Keynesian Business Cycle Analysis

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Introduction

- ▶ We saw that the central points of Classical business cycle analysis are that

  - ▶ Prices adjust quickly, and so markets are almost always in equilibrium
  - ▶ Business cycles are the economy's best response to disturbances, mainly productivity shocks
  - ▶ There is little justification for governments to attempt the cycle: fiscal policy can be counterproductive and monetary policy is ineffective

- ▶ Keynesians are less optimistic about the ability of markets to clear, i.e. to reach equilibrium, in a reasonable amount of time

- ▶ There are frictions in the economy that prevent prices from fully adjusting rapidly: prices are **sticky or rigid**

- ▶ These frictions imply that business cycles may be inefficient responses of the economy to shocks and disturbances

- ▶ This may justify policy intervention

# Introduction

This series of lectures:

1. Real Wage Rigidity

2. Price Stickiness

3. Monetary and Fiscal Policy in the Keynesian Model

4. Keynesian Business Cycle Theory

1. Real Wage Rigidity

Real Wage Rigidity

- ▶ The assumption that wages and prices are **rigid** (or sticky) is essential for Keynesian analysis
- ▶ In particular, Keynesian explanations of unemployment are predicated on the fact that wages do not adjust quickly to clear the labor market
- ▶ Compare to Classical explanations, which rely on mismatches between workers and firms
  - ▶ If unemployment during recessions was due to mismatch, one should observe greater search of new employees by firms
  - ▶ In practice, new job postings and vacancies decline during recessions
- ▶ Keynesians argue that unemployment arises from the fact that labor demand falls during recessions, but wages do not fall rapidly enough to clear the market
  - ▶ i.e., real wages are rigid
- ▶ This means that there are too many people looking for a job at the prevailing wage, but firms are not demanding enough workers at that wage

Real Wage Rigidity

Wage

S_L

Wages 'sticky'
at W1

W1

We

D_1

D_2

Q3 Q2 Q1

Q L
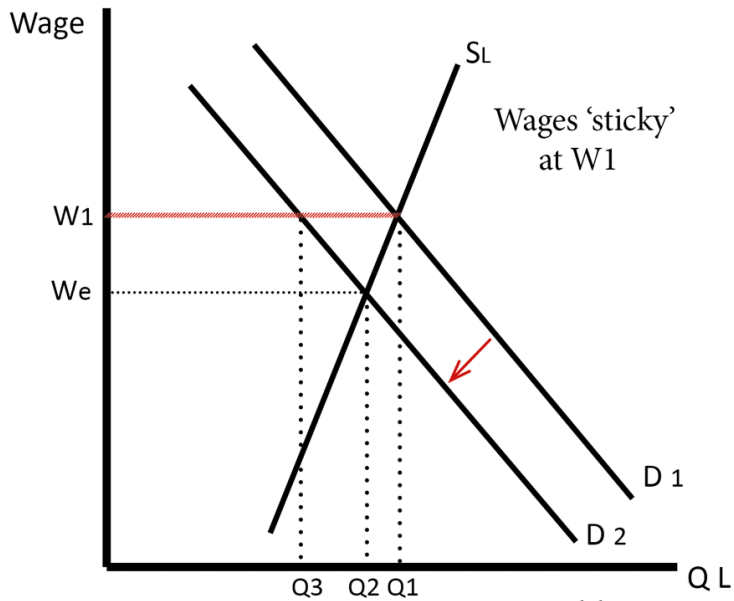
Why are real wages rigid?

Why don't firms simply cut wages during recessions so that the labor market clears?

- ▶ Legal and institutional factors: minimum wage laws and labor union contracts
  - ▶ However most US workers earn more than the minimum wage and do not belong to unions
  - ▶ Only about 3% workers earn the minimum wage and only 11% belong to unions
  - ▶ This is likely to be a better explanation in Europe

- ▶ Hiring and firing costs (implicit and explicit) make it costly for a firm to lose workers and have to hire and train new ones
  - ▶ Firms may not want to lower wages so as to keep workers during recessions
  - ▶ Also related to labor hoarding

- ▶ Worker productivity may be depend on the wages they are paid
  - ▶ This is called the **efficiency wage model**
  - ▶ Higher paid workers are more productive and/or work harder

The Efficiency Wage Model

Why would worker productivity depend on the wages they are paid?

► **Positive incentive**: Akerlof's gift exchange motive. Workers feel their employer is treating them fairly, and want to retribute by working hard.

