Introductory Macro Economics: Lecture Note Summary (Page 1)

Lecture #1:

GDP & GNP (Output = Income)

GDP (Gross Domestic Product)

→ Value of in-country goods & services at Market value in time

GNP (Gross National Product)

→ Value of in-country goods & services made by domestic owned factors of production

Production means income for someone ↑

GDP & GNP: Differences/Relations

GDP → don't care about – who earned, – who produce
care about – where produced

GNP → don't care about – where made/earned
care about – who is earning (your residents)

Relation

$$GNP = (GDP - FPF) + FPA$$

or

$$GNP = GDP + NFP$$

where

(FPA) → Factor Payment From Abroad (Income of resident from outside country)

(FPF) → Factor payment to Foreigner (Income to Foreigner In-country)

$$GNP \text{ & } \frac{\partial GNP}{\partial time} \sim GDP \text{ & } \frac{\partial GDP}{\partial time}$$

Computing GDP in Closed Economy

Two ways ① ②

① $\sum$ Value_Added = GDP

→ value added = (Value_output − value_Inputs of Product)

② $\sum$ Value of all final goods

→ goods sold to final user

Computing GDP in Open Economy

two ways ① ②

① $\sum$ Value_Added = GDP

② $\sum$ Value of final goods − value of Imported Intermediate + value of exported Intermediates

what's Normal for GNP/GDP Ratio

- usually $GDP/GNP \sim 1$

→ if discrepancy refer back to formula to explain why

Most Famous Equation in Macro: Production Function

$$GDP = C + I + G + NX$$

↳ Output = Spending

Entities of Interest

Private Sector	Government	Foreigner
• Household • Firm	• Federal • State • Local	(• Household • Firm • Gov)

Explanation of Symbols in Production Function

C → Private Consumption

- Purchase of goods & services by domestic Households

I → Private Investment

- Purchase of Goods by Domestic Firms
- PPE, Inventory, R&D costs, etc.

G → Government Purchase of Goods & Services

- Either goods for goverment consumetion or Investment

NX → Net Exports

- Exports − Imports

NOTE

Domestic Spending = (C + I + G)

Income = Spending

- Output = Income = Spending

(why?)

① Everything produced is sold to someone

② Put into inventory, so treated as Investment, ergo spending

Key Point = Domestic Spending CAN Include Imports

→ Net-Net GDP remains unchanged though

Example: Why Effects on GDP not always straight-forward

Question: Does ↑G imply ↑Y

⇓

Maybe, here's why

Short Answer { Inter dependency on one another of factors

Case 1 (Budget Deficit Increases)

G↑ ⇒ ↑ Deficit ⇒ ↑ r ⇒ ↓ I

Case 2 (currency appreciation lowers net exports)

↑ r ⇒ ↓ Exports & ↑ Imports

Takeaway
- Complex Relations Exist

what we need to Develop

1 Model of behavior

2 Fully Identified Descr of shock to system

Nature of Consumption vs. Investment

- Distinction is made based on why the good was bought

Traditionally classified based on who purchases (Firms vs. Households)

GNP & Welfare

→ In General, more income is Better (Duh)

→ Moral Quandry { Does GNP account for negative externalities when

The Facts

GNP per Capita correlates to Life satisfaction

Caveat: Correlation DOES NOT Imply Causation

→ Need controlled statistical experiment to know for sure

Optimal GNP exists where Marginal Benefit = Marginal Cost

→ of one more unit of GNP / capita

Disposable Income, Saving, & Gov Budget Deficit

Key: Presence of Goverment means not all income can be consumed, invested, or saved

Key Terms

- TRGP → Transfer of Gov to Private sector
- TRGF → Transfer of Gov to Foreigner
- TRPF → Private to Foreign Transfer
- TA → Taxes Paid to GOV
- G_I → Gove Investment
- G_C → Gov Consumption
- YD → Private Disposable Income
- $S_{P,G,C}$ → Savings (P = Private, G = Gov, N = National)
- BD = Budget Deficit

Relations

$$G = G_C + G_I$$

$$YD = GNP + TRGP - TA$$

$$S^P = YD - C - TRPF$$

$$S_G = TA - G_C - TRGF - TRGP$$

$$BD = G + TRGP + TRGF - TA$$

$$S^N = S^P + S^G$$

Calculating Real GDP & Inflation

- Everything in Nominal & Real Terms

Nominal → Currency focus

Real → Goods Focus

GDP Deflator

$$\text{GDP Deflator} = \left(\frac{\text{Nominal GDP}}{\text{Real GDP}}\right)$$

Inflation

Inflation = % change in GDP Deflator

Chain Weighting

→ just use avg price between time periods of interest to calculate real GDP

Example: Do high growth industries have falling relative price

Key { falling relative price vis-a-vis rest of inflation means higher quantity demanded

Decision of lower relative price implies supply curve shift

The Consumer Price Index (CPI)

- Cost of goods now vs. cost in Base year

⇒ if used as metric for inflation it overstates, b/c consumers shift away from goods whose relative price rises

Real & Nominal Interest Rates

- Every Asset has 4 Returns

Notation

Expected / Actual	Nominal	Real
	i	r
	i^e	r^e

Notation (cont.)

