Classical Dichotomy of Money and Real Economy

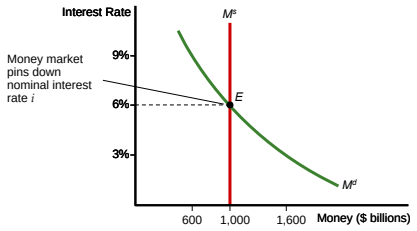
(no new reading assignment for this part)

Dichotomy of Money and Real Economy

- Economy exhibits dichotomy of money and real economy if real variables such as output, unemployment, and real interest rates can be analyzed without considering what is happening to nominal variables like money or price level
  - Classical model exhibits such dichotomy, a result referred to as classical dichotomy

Adding Money To Classical Model

- Money market pins down nominal interest rate i



Adding Money To Classical Model

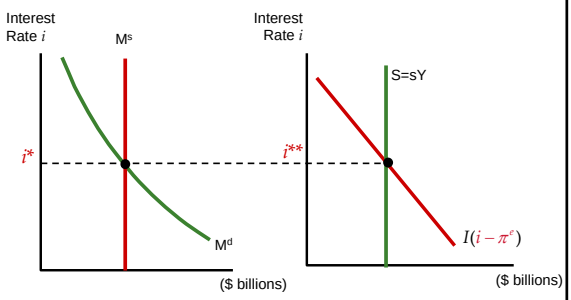
- Money market pins down nominal interest rate i
- Given expected rate of inflation, nominal interest rate i is linked to real interest rate r though

$$r \approx i - \pi^e$$

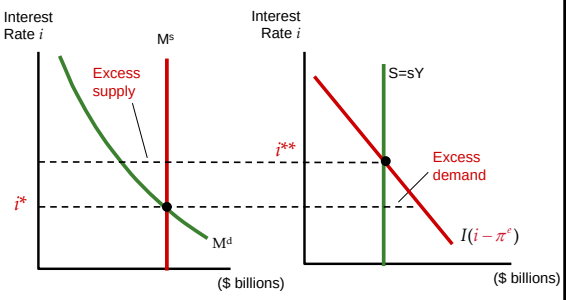
Adding Money To Classical Model

- For the money market to fit into Classical model, need money market equilibrium (MME) and loanable funds market equilibrium (LFME) to be consistent
  - MME and LFME are consistent, if they imply the same equilibrium interest rate

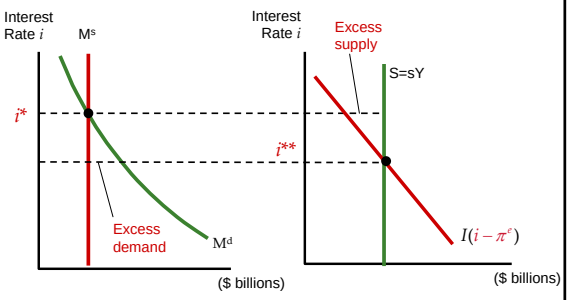
MME and LFME are Consistent



MME and LFME are Inconsistent



MME and LFME are Inconsistent



Fundamental Question

- What restores consistency between money market and loanable funds market in the Classical model?

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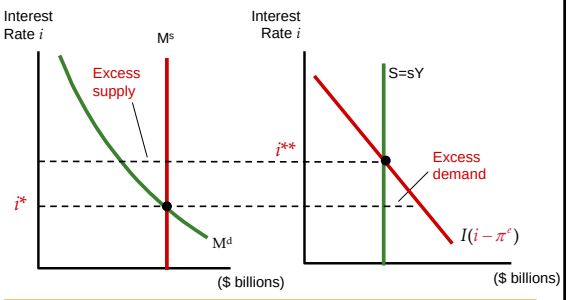
- What restores consistency between money market and loanable funds market in the classical model?
- Answer: the price level P does
  - The only thing left on the table!

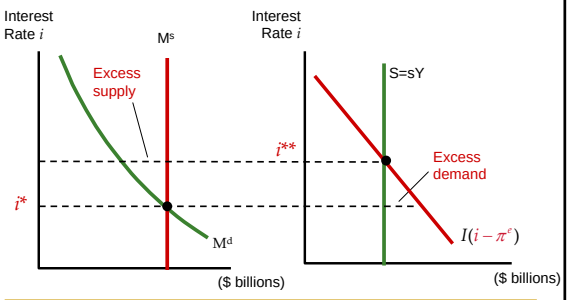
How?

