Introduction to Macroeconomics.

- Output ÷ per capita ⇒ measures welfare.
  - % change over time ⇒ growth rate
- Unemployment also measures welfare.
  - % of labour force ⇒ unemployment rate
- Inflation - sustained price rises ⇒ welfare?
  - % change over time ⇒ inflation rate.

Unemployment Rate

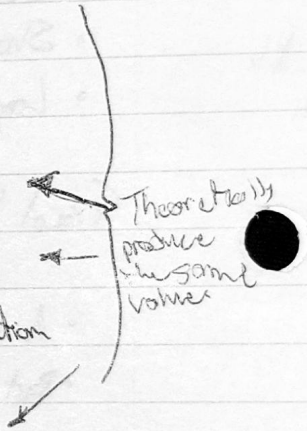
- Canada (Dec. 2017) - 5.7%
- Short Term - 1) General Volatility ⇒ Cycles
- Long Term - 2.) Long term trends ⇒ Structure.

Fiscal Policy

- A lot of borrowing demand raises interest rates.
- But 'a lot' means compared to borrowing supply
  - Relative circumstances.
- Government Deficit: - $Tax - G_{spend}$
  - < 0, Revenues less spending
  - > 0, Surplus.
- Debt = sum of all deficits and/or surplus
- Perfect vs Free markets

Aggregate Output

- Measured by Gross Domestic Product (GDP) typically
- The total value of the sum of all final goods and services produced in an economy during a given period.
- Note: this need not to be the same as the goods and services consumed in the economy in that same time period (not all consumed)
- There are three approaches to measuring GDP:
  - ① Final goods and services
  - ② Value added
  - ③ Income.
- Final Goods Method
  - Counting only the final goods automatically includes the intermediate inputs
- Value Added Method
  - Nets-out (subtracts) the cost of intermediate input and sums only the value added portion of each production activity.
- Income Method
  - measures GDP from the income/revenue side
  - Revenues after payments for intermediate input goto payments to indirect taxes, labour, and firm (capital/profit).
  - GDP(Income) = Indirect Taxes + Labour Income + Capital Income



Nominal vs Real GDP

- Recall: GDP the value of final goods and services produced
- Value is the price of the final good
- Therefore, GDP = Price × Quantity of final goods produced
- When prices raise, there is a GDP bias because the quantity doesn't change.
- Nominal GDP = Current Price × Quantity (includes price effects)
- Real GDP = Constant Price × Quantity (removes price effects).

Prices and Measured GDP

- Measuring value of all final goods
  - a weighted average of the output of each type of final good produced where relative prices serves as 'weights'
- $GDP = P_1Q_1 + P_2Q_2 + P_3Q_3 \ldots + P_NQ_N$ → Nominal
- $GDP = \frac{\text{Nominal GDP}}{\text{Average Price}}$
- Using Real GDP eliminates 'price only' effects
- But relative price changes are important signals of productivity changes
- So using real GDP changes, might also be misleading
- Real GDP in 'chained dollars' balances these effects to help address this issue.
- $P \cdot Q \rightarrow$ Nominal → Higher Average growth
  → less volatile
- Relative to Real GDP $\Rightarrow \frac{P \cdot Q}{P} = Q$.
- Changes of P & Q have some tendency to offset each other.

Observations

- The increase in real GDP is less than nominal GDP
- More variation in real GDP than in nominal GDP

Technical Notes

- GDP → refers to Real GDP
- Y_t → Real GDP in time, t. (usually quarters)
- $GDP = P \times GDP$ → nominal GDP
- $\$Y_t$ → Nominal GDP in time, t.
- GDP Growth → $\frac{(Y_t - Y_{t-1})}{Y_{t-1}}$ → in time period, t, the rate at which the Real GDP changes
- Expansions - Periods of positive growth
- Recessions - Periods of negative growth (2 consecutive quarters).

Other Major Macro Variables

- Unemployment Rate → $u = \frac{\text{number of people unemployed}(U)}{\text{labour force}(L)} \times 100$
- Labour Force (L) = # Employed (N) + # unemployed (U)
- Unemployed vs. Discouraged workers
- Participation Rate = $\frac{\text{Labour Force}(L)}{\text{Adult Population}(15+)}$

Unemployment and Economic Activity

- Okun's Law
  - High Output Growth - reduce unemployment
  - Low Output Growth - increases unemployment.
- Unemployment tells us the state of the economy

Social Implications of Unemployment

- Unemployment rates and duration vary by population groups
- Certain groups incur a disp

Inflation Rate

- A sustained rise in the price level
- 'Deflation' = sustained decline in price level
- 'Disinflation' and 'reinflation' are changes in the rates of inflation (lower, or higher)
- Two measures of price level
  - GDP Deflator
  - Consumer Price Index (CPI)

The GDP Deflator

- Average Price of final goods produced GDP deflator in period $t = P_t$
- $P_t = \frac{\text{nominal GDP}}{\text{Real GDP}} = \frac{\$Y_t}{Y_t}$
- P_t is an index number
- Index numbers are used to measure rates of change over time
- Rate of Inflation $= \frac{P_t - P_{t-1}}{P_{t-1}} = \%\Delta P_t$
- Covers all goods and services

The Consumer Price Index

- Average prices of goods consumed
- The price of so-called consumer basket.
- The CPI ≠ GDP Deflator
- Some final goods are sold to businesses, government, foreigners.
- Some goods are imported.

The Phillips Curve

- Low Unemployment - inflation rate increases
- High Unemployment - inflation rate decreases.
- A negative relationship between inflation and unemployment.
- A 'tension' in macroeconomic policy.

Why Do Economists Care About Inflation?

- Say x% inflation can increase across all prices by definition
- So wage/price tomorrow $= (1+x)W/(1+x)P = \frac{W}{P}$ (the same!)
- But wages and prices do not seem to rise proportionally in reality.
- Inflation creates market distortions due to changing prices in different markets, at different times, by different %'s
- Inflation can add uncertainty to economic decision making
- Inflation acts as a tax on 'money holding'
- Inflation erodes purchasing power on nonindexed pensions and fixed incomes.
- Inflation effects return on 'monetary assets'

Alternative Macro Models

- Macroeconomists seek to 'model' the basic facts we've discussed to this point (and other)
- The main disagreement dividing macroeconomists is about 'equilibrium adjustment'
- Do prices adjust quickly to produce 'equilibrium market clearing' or not?
- Two Extremes characterize these debates:
  - Classical Market Clearing - Fully Flexible Prices
  - Keynesian → Non-Market Clearing - Sticky Prices.