► **Negative incentive**: if a worker is well paid, it may not be easy to find other jobs that pay as well. Therefore, the worker is "afraid" of getting fired and will work hard to keep their job.

► If workers were paid the bare minimum, they would "shirk", i.e. not exert a lot of effort as unemployment or other jobs are equally attractive as the current job.

The Efficiency Wage Model

- Effort curve denotes the level of effort for a given wage
- If wage is too low, effort increases slowly
- After point A, wage is high enough that effort rises rapidly
- After point B, effort becomes very costly
    - Diminishing marginal utiliy of leisure
    - Time constraints
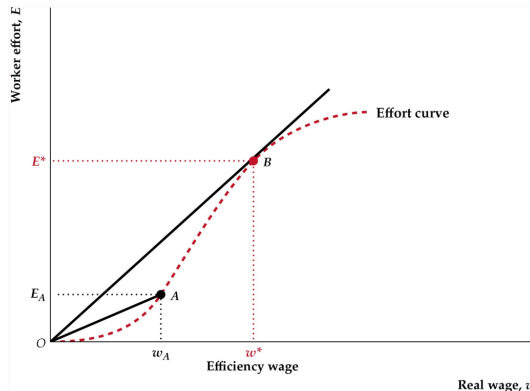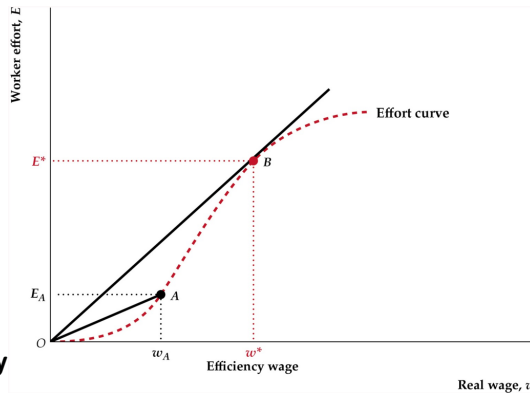
Wage Determination

What determines the real wage?

▶ Firms maximize profits, choosing the wage that maximizes effort minus wage costs

$$\max_{w} E(w) - w$$

▶ The first-order condition is

$$E'(w) = 1$$

▶ Firm chooses w such that slope of 45 degree line equals slope of effort curve

▶ This occurs at point B, w^* is called the **efficiency wage**

Unemployment in the Efficiency Wage Model

▶ The efficiency wage depends only on the worker effort curve, and not on aggregate factors such as whether the economy is in a recession or not

▶ For this reason, the efficiency wage is permanently rigid

▶ Employment and unemployment are determined in the labor market, depending on the difference between the efficiency wage and the market clearing wage

▶ The difference between the labor supply and the labor demand at w^* is the amount of unemployment

Unemployment in the Efficiency Wage Model
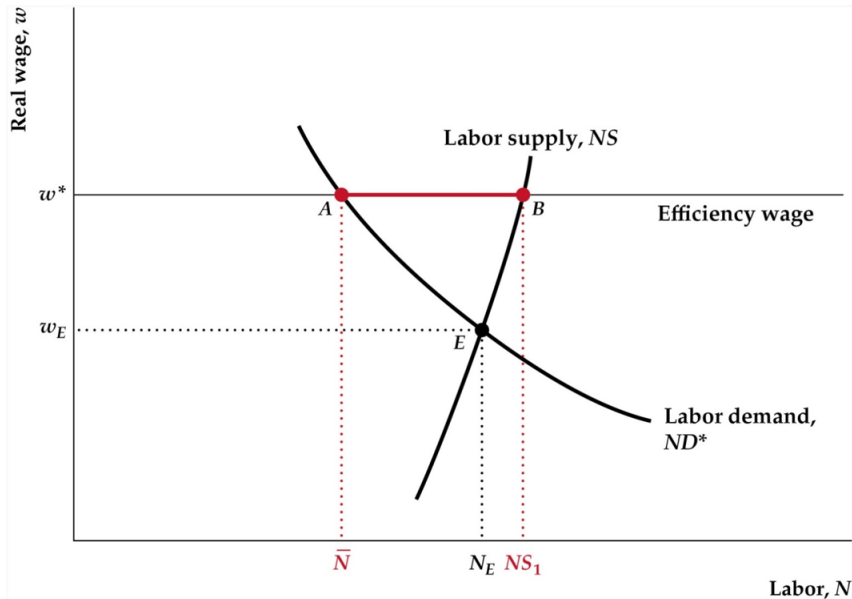
Unemployment in the Efficiency Wage Model

- ▶ Note that in this model, full employment is $\bar{N} < N_E$

- ▶ This means that there is unemployment even when the economy is at full-employment!