- Q_t → Price of one-period bond at time t
- P_t → Price level in period t
- π_t → actual inflation from t → t+1
- i_t → nominal return from t → t+1
- r_t → actual real return t → t+1
- P^e_{t+1} → expected Price level at t+1

⋮ (expected forms of above terms)

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First (b/c know time travelling, use expected form looking ahead)

$$1+\pi^e_t = P^e_{t+1}/P_t$$

Actual Nominal Return

$$1+i_t = 1/q_t$$

Actual Real Return

$$(1+i_t)=(1+r_t)(1+\pi_t)$$
$$= 1+r_t+\pi_t+\cancel{r_t\pi_t} \quad (\text{small})$$
$$= (1+r_t+\pi_t)$$

$$\Downarrow$$

$$r_t = i_t - \pi_t$$

This holds in expected form as well

$$r^e_t = i^e_t - \pi^e_t$$

Holds in Difference in Difference

$$r_t = r^e_t + (i_t - i^e_t) + (\pi^e_t - \pi_t)$$

Stocks & Flows

- **Value** per unit time are flows (Rate) → Income, saving, deficit
- **Stock** is just a value

$$\text{Flow} = \frac{d(\text{Stock})}{dt}$$

(Just say derivative sheesh)

✱ Cobb-Douglas Production Function ✱

→ Defines Economic output in terms of known inputs

$$Y = A K^{\alpha} N^{1-\alpha}$$

where

- Y = Real output
- K = Real capital input (units of capital)
- N = Labor input in hrs worked
- A = Total Factor Productivity
- α = Number on range $[0,1]$

Properties

- Decreasing Marginal product of Labor & Capital

MPN & MPK

- Marginal Productivities of Labor & Capital

$$MPN = \frac{\partial Y}{\partial N} = (1-\alpha)A(K/N)^{\alpha}$$
$$MPK = \alpha A(N/K)^{1-\alpha}$$

Note

- Labor & Capital are complements
- A helps all

Current Account & Sectoral Balance EQN

$$CA = NX + NFP - TRPF - TRGF$$

CA → Current Account

or

$$CA = GNP - (CCFI + C + TRPF + TRGF)$$

Key! Measures whether or not spending & net giving exceeds income

Sectoral Balance Eqn

$$S^p = I + BD + CA$$

- Linked, but not gauranteed to move together in

Rationale

→ When the private sector saves
- Acquire new capital, invest
- Loan to government to cover deficit
- Acquire new assets abroad

The Classical Economic Model

Truths

1. **Agents Maximize**
   - Firms max profit
   - Household maximize utility
2. **Wages, Prices, rates are flexible**
   - Markets must clear
3. **Firms are perfectly competitive**
   - Take wage & price as given

Also

- 1-good (homogenous product)
- Closed Economy
- Households & firms all the same in characteristic

Role of Households

- sell their labor to firms
- Produce output using capital & labor
- Receive profits & own firms

Role of Firms

- Hire labor
- Sell output to household & Gov

Role of Government

→ Collect taxes
→ issue debt
→ Purchase to Consume
→ make payments to households

Endogenous and Exogenous Variables

- Endogenous → variable Model explains (dependency)
- Exogenous → taken as given (Independent)

NOTE

- For a particular group something can be exogenous, but to the model itself endogenous w/ respect to someone else

Labor Demand

Notation

N_D = Labor Demand

W = Nominal wage

P = Price of output received by firm

W/P = Real wage

Key Equation

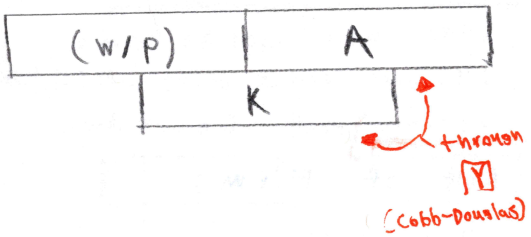
$$w/P = MPN$$

→ Derives from firm profit max condition

→ Marginal cost = Marginal Benefit

or $W = P \cdot MPN\left(\frac{\partial Y}{\partial N}\right)$

Variables that effect N_D



In general, when a shift in one occurs

→ check for secondary effects

→ Follow formula for answer

Labor Supply

→ How much to work linked to how much to consume

Across - Time Model employed

Notation

N^S → Labor Supply

c → Real consumption

t → Marginal Income Tax Rate

D → Real Deductions allowed before income tax rate Applies

s = sales tax rate

TR = Real transfers from government to private sector

$G = G^e$ Gov consumption

r^e = expected real interest rate

H = Real Household wealth

MUC = Marginal disutility of Current working

key $\frac{\partial MUC}{\partial^2 C} < 0$ (rate decreasing)

$MPUN$ = Marginal dis-utility of current working

key

The Utility Function

$$U(C, C^e, N^S, N^{SE}, G, G^e)$$

Conditions for household utility Maximization

$$MUC(1-t)(w/P)/(1+s) = MPUN$$

** Same in expectation

Key: Households choose N_S & N_E to satisfy

Influences to N_S: Income Effect & Substitution Effect

- Income Effect → Buy more of what you like when richer
- Substitution Effect → Buy less when more expensive

$\frac{(1-t)}{(1+s)}\frac{w}{P}$ → Cost of Leisure

Endogeneity of N_S & N_S^e

- W/P
- W^e/P^e
- t & t^e
- s & s^e
- D & D^e
- TR & TR^e
- r^e
- H

Note: Last six influence how much people consume, so effects MUC

* See Page 167 for Treatment of (w/P) change scenario

Patterns of behavior in the choice of N_S

- t & s effect labor supply → through influence on after tax real wage
- Permanent/Temp increases have different effects → d/c of implication of different future expected income flows