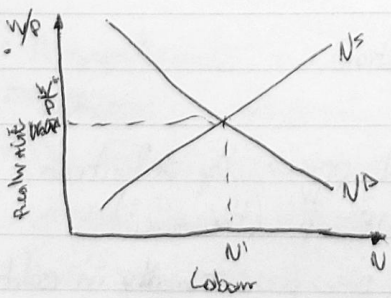
Keynesian vs. Classical
$Q^s = Q^D$?
Keynesian? = No
Classical? = Yes

The Classical Market Clearing Model

- Main assumption - Flexible prices - Continuous Market Clearing
- Output is assumed to be produced through a production function which contains → K - capital, N - labour, $Y = AF(K, N)$
- A = level of technology (or total factor productivity.
- Business cycle time frame (short run)
- A (Technology) and K (capital) are assumed fixed.
- The amount of output produced depends on the amount of labour input only.
- This means that what happens in the labour market is critical for understanding changes in output for GDP

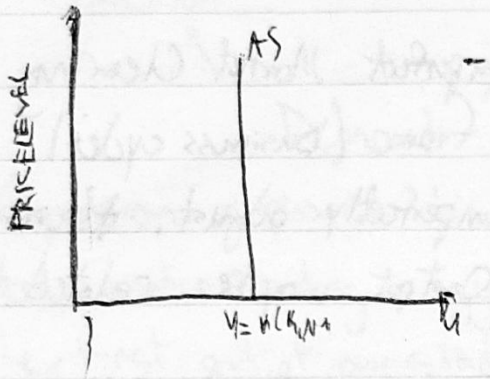
3 Markets
- Goods/Outputs
- Assets
- Labour Market.

Labour Market Equilibrium



- Wage Rate is a ratio $\frac{W}{P}$
- The real wage is assumed to be equilibrium price not nominal wages prices
- Given that real wages adjust quickly for market clearing, equilibrium employment is equal

Aggregate Supply

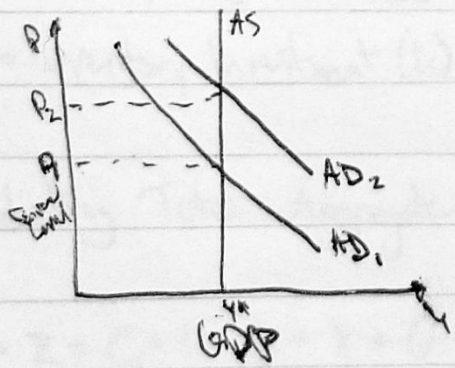


- Since output depends only on the level of employment at $\bar{L}$

Aggregate Demand in Short

- Aggregate demand - the relationship between the price level in the economy and Aggregate Expenditure (AE)
- AE is related to the price level because at any time the amount of "money" in the economy is limited
- This relationship is often represented by Quantity Theory of Money
  - $M/P = kY$

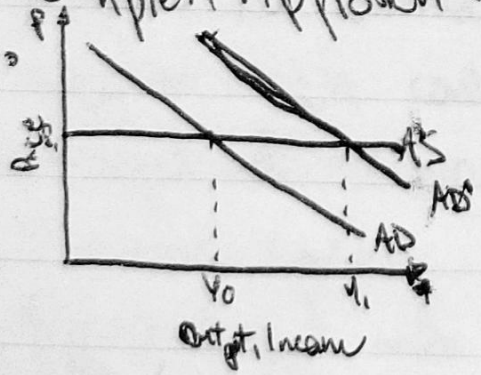
The AD Curve



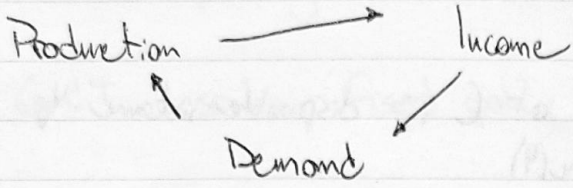
- AD slopes downwards because inequality constants remain in the economy

Keynesian Models

- Main Assumption: Sticky prices - Imperfect Market Clearing
- Usually applied to 'short-run' time frame (business cycles)
- When prices fail to adjust or imperfectly adjust, there are several ways in which Aggregate Output may be related to Aggregate Demand
- This leads to non-trivial relations between Output and Aggregate prices (aka price level) → AS is NOT vertical
- These issues are related to: monopoly, power, incomplete information, "aggregate externalities", and "market failures"
- ~~Simple/Extreme Keynesian~~
- Simple/Extreme Keynesian models actually assume AS is horizontal
- Keynesian models are long forms in ECON 2022
- Keynesian models move away from 'perfect market' assumptions
- Simplest Approach → Short-Run Fixed Prices
  - In the very short run the aggregate supply curve is horizontal, when AD curve shifts to the right output increases, while price level remains constant



Chapter 3 Introduction



- Keynesians emphasize how changes in demand matter in GDP
- So, understanding aggregate demand is important
- The first part of our study of aggregate, "Goods markets".

The Sources of Demand for Aggregate Production (GDP)

Aggregate Production/ output/income/expenditure all mean the same.

- Consumption (C) - Goods and services purchased by consumers (56% of GDP)
- Fixed Investment (I) - Non-residential and residential investment (20% of GDP)
- Government Spending (G) - Purchases by federal, provincial, and local governments. Excludes transfer payments (22% of GDP)

56
+20
+22
96%?

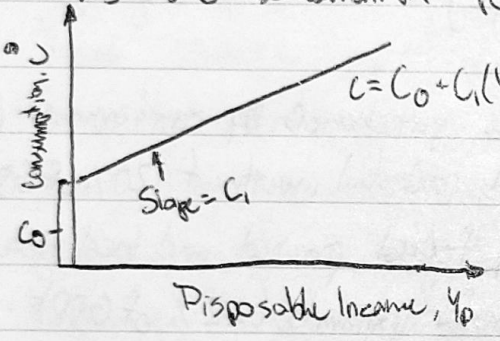
- X - Q - Net Exports
  - Exports (X) → 32-35% of GDP
  - Imports (Q) → 32-35% of GDP
  - X = Q → 0% long-run average.
  - X > Q → trade surplus
  - X < Q → trade deficit.
- Inventory Investment (Is) - Production minus sales (less than 1% of GDP)

Modelling Total Aggregate Demand (aka aggregate expenditure - Z)

- $Z = C + I + G + X + Q$
- 1 - All firms produce the same 'good'
- 2 - The supply of goods is completely elastic at price, P.
- 3 - Start with closed economy ($X = Q = 0$).
  - $Z = C + I + G$

Consumption (C)

