Jan 25th: measuring the Macroeconomy

1) what drives economic growth (we don't know)

2) what causes short run recessions / inflation

Gross Domestic Product (GDP) is the market value of final goods and services produced in an economy over a certain period of time — created during great depression

- NGDP: $P \times Y$
- Y or real GDP = Output, adjusted for price changes
- GDP/capita = GDP per population
- GDP is a measure of national production, income and expenditure

$Y = C + I + G + NX$

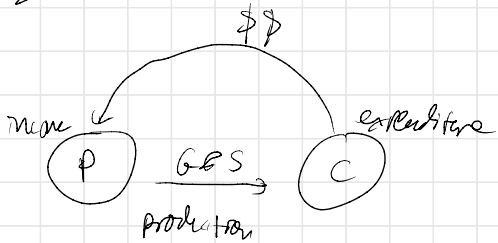
C: consumption

I: Investment

G: government spending (excluding transfers, which are counted/saved)

NX: Exports net of imports

- Size a firm produces 20 transactions
  - production: 20 transactions
  - Expenditure: 20 transactions
  - income: 20 transactions



- Consumption: Spending by consumers
- Investment: saving / spending by firms on capital goods - Δ in capital stock
- Government spending: on stuff other than transfers

- Other important considerations of GDP
  - other measures of welfare correlated but not included
  - measurements in poor countries are flawed
  - informal sectors
  - environment
  - quality improvements
  - inequality

- Despite imperfections, GDP is probably the best measure of economic well-being
  - Why are some countries rich and others poor?
  - Drivers of long-term growth
  - how to counter recessions

Jan 27:

Qs:

- Why is the US rich and Mexico poor?
  - LR question

Macro divided into:

- Long Run
- Short Run

Standards of living have increased dramatically. Why?

- Sources of the industrial revolution?
- Great enrichment → great divergence

Growth rates: find % change from 1 yr to the next

$Y_{t+1} = Y_t(1+g)$

$Y = Y_0(1+g)^t$

$L_t = L_0(1+n)^t \qquad L_0 = 8B$

$L_t = 8B(1.02)^t =$

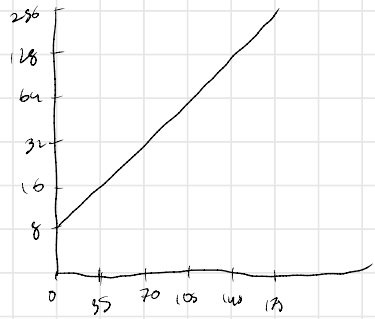
Rule of 70:

$Y_{to\ double} = 70/g$, g in %

Ex: $g = 2\%$, $Y_2 = 35$ yrs

$g = 5\%$, $Y_2 = 14$ yrs

Log scale/ratio scale:



$$\frac{Y}{Y_0} = (1+g)^t$$

$$\left(\frac{Y}{Y_0}\right)^{1/t} = 1+g$$

$$g = \left(\frac{Y}{Y_0}\right)^{1/t} - 1$$

Properties of growth rates

- $Z = X \cdot Y$, $g_Z = g_X + g_Y$
- $Z = X/Y$, $g_Z = g_X - g_Y$
- $Z = X^a$, $g_Z = a\, g_X$

Jan 30:

4 key facts about Economic growth

- Enormous variation - poorest places have < 5% of per capita income of rich countries
- rate of growth very substantially
  - Some countries speed up, others not so
- growth rates not constant over time
  - for individual countries, growth rates change drastically over time
  - until about 1800 no growth
  - Example: Philippines and SK
    - in 1960, PC GDP was < $1,000
    - both had similar sized local market populations
    - Over decades, performance diverged drastically
      - Korea: 5.1%
      - Philippines: 1.3%
- A country can change distribution in rankings
  - Argentina was rich, now it's not
  - China and India have grown rapidly

Why?

- models:
  - what is it leaving out?
  - Does it fit the data?
    - A problem: past performance is no guarantee of future success
  - institutions?

A model of production:

Notation:
- $\bar{A}, \bar{K}, \bar{L}$ → constants / exogenous variables

Production function: output given a set of inputs

Cobb-Douglas production function:

$$Y = F(K, L) = \bar{A} K^{\alpha} L^{\beta}$$; in this case, we have $\alpha + \beta = 1$

K: capital — non-consumed inputs not labor
L: labor — workers

$$Y = \bar{A} K^{1/3} L^{2/3}$$

$\bar{A}$: Total factor productivity

Exponents sum to one — constant returns to scale
- double input → double output

RTS: double input → >double outputs

Behavior of firm:

- firms seek maximal profits: $\Pi_{max}(K,L) = F(K,C) - rK - wL$

r, w in normalized prices

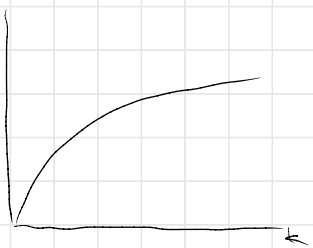
Marginal Product of Capital MP_K: extra amount of output you would get on additional unit of capital, holding all else constant

- MP_K decreases as $K \uparrow \rightarrow$ Diminishing returns to capital
  - we reach "saturation"

$Y = \bar{A} K^{1/3} \bar{C}^{2/3}$; $Y = (K^{1/3})(\text{constant})$

↓

Diminishing returns



Solve for MP_K: $\frac{dY}{dK}$

$$Y = \bar{A} K^{1/3} \bar{C}^{2/3}$$

$$\frac{dY}{dK} = \frac{1}{3} \bar{A} \bar{C}^{2/3} K^{-2/3}$$

$$= \frac{\bar{A} \bar{L}^{2/3}}{3 K^{2/3}}$$

$$= \frac{1}{3} \bar{A} \left(\frac{\bar{L}}{K}\right)^{2/3} = \frac{1}{3} \frac{Y}{K}$$

MP_L = Extra unit of Labor → extra output

Diminishing returns to Labor → workers become redundant

$$MP_L = \frac{2}{3} \frac{Y}{L} = \frac{2}{3} \bar{A} \left(\frac{K}{L}\right)^{1/3}$$

- Exogenous variable set outside model
- Endogenous variable determined inside the model
- Profit Max condition:
  - $MP_K = \frac{1}{3}\frac{Y}{K}$
  - $MP_L = \frac{2}{3}\frac{Y}{L}$

$MP_K > r \Rightarrow$ hire a machine $\rightarrow$ until $MP_K = r$
$MP_L > w \Rightarrow$ hire a worker $\rightarrow$ until $MP_L = w$

Feb 1st:

Recap of previous class:

- $Y = \bar{A} K^{1/3} L^{2/3}$
- CRS: $Y(2K, 2L) = 2Y(K, L)$
- Diminishing returns to K: $MPK = \frac{dY}{dK} = \frac{1}{3}\frac{Y}{K}$
- Profit max conditions:
  $r = MPK$
  $w = MPL$
- $y^* = \frac{Y^*}{L^*} = \bar{A}\left(\frac{\bar{K}}{\bar{L}}\right)^{1/3} = \bar{A}\, k^{1/3}$

  $k = \frac{\bar{K}}{\bar{L}}$ = capital per person
- key determinants:
  - higher TFP
  - more capital / person
- exponents are the shares of national income that goes to each factor

$\frac{wL}{Y}$ = share of national income goes to workers

$\frac{wL}{Y} = \frac{\frac{2}{3}\frac{Y}{L} \cdot L}{Y} = \frac{2}{3}$ = exponent of L

Share going to capital:

$\frac{rK}{Y} = \frac{\frac{1}{3}\frac{Y}{K} \cdot K}{Y} = \frac{1}{3}$ = exponent of K

Analyzing wealth:

- Assume every country has $\bar{A} = 1$

US = 1

$y_{i,2011} = 0.734$, $k_{i,2011} = 0.930$

- model seems to systematically predict that countries should be richer than they are
- our assumption that $\bar{A} = 1$ is maybe wrong
  - allowing for differences in $\bar{A}$ could improve our model's fit
  - $\bar{A}$ ↑ ⇒ higher efficiency of capital and labor
  - identified via the residual

Why $\bar{A}$ matters more: diminishing returns to capital

Approx half the diff in GDP p/c explained ⇒ due to differences in TFP

$$\frac{y_{rich}}{y_{poor}} = 64$$

$$\frac{y_{rich}}{y_{poor}} = \frac{\bar{A}_{rich}\, \bar{k}_{rich}^{1/3}}{\bar{A}_{poor}\, \bar{k}_{poor}^{1/3}}$$

$$= \left(\frac{\bar{A}_{rich}}{\bar{A}_{poor}}\right)\left(\frac{k_{rich}}{k_{poor}}\right)^{1/3}$$

$$= (3)(5)$$

- share due to $\Delta \bar{A}$: $\frac{13}{13+5} \times 100\% = 72.2\%$

Share due to Δk: $\frac{5}{13+5} \times 100\% = 27.8\%$

Why does $\bar{A}$ vary?