Key

↑ wealth (H)
Pre-Tax Allowance (D)
Transfer of (TR)
} ↓ N_S & N_S^E

why?, these are funds to consume not necessitating additional labor hours worked to attain

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How Tax cuts influence the Labor Supply

It matters how

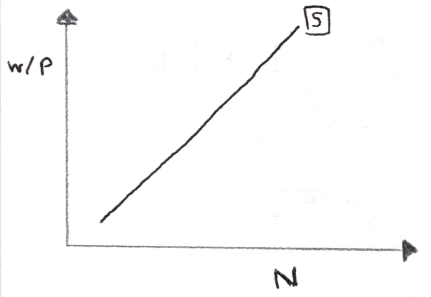
- Taxes are being cut ($\uparrow D$ or $\downarrow t$) each influence different components
- If temporary or Permanent

CRITICAL ASSUMPTION

change in r^e, does not effect N^s & $N^{s/e}$!!

Assume: Income effect & Substitution effect on consumption cancel out

Labor Supply Curve



Features

- Upward sloping
- Current Real wage (y), Labor Hours(x)

~~Right~~ Left Shift

$\uparrow w^e/p^e$

- household choose to work more, when real wage relatively higher

$\uparrow t$

- Influences Leisure factor

$\uparrow S$

$\uparrow D$ or TR

$\uparrow H$ $\uparrow D^e$ or TR^e

~~Left~~ Right Shift

$\uparrow t^e$

$\uparrow S^e$

Functional Form

$$N^s\left(\frac{w^e}{p^e}, t, t^e, s, s^e, D, D^e, TR, TR^e, H\right)$$

$$(-, -, +, -, +, -, -, -, -, -)$$

Two Notes

- working up N^s curve utility increases
- This is for individual, pop growth will shift "Market" Labor supply right over time

Equilibrium in the Labor Market

- We operate at intersection of Labor Demand & Supply

wages or Price (Move to Equilibriate)

- Employment & Real Wage Endogenous

What is Endogenous vs. Exogenous

Endogenous: (Slide 198)

- w/p → Real wage
- N → Labor Hours
- Y → output
- TA → Taxes paid to Gov
- YD → Private Disposable Income
- BD → Budget Deficit
- C/C^e → consumption
- S^p & S^u → Savings
- $ATRW$ → "After Tax" Real wage
- $N^{s/p}$ → Labor Supplied
- U → Utility Funct

Exogenous

- A → Factor of Production
- K → capital
- t & t^e → marginal tax
- s & s^e → Sales tax
- D & D^e → Pre-tax Deductions
- TR & TR^e → Transfer
- w^e/p^e → expected real wage
- H → Household wealth
- G & G^e → Govern ment Spend

Critical Assumetion

- Money Supply
- Government spending

DO NOT Change Employment, Output, or Income

Using the Labor Market Model

→ analyze change to Endogenous, from change in exogenous

"significant other Test"

→ Describe in words why shift causes action

Page 219 (Good Examele)

Lecture #3:

Goods Market / Credit Market

Consumption w/ No Government

- Given disposable income (decision to ~~spend~~ consume / save is same decision)

Assumptions

- can borrow & lend at same rate
- Can always borrow, so long as they've ability to repay

Key Equations

(1) $C + C^e/(1+r^e) = H + Y + Y^e(1+r^e)$

(2) $MUC = (1+r^e)\,MUC^e$

(1) → 'Budget Constraint'
- Dictates total spending over planning horizon

(2) → Marginal Benefit of current Consumption = Lost opportunity cost of future consumption

(1) → How much spending?

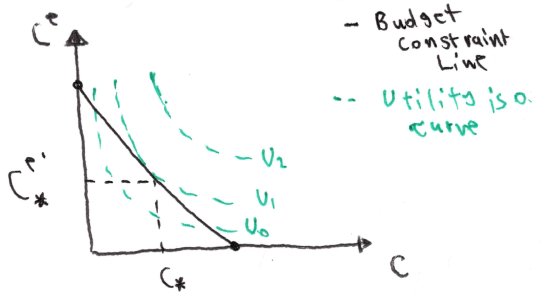
(2) → When?

Analyzing Change to [C] & [Cs]

First: Analyze Budget Constraint to see if possible

Second: Use (2) to see how consumption allocated across time

Graphically



- Budget Constraint Line
-- Utility is o. curve

Variables that Influence Consumption

↑ Y, Y^e, H ⇒ [↑C] & [↑C^e]

(*) r^e has no effect

Consumption w/ Taxes, Transfer, Government Purchase

Assumptions

- Interest payments Tax deductible
- Tax Rates apply to Nominal interest rates

[r'] = after-tax expected real interest rate

$(1+r') = [(1+s)/(1+s^e)] \cdot [1 + r^e(1-t) - t\pi^e]$

&

$c(1+s) + c^e(1+s^e)/(1+r') = H + Y(1-t) + tD + TR + Y^e(1-t^e)/(1+r') + t^eD^e/(1+r') + TR^e(1+r')$

$MUC = (1+r')\,MUC^e$

Intuition

$r^e \to r^e(1-t)$ (Account for Taxes)