Suppose money market interest rate is too low…



How?

Price level P increases → money demand goes up …



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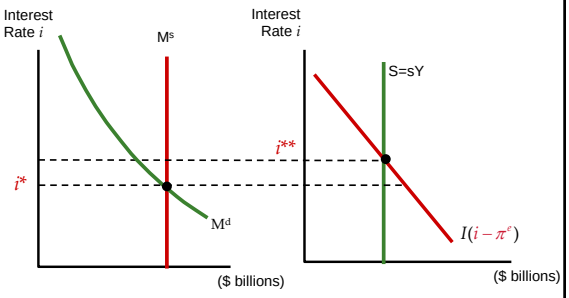

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How?

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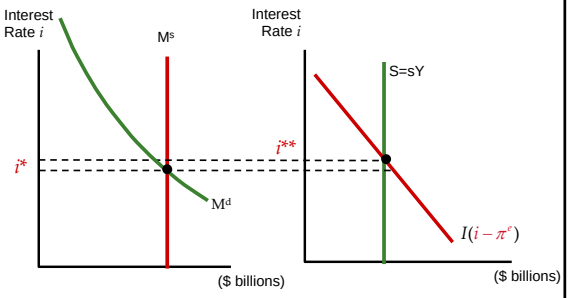

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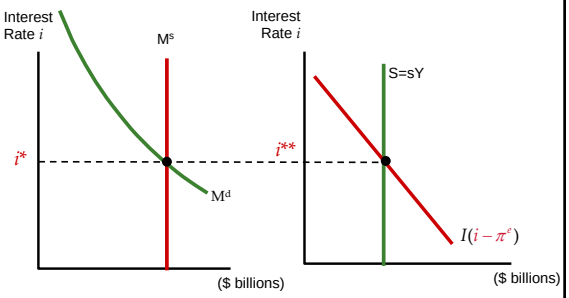
How?

The gap closes in



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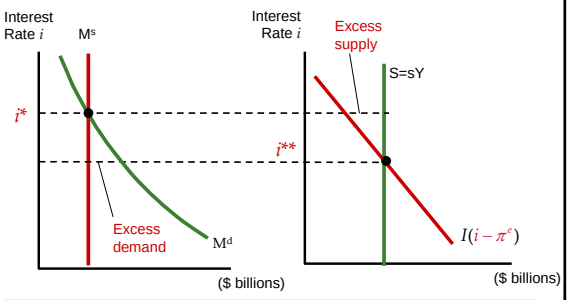
How?

Suppose money market interest rate is too high…



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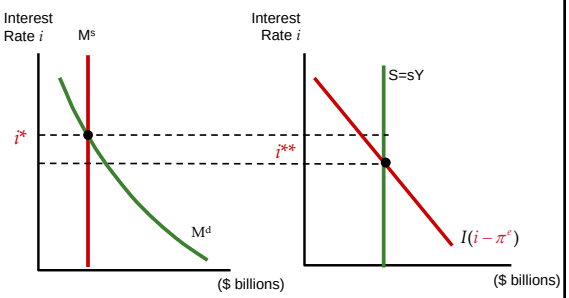
How?

Price level P falls → money demand goes down …



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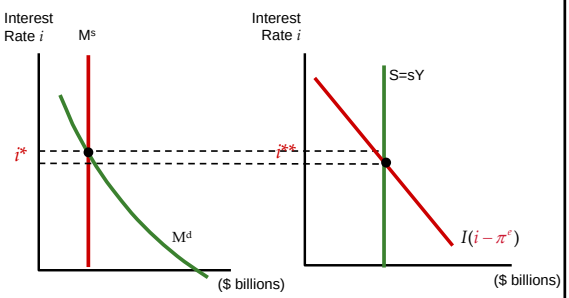

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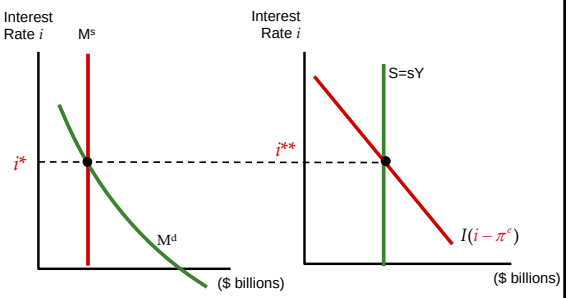
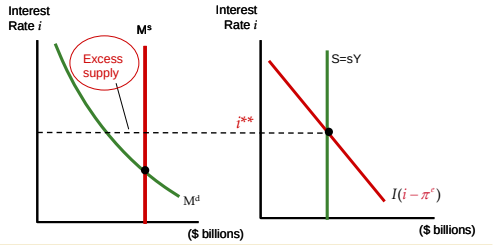


Mechanism?