- The main determinant of C is disposable income Y_D
- Disposable Income(Y_D) = Income(Y)
- Taxes (T) - transfers recieved by consumers
- $C = C_0 + C_1 Y_D$
- $Y_D = Y - T$
- $C = C_0 + C_1(Y - T)$
- $0 < C_1 < 1$, marginal propensity to consume
- This is a 'behavioral' relation



Investment (I)

- $I = \bar{I}$
- For now, to start, we will assume that I does

- Exogeneous Variables - variables that are given by factors outside the model and thus are not explained within or by the model
- Endogenous Variables - Variables that are explained by or predicted by the model
  - C is endogenous because it depends

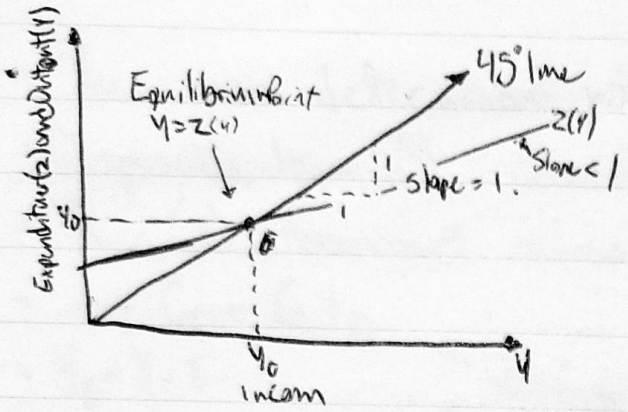
Government Spending and Taxes (G&T)

- G & T describe fiscal policy

Keynesian "Cross" Model

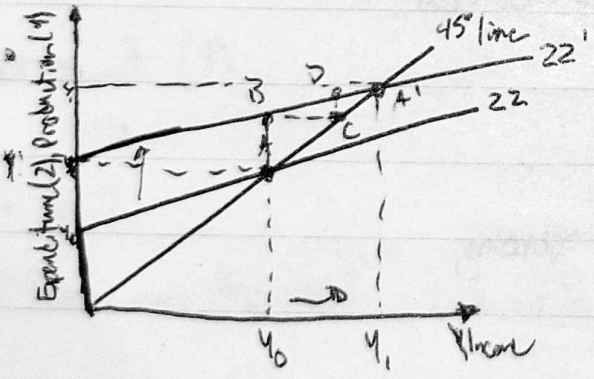
- Refer to graphs
- Income - Expenditure (multiplier) model
- Output equals expenditure in equilibrium
- Expenditure depends on income $\Leftrightarrow$ output.
- $Y = AE(Y)$
- $Z = C_0 + C_1(Y - \bar{T}) + \bar{I} + G$
- $Y = C_0 + C_1(Y - T) + \bar{I} + G$
- Solved for Y, $Y = \frac{C_0 + \bar{I} + G - C_1 T}{(1 - C_1)}$ ← Autonomous spending.
- Multiplier → $\frac{1}{1 - \frac{\Delta AE}{\Delta Y}} \rightarrow \frac{1}{1 - C_1}$
- For the simplest case, the larger the propensity to consume (C_1) the larger the multiplier
- More generally, the greater is the response of $AE (= C + I + G)$ to Y, the larger is the multiplier
- A change in autonomous spending will change output more than the initial direct change in autonomous spending.
- I & G have the same impact on Y opposed to T.
- Also we assumed prices are fixed.

The Income - Expenditure Model



- Gross Expenditure → $AE(Y) = C(Y) + I + G$
- $C = C_0 + C(Y - T)$
- $Y = C_0 + C(Y-T) + I + G + (X - Q)$
- Solved for Y, $Y = \left(\frac{1}{1-b}\right)(C_0 - cT + G + T + (X - Q))$
- $G_{TOTAL} = G_0 - GY$

Changes in Autonomous Spending



- ΔY = multiplier • Δ Autonomous Spending.

Some Intuition

Can Govt choose any level of spending?

- The previous assume no supply constraints
- Output expands by any increase of Z
- Recessions suggest things are more complex
- Govt policy does have the ability to impact output though

Three Main Markets in Macroeconomy

- Goods (Output GDP) → Output/income and price level
- Assets → Asset holdings and interest rates
- Labour → Wages and employment
- So far the 'Keynesian Cross' model has goods markets only
- Goods Markets - Assume activity here with GDP Conjecture that desired expenditure depends itself on this output

$$AE(Y) = C(Y) + I + G.$$

$Y = AE(Y)$

observed = theory

$AE(Y) = Y \leq Y_{MAX}$ (Potential)

= Full employment

Some Definitions

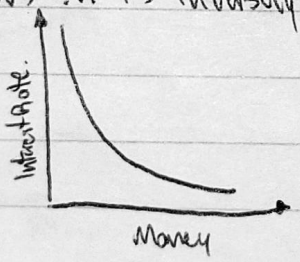
- Income - A flow of compensation per unit time
- Wealth - A stock variable at a given point in time, equal to financial assets minus financial liabilities
- Money - A stock variable equal to financial assets used for transactions
  - Eg Currency plus chequable deposits.
- Investment - Economists use this term for the purchase of new capital goods.

Financial Markets

- Financial Markets allocate wealth amongst various alternative assets
- Alternative: returns, risks, liquidity, terms
- Well focus on returns (interest rates) and liquidity (demand for money/transactions)
- Interest rates → price of liquidity

The Demand for Money

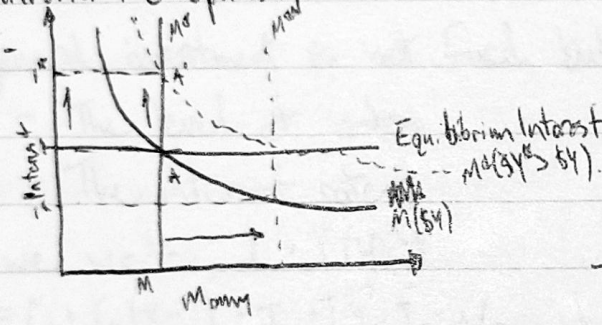
- Only 2 financial assets to chose from:
  - Money - Used for transactions (liquid) (currency and checkable deposits
  - Bonds - Cannot be used for transitions but pays a positive return → interest rate (i).
- $M^d = \$Y L(i)$ where M^d is demand for money, $\$Y$ is nominal income, (-) $L(i)$: is the liquidity demand for money as a function of i, (-) shows M^d is inversely related to i;
  - M^d and i are inversely related
- Demand for Money



- Proof of Negative Relation
  - $M^d = \$Y L(i) \Rightarrow \frac{M^d}{\$Y} = L(i)$
  - $\frac{M^d}{\$Y}$ is ratio of money to nominal income.
- $\frac{M^d}{\$Y} = i$ should be inversely related.
- Alternatively
  - $\frac{\$Y}{M}$ = velocity of money = $\frac{1}{L(i)}$

The Determination Determination of Interest Rates

- Assume - All money is currency, supplied by the central bank
  - Financial Market Equilibrium occurs when:
    - Money Supply = Money Demand
      $M^s = \$Y\, L(i)$.
- The LM relation: $M = \$Y\, L(i)$
- The demand for Liquidity (L) = Supply of Money.
- Equilibrium Graphically



Open Market Operations

- Buying, selling, goverment bonds by the central bank
- Buy bonds to increase the money supply.
- Sell bonds to decrease the money supply.