- Quality of institutions:
  - sound policies & rules and regulations
  - property rights
  - rule of law
  - contract enforcement
  - stable political system
  - ensure civil liberties
- human capital: skills individuals have
  - education & job training
- Technology

02-03: Solow Growth Model

- Framework to understand why countries are rich

  - $y^t = \bar{A}\bar{k}^{1/3}$
    - capital per person
    - $\bar{A}$: total factor productivity
      - institutions: property rights, rule of law, democratic government, civil liberties
      - education
      - technology

- institutions aren't all that matter, but they do matter a lot

- What other factors matter?
  - geography
    - disease burden (what types, caused by?)
    - agricultural output

Solow Growth Model

- models how change in capital stock affect output per person
  - physical capital is all that is modeled here

Eqn 1: production function at time t

$$Y_t = \bar{A} K_t^{1/3} L_t^{2/3} \rightarrow \text{hold } \bar{A} \text{ constant}$$

Eqn 2: Resource constraint: where does money go?

$$Y_t = C_t + I_t$$

C_t: consumption; I_t: investment

Eqn 3: capital accumulation

$$K_{t+1} = K_t + I_t - \bar{d} K_t$$

- K_t: current capital stock
- I_t: new capital stock
- $\bar{d} K_t$: depreciation

$$\Delta K_t = I_t - \bar{d} K_t$$

Eqn 4: Labor Force

$$L_t = \bar{L}$$

Eqn 5: allocation of resource

$$I_t = \bar{s} Y_t$$

$$C_t = (1 - \bar{s}) Y_t$$

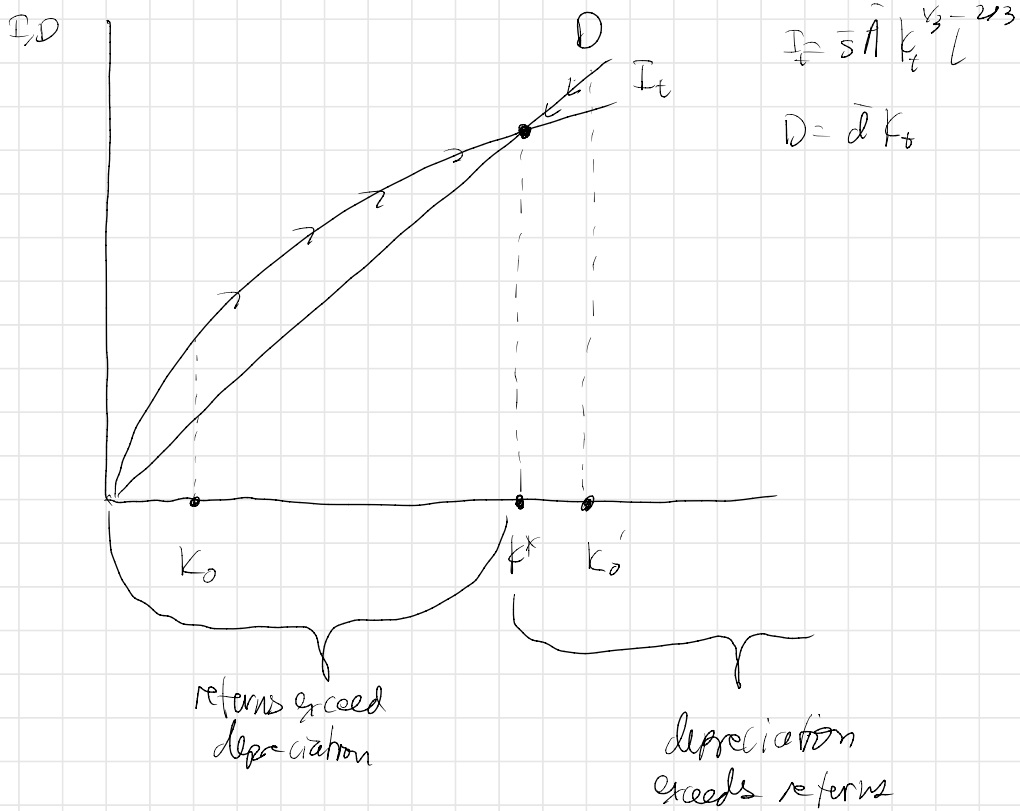
Bring us all together:

$$\Delta K_t = \bar{s} Y_t - \bar{d} K_t$$

$$Y_t = A K_t^{1/3} \bar{L}^{2/3}$$

} we cannot use these to solve for Y at any time t, but we can find the steady state

Solow Diagram

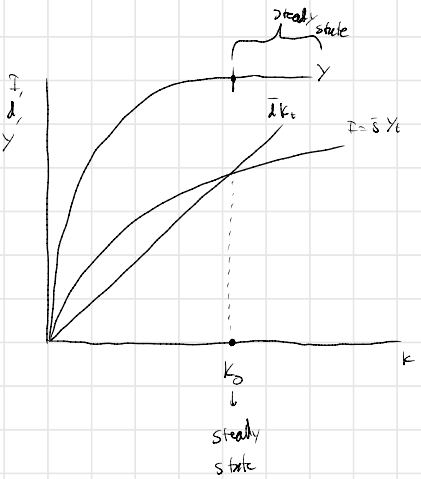


$I_t = \bar{s} \bar{A} K_t^{1/3} L^{2/3}$

$D = \bar{d} K_t$

Feb 6

- Recap: Solow Model focused on capital accumulation's effect on growth
- Production: $Y_t = \bar{A} K_t^{1/3} L_t^{2/3}$
- Resource constraint: $Y_t = C_t + I_t$
- Capital accumulation: $K_{t+1} = K_t + I_t - \bar{d} K_t$
- Labor force: $L_t = \bar{L}$
- allocation of resources: $I_t = \bar{s} Y_t$



Solow Steady State:

- key condition: steady state reached at point where depreciation = investment

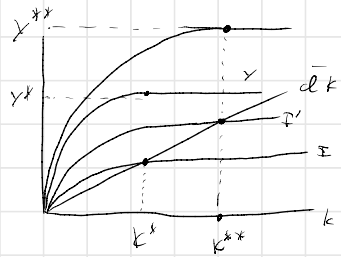
$$y^* = A^{3/2} \left(\frac{s}{d}\right)^{1/2}$$

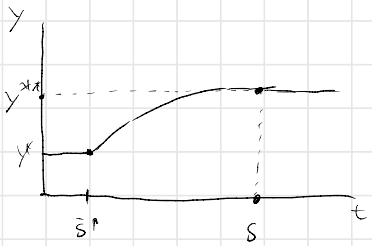
- can physical capital accumulation explain sustained LR GDP growth?
  - No!
    - in LR we should reach steady state
    - Diminishing returns to capital!

Solow Model can explain growth up to steady state

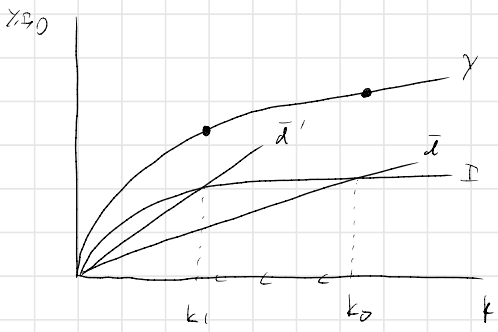
Ex 1: Sudden increase in investment rate

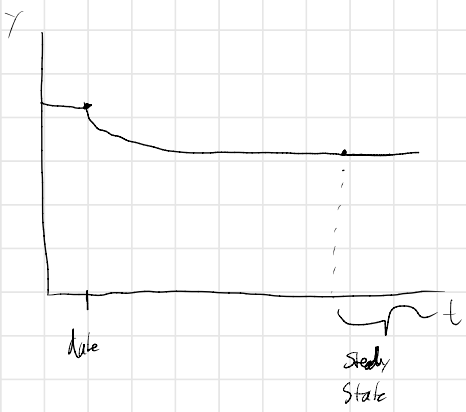
$\bar{s} \rightarrow \bar{s}'$



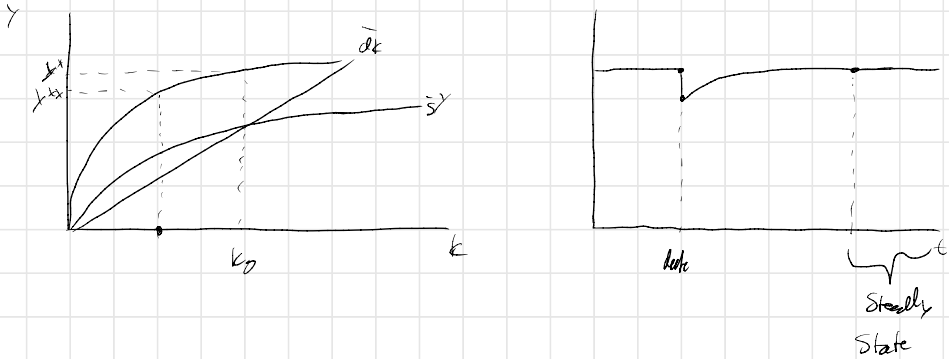


$\bar{d} \uparrow \rightarrow \bar{d}'$





Earthquake destroys half the economy's capital stock



Principle of transition dynamics:

- farther from steady state → faster growth (absolute terms)

Helps explain variation in growth rates, partly
- but many poor countries are poor not b/c they're lower than steady state, but steady state for them is much lower
- poor b/c determinants (investment, TFP) are low

$$y^{*} = \bar{A}\, k^{1/3}$$

$$\frac{g_{rich}}{g_{poor}} = \frac{\bar{A}_{rich}}{\bar{A}_{poor}} \left(\frac{k_{rich}}{k_{poor}}\right)^{1/3}$$

$$g_k = (13) \times s$$

↳ TFP determines more

$$Y = \bar{A}^{3/2}\left(\frac{\bar{s}}{\bar{d}}\right)^{1/2}$$

$$\frac{Y_{rich}}{Y_{poor}} = \left(\frac{\bar{A}_{rich}}{\bar{A}_{poor}}\right)^{3/2}\left(\frac{\bar{s}_{rich}}{\bar{s}_{poor}}\right)^{1/2}\left(\frac{\bar{d}_{poor}}{\bar{d}_{rich}}\right)^{1/2}$$

$64 = (32) \times (2) \times (1)$

↓

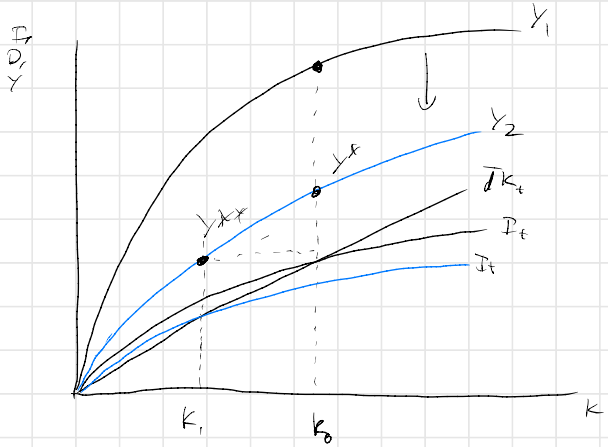
overlooking vs. saving & depreciation

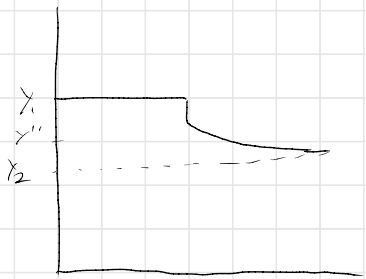
higher TFP → more k/person

Strengths & weaknesses of Solow Model:

- Strengths:
  - theory of output in steady state
    - $\bar{A}$ ↑
    - $\bar{s}$ ↑
    - $\bar{d}$ ↓
  - PTD: explains variation in growth rates
- Weaknesses:
  - $\Delta \bar{A}$?
  - why diff. productivity & investment rates
  - no theory of LR growth