$-t\pi^e$ (b/c tax is of nominal amount not real amount, adjustment term)

$\frac{(1+s)}{(1+s^e)}$ (if sales tax varies over time, relative price of goods affected)

→ not otherwise captured in [r]

(+/−) of consumption Theory

[Y]	+	[D]	+
[Y^e]	+	[D^e]	+
[H]	+	[TR]	+
[t]	−	[TR^e]	+
[t^e]	−	[i^e]	0
[s]	−	[π^e]	0
[s^e]	−		

Government Spending, Tax Rates, Deductions, Transfers

- All exogenous

&

$G = G^e$	$BD = -S^G$

National Savings

Two ways to analyze Goods Market (Equilibrium)

Supply of Goods = Demand of Goods

OR

Desired National Savings = Desired Investment + Desired Current Account

(we will employ this Definition)

" (For closed Economy)

Derivation

$Y = C + I + G$

$Y - C + TR - TA = I + G + TR - TA$

$S^P = I + BD$

$S^P + S^G = I$

$S^{national} = I$

Intuition

[1] Makes it easier to see that choice of r^e adjusts to clear goods market

[2] Easier to extend to open economy

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Recall

$$S^N = Y - C - G$$

Comparison of (+/−) Influence vs. C

	C	$S^N = Y - C - G$
Y	+	+
Y^e	+	−
H	+	−
t	−	+
t^e	−	+
S	−	+
S^e	−	+
D	+	−
D^e	+	−
TR	+	−
TR^e	+	−
r^e	0	0
π^e	0	0
G	0	−

(From assumption of no effect on C)

what've effect of Y on S^N

Key!

$\uparrow Y \Rightarrow \uparrow C$, however $|\uparrow Y| > |\uparrow C|$

so $\uparrow S_g$

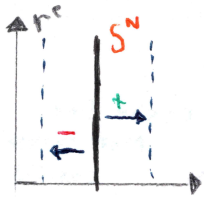
Rule of Thumb: Magnitude of effect from endogenous association usually less than direct effect

National Savings Curve

- Which will go on vertical axis? → r^e

why! (we assume r^e adjusts to clear the Goods Mkt)

Notes on Form of Curve



1) Curve is vertical line (No dependence on r^e)

2) For (+) factors shifts right

3) For (−) factors shifts left

Note

- In most classical texts it's upward sloping, & an assumed dependence on r^e, for your class, Not the case

Investment

Notation

- J → Nominal price of capital
- π^e → expected inflation
- * δ → depreciation rate (Economic/Market)
- Θ → corporate tax Rate
- * Φ → Dep rate allowed for (taxes)
- τ → investment tax credit

side note, US GAAP has a list of approved asset depreciation rates For accounting purposes

Hence, real market dep rate could be different

Key Assumptions

i) Following purchase of capital
- output begins next period
- Taxes begin immediately

ii) Depreciation is of capital based on historical cost of acquiring in first place

iii) Depreciation rate k years from now: $\Phi(1-\Phi)^k$

iv) Amount to be depreciated is after-tax credit price

v)

$\delta^e = \delta$	$\Phi^e = \Phi$
$\Theta^e = \Theta$	$i^e = i$

(Remain Unchanged)

vi) Firms can always borrow to pay for positive NPV Projects

Decision of the Firm: Capital Purchase to Max Profit

- The price the firm pays for unit of capital Must be recaptured by future cash flows

$$J = \sum \text{Discounted future cash flow from unit of capital}$$

LHS = RHS

This term depends on
- Periods you intend to produce
- But Generally

$$RHS = \sum_{j=1}^{K} \frac{(\quad)^j}{(1+i)^j} + \frac{\quad}{(1+i)^K}$$

where!

$(\quad)$ = After tax revenue from sale of extra output per period = $(1-\Theta)P(1+\pi^e)^j MPK^e$

[ ] = Investment tax credit = τJ

[ ] = Deductions from taxable income = $\Theta\Phi(1-\tau)J\frac{(1-\Phi)^{j-1}}{(1+i)^{j-1}}$

NOTE: J (the letter j) is a series term denoting the year from [1, period K] that term belongs to

⇓

Not to be confused w/ i = Nominal interest rate

Presence of terms in investment schedule

	[ ]	[ ]	[ ]
1	X	✓	✓
2	✓	X	✓
⋮			
K	✓	X	✓

The Key Equation for capital Investment Decisions

$$MPK^c = (r^c + \delta)\left(\frac{1-\tau}{1-\Theta}\right)\left(1-\frac{\Theta\Phi(1+i)}{\Phi+i}\right)\frac{J}{P}$$

MPK = marginal Product of capital = $\frac{\partial Y}{\partial K}$

- The Right hand side Titled { Real user cost of capital }

Key Point

(*) we've derived expression for desired future capital stock, Next move to determine Investment

(+/−) for desired future capital stock

(slides 340-)

Desired capital Stock

↑ δ or ↑ $\frac{J}{P}$ ↓ relatively for excessive b/c of faster dep & initial cost