The Link Between Price of Bonds and Interest Rate

- The return on the bond, the implied interest rate is:
  $$i = \frac{\$100 - \$P_B}{\$P_B}$$
- So given face value and the current price of a bond we can work out the implied interest rate (i)

Combining Goods and Financial Markets.

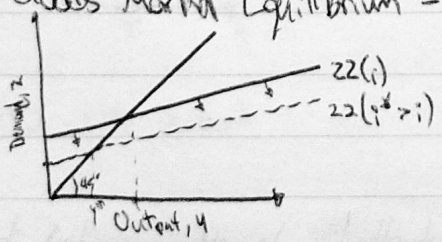
- Goods Market Equilibrium - $Y = C(Y-T) + I + G$
  - Determines output level, Y
- Then, Financial Market Equilibrium - $M = \$YL(i)$
  - Determines interest rates, i, given Y.
  - Real Money Balances - $\frac{M}{P} = L(i, Y)$ (− on i, + on Y)

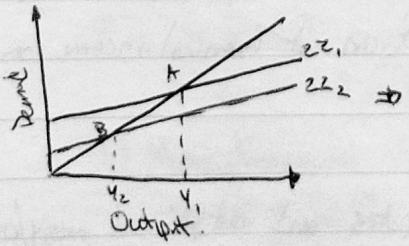
Goods Market and Interest Rates

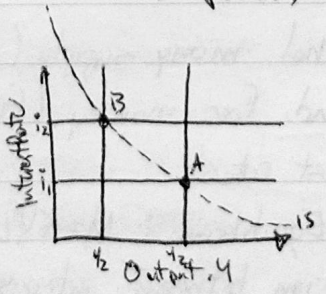
- In general investment is not fixed but rather depends on
  - The level of sales
  - The interest rates
- So we write; $I = I(Y, i)$
- $AE(Y) = C_0 + C_1(Y-T) + I + I_1 Y + I_2 i + G$, $I_1 > 0$, $I_2 < 0$
- $Y = AE(Y, i) = C_0 + C_1(Y-T) + I_0 + I_1 Y + I_2 i + G$

$$= \left(\frac{1}{1-C_1-I_1}\right)[C_0 - C_1 T + I_0 + I_2 i + G]$$

The IS Curve with Variable Investment

- Goods Market Equilibrium - $Y = C(Y-T) + I(Y, i) + G$
- 

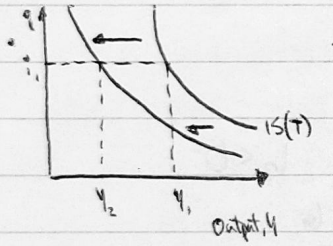
- All combinations of all interest rates and income giving equilibrium a goods market ceteris paribus
- 



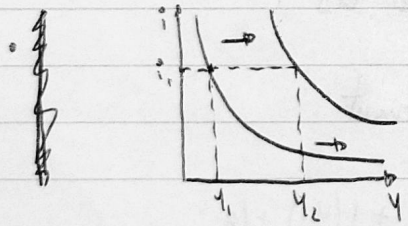
Goods Market Equilibrium

- The higher the interest rate, the lower the output
- The IS curve is downward sloping in (i-Y) space.
- The location of the IS-curve depends on elements of autonomous (exogenous) spending
- In other words, the IS-curve shifts when autonomous spending changes.

Shifts in the IS Curve



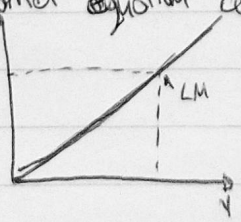
- ↑ in taxation, ↓ in spending, resulting in a lower level of Y.



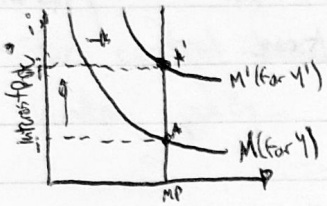
- ↑ in govt expenditure, ↑ in equilibrium Y_2

Financial Markets Revisited

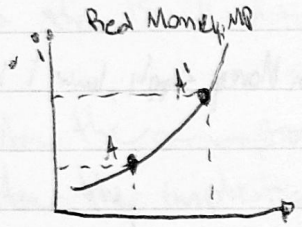
- M - the nominal money supply (controlled by the central bank)
- $YL(i) - Demand for money (function of nominal income and interest rates)
- Money Market Equilibrium: $M = \$YL(i)$
- A positive relation between interest rates and output in money/asset market equation ceteris paribus



Deriving the LM Curve



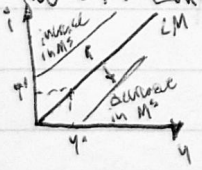
Increase in Y ⇒ Increase in M which increases i



Income

Money Market Equilibrium

- The higher is output (Y), the higher is the equilibrium interest rate (i)
- LM curve is upward sloping in (i-Y) space
- The location of the LM curve depends on the level of the money supply (M) and the price level (P)
- The LM curve shifts when real money supply changes

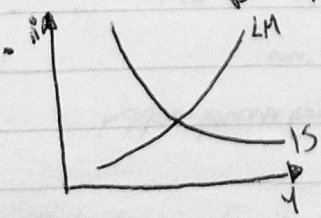


$$\frac{M^s}{P} = L(i, Y)$$

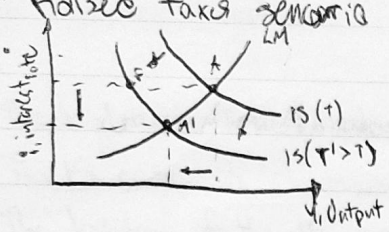
The IS - LM Model

- 2 simultaneous equilibrium Conditions
  - ① Goods Market Equilibrium
    - $Y = C(Y-T) + I(Y, i) + G$ ← IS
  - ② Money/Financial Market Equilibrium
    - $\frac{M}{P} = YL(i)$ ← LM.