- What is the mechanism that restores consistency?
  - Why price level P?
  - What makes the price level P go up?

Example

- Money demand is "too low" → excess supply of money

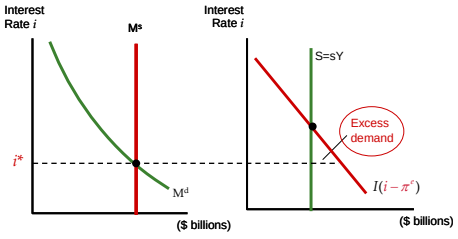


Example

- Money demand is "too low" → excess supply of money
  - Public wants to increase their bond holdings and reduce their money holdings
  - Price of bonds increases on the bonds market; interest rates fall
    - As interest rates fall, additional bonds are issued by firms to fund their excess demand for investment…

Example

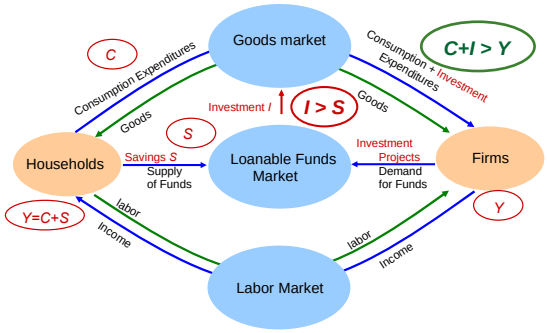
- Interest rates fall → investment starts to exceed savings *S* (i.e. *I>sY*)



Example

- Total *planned* expenditures > total output produced by firms
  - In the circular flow diagram, inflows (investment) exceed outflows (savings)
  - Say's law no longer holds!

Outflows < Inflows



Same Thing Analytically

- Define *AE* as total *planned* expenditures (called also aggregate demand)
- Then,

$$AE = C + I$$
$$AE = (1 - s)Y + I$$
$$AE = Y + [I - sY]$$

Since $I > sY = S$, so we have $AE > Y$

What Happens Next?

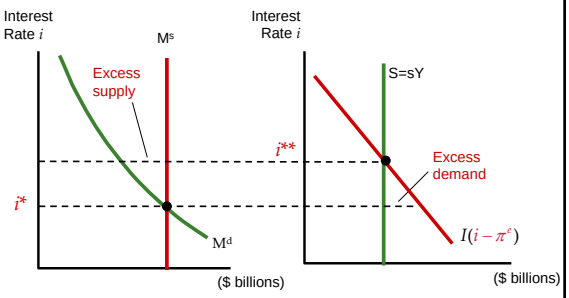
- Extra profit opportunity for firms
  - Firms can increase prices slightly, produce more and still sell everything!
- However:
  - Since all factors are already employed due to market clearing in all markets, any attempt to increase production and employment immediately results in higher wages, higher costs, and thus higher and higher prices…

What Happens Next?

- Bingo! Firms increase prices, P goes up until the gap closes in completely
  - Output remains unchanged

What Happens Next?

Price level P increases → money demand goes up …



What Happens Next?

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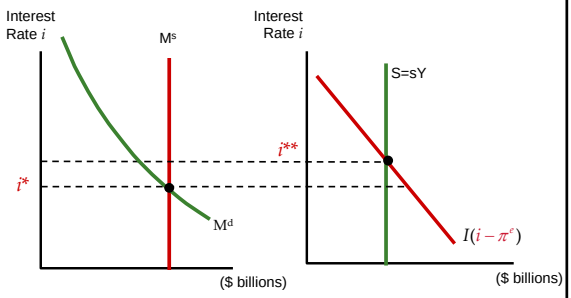

