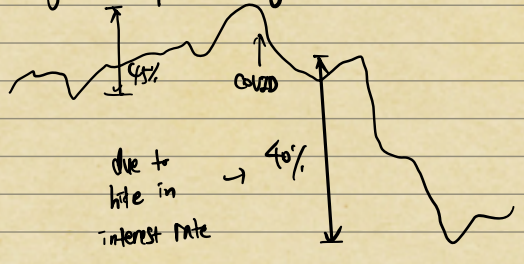
S&P 500 (Σ equity shares in the US)



NASDAQ <= tech/tgy companies

If people don't want to take risk, asset price will collapse

US Treasury bonds 2yr+ (risky safe bond) price



"Expected present discounted value" (EPDV)

- Expectations (E)
- PDV ⇒ method to compare future & present

(future ⇒ less hence "D")

Q: which interest to pick? IDK

$$\$V_t = \$Z_t + \frac{\$Z_{t+1}}{(1+i_t)} + \frac{\$Z_{t+2}}{(1+i_t)(1+i_{t+1})} + \cdots + \frac{\$Z_{t+n}}{(1+i_t)\cdots(1+i_{t+n})}$$

What if we don't know the future?

$$\$V_t = \$z_t + \frac{\$z^e_{t+1}}{(1+\bar{i}_t)} + \frac{\$z^e_{t+2}}{(1+\bar{i}_t)(1+\bar{i}^e_{t+1})} + \cdots + \frac{\$z^e_{t+n}}{(1+\bar{i}_t)\cdots(1+\bar{i}^e_{t+n-1})}$$

↑ 1-yr rate of bond today for a yr.

"$E_t(X_{t+s})$: given info at time t, what's it at $x+t$?"

Constant interest rate: $\$V_t = \$z_t + \frac{\$z^e_{t+1}}{1+\bar{i}} + \frac{\$z^e_{t+2}}{(1+\bar{i})^2} + \cdots + \frac{\$z^e_{t+n}}{(1+\bar{i})^n}$

Constant payment: $\$V_t = \$z\left(1 + \frac{1}{1+\bar{i}_t} + \frac{1}{(1+\bar{i}_t)(1+\bar{i}^e_{t+1})} + \cdots + \frac{1}{(1+\bar{i}_t)\cdots(1+\bar{i}^e_{t+n-1})}\right)$

Constant interest rate & payments:

$$\$V_t = \$z\,\frac{1-\frac{1}{(1+\bar{i})^n}}{1-\frac{1}{1+\bar{i}}}$$

(perpetuity) Forever:

$$\$V_t = \$z\,\frac{(1+\bar{i})}{\bar{i}}$$

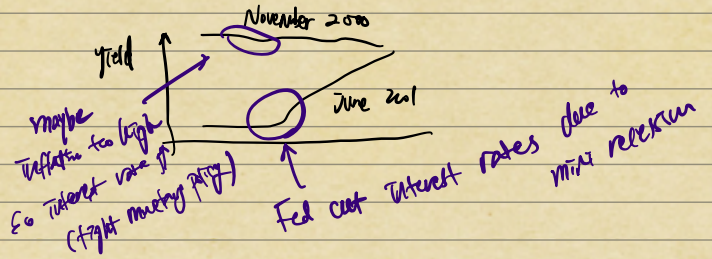
$$\$V_t = \frac{\$z}{\bar{i}} \Rightarrow \text{payment starts next year}$$

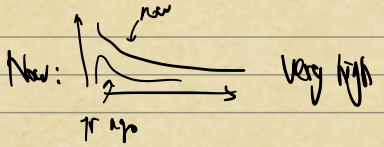
↑ $\bar{i}\to 0$; $\$V_t \to \infty$

$\$1k$ in 6 months ⇒ "maturity of 6 months"

Terminology: "yield to maturity" or "yield" ⇒ constant (diff from interest rate) "maturity"