Feb 8

a) 



$Y_1 \Rightarrow Y_2$ happens to decline in $\bar{A}$

- we check that $\bar{S}$ and $\bar{d}$ stay constant while $\bar{A}$ changes

b) Venezuela ran out of US Dollars to maintain their currency peg, and to make up for the lacked dollars, Venezuela printed more bolivars

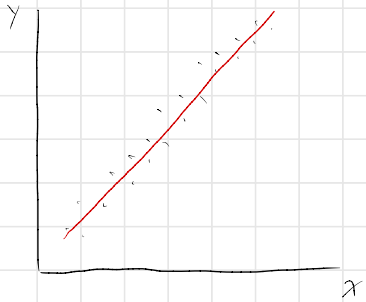
c) Yes

2) $y = (k)^{1/4}(n)^{1/4}(m)^{-3/4}$

$g_y = \frac{1}{4} g_k + \frac{1}{4} g_n - \frac{3}{4} g_m$

3) $Y(2K, 2L) = 2(k^{1/3}L^{2/3}) + \bar{A} < 2Y(K, L)$

Feb 13th



OLS: minimize residuals

$y = \alpha + \beta_x$

Case whether statistically significant

t-statistic: $\left| \frac{\beta}{\text{Std. error}} \right| > 2 \rightarrow$ statistically significant

dummy variable: use for categories

omitted variable bias: might find spurious correlation
- include control variables as R&D variable

Group Exercise: Regression Table

Determinants of State High School Graduation Rates (standard errors in parentheses)		
	1910	1928
log per capita wealth	0.236	0.852
	(0.090)	(0.370)
% labor force in manufacturing	-0.067	-0.144
	(0.034)	(0.097)
South (0/1 dummy variable)	-0.0449	-0.0935
	(0.010)	(0.030)
New England (0/1 dummy variable)	0.0444	0.1
	(0.010)	(0.030)
Constant	-0.136	-0.468
	(0.07)	(0.27)

Source: Goldin and Katz, "Human Capital and Social Capital," Table 1

Questions

1. What does each column represent?
   HS grad rates in 1910 & 1928, regressed against both factors
2. What is the dependent variable?
   HS grad rate
3. What are the independent variable(s)?
   pc wealth, % in manufacturing, South, NE
4. For each variable, what are?

   Top #'s: coefficient

   Bottom #'s in parentheses: standard error

For the questions below, only answer for the 1910 regression.

5. Suppose we have a state in New England with the following made-up values in 1910 (chosen so that the math is easy!): log per capita wealth = 2, % LF in manufacturing = 20% (or 0.20). What is that state's predicted graduation rate?

~36 %

6. Suppose two states are alike in all regards, except that one state is in the South and one is in New England. What is the predicted difference in high school graduation rates between these two states?

~9 %

7. Suppose two states are alike in all regards, except one state has 100% of its labor force in manufacturing (i.e. 1.0) and the other 0% (i.e. 0.0). What is the predicted difference in high school graduation rates between these two states?

~7 %

8. Two states are alike in all regards, except one state has 50% of its labor force in manufacturing (i.e. 0.5) and the other 30% (i.e. 0.30). What is the predicted difference in high school graduation rates between these two states?

~1 %

9. What variables are statistically significant?

pc wealth

Another Exercise: "Do students go to class? Should they?"

UC Berkeley professor David Romer took attendance at six meetings of his Intermediate Macro course. He regressed final class grade (on a 4.0 scale) on the fraction of class meetings attended:

	(1)
Constant	1.25 (0.27)
Fraction of meetings attended	2.19 (0.35)
Sample size	195
R^2	0.31

Source: Romer, David. "Do students go to class? Should they?" *Journal of economic perspectives* (1993): 167-174.

Questions

1. Please identify the following:
   - Dependent variable: GPA
   - Independent variable(s) proportion of class attended
   - # students in sample: 195
   - R^2 (measures the fraction of the variation of the dependent variable associated with variation in the independent variable(s)): 0.31

2. Is the variable "fraction of meetings attended" statistically significant? Why or why not?
   Yes, $t > 2$

3. What is the predicted course grade for a student who attends
   - No class meetings: 1.25
   - Half of class meetings: 2.3
   - All class meetings: 3.34

4. What omitted variable might bias the results?
   time spent studying

Motivation may be an omitted variable.

- Students who attend more classes may study more, so the variable on attendance may be picking up some of the effects of being more academically motivated.

To reduce omitted variable bias, David Romer estimates another regression that includes a variable designed to control for motivation: Fraction of problem sets completed.

- Students who complete more problem sets are likely more motivated and hardworking.

	(1)	(2)
Constant	1.25 (0.27)	1.07 (0.23)
Fraction of meetings attended	2.19 (0.35)	1.74 (0.46)
Fraction of problem sets completed		0.60 (0.32)
Sample size	195	195
R^2	0.31	0.33

5. Is the variable "Fraction of meetings attended" still statistically significant?

Yes

02/15: Colonial Origins, AJR

- Why are countries rich or poor?
  - Total factor productivity!
  - Solow and production model pretty much as originally AJR
- AJR focus on institutions (rules of the game)
  - Quality of govt
  - private property rights
  - second rule of law
- We know institutions matter
  - North vs. South Korea
  - East and West Germany
- Q: to what degree do institutions matter?
  - cannot do double blind RCTs b/c of ethics
- look at history and data

Problems:
- Questions of causality: institutions → rich countries or rich countries → institutions?
- Can't measure institutions: use PRS?
- Omitted variable bias: disease, geography, etc.

AJR's focus: settler mortality rates

- mortality rates high → extract resources
- mortality rates low → modeled after home country

Colonies:
- Settler colonies: large numbers of settlers, modeled after euro institutions
- Extractive colonies: take away resources

Path dependence?

- elite don't want change
- expensive to change institutions

Measure institutions
- protection against expropriation (PRS)
  - hard to measure
  - bias

OLS regression: $\log y_i = \alpha R_i + X_i'\gamma + \varepsilon_i$

R_i: protection against expropriation

Correlation ≠ causation!

Identification or endogeneity problem: Reverse causality

Solution: instrumental variables
- Source of mortality: malaria and yF
- Local pop were immune through

- data comes from Disease and Empire by Philip Curtin

$X \rightarrow Y$?

- $Y \rightarrow X$, perhaps
- find Z, strongly connected to X, unconnected to Y other than through its effect on X

X: institutions
Y: output/capita
Z: Settler Mortality

Z should have no direct impact on Y other than through X
- ultimately, it's just persuading the reader

- if instrument affects economic performance outside of X, then it's less persuasive.

Criticisms:

- Albouy (2012)
  - criticizes judgment calls AJR make about mortality data
  - inconsistently select among multiple data
    - more than one mortality rate, inconsistently select
  - judgment calls about neighboring countries
  - limited comparability of data
    - no distinction between barracks and campaigns
  - AJR becomes less significant

Feb 17

Where we have been:

- frameworks:
  - production model
  - solow model
- focused on capital/person, but mostly A
- AJR focus on differences in A

Romer growth model

- give penny from the dynasty to the next double
  - $92,000,000,000,000,000

- ppl not good at estimating effects of compounding

What sustains growth → technological progress

Coffee cup lids: one size for all coffees
- small ideas free up resources, reduce input costs

Big technology attracts attention, but all these small ones matter too!

Why countries are richer/poor: institutions & ideas

Taiwan: few resources and capital goods, but rich now

Institutions → trade and foreign investment → knowledge

At growth frontier, must develop ideas to sustain growth

- patents
- R&D
- industrial policy?
- education

Meta-ideas: ideas to support new ideas

- Technological progress → better allocation of scarce resources.

- Objects: tangible goods (cell phones)

- Ideas: instructions/recipes (improvement, solar electricity)

Ideas: rearrange raw materials into higher and better uses

Solow Model doesn't deliver, Romer model can

Rivalry:

Rivalrous goods: using something reduces its usefulness to someone else: objects are rivalrous

Non-rivalrous: one person using idea ↛ less available to house it: ideas are nonrivalrous

Excludability: property rights over ideas to exist (patents)

Govt policy:
- patents
- R&D
- prizes
- education

Variables:
- Y_t: output
- A_t: TFP over time
- $\bar{A}_0$: TFP at start
- $\bar{L} = L_{yt} + L_{at}$

L_{yt}: output workers
L_{at}: idea workers

Equations:

Output: $Y_t = A_t L_{yt}$
- not simplified model

Ideas: $\Delta A_t = \bar{z} A_t L_{at}$

Labor constraint: $\bar{L} = L_{yt} + L_{at}$

Allocation of resources: $L_{at} = \bar{\ell} \bar{L}$, $L_{yt} = (1-\bar{\ell})\bar{L}$

$\bar{\ell}$: fraction focused on new ideas

Unknowns:

Y_t, A_t, L_{xt}, L_{at}

Exo vars: $\bar{z}$, $\bar{C}$, $\bar{\ell}$, $\bar{A}_0$

$Y_t =$

02/22

Output: $Y_t = A_t L_{Yt}$

Idea production: $\Delta A_t = A_t \bar{z} L_{At}$

Resource constraint: $L_{At} + L_{Yt} = \bar{L}$

Allocation: $L_{At} = \bar{\ell} \bar{L}$

$L_{Yt} = (1 - \bar{\ell}) \bar{L}$

Solve for y_t:

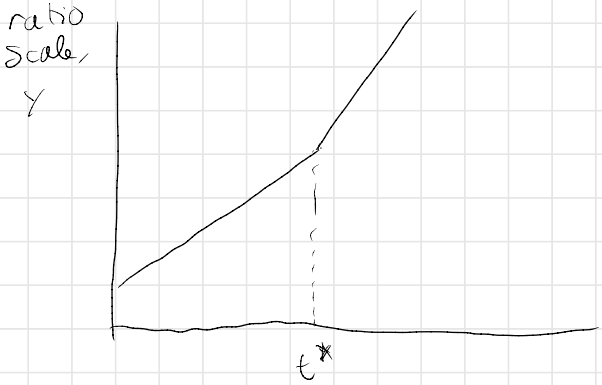
① $y_t = \frac{A_t (1-\bar{\ell}) \bar{L}}{\bar{L}} = A_t (1-\bar{\ell})$