- ▶ Even if unemployed workers offered to work at lower wages, firms would not hire them as they know that they would not be putting an optimal amount of effort

- ▶ Does the Efficiency Wage theory match up with the data?

  - ▶ Plenty of empirical support, i.e. Henry Ford in 1914
  - ▶ But it predicts that the real wage is completely rigid, while we know that real wages move over time and the business cycle
  - ▶ This requires a more complicated model that makes the effort curve change with the business cycle
  - ▶ During recessions, workers worry more about losing their jobs hence a lower real wage is sufficiency to maintain optimal effort

Efficiency Wages and the *FE* line

▶ Does the efficiency wage model change the (vertical) slope of the *FE* line?

▶ **No**: in the efficiency wage model, $\bar{N}$ does not change with the interest rate

▶ There is an important difference with respect to the Classical model, however:

  ▶ In the Classical model, anything that shifts labor demand or labor supply changes $\bar{N}$ and thus shifts the *FE* line

  ▶ In the Keynesian efficiency wage model, labor supply shifts are irrelevant as they do not affect the efficiency wage market equilibrium, they only change the amount of unemployment

  ▶ Changes in labor demand still shift the *FE* line, i.e. changes in productivity

2. Price Stickiness

Price Stickiness

▶ The fact that real wages do not immediately adjust to clear markets is a type of **real rigidity**

▶ Keynesian theory also emphasizes **nominal rigidities**, i.e. rigidities in nominal prices themselves

▶ These happen when dollar prices or wages do not rapidly adjust in response to shocks or disturbances

▶ Real wage rigidities are useful to explain unemployment, while nominal rigidities are useful to explain the nonneutrality of money

Why are prices sticky?

▶ Monopolistic competition: the fact that most firms set the prices of their products rather than taking those prices as given

▶ Menu costs: the fact that changing nominal prices is costly

Monopolistic Competition

▶ We often assume that producers are **price takers**, i.e. they take the product of the price as given and operate under **perfect competition**

▶ This is a powerful simplification that holds in many real life markets, i.e. commodities or financial securities that are traded in centralized exchanges

▶ In practice, the sellers of most goods, services or assets may be **price setters**, and have (some) power to set prices, operating under **monopolistic competition**

▶ Example: movie theaters competing for movies. Even if a specific movie theater raises the price of a ticket above others, you may still want to go there because the theater is closer, or it has a better screen, or a better concession stand

Monopolistic Competition

In monopolistically competitive markets, sellers do three things

1. They set prices in nominal terms (rather than take them) and maintain them for some period of time

2. Since they make positive profits at those set prices, they are willing to adjust their output to meet demand at those fixed prices

3. They readjust those prices occasionally, if costs or demand change significantly

Menu Costs and Price Setting

▶ Changing prices themselves is costly and firms may want to do so only occasionally

▶ These costs are known as **menu costs**, this term comes from the literal cost of having to print new menus when a restaurant changes its prices

▶ These costs are broader, and include things like informing customers, remarking merchandise, etc.

▶ These costs tend to be rather small - so how can they create an amount of rigidity that is important from a macro perspective?

    ▶ If firms are perfectly competitive, getting the price wrong may mean losing all of its customers

    ▶ But if firms are monopolistically competitive, having prices that are a little bit wrong may not matter much

▶ Firms change prices only when the menu cost is smaller than the profits that are lost from not having the "right" price

Menu Costs and Price Setting

Empirical Evidence on Price Stickiness

▶ Blinder (1994) found that half of managers change prices at their firms once a year or less

▶ Bils and Klenow (2004) looked at 350 goods used to compute the CPI and find that the average time between price changes was only 4.3 months

▶ Nakamura and Steinsson (2008) found that such short duration was mostly driven by temporary sales. Excluding sales, the median length of time between price changes is 11 months.