② maturity-yield ⇒ yield curve, term structure of interest rates





$$\$P_{1t} = \frac{100}{1+\bar{i}_{1t}}$$

$$\$P_{2t} = \frac{100}{(1+\bar{i}_{1t})(1+\bar{i}^e_{1,t+1})}$$

notation: 1yr from t+1

	yr t	yr t+1	
1 yr bond	\$1	⟶ $1\times(1+\bar{i}_{1t})$	1 yr bond
2 yr bonds	\$1	⟶ $1\times\frac{\$P^e_{1,t+1}}{\$P_{2t}}$	2 yr bond & sell after 1 yr

$$\$P_{2t} = \frac{\$100}{(1+\bar{i}_{2t})^2}$$

$$\Rightarrow (1+\bar{i}_{2t})^2 = (1+\bar{i}_{1t})(1+\bar{i}_{1,t+1})$$

$$\Rightarrow \bar{i}_{2t} \approx \frac{1}{2}(\bar{i}_{1t}+\bar{i}^e_{1,t+1})$$

$$P_{2t} = \frac{\$P^e_{1t+1}}{1+\bar{i}_{1t}}$$

$$P^e_{1t+1} = \frac{\$100}{1+\bar{i}^e_{1t+1}}$$

$$\$P_{2t} = \frac{1}{1+\bar{i}_{1t}} \quad \frac{100}{1+\bar{i}^e_{1t+1}}$$

$$= \frac{100}{(1+\bar{i}_{1t})(1+\bar{i}^e_{1t+1})} \quad \cdots \text{what we get before}$$

Debt ceiling increased a lot : concern ⇑ if $\bar{i}$ (short term bonds) unstable ⇝ uses (don't know how to price)

#Ch 20

$\Sigma \uparrow \Rightarrow$ Y⇓ NX⇓

- short run: cut $\bar{i}$
- medium run: $\pi \downarrow \Rightarrow P \downarrow \Rightarrow \Sigma \downarrow$
  - ↳ costly (recession & unemployment)

⇒ "one-time devaluation"

Since "beat the purpose" why?

E^e⇓ (can be unfounded)
- ① CB will convince people
- ② $\bar{i} \uparrow$
- ③ $E \downarrow$ ⇝ may cause exchange rate crisis

#23 Asset pricing

payoff of asset comes from the future

Q how to set $\bar{i}$? & risk?

* Sometime we don't know the future payoff

* $\bar{i}_{2t} \approx \frac{1}{2}(i_{1t} + i^e_{(t+1)})$ ← risk

Bonds have two risk
- ① default risk
- ② price risk ← focus on this

$$1+\bar{i}_{1t} + x^b = \frac{\$P^e_{1t+1}}{\$P_{2t}}$$

x^b

P_{2t} lower due to risk, usually (x^b used to be negative, due to firms property for catastrophe and expect $\bar{i} \downarrow$)

↑ now the concern ⇑ inflation

Stock vs. Equity

↑ Coupon maturity

↑ dividends (no commitment, no sense of default) no maturity

$$1 + i_{t+1} + x^s = \frac{\$D^e_{t+1} + \$Q^e_{t+1}}{\$Q_t}$$

equity market risk

$$\$Q_t = \frac{\$D^e_{t+1}}{1 + i_{t+1} + x^s} + \frac{\$Q^e_{t+1}}{1 + i_{t+1} + x^s}$$

$$= \frac{\$D^e_{t+1}}{1 + i_{t+1} + x^s} + \frac{\$D^e_{t+2}}{(1 + i_{t+1} + x^s)(1 + i^e_{t+1} + x^s)} + \cdots$$

We can do this in real terms.

$$Q_t = \frac{D^e_{t+1}}{1 + r_{t+1} + x^s} + \frac{D^e_{t+2}}{(1 + r_{t+1} + x^s)(1 + r^e_{t+1} + x^s)} + \cdots$$

i ↓ bond price go up

① even if dividend change x ⇒ price ↑ (same reason as bond)

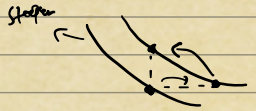
② Aggregate demand ↑ ← why people in finance look at rate all the time

Suppose C_0 goes up: yall think since Y↑, the price will go up.

But will Fed like it? Will interpolate, due to inflation concern, that they'll hike interest rate.

Market rate will go up immediately. → reduce the price of bonds

same discounting effect of the bond ⇒ bond news



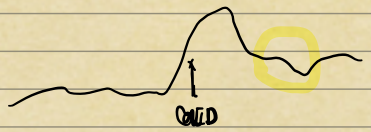
no effect due to aggregate demand ↑

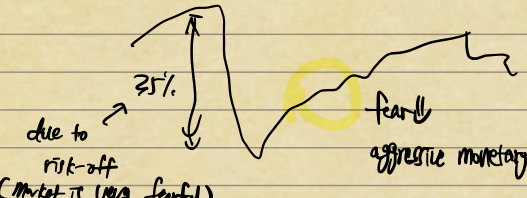
"good news is bad news"