② $g_A = \frac{\Delta A_t}{A_t} = \bar{z} \bar{\ell} \bar{L}$

$y_t = \bar{A}_0 (1-\bar{\ell}) (1 + \bar{z} \bar{\ell} \bar{L})^t$

We see that y_t grows over time at the rate of idea growth

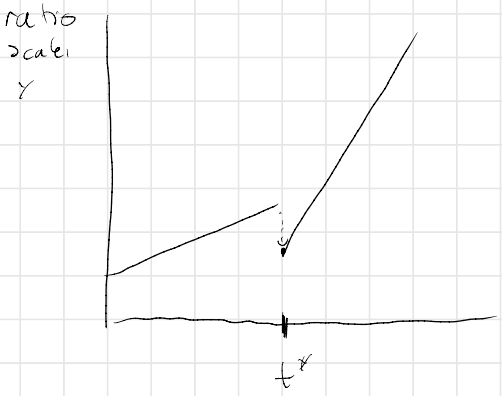
Change $\bar{L}\uparrow$



$$Y = \bar{A}_0 (1-\bar{\ell})(1+\bar{z}\,\bar{\ell}\,\bar{L})^t$$

- Level effect: change in Y
- Growth effect: change in g_Y

Suppose $\bar{L}\uparrow$



Level effect: $Y_t \downarrow$

Growth effect: $g_Y \uparrow$

Meta-idea: how we became rich

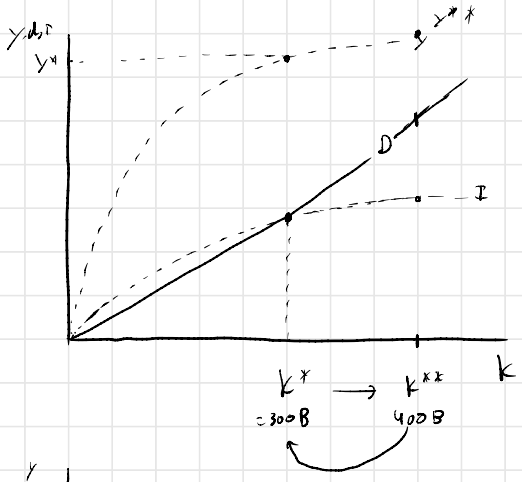
- Patent laws spur technological progress
- Impact of printing press

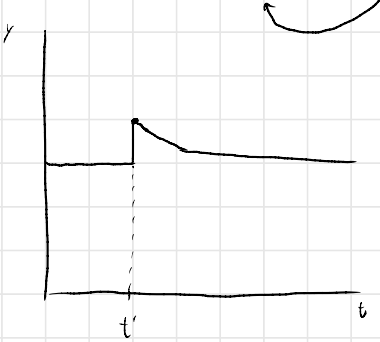
Idea getting more difficult to find:

- Moore's law: more researchers, but same rate of growth
  - research productivity falling

Feb. 24:

Practice Problem:





- One time emergency aid doesn't help long-term living standard

- However, aid in real life does affect $\bar{A}$

Aid views:

- Big push: aid beats poverty trap
  - Jeffrey Sachs (Glech)

- AJR:
  - Bad institutions are problem
  - aid won't improve fundamentals w/o better institutions

How aid can reduce conflict

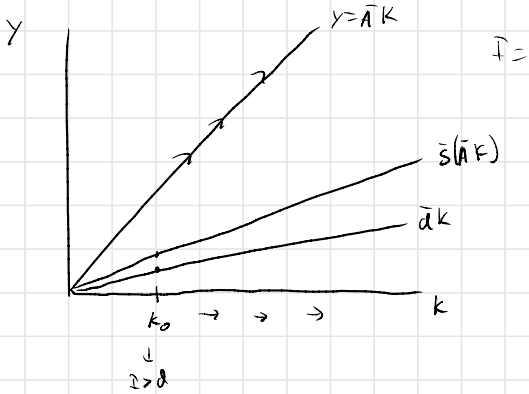
- wealth shock → poverty? → violence
- technique: instrumental variables
- solution: income insurance
- success: Botswana

Increase human capital:

- schooling → human capital → greater growth
- technique: randomized controlled trials
- Kenya: randomly assigned schools, awards given to top 20% of girls

A variation of the solow model:

- $Y = \bar{A} K_t$



$I = \bar{S} Y$

No diminishing returns → continual growth

02-27

Macro practice exercises

2) a) $Y = \bar{A} K^{1/3} L^{2/3}$

$$\frac{\partial Y}{\partial L} = \frac{2}{3} \bar{A} \frac{K^{1/3}}{L^{1/3}}$$

b) $\Pi = \bar{A} K^{1/3} L^{2/3} - rK - wL$

c) $$\frac{\partial \Pi}{\partial L} = \frac{2}{3} \bar{A} \frac{K^{1/3}}{L^{1/3}} - w$$

$0 = MP_L - w$

$w = MP_L$

3) $$\frac{y_1^*}{y_2^*} = \left(\frac{\bar{A}_1}{\bar{A}_2}\right)^{3/2}\left(\frac{\bar{s}_1}{\bar{s}_2}\right)^{1/2}\left(\frac{\bar{d}_2}{\bar{d}_1}\right)^{1/2}$$

$$= (1)^{3/2}\left(\frac{4}{1}\right)^{1/2}\left(\frac{1}{1}\right)^{1/2}$$

$$= 2$$

The rich country has twice the steady state income per capita as does the poor country

March 3rd:

Why Britain?

- cheap coal

- Institutional changes
  - Limited liability Corporation
  - Property rights
  - Patents
  - Interest rates fell

- Rising incomes
  - ↑ private savings
  - high wage → technology innovation

Inequality: is growth evenly distributed across society

- We want incentives to spur people to work

- Extreme levels of inequality → corrode political institutions → no more growth (the story of Britain)

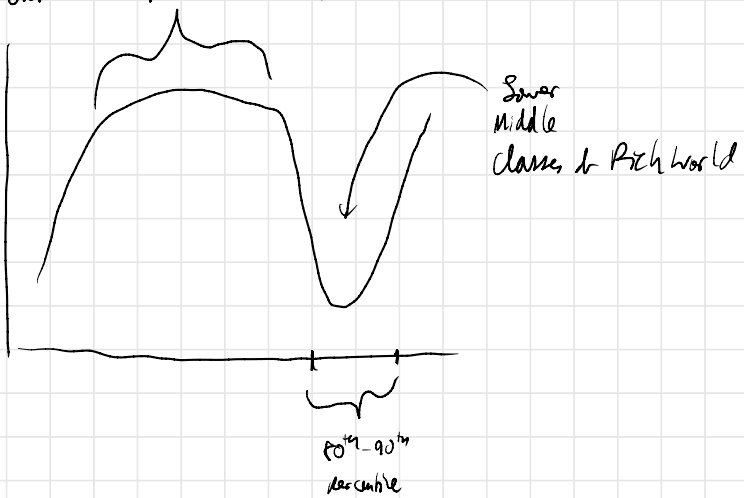
- Poverty trap: increases inequality of opportunity

- Structural barriers to competition

Trends in inequality:

- inequality has been falling due to growth in lower income countries

Elephant graph: growth in China and India



- Precarity is increasing in the US (L-R trend)
  - why?

- States increasing in the 1980s
  - due to labor income:
    - declining labor mobility
    - education
    - health care
    - Superstar effect: if you become really good, you get much richer
      - Superstar firms!
    - Skill-biased technological change
    - Globalization & automation

March 6: Discrimination

Quasi-Experimental evidence to measure discrimination
- Are Emily and Greg more employable than Lakisha and Jamal?

Wealth Accumulation:
- Income: flow, amount earned in a yr
- Wealth: assets - liabilities, over life period

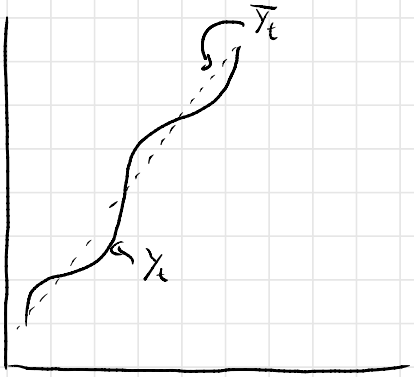
Implicit Bias: unconscious attribution of certain qualities

History of discriminatory policies:
- GI Bill: only available to whites
- Redlining: race ⇒ lack of access to preferential loans
  - detail expectation of "shifting" or "infiltration"
- Housing & house values were the primary method of wealth accumulation
- Lisa Cook: patents & racism
  - until Plessy: patent rate ≈ similar, but after Plessy, patents for Af-Ams fall dramatically
    - Violence spikes → drop in patenting

March 8: The short run

1) What causes business cycles?

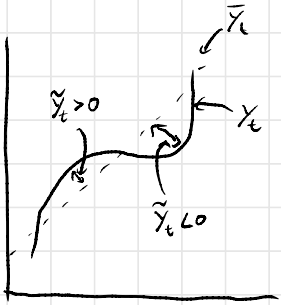
2) What policy tools can we use to counteract business cycles?



$$\text{Output gap} = \frac{Y_t - \bar{Y}_t}{\bar{Y}_t} = \tilde{Y}_t$$

$\tilde{Y}_t > 0$: positive output gap

$\tilde{Y}_t < 0$: negative output gap



Output gap is key outcome variable in short run

Most recessions last about 2 years;

- lose about 6% GDP per capita
- unemployment usually rises 2%
  - but Great recession was much more severe

Key features of SR model:

- shocks cause business cycles
  - COVID Recession: pandemic
  - Great Recession: housing bubble burst
  - 2001 Recession: dot-com + 9/11
  - Volcker Disinflation: spiking interest rates
  - Great Depression: the gold standard, unit banking, stock market crash

Monetary and Fiscal policy:

- Monetary policy: central bank changes money supply and interest rates
- Fiscal policy: govt. spending and taxation policy

March 10:

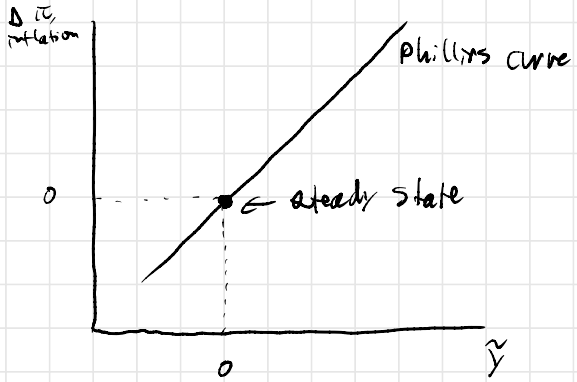
- tradeoff between SR output and inflation: Phillips curve