NOTE:
P is fixed - Short run

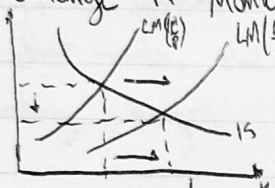


- Raised taxes scenario



- An increase in taxes lowers spending
- Vice versa is true.

- Change in Money Supply



- An increase in Money supply, lower i higher Y
- Viceversa.

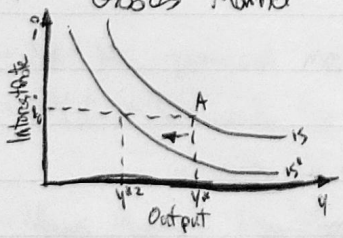
	Shift in IS	Shift in LM	Movement of Y	Movement of i
↑ in taxes	left	none	down	down
↓ in taxes	right	none	up	up
↑ in spending	right	none	up	up
↓ in spending	left	none	down	down
↑ in money	none	down	up	down
↓ in money	none	up	down	up

- Above is table 5-1 from the textbook under the effects of fiscal and monetary policy.

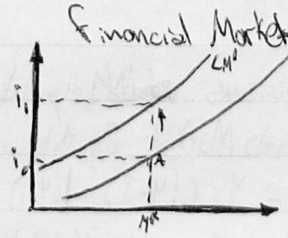
Adding Dynamics

- Dynamics Graphically

Goods Market

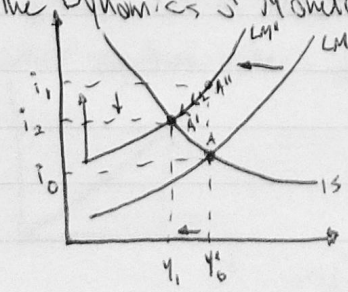


Financial Markets



- Adjusting for monetary contraction

- The Dynamics of Monetary Contraction with IS-LM



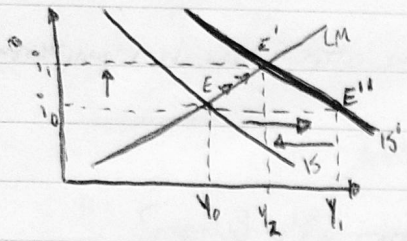
- A: Initial Equilibrium
- LM': After reducing money supply
- i_0 rises to i_1
- Higher i reduces demand and output slowly moves A'' to A'
- New equilibrium at (Y_1, i_2)

- Monetary policy changes interest rates more rapidly and output slowly
- The central bank must consider the output lag when implementing monetary policy.

Does the IS-LM Actually Capture what Happens in the Economy?

- Are the assumptions of IS-LM reasonable?
- Are the implications of IS-LM consistent with real world observations?
- Does the model pass these 2 basic tests?
- The IS-LM model explains movements in economic activity well in the short-run?
- The IS-LM model is consistent with economic observations once dynamics are introduced
-

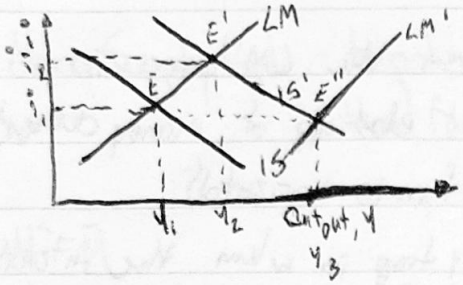
Fiscal Policy and Crowding Out



- Increased government spending increases aggregate demand shift IS right.
- Excess demand creates a rise in interest rate
- Overall result is mixed; ↑AE ⇒ ↑Y & ↑i
- if Δi = 0, Full effect on ↑Y (vice versa)

- Crowding out through interest rates
  - Occurs when expansionary fiscal policy (↑EXPAND) causes interest rates to rise, and this reduces private spending, particularly investment spending (↑E falls back again, offsetting the initial rise)
  - Income increases more and interest rates increase less, the flatter the LM schedule
  - Income and interest rates increase more the larger the multiplier i.e. the larger is the horizontal shift in the IS schedule
- Is crowding out important
  - In fully employed economies, crowding out occurs through a different mechanism. An increase in demand will lead to an increase in the price level. The increase in price reduces real balances. The LM curve moves to the left raising interest rates until the increase in aggregate demand is fully crowded out.
  - In an economy with unemployed resources there will not be full crowding out because the increase in demand need not raise the price level
  - Crowding out can also be reduced if the monetary authorities can accommodate the fiscal expansion
  - Monetary Accommodation - The central bank prints money to buy bonds with which the government pays for its expenditure. So money supply increases at the same time as govt engages in expansionary spending

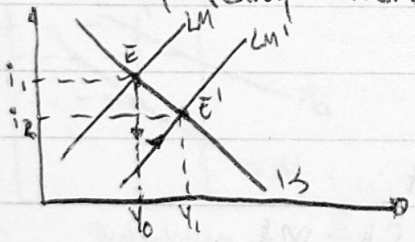
Monetary Accommodation



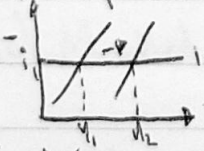
- Both IS & LM but interest rates don't move, no crowding out

Monetary Policy

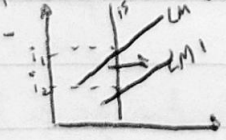
- Monetary policy - any decision made by the bank of Canada concerning nominal money stocks
- The adjustment of economy as a result of a monetary policy change depends on two responses
  - The ability of the policy to change interest rates (via LM curve)
  - The effects of interest rates changes on AE, and so on Aggregate Output (Y) (via interest sensitivity on IS)
- Monetary Policy Theory



- If AE depends on i fully, monetary policy is fully effective

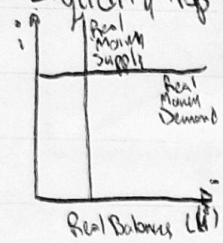


- If AE does not depend on i, monetary policy is not effective.