↑ τ ↑ larger tax credit advantage

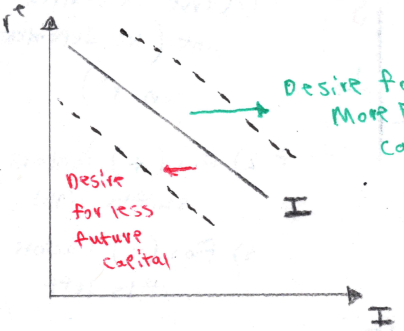
↑ r^c ↓ De values future cash flows, makes today's investment more expensive

↑ π^e ↓ Recall $i = r + \pi$

↑ Φ ↑ faster the firm can write off capital expense the better

↑ Θ ↓ De-values on how fast firm can write-off

The Investment Carve



Return to National Savings & Labor Supply

Modifications to Savings Curve

1) ↑ J, shift left b/c ↑C
2) ↑ Φ, shift left b/c ↑C
3) ↑ Θ, shift Right b/c ↓C
4) ↑ π^e, shift Right b/c ↓C

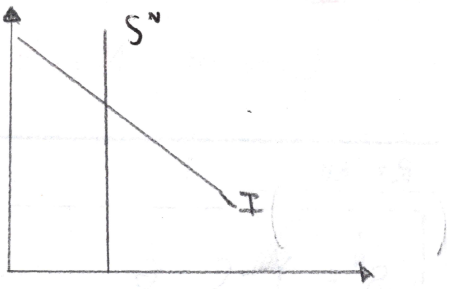
Logic chain

Capital Decision → effects MVC → ↓N → ↓C → ↑S^N

Modifications to Labor Supply

1) ↑ J, shifts left (positive income effect)
2) ↑ Φ, shifts left (positive Income effect)
3) ↑ Θ, shift right (negative income effect)
4) ↑ π^e, shift right (negative income effect)

Goods Market Equilibrium



$I(A^c, \delta, \Theta, \Phi, J, \pi^e, J/P, K)$
(+ − − + + − − − −)

$S^N(Y, Y^p, H, t, t^e, S, S^e, D, D^e, TR, TR^e, G, \underline{\bar{J}, \Phi, \Theta, \pi^e})$
(+ − − + + + + − − − −)

second-order effects

VERY CRITICAL

- I, S are endogenous on other endogenous quantities

The labor market Problem must reach Equilibrium first

why?

- shift in Re won't shock labor problem, but shift in labor will alter I-S, decision

Recipe FOR SUCCESS

[0] Draw original Equilibrium

[1] Determine if shock hits N^D curve

[2] Determine if shock hits N^S

[3] combine (1 & 2) see what happens to W/P, N & Y

[4] Determine if shock hits S^N

[5] Determine if shock hits I

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See Slides 380-417 for worked examples

The Open Economy Model

- Two countries (Domestic / Foreign)
- Unrestricted Trade (Import/Export)
- Export/Import for consumption

→ Law of ONE Price holds

- Different currencies w/ nominal bonds at their own rate
- Labor & Production transfer between countries non-existent

Notation

E → Nominal exchange rate; Domestic price of foreign currency

E^f → Future Nominal exchange rate

$E^{f,e}$ → (Expectation of) Future Nominal rate

d → depreciation of rate; $\left(\frac{E^f - E}{E}\right)$

d^e → (Expectation of); $\left(\frac{E^e - E}{E}\right)$

P → Price of domestic good

P^f → Price of Domestic Good in Future

P^e → Expectation of Future Domestic Price

π^e → expected Inflation $\left\{\frac{(P^e - P)}{P}\right.$

Note: CPI valid b/c only one good in economy

P^* → " " Foreign (in foreign currency)

P^{*f} → " "

P^{*e} → " "

π^{*e} → " "

i → Nominal Domestic bond return (Domestic currency)

i^* → Nominal Foreign bond return (Foreign Currency)

$r^e = i - \pi^e$ — Expected Real return (Domestic)

$r^{*e} = i^* - \pi^{*e}$ — Expected Real Return (Foreign)

Notation; (Continued)

γ = Fraction of Domestic consumption on Domestic Goods

γ^* = " " on Foreign goods

EP^* = Price of domestic Imports

P/E = Price of ~~domestic~~ Foreign imports

Domestic cost of Living Index

$$P^{\gamma}(EP^*)^{1-\gamma}$$

% Δ cost of living

$$\Pi^e = \gamma\pi^e + (1-\gamma)d + \gamma^*\pi^{*e}$$

Foreign Cost of Living Index

$$P^{*\gamma^*}(P/E)^{1-\gamma^*}$$

% Δ cost of living

$$\Pi^{*e} = (1-\gamma^*)\pi^e - (1-\gamma^*)d^e + \gamma^*\pi^{*e}$$

Terms of Trade (TOT)

$$EP^*/P$$ ~ relative price metric

units $\left(\frac{\text{dom good}}{\text{for good}}\right)$

↑ TOT (deterioration, domestic residents poorer)

↓ TOT (improvement, Domestic residents richer)

when TOT ↑, purchase power in open economy decrease

Interest Rate Parity Condition

$r^e = r^{*e}$ (Equilibrium in International Bond market)

Three Key Assumptions

① TOT follows random walk

→ $d^e = \pi^e - \pi^{*e}$ (Long-Run no change in TOT)