Okun's law: relationship between output and unemployment

$$u_t - \bar{u} = -\frac{1}{2}\tilde{y}_t$$

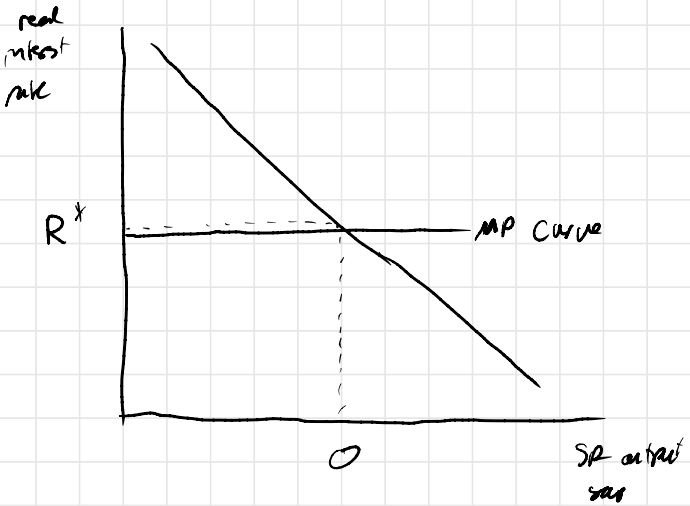
- $\bar{u}$: natural rate of unemployment
- $\tilde{y}_t$: output gap

$\bar{u} \approx$ 4-5%, mostly frictional unemployment



IS Curve

- relationship between interest rate and level of output in the economy
- R: interest rate, cost of borrowing



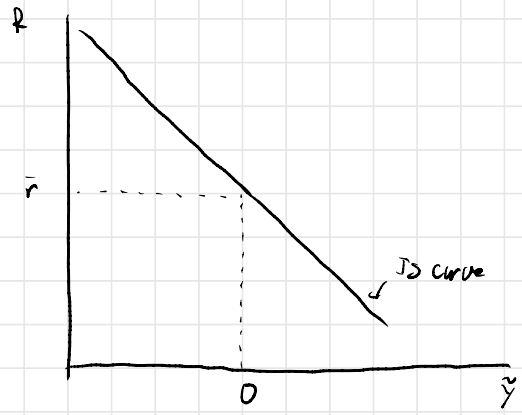
Countercyclical monetary policy:

- $\tilde{y} > 0 \rightarrow \Delta\pi\uparrow \rightarrow R\uparrow$
- $\tilde{y} < 0 \rightarrow \pi\downarrow \rightarrow R\downarrow$

March 20

IS Curve: $\tilde{y} = \bar{a} - \bar{b}(R_t - \bar{r})$

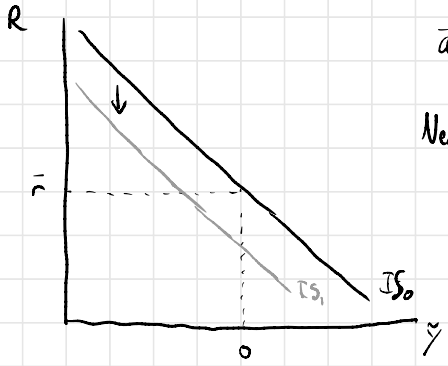
$R \uparrow \rightarrow Y_d$



Assume $\bar{a} = 0$ at long run equilibrium, and $R_t = \bar{r}$

Example 1:

- consumers stop spending so much

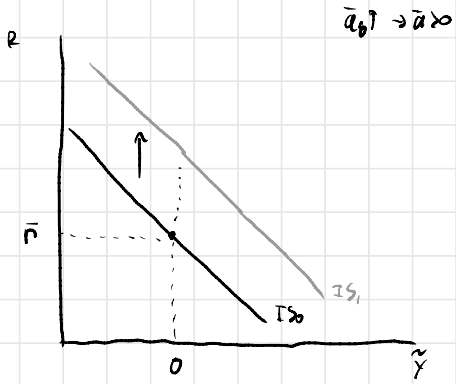


$\bar{a}_c \downarrow \rightarrow \bar{a} < 0$

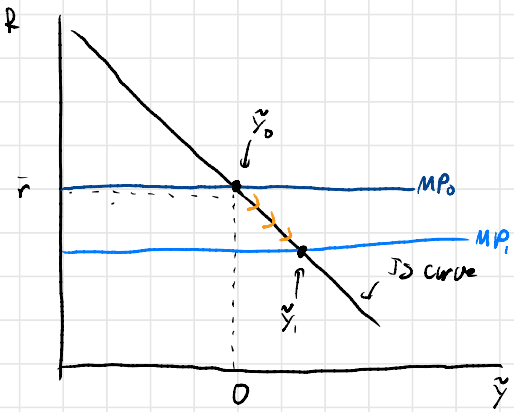
Negative Aggregate Demand Shock

Example 2:

- Govt. Stimulus program



Monetary Policy Curve:



Central bank selects a lower interest rate.

Countercyclical policy: $\bar{a} \downarrow \rightarrow R \downarrow \rightarrow \tilde{Y}$ returns to LRE

$\bar{a} \uparrow \rightarrow R \uparrow \rightarrow \tilde{Y}$ returns to LRE

Multiplier effect:

- govt. stimulus → increased consumption → increased output

Incorporating the multiplier effect:

$$\frac{C_t}{\bar{Y}_t} = \bar{a}_c + \bar{x}\,\tilde{Y}_t$$

$$Y = C + I + G + EX - IM$$

$$\frac{Y_t}{\bar{Y}_t} = \frac{C_t}{\bar{Y}_t} + \frac{I_t}{\bar{Y}_t} + \frac{G_t}{\bar{Y}_t} + \frac{EX_t}{\bar{Y}_t} - \frac{IM_t}{\bar{Y}_t}$$

$$= \bar{a}_c + \bar{x}\,\tilde{Y}_t + \bar{a}_i - \bar{b}(R_t - \bar{r}) + \bar{a}_g + \bar{a}_{ex} - \bar{a}_{im}$$

$$\tilde{Y}_t = (\bar{a}_c + \bar{a}_i + \bar{a}_g + \bar{a}_{ex} - \bar{a}_{im} - 1) + \bar{x}\,\tilde{Y}_t - \bar{b}(R_t - \bar{r})$$

$$\tilde{Y}_t(1 - \bar{x}) = \bar{a} - \bar{b}(R_t - \bar{r})$$

$$\tilde{Y}_t = \frac{\bar{a} - \bar{b}(R_t - \bar{r})}{(1 - \bar{x})}$$

March 22

Monetary Policy and the Phillips curve

Long run equilibrium is our starting point

$\bar{Y}$: potential, LR equm output

$\bar{r}$: "natural" rate of interest

$\bar{u}$: "natural" rate of unemployment, or Non-Accelerating Inflation Rate of Unemployment (NAIRU)

Federal Reserve targets federal funds rate
- FFR: interest rate for interbank overnight loans

Fisher Equation:

$$i = \bar{r} + \pi$$

- i: nominal interest rate
- $\bar{r}$: real interest rate
- π: inflation rate

P = \$100	i = 5%
→ \$105	
π = 3% → \$100 at start of yr costs	
\$103, so your add'l rate of	
return is +\$2, or 2%	

Alternatively, we can write it as

$$r = i - \pi$$

Ex post and Ex ante:

$$r^{\text{ex post}} = i - \pi^{\text{actual}}$$

$$r^{\text{ex ante}} = i - \bar{\pi}^{\text{expected}}$$

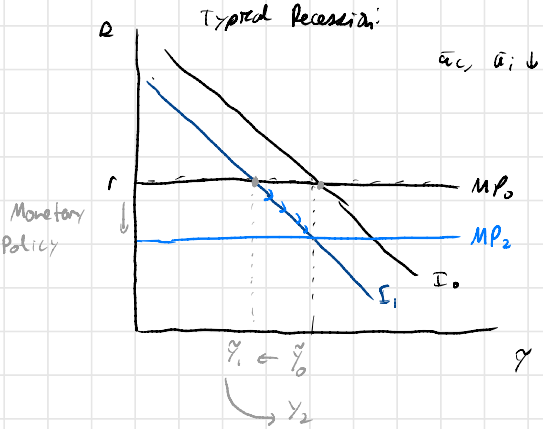
Sticky inflation assumption:
- expectations update slowly
- contracts are fixed and nominal
- menu costs – cost associated with changing prices

Example:
1) housing bubble bursts, $\bar{a}_c$ and $\bar{a}_i$ ↓

2) Federal Reserve drops interest rate

3) Fiscal policy ↑ govt spending and ↓ taxes

Typical Recession:



Central banks cannot lower i to be low zero

March 24:

The Phillips Curve

$$\pi_t = \pi_t^e + \bar{v}\tilde{Y} + \bar{o}$$

- π_t: Inflation rate
- π_t^e: expectations
- $\bar{v}\tilde{Y}$: location in Business Cycle
- $\bar{o}$: price shocks (increase in input costs for firms)

Adaptive expectations: $\pi_t^e = \pi_{t-1}$

Inflation next year is equal to inflation at the previous year

$$\pi_t = \pi_{t-1} + \bar{v}\tilde{Y}$$

$$\Delta\pi = \bar{v}\tilde{Y}$$

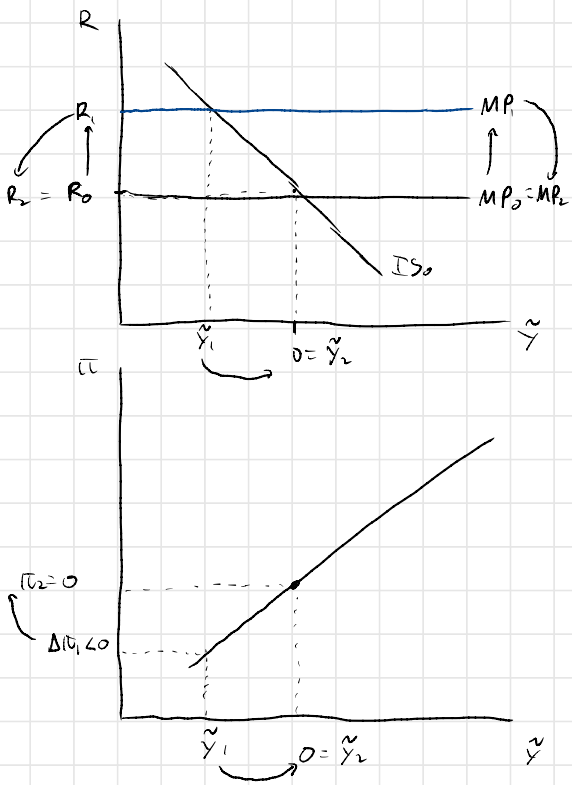
$\bar{v}$ is the slope of the Phillips curve