Meeting the Demand at a Fixed Nominal Price

- ▶ Under sticky prices and monopolistic competition, firms respond to changes in demand by changing production rather than changing nominal prices

- ▶ The two assumptions are important

- ▶ Under perfect competition, firms make zero profits and thus charge a price that is equal to their marginal cost

$$P = MC$$

Meeting the Demand at a Fixed Nominal Price

▶ Under monopolistic competition, firms make positive profits and charge a price that is higher than their marginal cost

$$P = (1 + \eta)MC$$

▶ The difference between the two is called the **markup**, η

▶ If demand increases, the firm can increase production and earn positive profits thanks to a positive markup, even without changing prices

▶ If the firm is paying efficiency wages, it is easy to hire extra workers to produce those extra units since there is an excess supply of labor

Effective Labor Demand

▶ The economy can then produce an amount of output that is not on the *FE* line

▶ The firm's labor demand is therefore determined by the demand for its output

▶ The $ND^e(Y)$ curve slopes up because more labor is needed to produce more output

▶ Due to excess supply of labor, this curve determines the equilibrium level of employment

▶ After prices adjust, employment returns to its full-employment level $\bar{N}$

Labor, *N*

Effective labor demand, $ND^e(Y)$

Higher output implies that more labor is needed

$\bar{N}$

$\bar{Y}$

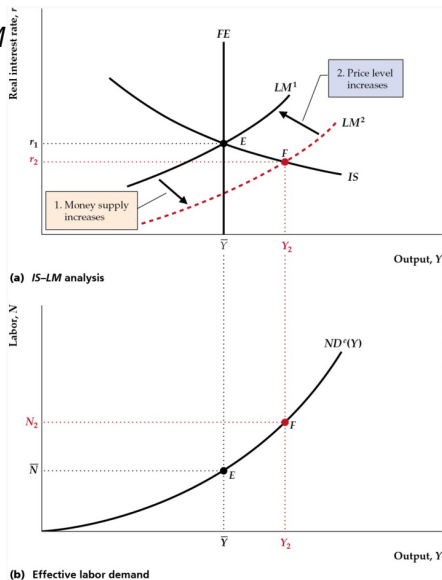Output, *Y*
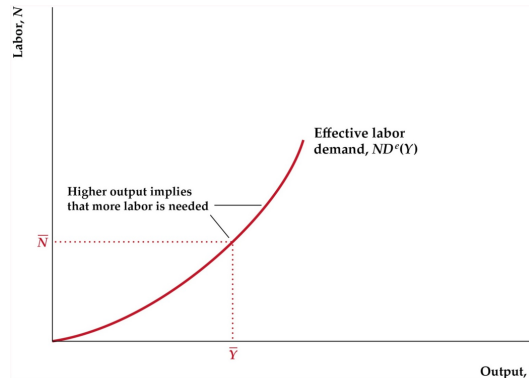
3. Monetary and Fiscal Policy in the Keynesian Model

Monetary Policy in the Keynesian Model

▶ Nominal price stickiness generates monetary non-neutrality

▶ In the short-run, equilibrium is given by the $IS - LM$ curves

▶ In the short-run, the economy may be off the FE line and employment is determined by the $ND^e(Y)$ curve

▶ In the long-run, prices adjust and the economy must return to the FE line

Monetary Policy in the Keynesian Model

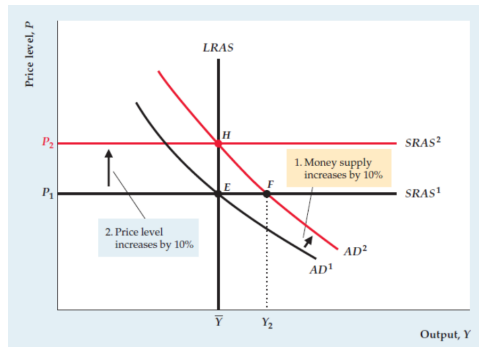Consider an expansion of the nominal money supply M

▶ LM curve shifts to the right

▶ Equilibrium shifts from E to F, aggregate output exceeds its full-employment level $Y_2 > \bar{Y}$

▶ Keeping prices fixed in the short-run, firms hire more workers $N_2 > \bar{N}$ to satisfy increased demand

▶ Eventually firms raise their prices, which lowers real money supply $M^s/P \downarrow$

▶ This shifts the LM curve back to its original point

▶ Money is neutral in the long-run but not in the short-run

▶ Adjustment similar to Misperceptions Theory, but the mechanism is different!