Infinite Interest Elasticity of Money Demand

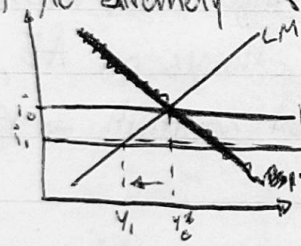
- Liquidity Trap - A situation that arises when the LM curve is horizontal because the interest elasticity of money demand is infinite (money demand fxn is horizontal)



- Modern version of the liquidity trap is when the interest rates are so low that a central bank has no scope to lower them further

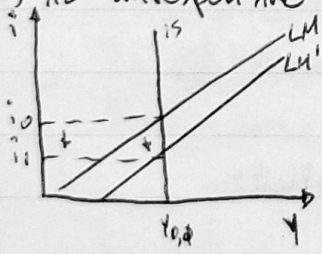
Extreme Cases

- IS → Goods Market (i, Y)
  LM → Assets/Financial (i, Y)
- i) AE extremely responsive to Δi



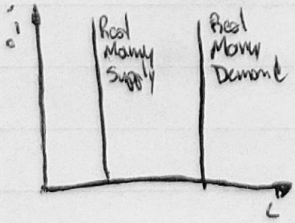
Small change of i leads to a very large drop in AE
$\frac{\Delta i}{\Delta Y} = 0$.

- ii) AE unresponsive to Δi



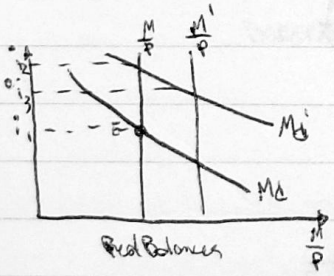
- No crowding out
- Fiscal Policy is fully effective
- Monetary Policy is ineffective

Zero Interest Elasticity of Money Demand



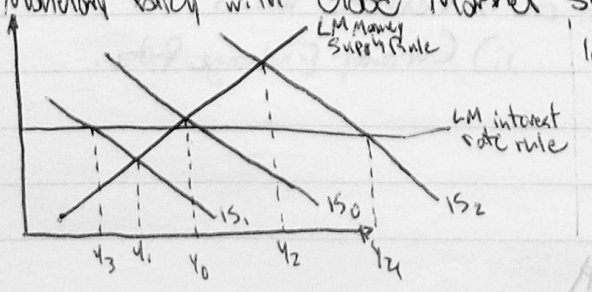
Monetary Policy and the Interest Rate Rule

- **Money Supply Rule** - A policy stance where the central bank holds the level (or growth rate) of the money supply constant, so money supply is exogenous
- $M^S = \bar{M}$
- Money supply may react to the interest rate. If so, then it has an endogenous component.
- **Interest Elasticity of the Money Supply** - A parameter that measures how much the central bank changes the money supply in response to an interest rate change
- $i = \frac{1}{g}(M^S - \bar{M})$
- **Interest Rate Rule** - Monetary policy is conducted according to an interest rate rule, if the money supply is changed in response.



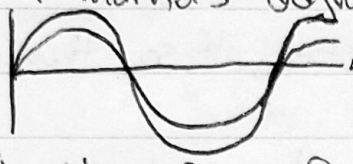
Financial Market Equation

- Monetary Policy → Sets Money supply → interest rate determined by markets
- LM is upward sloping, higher Y, more money demand
- Monetary Policy with Good Market Shocks

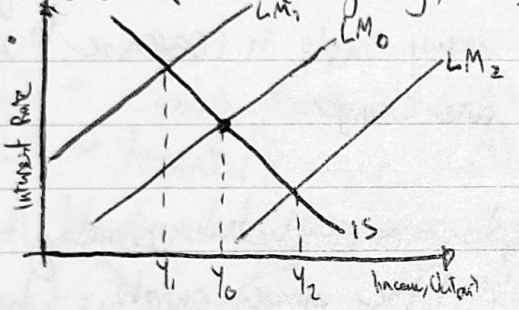


Interest rate Setting - Match $\frac{M^S}{P}$ to $L(i,Y)$ so i is fixed.

Goods Markets Volatility (Shocks)

- Fixed i-rate maximizes output fluctuations (eliminates crowding out/in effects).
- Not good monetary policy (Dc-stabilizing).
- Let markets adjust rate to stabilize
- 

- In the face of financial market fluctuations interest rate rules (targetting) → stabilize the Economy



- when fluctuations occur in asset or money market the variance of income is smaller under an interest rate rule than it would be under a money supply rule.

Openness in Goods and Financial Market

Trade Deficit value of imports exceeds value of exports.

- 3 Dimensions of Openness:
  1. - Openness in Goods Markets
  2. - Openness in Financial/Asset Markets
  3. - Openness in Factor/Labour markets

The Choice Between Domestic and Foreign Goods

- This depends on the relative cost of domestic and foreign goods
- Relative costs depend on: i) Relative Prices
  ii) Currency Exchange Rate.

Nominal Exchange Rates

- 1- The Price of domestic currency in terms of foreign currency
- 2- The price of foreign currency in terms of domestic currency.
- Nominal Exchange Rates = $\bar{E}$ = Price of foreign currency in terms of terms of domestic currency
  - The domestic currency price of a unit of foreign currency
- Real Exchange Rates = Price of foreign goods in terms of domestic goods

Measuring Changes in the Nominal Exchange Rate(E)

- Appreciation - of domestic currency corresponds to a decrease in $\bar{E}$
- Depreciation - of domestic currency corresponds to an increase in $\bar{E}$

Openness to Foreign Trade

- Goods Market - $Y = AE = C + G + I + X - M$
- How do X & M depend on
  - ① the exchange rate → current price?
  - ② domestic income?
  - ③ foreign income?
- Nominal Exchange Rate (E) - the domestic price of a foreign currency unit.
- Real Exchange Rate (ε) = $\frac{P^* \cdot E}{P} = \frac{\text{domestic price of foreign good}}{\text{domestic price of domestic good}}$
- In practice we use things like CPI to calculate exchange rate
- Real Appreciation of $CAD - lower real exchange rate
- Real Depreciation of $CAD - higher real exchange rate.
- Real & Nominal Exchange rate track each other closely

Openness in Financial Markets

- Foreign Exchange
  - Buying and Selling foreign currency
- The Problem: Choose between Canadian and U.S 1 yr bonds
  - Canadian Bonds - i_n = nominal interest rate for Canadian
    - $(1 + i_n)$ = Returns next year per C$ purchase of Canadian bond
  - US Bond - E_n = the C$ price per US$ → $\frac{1}{E}$ = # of US$ per C$
    - i_n^* = one year nominal interest rate on US bonds
    - $\frac{1}{E}(1 + i_n^*)$ = returns next year in US$ per C$
    - E_{n+1} = Expected exchange rate next year
    - $\frac{1}{E_n}(1 + i_n^*)E_{n+1}$ = Expected return next year in C$ per C$

The Choice Between Domestic and Foreign Assets

- Assumption - Competitive arbitrage works so investors will hold only the assets with highest expected rate of return
- The Interest Parity Condition - $1+i_{\$} = (1+i^*_{\$}) \frac{E^e_{\$/€,t+1}}{E_{\$/€,t}}$
- An Approximation for small i
  - $i_{\$} \approx i^*_{\$} + \frac{E^e_{\$/€,t+1} - E_{\$/€,t}}{E_{\$/€,t}}$