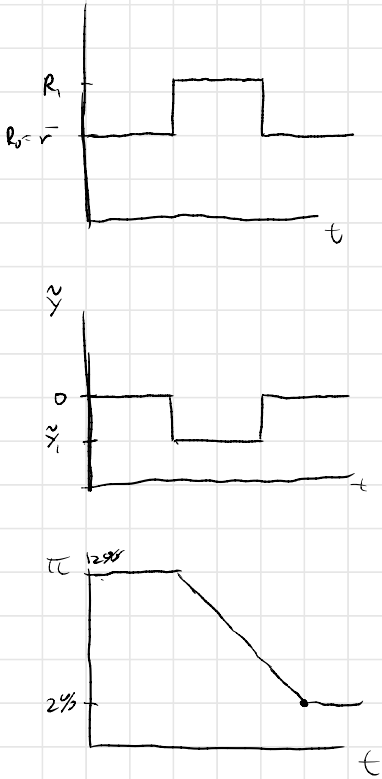
Volcker Disinflation:

- inflation rate falls

Increase interest rates → recession → stable inflation → stable interest rates

Modeling the Volcker Disinflation





March 27

Fiscal Policy:

- Contractionary: govt. spending ↓, taxes ↑
- Expansionary: govt spending ↑, taxes ↓

Monetary Policy:

- Contractionary: MS↓, Interest rate ↑
- Expansionary: MS↑, Interest rate ↓

Inflation target: 2%

$R_t - \bar{r} = \bar{m}(\pi_t - \bar{\pi})$

$\bar{m}$: positive constant

$\bar{\pi}$: inflation target

$\pi_t > \bar{\pi} \rightarrow R_t > \bar{r}$

$\pi_t < \bar{\pi} \rightarrow R_t < \bar{r}$

$\bar{m}$ represents the hawkishness of the Central Bank

$\bar{m}$ high → Central Bank raises rate quickly if inflation goes up

$\bar{m}$ low → bank raises rate slowly

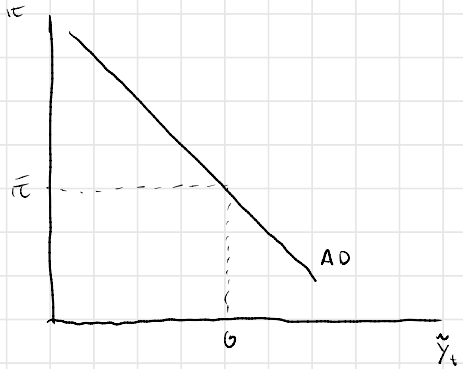
Aggregate Demand Curve

1) IS curve: $\tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r})$
relationship between economic activity and interest rate

2) Monetary policy rule: $R_t - \bar{r} = \bar{m}(\pi_t - \bar{\pi})$

Aggregate demand: $\tilde{Y}_t = \bar{a} - \bar{b}\left(\bar{m}(\pi_t - \bar{\pi})\right)$

$\pi_t \uparrow \rightarrow \tilde{Y}_t \downarrow$ Assume $\tilde{Y}_{t+k} = 0$, $\bar{a} = 0$, so $\pi_t = \bar{\pi}$ at eq'm

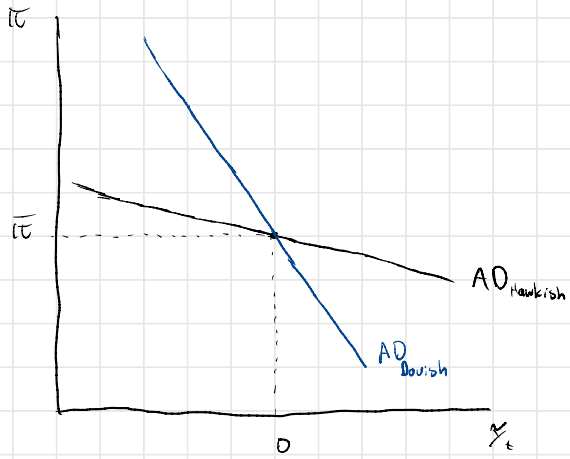


AD curve shows relationship between output and inflation, mediated through the central bank

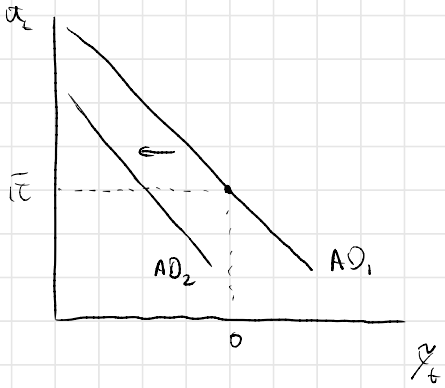
$\pi_t \uparrow \rightarrow R_t \uparrow \rightarrow \tilde{Y}_t \downarrow$

AD curve for hawkish central bank:
$\bar{m}$ high $\rightarrow$ Y_t changes more for any given change of inflation $\rightarrow$ flatter AD curve

$\bar{m}$ low $\rightarrow$ Y_t change little for a given change of inflation $\rightarrow$ Steeper AD curve



A change in $\bar{a}$:

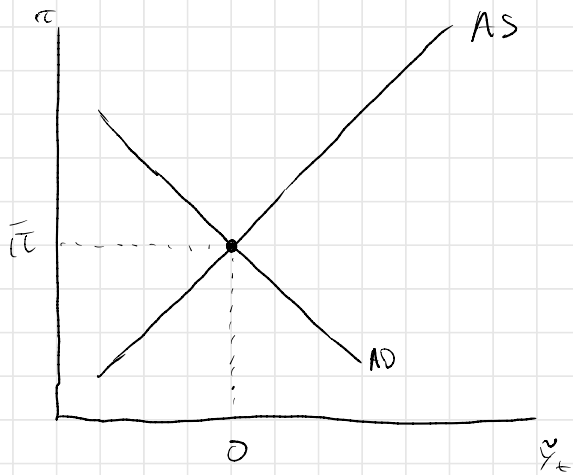


Aggregate Supply = Phillips Curve

$$\pi_t = \pi_t^e + \bar{\nu}\tilde{Y}_t + \bar{\sigma}$$

AD: $\tilde{Y} = \bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})$

AS: $\pi_t = \pi_t^e + \bar{v}\tilde{Y} + \bar{o}$



Adaptive expectations:

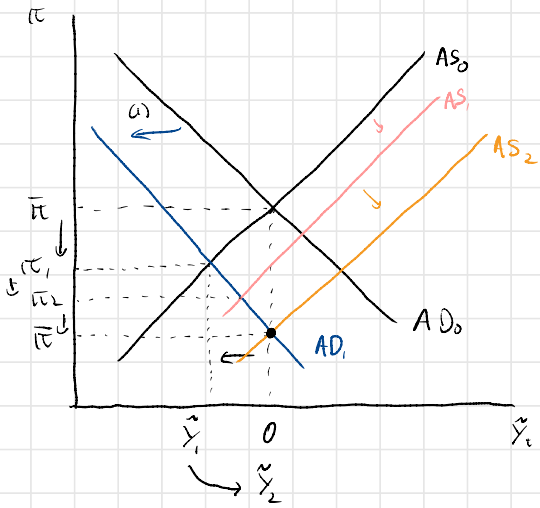
$\pi_t^e = \pi_{t-1}$

Aggregate Demand - Aggregate Supply

Ex. 2:

AD: $\tilde{y} = \bar{a} - \bar{b}m\,(\pi_t - \bar{\pi})$

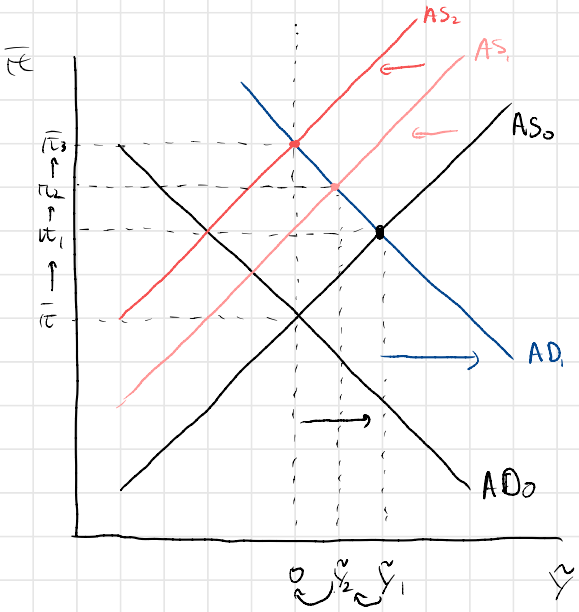
AS: $\pi_t = \pi_t^e + \bar{\nu}\tilde{y}_t$



Volcker Disinflation: $\bar{\pi}' < \bar{\pi}$

Short run: AD↓, $\tilde{y}_1 < 0$

Ex. 3:


AS2
AS1
AS0
AD1
AD0
$\bar{\pi}$
π_2
π_1
$\bar{\pi}$
0
$\tilde{y}_2$
$\tilde{y}_1$
$\tilde{y}$

March 31: How the Federal Reserve conducts monetary policy

Review short run model

Output gap: $\tilde{Y}_t = \frac{Y_t - \overline{Y_t}}{\overline{Y_t}}$

Okun's Law: $U_t - U^* = -\frac{1}{2}\tilde{Y}_t$

IS curve: $\tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r})$

Real interest rates

MP curve: Fed sets R_t

Policy Rule: $R_t - \bar{r} = \bar{m}(\pi_t - \bar{\pi}) + \bar{n}\tilde{Y}_t$ (Taylor Rule)

Dual Mandate:

- price stability
- maximum employment — output gap = zero

AD curve: $\tilde{Y}_t = \bar{a} - \bar{b}\left(\bar{m}(\pi_t - \bar{\pi}) + \bar{n}\tilde{Y}_t\right)$

$\tilde{Y}_t(1 + \bar{n}\bar{b}) = \bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})$

$\tilde{Y}_t = \left(\bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})\right)\frac{1}{1+\bar{b}\bar{n}}$

AS Curve: $\pi_t = \pi_t^e + \bar{v}\tilde{Y}_t + \bar{o}$

Federal Reserve structure:

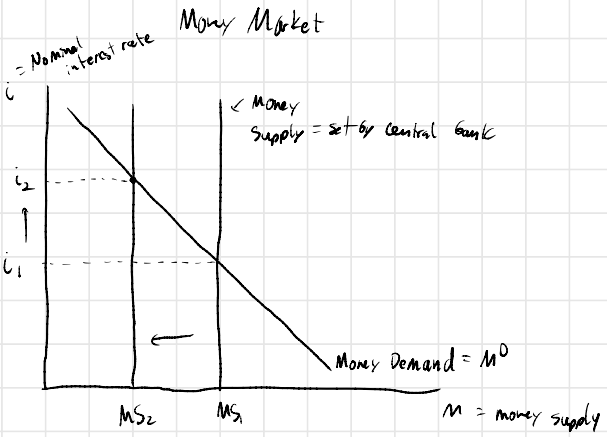
- Chair
- vice chair
- Five governors
- Chair of FRBNY
- Four of the other remaining reserve bank presidents

- Nonvoting reserve bank presidents

April 3: FOMC & Federal Reserve

Financial Assets collapsed	
Money	Bonds
- immediately available - can be used to buy goods and services	- interest

Nominal interest rate = opportunity cost of money (what you give up holding money instead of bonds)



How central banks change money supply:

1) Open Market Operations:
   - Sell Bonds: take money out of circulation
   - Buy Bonds: putting money into circulation

Buy Bonds → Demand for Bonds ↑
→ price of Bonds ↑
→ interest rate ↓

Discount Bond:

$P_0 = \$900$ $P_1 = \$1000$

$i_1 = \frac{1000}{900} = (1.11) - 1 = 11.1\%$

$P_2 = 950$ $P_1 = \$1000$

$i_2 = \frac{1000}{950} - 1 = 5.26\%$

2) Interest rate floor and ceiling
   - Interest rate on reserves
   - Discount Rate

Interest rate on reserves ↓ → reserves ↓
→ loans ↑
→ M ↑

Federal Funds rate:

- excess reserves → lent to other banks
- overnight loan rate = FFR

IRR:

- sets floor on FFR
- No bank lends to another bank below IRR

Discount Rate:

- rate on loans from discount window
- ceiling on FFR

FFR and market interest rates tend to move in tandem

April 6: Liquidity Traps

Okun's Law: $\tilde{Y}_t = \frac{Y_t - \bar{Y}_t}{\bar{Y}_t}$

Okun's Law: $u_t - u^* = -\frac{1}{2}\tilde{Y}_t$

IS Curve: $\tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r})$

MP Curve: $i_t = R_t + \pi_t$

Policy Rule: $R_t - \bar{r} = \bar{m}(\pi_t - \bar{\pi})$ — Taylor Rule: $R_t - \bar{r} = \bar{m}(\pi_t - \bar{\pi}) + \bar{n}\tilde{Y}_t$

AD Curve: $\tilde{Y}_t = \bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})$

Phillips Curve / AS Curve: $\pi_t = \pi_t^e + \bar{v}\tilde{Y}_t + \bar{o}$

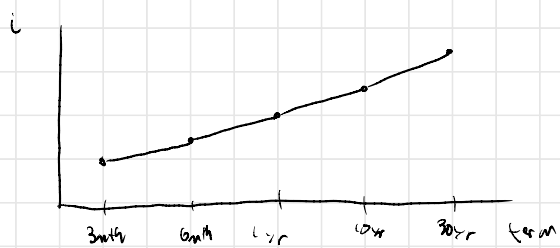
Liquidity trap:

- unable to lower interest rate below zero, even if conditions necessitate it
- prime example: 2008 recession

Key Question: how do/should central banks stimulate the economy?

First, yield curve:

- Nominal interest rate depends on term of loan:



i ↑ as term ↑ as it's riskier to borrow over longer horizons

What else todo to stimulate economic activity?

- Quantitative Easing: buying long term bonds to affect long term interest rates

Long term interest rates are a function of future short term rates, plus risk premium

Forward guidance: commitment by central bank to keep ST rates low for a long period of time

In class practice exercises on Automatic Stabilizers

$\tilde{Y}_{\downarrow} \rightarrow G \uparrow$

$\tilde{Y}_{\uparrow} \rightarrow G \downarrow$

$\frac{G_t}{Y_t} = \bar{a}_g - \bar{d}\, \tilde{Y}_t$

Date: Apr 5

Professor Andy Jalil

Group Exercise: Automatic Stabilizers in our Short-Run Model

Background: Government spending tends to increase naturally when an economy slips into a recession, even without any legislated changes in fiscal policy. Why? When an economy is in recession, unemployment increases and the government automatically increases its spending on unemployment insurance and the social safety net. By contrast, government spending tends to decrease automatically when an economy enters a boom: When the economy is in a boom, unemployment decreases and the government automatically reduces its spending on unemployment insurance and the social safety net.

Government spending that automatically responds to the business cycle is referred to as "automatic stabilizers." Why? When the economy weakens, the increase in government spending that automatically occurs helps to counteract the fall in output, thereby stabilizing the economy.

a. How could you incorporate automatic stabilizers into our short-run model? Starting with our baseline model from class, what equation(s) would you change? Why?

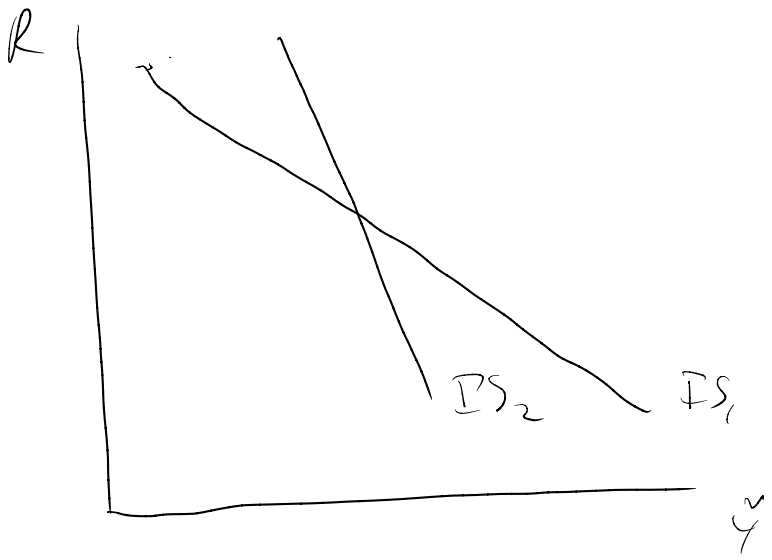
$$\frac{G_t}{\bar{Y}_t} = \bar{a}_G - \bar{d}\,\tilde{Y}_t$$

b. Derive the IS curve in this economy.

$$\tilde{Y}_t = \bar{a} - \bar{b}(R_t - \bar{r}) - \bar{d}\,\tilde{Y}_t$$

$$\tilde{Y}_t = \frac{\bar{a} - \bar{b}(R_t - \bar{r})}{1 + \bar{d}}$$

c. Graph the new IS curve you derived in part (b) and show how it is different from the standard IS curve considered in class. Specifically, show how the slope of this new IS curve differs from the slope of the standard IS curve considered in class. What is the economic interpretation of the difference? (Assume that $\bar{r}$ is the same across both IS curves.)



d. Which IS curve shifts by more in response to a given aggregate demand shock (i.e. a given change to $\bar{a}$): the new IS curve (from part b) or the standard IS curve considered in class? Does your answer depend on whether the shock is a positive or negative aggregate demand shock (i.e. whether $\Delta\bar{a} > 0$ or $\Delta\bar{a} < 0$)? Explain, either mathematically or graphically.

The original IS curve shifts more, since
ΔY + unit multiplied by the $\frac{1}{1+\bar{r}}$ term

e. Now, assume that the Federal Reserve follows a particular policy rule:

$$R_t - \bar{r} = \bar{m}(\pi_t - \bar{\pi}) + \bar{n}\tilde{Y}_t$$

Does this policy rule reflect the dual mandate of the Federal Reserve? Why or why not?

Yes, it seeks to keep inflation under control and maintain output close to potential