↑ for aggregate demand ↑ for asset market

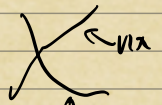
* risk premium can make a lot

VIX (index of for based on option price etc ...) SPX index



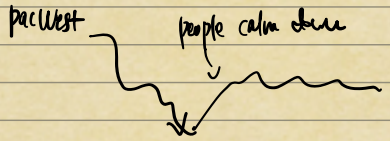


Two banks declined => VIX went up



SPX Index (price index) immediately declined

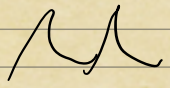
Banks in trouble



"Circuit breakers": you cannot trade since it declined rapidly

↑

x got out of control



Speculative bubble (much likely in equity)

#24 Based on Ch 15, 16

The basic IS-LM overweights present

In practice, gvmnt, firms, consumers, foreigners => expectation play a big role

↑

why fiscal matters

Steps.

① Consumption, Investment w. expectations

② IS-LM w. expectations

- permanent income theory of consumption
- Life-cycle theory of consumption

) => not necessarily on the current income, but sth about one's lifetime

"smoothing" of consumption

Total wealth

(Financial wealth = asset - debt (EPDV)

"Human wealth" = EPDV of labor income (also kind of EPDV: Current income = lot lower than what your income will be in the future)

$C_t = C(\text{Total Wealth}_t)$

↑ "0.03"

related to C_0 before

In practice, $C_t = C(\text{Total Wealth}_t, Y_t - T_t)$: $C_1 > 0$ $C_2 > 0$

Investment (real investment, not financial investment)

- Current, expected profits (↓ if r↑)
- depreciation of "year-to-year"

PV of Expected Profits

$$V_t = \frac{\Pi^e_{t+1}}{1+r_t} + (1-\delta)\underbrace{\frac{\Pi^e_{t+2}}{(1+r_t)(1+r^e_{t+1})}}_{\text{can use } (1+r_{t+1})^2} + \cdots + (1-\delta)^n \frac{\Pi^e_{t+n}}{(1+r_t)\cdots(1+r^e_{t+n})} + \cdots$$

(Π^e_t: expected profit at yr t)

The larger V_t is, the more you're going to invest.

$I_t = I(V_t)$

not only today but also future interest rate, etc.

In practice, $I_t = I(V_t, \Pi_t)$ $\quad I_1>0$ $I_2>0$

← current cash flow ⇒ if high, firm is less likely to be financially constrained

$= I(V_t, \Pi(\frac{Y_t}{K_t}))$

~ output to capital ratio, since it's how well they use capital to profit

$\approx I(V_t, Y_t)$

persistently higher profits matter more than transitory ones.

(prefer — than ∧)

CB will tell how the interest rate will remain high

(It's about psychology)

$Y = C(Y-T) + I(Y, r) + G_t$

$= A(Y, T, r, G)$ $\quad A_1, A_4 > 0$ $\quad A_2 A_3 < 0$

Shortcut to IS-LM w. expectations

$Y = A(Y, T, r, G, Y^e, T^e, r^e, G^e)$ $\quad A_1 A_5 > 0$ $\quad A_2 A_6 < 0$ ...

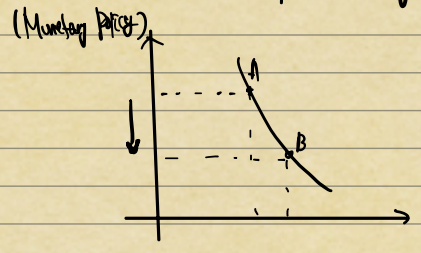
Same LM $\bar{1}$.

$\Delta I > 0 \Rightarrow Y \downarrow$ (but less so since cut of T now will affect future too)

$\Delta T^e > 0 \rightarrow$ human wealth ⇓ ⇒ $Y \downarrow$

If $\Delta T, \Delta T^e > 0$, then it's the increase of T in the static IS-LM model before.

(i.e. permanent change)

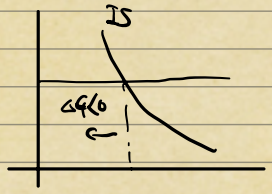


If you cut rates and people believe it will stay long

A→B and then IS will shift to the right. (recover monetary effect)

Greenspan Conundrum : economy overheating => hike interest rate → long rate ↓↓
(market not convinced that Fed will be long-lasting effect)

(fiscal policy)



→
$\Delta Y^e > 0$
$\Delta r^e < 0$

"expansionary fiscal contraction"

ex) Ireland : contractionary but GDP ↑, consumption ↑ (even if unemployment rate ↑)
↑
to beat budget deficit

But this was extreme case