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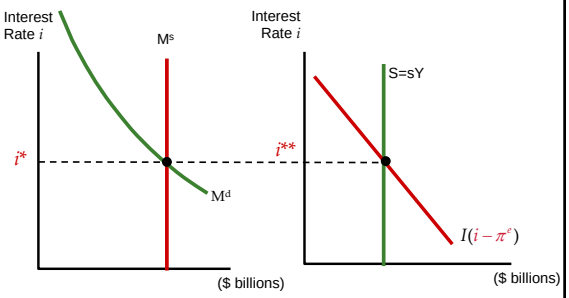
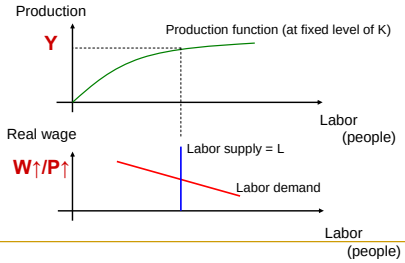


Behind the Scene: Output and Employment

- Nominal wage W and price level P both increase
  - Real wage, employment, output, stay the same



Conclusion

- In the classical model, changes of money supply and monetary policy have no real effects (output, employment, real interest rates etc… all stay the same)
  - More money = inflation
  - Less money = deflation

Evidence for Classical Dichotomy in the Data

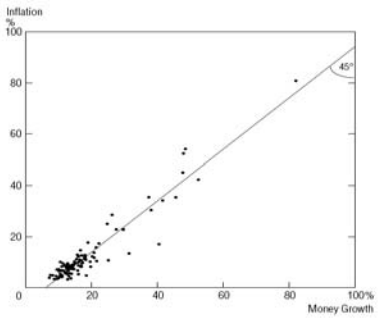
Evidence for Classical Dichotomy

- Consensus among economists is that classical dichotomy is true in the long-run
  - Higher money supply growth is systematically associated with higher inflation
  - Growth of output is unrelated to money growth rate and inflation

Money Growth and Inflation in the Data

- 30 years average growth rates of M2 money and inflation rates, 1960-1990 in 110 countries
- Source: Weber and McCandless (1995)

Money Growth and Inflation in the Data



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Inflation and Growth in the Data

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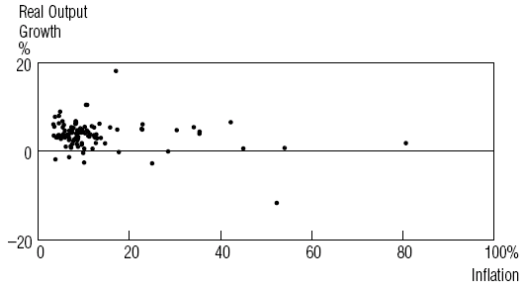
Inflation and Growth in the Data



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Key Take Away

- In the long-run, printing money leads to inflation, and nothing more

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Numerical Example

- Suppose in the equilibrium of the classical model, we have
  - Output Y= 10
  - Real interest rate r implied by LFME 3%
  - Money demand equation $M^d=2P+Y-100i$
  - Money supply $M^s=10$
  - Expected inflation rate π^e=2%

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Numerical Example

- Using the result of classical dichotomy, calculate the price level P

  Using equilibrium condition, $M^s=M^d$, we have

  $10=2P+Y-100i$

  $10=2P+10-5$ *(substituted out Y=10 & $i=r+\pi^e$)*

  $P=5/2=2.5$
- What happens to the price level if M^s increases to 11? Following the same calculations, we obtain:

  $P=3$ (which implies inflation of 20%)

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Numerical Example

- Assuming investment function is given by I(r)=50-500r, plot investment function as a function of nominal interest rate instead, i.e. plot *I(i)* given π^e *=2%*
  - Plug in $r=i-\pi^e$, to obtain:
  - $I(i)=5-100(i-\pi^e)=5-100i+2=7-100i$

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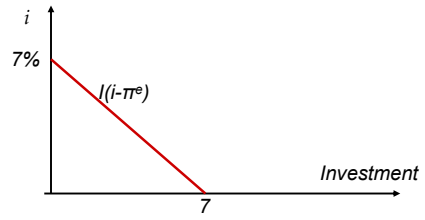
Numerical Example



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Numerical Example

- What happens to this function, if expected inflation goes up from 2% to 3%?
  - It shifts outwards
  - The new equation is $I(i)=5-100(i-\pi^e)=5-100i+3=8-100i$

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