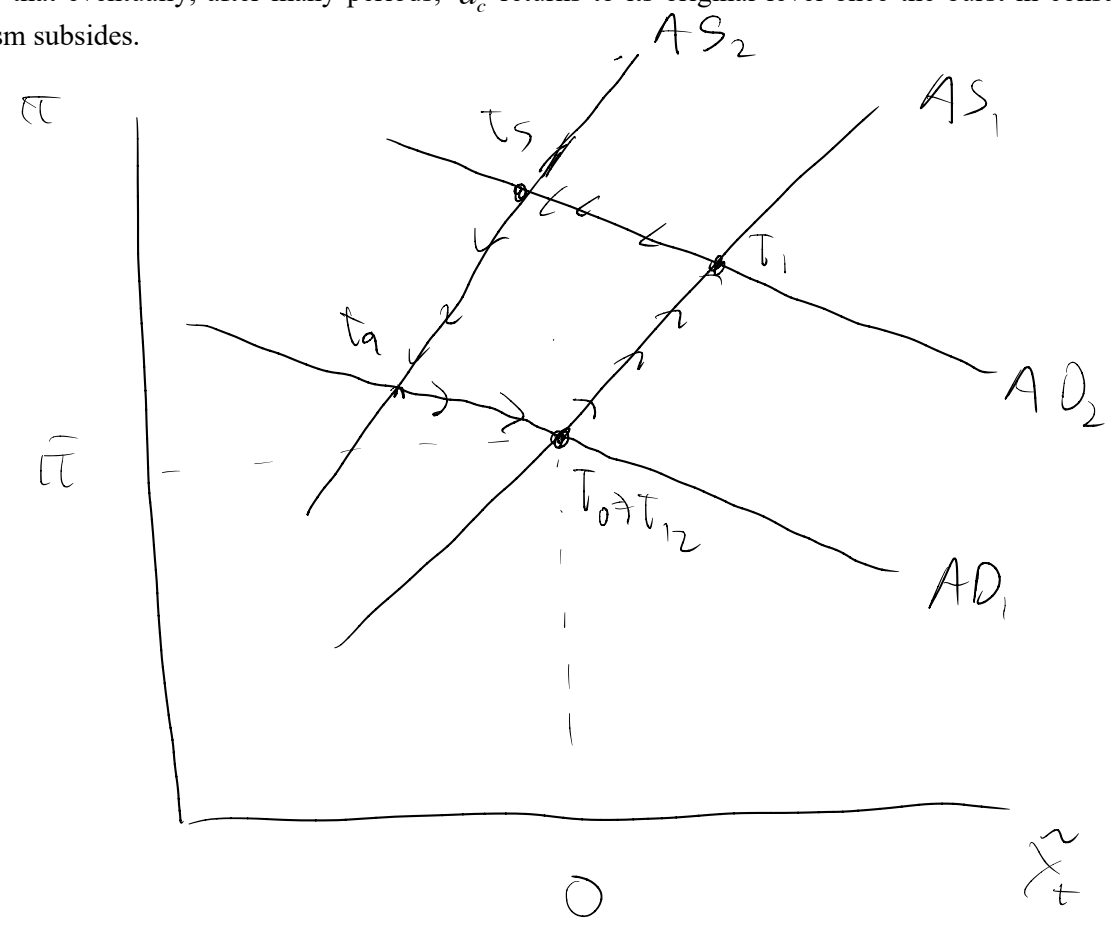
f. Using the IS curve you derived in part (a) and the policy rule from part (d), derive the new AD curve for this economy.

$$\tilde{Y}_t = \frac{\bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi}) - \bar{b}\bar{n}\tilde{Y}_t}{1+\bar{d}}$$

$$Y_t\left(1 + \frac{\bar{b}\bar{n}}{1+\bar{d}}\right) = \frac{\bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})}{1+\bar{d}}$$

$$Y_t = \frac{\bar{a} - \bar{b}\bar{m}(\pi_t - \bar{\pi})}{1+\bar{d}+\bar{b}\bar{n}}$$

g. Suppose consumers suddenly become optimistic and increase their spending. You can interpret this as an increase in $\overline{a}_c$. Illustrate how the economy will behave over time in an AD-AS diagram. Also, please assume that eventually, after many periods, $\overline{a}_c$ returns to its original level once the burst in consumer optimism subsides.



April 7 - 10

Automatic Stabilizer incorporation:

$$\frac{G_t}{\bar{Y}_t} = \bar{\alpha}_g - \bar{d}\tilde{Y}_t$$

Biden's Industrial policy:

- large checks to particular domestic industries
  - subsidies/payments
- Semiconductors: CHIPS ACT
  - "national security"
- Inflation Reduction Act:
  - also includes healthcare subsidies
  - Corporate tax reform / IRS Funding
  - clean energy incentives

Is the govt. better at picking winners than the market?

Great Depression & Great Recession

Recession:

NBER determination:

- significant decline economic activity
- Depressions are very bad recessions

Great Depression was global

- Summer 1929: peak of industrial production, enter minor recession
- Industrial production fell 40%
- falling prices & Deflation

April 14:

How do we verify our model is correct?

- regress $\ln(Y) = \alpha + \beta \Delta x_t$
- x_t is the measure of the stance of monetary policy
  - level of FFR
- Y_t is output / GDP

We might think $\hat{\beta} < 0$, but it's not!

- St. Louis Fed'n
- They found no correlation between FFR and output

Monetary policy is conducted countercyclically,

So $Y_t \uparrow \rightarrow i_t \uparrow \rightarrow Y_t \downarrow \rightarrow i_t \rightarrow Y_t \uparrow \rightarrow$ etc.

The rise in output is correlated with high interest rates AND low interest rates

Interest rate shocks reduce output

When to use AS-AD vs. IS-MP w/ Phillips curve

AD curve comes from IS curve and policy rule

- only works if central bank is following policy rule
- i.e., at liquidity trap / ZLB, cannot use AS-AD curve

Bubble: unsubstantiated overvaluation of a commodity or asset

- lax lending standards

- Banking Panics:
  - Banks accept demand deposits and lend out
  - channel supply of loanable funds to demand for loanable funds

  - Happened ~ every 10-15 years until Great depression, then didn't happen until 2008

  - loss of confidence → Bank runs → failures → etc.

  - After great Depression:
    - bank regulation
    - Deposit insurance

Apr 17.

- Change in leading to 2008:
  - Shadow banking
  - bank deregulation
  - financial product innovation

Shadow banking sector:
- banking outside the exc of regulations
- no deposit insurance

Repo: depositors banking for large financial institutions

- No deposit insurance
- Asymmetric info about risk of banking → run
- Bank run in shadow banking sector
  - unwind counterparty risk

2008 Bank Bailout: TARP (Troubled Asset Relief Program)

Balance Sheet:

- CMO: collateralized mortgage obligation
  - bond dependent on value of mortgage

Assets	Liabilities
$80: CMOs	$100: Deposits
$50: cash	$30 Net worth

$80 in Period 2

$40 in Period 1

→ Financial crisis in period 1

Assets	Liabilities
$40: CMOs	$100: Deposits
$50: Cash	-$10: NW

Cash injection: $12

Assets	Liabilities
$40: CMOs	$100: deposits
$50: cash	$2: NW
$12: assistance	

Took ownership in bank, sold at profit

Apr 19

Does Monetary policy matter?
- Update to Friedman and Schwartz
- shows that macro class matters

The narrative approach:
- uses information that is historical
- minutes of FOMC meetings
- non-purely statistical information to deal with reverse causality

The St Louis Regression:
$\Delta \ln Y_t = \hat{\alpha} + \hat{\beta} X_t + \varepsilon_t$
- Y_t: GDP
- X_t: level of FFR

$\hat{\beta} \simeq 0$!
expected from countercyclical policy!

Friedman and Schwartz: A Monetary History of the United States
- reverse causality/identification/exclusivity
- Historical Narrative approach

$Y_L \rightarrow$ fewer loans $\rightarrow$ M_L
$Y_F \rightarrow$ loans $\uparrow \rightarrow$ M_F

F & S use "unused" monetary movements

Crucial experiments:

- 1920: Federal reserve jacks up interest rates, doesn't know what its doing, no lags accounted for

- 1931: Gold outflows, Federal reserve raises interest rate to maintain the gold standard

- 1936-37: double reserve requirements, M1 substantially as banks scramble to call loans

Decline in M causes decline in Y

strengths:
- address endogeneity problems
- money matters

weaknesses:
- identification strategy is largely a judgment call
- Two examples of missed episodes:
  - 1933
  - 1950
- Definition too vague
- time period
- OVB: Fiscal policy changes
  - Fiscal policy contraction → Y↓?

Romer's definition of a monetary shock:
- negative shock
  - actively wants to reduce inflation from excessive rates

April 21

Inflation in Turkey: 85%

Erdoğan installs crony to central bank, refuses to jack up interest rates
- doesn't like high interest rates
  - economic populism: thinks high interest rates increase inflation (not borne out by evidence)
  - islam: interest = exploitative

Independent central banks: incentive for politicians ≠ incentive for fed officials

April 24:

Deficit: G-T over 1 yr period
2022: $1.4T, 5.5% of GDP

Debt: accumulated deficits − accumulated surpluses

Primary spending:
- Social Security
- Medicare
- Medicaid

> half of federal spending on these

Most revenue is from income taxes (personal and corporate)

Debt ceiling: govt. isn't allowed to borrow over the limit

Market for debt:
- Demand for loans:
  - interest rates ↑ ⇒ fewer loans demanded
- Supply of loans:
  - interest rates ↑ ⇒ more loans supplied
- Equilibrium price is the prevailing interest rate

By borrowing at full employment, govt. crowds out private sector

Except:
- liquidity trap
- negative output gap

April 26:

Why Health care?
- >1/6 of our GDP

Market for healthcare:
- ACA, 2010
- Before ACA, ~ 1/6 of Americans lacked health insurance
- Primarily 20-25 year olds, little income and no parents' health insurance

- costly
  - avg. premium over $5k for individual coverage
- tax advantages
- adverse selection: people who need insurance need it more, price ↑, spirals
- pre-existing conditions

Market Failure in Healthcare: Asymmetric information
- consumers know health history, insurance cos don't
- prices are opaque

ACA expands coverage:
- Exchanges to purchase insurance
- Companies cannot deny on the basis of pre-existing conditions
- insurance purchase mandate — tax of 2.5% or $695 if you don't
- Subsidized to purchase insurance
- Medicaid expansion: 40 out of 50
- Stay on parents' plan until 26

Rising healthcare costs:
- deficits ↑ (unless taxes rise)
- crowd out private investment
- crowd out other govt. spending
- probability of debt crisis ↑

We spend a lot of money on healthcare
- not great health outcomes
- wasteful spending

Doc. notes:
- last two years of life,
- WTP for longevity is very high, >30% is on sheet that doesn't pass CBA
- Medical advancements sometimes don't matter
- fee for service
  - paid on the basis of service
  - as opposed to prepaid management
  - incentive to maximize # of procedures

April 28:

Drivers of healthcare costs:
- Medical innovation
- Fee for service

Intl Macroeconomics:
exchange rate: price of one currency in another
- determined by S & D

(1) 0.9 euro — 1 USD
↓ Dollar appreciating

(2) 1 euro — 1 USD Euro depreciated

Americans prefer (2) over (1)
- goods in euros are cheaper to Americans

Appreciated currency → IM↑, EX↓, NX↓

i↑ → Dollar↑ → NX↓
(demand for dollars increased)

May 1:

$i \uparrow \rightarrow D_{dollars} \uparrow \rightarrow \text{Dollar} \uparrow \rightarrow NX \downarrow$

$$\frac{NX_t}{Y_t} = \bar{a}_{nx} - \bar{b}_{nx}(R_t - \bar{r})$$

effect of monetary policy on trade flows

Fixed exchange rate: rate doesn't change

Reasons:

- less volatility
- signal of macroeconomic discipline

Requirements:

- must maintain adequate currency reserves

If can't maintain fixed exchange rate, currency crisis ensues

Similar to run on bank, but a run on the peso