The IS Relation in the Open Economy

- $Y = C + I + G - eQ + X$, where eQ is the value of imports in terms of domestic goods & X is exports
- $e = \frac{EP^*}{P}$
- Openness in Financial Market
  - Interest Rate Parity "dominant" Force
  - $i = i^* + \frac{E^* - E}{E}$ over $\frac{M}{P} = L(i, Y)$
  - must be consistent with IRP + domestic i determination
  - money supply cannot function in isolation

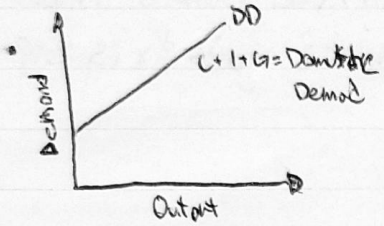
- Monetary Policy in Canada is always a compromise between targets
- $i \rightarrow$ unemployment ; $\frac{M}{P} \rightarrow$ inflation ; $E \rightarrow$ Exchange Rate

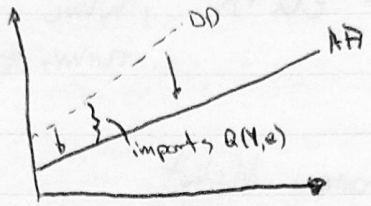
- Financial Markets → Now 2 equations (trading nominal assets (money/bonds))
  → $i = i^* + \frac{E^* - E}{E}$; $\frac{M}{P} = L(i, Y)$

The Determinants of the Demand For Domestic Goods

- The Determinants of $C, I, \& G$
  - Domestic Demand $C + I + G = C(Y - T) + I(Y, i) + G$ (+ and + − signs)
- The Determinants of Imports
  - Imports $Q = Q(Y, e)$ (+, −) $e = \frac{EP^*}{P}$
- The Determinants of Exports
  - Exports $X = X(Y^*, e)$ (+, +)

The Open Economy Graphically

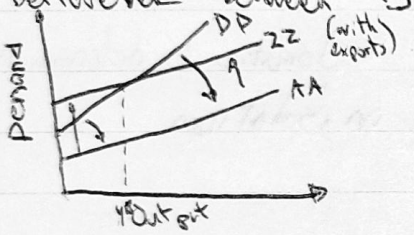


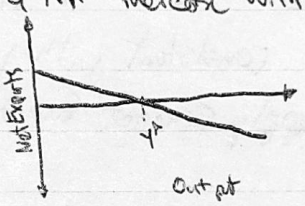


$Y = DD + X - eQ$

$AA = DD - eQ$

- Difference between DD & AA increase with income





The IS Relation in the Open Economy

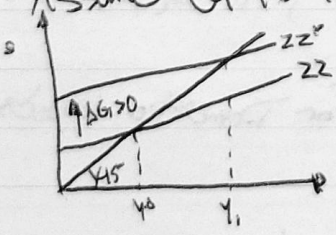
- Goods Market Equilibrium: $Y = Z$

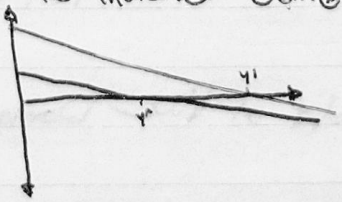
  Domestic Output = Demand for Domestic Goods

- $Y = C(Y-T) + I(Y,i) + G - eQ(Y,e) + X(Y^*,e)$

Increase in Domestic Demand

- Assume G is increased to increase domestic demand & Y

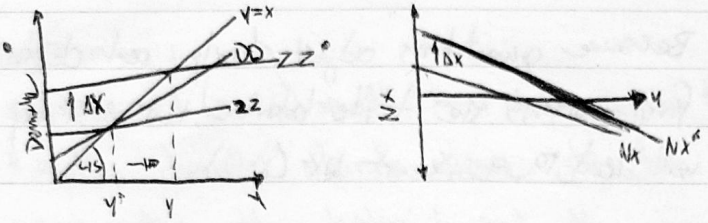




The Impact of Increasing G in an Open Economy

- Observation - A trade deficit treated
  - The multiplier is smaller
- The more open an economy the smaller the impact of a change in domestic demand on output

Increases in Foreign Demand



- Increased export increases Domestic demand for goods

Increases in Demand, Domestic, Foreign

- 2 Observation: ①

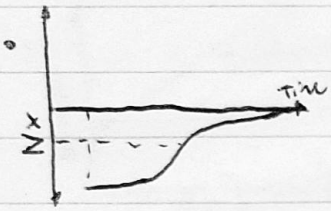
Depreciation

- $e = \frac{EP^*}{P}$ recall
- Real Exchange Rate - E = nominal; P^* = Foreign Price; P = domestic Price
- Assuming constant prices the depreciation of a currency will make that country's goods cheaper in other countries and vice versa.

Depreciation & Trade Balance

- $NX = X - eQ$
- $NX = X(Y', e) - eQ(Y, e)$
- Depreciation (increase in e) affects the trade balance in 3 ways.
  - ① import quantities (Q) decrease (relatively expensive) NX rise
  - ② Export " (X) increase (relatively inexpensive) NX rise
  - ③ The value of imports increase (depreciate domestic $) NX fall
- The Marshall-Lerner Condition - for depreciation to improve the trade - the increase in Q is greater than the value of Q.

Dynamics: The J-Curve



Because quantities adjust slowly, real depreciation first worsens the trade balance, but eventually will lead to a rise of $NX = (X - Q)$.

Output (Y), Interest Rate (i), and Exchange Rate (E)

- Short Run Assumptions - Domestic & Foreign price levels
- ~~Demand & therefore~~ are given fixed ($P^*/P = 1$)
- Demand & therefore equilibrium Y depend on the real interest rate (i) and real exchange rate (E).