② Uncovered interest rate parity

→ Anti-Arbitrage argument between two investing strategies (Domestic & Foreign bond)

$$i = i^* + d^e$$

③ Perfect Capital Mobility

- Assume existence of unique risk premium $\{\rho$

$$i = i^* + d^e + \rho$$

From ① $d^e = \pi^e - \pi^{*e}$

$$r^e = r^{*e} + \rho$$

condition for equilibrium in both bond Markets

Bond Market Equilibrium & PCM Curve

$r^e = r^{*e}(+d^e + \pi^{*e} - \pi^e) + \rho$ (PCM Curve)

→ stated in terms of r^e, can be placed on same curves as S^N & I

Allows us to see multiple markets at once

simplified $r^e = r^{*e}$ only valid when

- TOT random ($d^e + \pi^{*e} - \pi^e = 0$)
- $\rho = 0$ (no risk premium)

Goods Market Equilibrium in Small / Large Economy

Recall

$S^N = I$ (closed Economies)

$S^N = I + CA$ (open Economies)

$CA = NX + NFP - TRPF - TRGF$

Key Difference: Small Country vs. Large Country

- small country's borrowing needs to small to shake up international rates

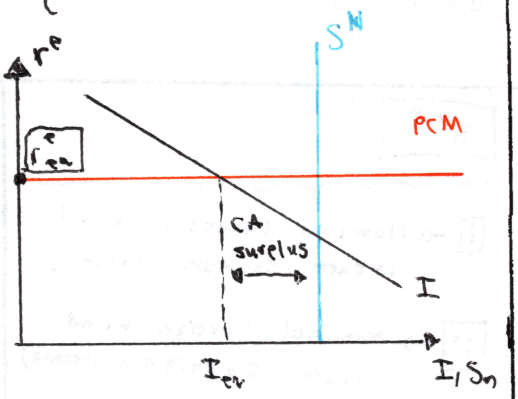
r^{*e} exogenous

- For Large, opposite is True

r^{*e} exogenous

Small Open-Economy Model

- PCM determines, equilibrium value of r^e
- Equilibrium Investment where PCM intersects I



PCM:

$(r^e, d^e + \pi^{*e} - \pi^e, \rho)$

\+ + +

Formula for Success: Open Economy Model

0) Draw original Equilibrium

1) Determine if shock to N^0

2) Determine if shock to N^S

3) combine 1) & 2) to reconcile

w/ P	N	Y

4) What happens to Y & as of consequence S^N

5) see if shock to S^N

6) see if shock to I

7) See if shock to PCM

8) what happens to r^e, I, S^N, CA

9) Use what happens to CA to logic out influence on

NX	TOT

10) Determine remaining endogenous variables

The Money Market

Terminology

Bank Reserves → Vault Cash + Deposits

Reserve Requirement → Fraction of Private sector deposits ~~cannot~~ bank must hold as reserves

Excess Reserves → reserves in excess of what's required

- Borrowed / Non-Borrowed

Monetary Base → Public-held currency + Bank reserves

Money Multiplier → Money Supply / Monetary Base

Derivation of Money Supply Equations

CU → currency held by Public

CD → Checkable Deposits w/ reserve requirement

ZD → Non-checkable deposits of non-bank public

TD → " " w/ reserve requirement

$M1 = CU + CD$

BR = Bank Reserves = vault cash + deposits to central bank

rr_{cd} / rr_{td} → Reserve ratios for each type of currency

B (Monetary Base) = BR + CU

Money Supply Key Results

$$M_1 = (B - ER) \cdot \frac{(1 + cu)}{cu + rr_{cd} + rr_{td} \cdot td}$$

Note: ER = Excess Reserves (BR - RR)

Introductory Macro Economics Lecture Note Summary: (Page 6)

who can change MI Money Supply?

Answer| Central Bank, Private Banks

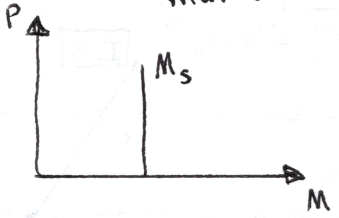
The Money Supply Curve

Recall|

$$M^S = (B - ER) \cdot \frac{(1+cu)}{(cu + rr_{cd} + rr_{td})}$$

- ↑B → ↑M^S (Larger Monetary base, larger supply)
- ↑ER → ↓M^S (Reserves beyond which are required Decrease Supply)
- ↑rr or ↑deposit → ↓M^S

• Price [P] clears the money market



Money Demand

→ No formal derivation, take functional form & discuss

$$MD = P \cdot L(Y, i - i_m, \lambda)$$

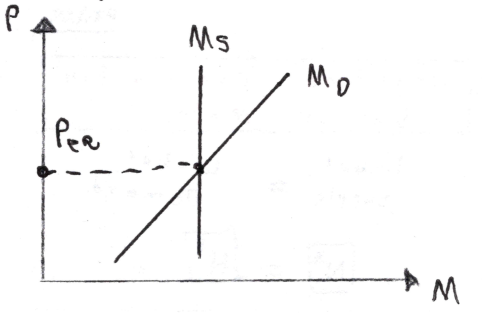
[Y] when increase in real output transactions increase, & transactions need money

[i-im] reflects opportunity cost of not buying bond at nominal rate

↑P	↑M_D	(Price increases need for money to pay for it)
↑r_e	↓M^D	
↑π^e	↓M^D	
↑i_m	↑M_D	
↑Y	↑M_D	
↑λ (Payment Technology)	↓M_D	

Money Market Equilibrium

• [P] (Price of Goods Equilibriates Money Supply/Demand)



Finale Recipe For Success | Small Open Economy Version

0) Draw original Equilibrium

Isolate

- Exogenous shift factors
- Be aware of 3 endogeneities

$S^n = S^n(Y)$ | $M^D = M^D(Y)$ | $M^D = M^D(r^e)$

1) Determine if shock shifts N^D

2) Determine if shock shifts N^S

3) combine 1) & 2) see what happens to W/P and N, Y

4) If [Y] effected, evaluate change on S^n (Endogeneity #1)

5) Determine if shock effects S^N (in any other way than in 4))

6) Determine if shock effects [I]

7) Determine if shock shifts PCM curve

8) evaluat 4) → 7), see what happens to

r^*	S^N
I	CA

9) Use result for [CA], to gauge effect on [NX] & [TOT]

10) & 11) See if M^D was effected by means of endogenous factors [Y] & $[r^e]$

12) Determine if shock to M^D (not related to 10) & 11))

13) Determine shock to M^S

14) Figure out what happens to [P] & [M]

15) Lear [W] from [P] & [W/P] (sometimes)

16) Lear [E] from [P] & [TOT] = EP^*/P (sometimes)

Overall

Start in the Labor Market

↓

Go to Goods Market

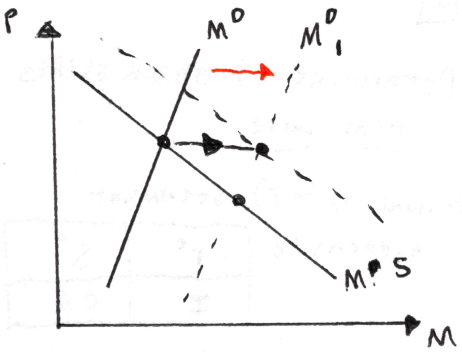
↓

Conclude analysis in Money Market

Special Scenarios in Classical Model

(1) Ensure No inflation

Key: shift Money Supply perfectly w/ money demand

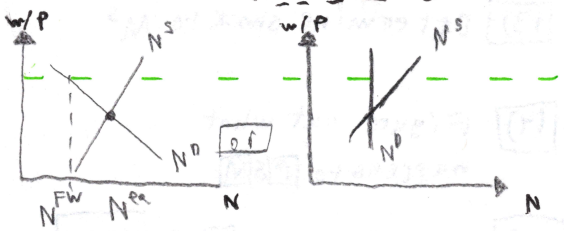


$\%\Delta M^S = \%\Delta M^D$

(2) Unemployment in Classical Model

→ can occur when government implements a fixed wage

→ On the Labor curve there is a $\bar{w}$ can't drop below, therefore households can't provide labor they otherwise would ⇒ unemployment



(# of hours workers willing to give)

(# of hours firms willing to supply)

Problems with the Classical Model

(1) Rate of Output Growth ≈ change in unemployment rate

(2) In short-run, shocks do not impact labor market but move output

A Keynesian Model: New labor Market Assumptions

- Start w/ Closed Economy

New Labor Market Assumption

- Dis-equilibrium in labor market; idle labor available
- Employment determined by Demand
- Firms willing to increase output at existing wages & prices

condition Proceed from Classical Model

Labor Supply = Labor Demand

$N^S = N^D$

Conditions Kept as Before

$N^S = I$ (rational S, Z Goods)

$M^D = M^S$ (Money)

Key properties of Keynesian Models

- N^S curve depends on Y
- I curve depends on r_e

KEY: You Don't sequentially Resolve market in traditional order

~~Labor → Goods → Money~~

You Must Solve Simultaneously

How?

- Collapse N^S = Investment into one curve

The IS Curve

where Does IS curve come from?

- It's collection of intersections of I & N^S plotted

The LM Curve

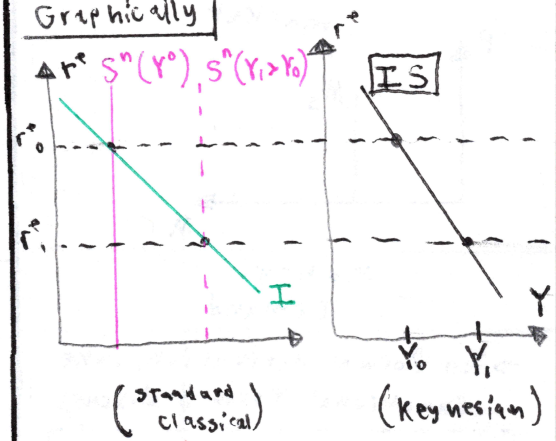
- we collapse $M^S = M^D$ into single curve as well
- Collection of intersection points

The IS Curve

→ It's not a demand or supply curve!