Open Markets: Equilibrium in the Financial Markets

- Money: Supply of Money = Demand for Money (From each nation)
  $\frac{M}{P}$ $= Y L(i)$
- Domestic bonds vs foreign bonds
  - Equilibrium in domestic and foreign bonds
  - Interest parity relation: $i_n = i_n^* + \frac{E^e_{n+1} - E_n}{E_n}$
    Domestic = foreign + Foreign Currency Appreciation

Putting Goods and Financial Markets Together

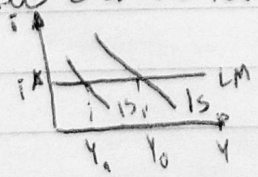
- Output → $Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, e)$
- Interest Rate → $\frac{M}{P} = Y L(i)$
- Exchange Rate → $E = \frac{E^e}{1+i-i^*}$

Fiscal Policy

- A Summary
- ↑ Demand (Ex. ↑G) ⇒ ↑Y ⇒ ↑ Money Demand ⇒ ↑i
- makes domestic bonds more attractive ⇒ domestic currency appreciates the higher i and the appreciation reduces demand for domestic goods (crowding out) and offsets some of the effects on ↑G & on Y
- ~~The smaller the multiplier~~ There is a small multiplier in an "open" vs. "closed" economy
- AE eg. G↑ ⇒ ↑Y⇒↑C (increases)
  ⇒ ↑Y → ↑I, but ↑i → ↓I (ambiguous)
  ⇒ ↓E → ↑Q & ↓X → ↓NX (decreases)
- Assume that the Marshall-Lerner Condition holds in the short run → E↑ ⇒ NX↑ depreciation improves the current account.

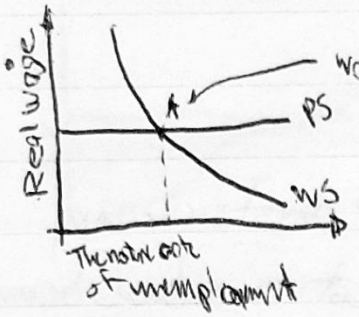
Fixed Exchange Rates

- Assume - A country pegs or fixes its exchange rate at $\bar{E}$
- Given the interest parity condition $i_n = i^*_{n+1} + \frac{E_{n+1} - E_n}{E_n}$
- Then a fixed $\bar{E}$ implies $i_n = i^*_{n+1} + \frac{\bar{E} - \bar{E}}{\bar{E}} = i^*_{n+1}$
- Recall the LM Relation $\frac{M}{P} = L(i, Y)$ now $i = i^*$, $\frac{M}{P} = YL(i^*)$
- To fix the exchange rate, the money supply must be constantly adjusted so as to keep i at i^*. No independent monetary policy, ~~same~~ So no "LM curve".
- fixed $\bar{E}$ ⇒ Horizontal LM Curve



fiscal policy is the only effective tool

The Natural Rate of Unemployment



- Allows for markups on outputs
- "workers" how to predict future price
  - labour supply
  - to contracting/bargaining
- But reduces to classical model.

Labour Market ~~classical model~~ is a special case of classical model

- labour market equilibrium determines natural level of unemployment which determines output.
- Monetary policy, fiscal policy, consumer confidence do not impact the "natural" level of unemployment or output.
- The input labour market conditions
  1. Labour supply - worker preferences
  2. Labour demand - value of marginal product
  3. Price Expectations - forward looking behavior

The Importance of Time Frame

- Short Run - Price level may not equal the expected price
  - ∴, the unemployment rate may not equal the so-called "natural" rate
  - And output may not equal its natural level
- Medium Term - Expected prices tend to be correct = actual price
  - Unemployment tends to the natural / equilibrium rate
  - Output tends toward its natural level.

The AS-AD Model

- Determination of output (Y), interest rates (i), and the price level (P) in the medium run (suppress E for now)
- Includes equilibrium in the goods, financial, and labour markets
- Aggregate supply focuses on eq'm in the labour market
- Aggregate demand " " " " " goods/financial markets

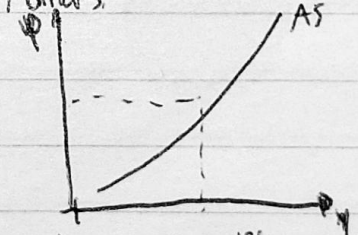
The Determination of Aggregate Supply

- Labour Market eq'm when P does not equal P^e
- Nominal wage bargaining: $W = P^e F(u, z)$
- Price-level Setting: $P = (1+\mu)W$
- Together: $P = P^e(1+\mu)F(u, z) \Rightarrow$ AS.
- $P^e \rightarrow$ the expected price level
- $u \rightarrow$ the unemployment rate
- P-Y relation stemming Labour Markets.

P^e = price expectation

$F(u, z) \rightarrow F\left(1 - \frac{Y}{L}, z\right)$

u high $\Rightarrow$ Y low vice versa

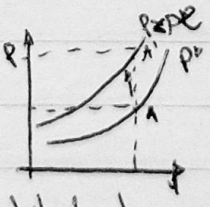


- $u = \frac{U}{L} = 1 - \frac{N}{L} \Rightarrow P = P^e(1+\mu)F(u, z) \Rightarrow P = P^e(1+\mu)F\left(1 - \frac{Y}{L}, z\right)$

$= 1 - \frac{Y}{L}$

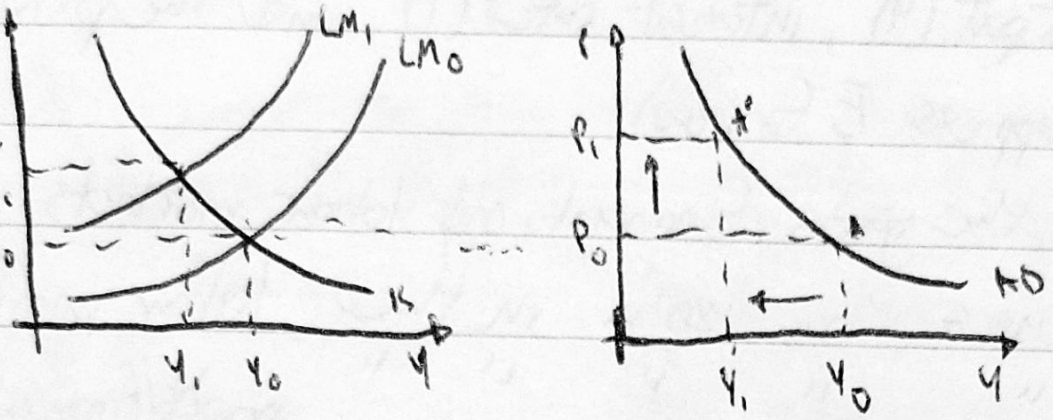
The AS curve.

- Impact of an increase in P^e



- Price Expectations is related to wage rate

Determining the Aggregate Demand



- $Y = Y(\frac{M}{P}, G, T)$
- Y is a decreasing function of P
- Shifts in IS or LM shift AD

Equilibrium Output in the Short & Medium Run

- AS: $P = P^e(1+\mu)F(1-\frac{u}{L}, z)$
- AD: $Y = Y(\frac{M}{P}, G, T)$