- Collection of possible Equilibrium points between I & S^N

Graphically



What shifts IS curve

- Anything that shifts S^N or I (other than Y, which is now our horizontal axis) shifts IS

Introductory Macro Economics: Lecture Note Summary (Page 8/7)

Mapping Rule between IS, I, S^n shifts

Variables that shift I & S^n intersection to higher r^e ↑

⇓

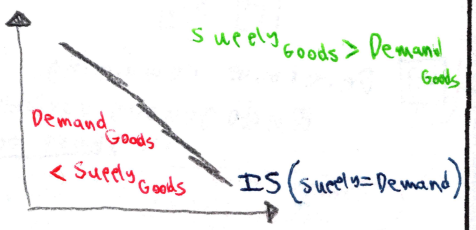
IS curve shifts Right

Variables that shift I & S^n intersection to lower r^e ↓

⇓

IS curve shifts left

See slide 619 for full list of scenarios



Integrating IS and LM

- In Keynesian Model

Intersection of IS & LM

(Equilibrium Condition)

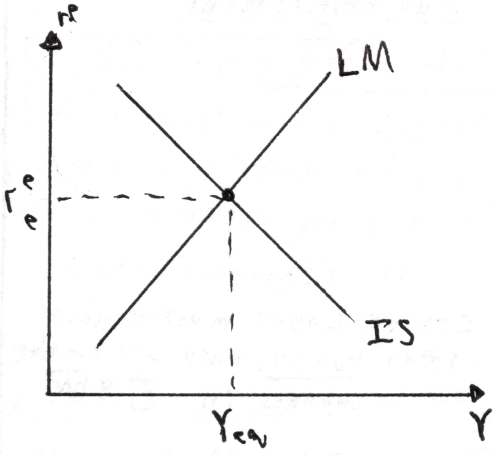
Key Endogenous Variables: Y & r^e

→ variables that depend on Y & r^e are endogenous

BIG DIFFERENCE: N (Labor) is Endogenous

complete opposite to classical Model

Key Nesian Full Form Model



IS

IS (↑ → shift Right; ↓ → shift Left)

VF

Y^e	+	δ	−
H	+	π^e	−
t	−	J/P	−
t^e	−	K	−
s	−		
s^e	−		
D	+		
D^e	+		
TR	+		
TR^e	+		
G	+		
θ	−		
φ	+		
T	+		
A^e	+		

LM

B	+	λ	+
ER	−	ρ	−
cu	−		
td	−		
rr_{cd}	−		
rr_{fd}	−		
π^e	+		

Recipe for Success in Key nesian Model

0) Draw original IS-LM Equilibrium

Note: No endogenous variables shift IS or LM in Keynesian Framework

1) Determine if shock shifts IS - curve

2) Determine if shock shifts LM curve

3) Learn what happens to r^e & Y

→ can learn behavior of N from whether Y increases or decreases

The Full Employment Line

Key: understand how to Transition between

Key nesian Short-Run ⟺ Classical Long Run

WANT { To overlay Labor Demand = Labor supply on top of IS-LM Framework

Solution **FE Curve**

How FE Curve Constructed

i) pick r^e_0, and find where labor demand & supply intersect, label N_0

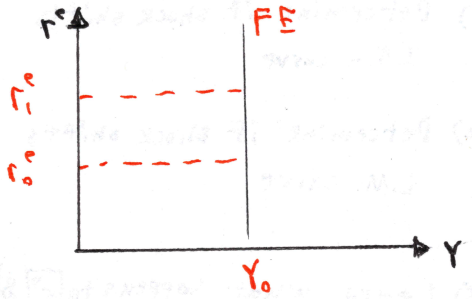
ii) Let Y_0 be level of output possible with N_0

iii) Point (r^e_0, Y_0) will exist on FE curve

(Repeat for a range of r^e, get FE curve)

Graphical Appearance of FE

- FE curve is a vertical line



What shifts FE curve

→ whatever shifts N^D or N^S curves

See Slide 690 for full list re-stated

Integrating IS, LM, & FE

- The key is understanding that W & P will adjust over time to restore Full employment

Side Note This is very critical. This is why we're able to think about long-term/short-term operating in the classical/Keynesian sense. It's ok Labor markets dont clear today, they will overtime Due to changes in P & W

① When IS-LM intersection to right of FE

Prices Rise

② When IS-LM left of FE, Prices Fall

How do Prices P restore Full Employment?

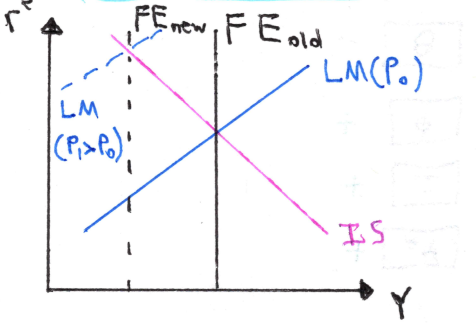
↑P means LM shifts back b/c of an ↑ M^D

Recall, $M^D = P \cdot f(Y, i-i_m, \lambda)$

- This necessitates higher r^e or lower Y to restore equilibrium in Money Market

Stable Long term Equilibrium Achieved when

IS-LM-FE Intersect



Final Recipe for Success in Keynesian Model

0) Draw original Equilibrium
- → label curves
- → identify exogenous variables that be changed
- → (In the long run P is endogenous, remember)
- → to start have IS-LM-FE on intersection

1) Determine shocks to IS

2) Determine shocks to LM

3) Use 1) & 2) to see effect on r^e & Y

4) Determine remaining Endogenous variables in Short term

Short-term Reconciliation

Long-run Reconciliation

5) & 6) Determine if shock shifts N^D or N^S

7) See what effect to Long-term N, w/P, Y, & FE curve result

8)
- If new IS-LM > FE curve (Prices will rise)

Long-Run r^e, P, W determined

- If new IS-LM < FE curve (Prices will Fall)

9) Lastly, determine Long-Run values of other Endogenous variables