(a) IS–LM analysis

(b) Effective labor demand

Monetary Policy in the Keynesian $AD - AS$ Model

Analysis is similar in the $AD - AS$ model

▶ Expansion of LM curve and new $IS - LM$ equilibrium shift the AD curve to the right
▶ Since producers do not adjust their prices, $SRAS$ is flat and output rises
▶ Eventually prices adjust and $SRAS$ shifts up
▶ This contracts the LM curve, but is a movement along with AD curve

Fiscal Policy in the Keynesian Model

Consider a permanent increase in government purchases, $G \uparrow$

- Expansion of autonomous demand, so IS curve shifts to the right
- Equilibrium shifts from E to F, aggregate output exceeds its full-employment level $Y_2 > \bar{Y}$
- Keeping prices fixed in the short-run, firms hire more workers $N_2 > \bar{N}$ to satisfy increased demand
- Eventually firms raise their prices, which lowers real money supply $M^s/P \downarrow$
- This shifts the LM curve to the left, and the equilibrium converges to H
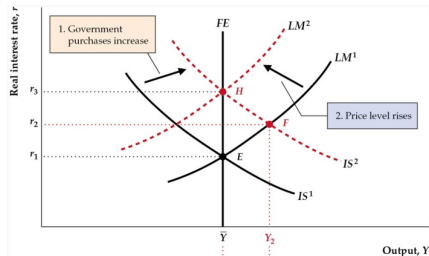
(a) IS–LM analysis
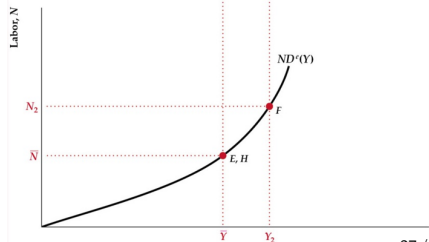
The Fiscal Multiplier

▶ An important concept when discussing fiscal policy is that of the **fiscal multiplier**

$$\mathcal{M} = \frac{\Delta Y}{\Delta G}$$

▶ The multiplier is the change in output that results from a one dollar change in government spending

   ▶ In our example, $\Delta Y = Y_2 - \bar{Y}$

▶ Keynesians typically argue that the multiplier is great than 1, so one dollar of government spending generates more than a dollar in output

▶ Classical analysis also obtains an increase in output due to the expansion of labor supply and thus of the *FE* line

▶ In the Keynesian model, shifts in labor supply are irrelevant as they do not affect labor market equilibrium, and only the *IS* curve shifts

The Fiscal Multiplier: Simple Example

▶ Consider a simple closed-economy without investment

▶ Assume that the consumption function is

$$C(Y, T, G) = \alpha_C + \beta_C(Y - T) - \gamma_C G$$

where α_C is autonomous consumption, β_C is the marginal propensity to consume, T are taxes, and γ_C captures other ways through which consumption may react to government purchases (i.e. Ricardian Equivalence)

▶ Equilibrium in the goods market is given by

$$C + G = Y$$

▶ Replacing for $C(Y, T, G)$, we can write total output as

$$Y = \frac{a_C - \beta_C T + G(1 - \gamma_C)}{1 - \beta_C}$$

The Fiscal Multiplier: Simple Example

The fiscal multiplier is then given by

$$\mathcal{M} = \frac{dY}{dG} + \frac{dY}{dT}\frac{dT}{dG}$$
$$= \frac{1 - \gamma_C - \beta_C\frac{dT}{dG}}{1 - \beta_C}$$

Different cases:

1. **No RE, no tax increases:** then we have that $\gamma_C = \frac{dT}{dG} = 0$, and the multiplier is

$$\mathcal{M} = \frac{1}{1 - \beta_C} > 1$$

2. **No RE, tax increases:** then $\gamma_C = 0$ and the multiplier is

$$\mathcal{M} = \frac{1 - \beta_C\frac{dT}{dG}}{1 - \beta_C}$$

   If $G \uparrow$ is deficit-financed, multiplier is still larger than 1.

3. **Ricardian Equivalence:** Then $\gamma_C > 0$, and the multiplier may be smaller than 1 if $\gamma_C > \beta_C$

Fiscal Policy in the Keynesian $AD - AS$ Model

Analysis is similar in the $AD - AS$ model

▶ Expansion of IS curve and new $IS - LM$ equilibrium shift the AD curve to the right

▶ Since producers do not adjust their prices, $SRAS$ is flat and output rises

▶ Eventually prices adjust and $SRAS$ shifts up

▶ This contracts the LM curve, but is a movement along with AD curve
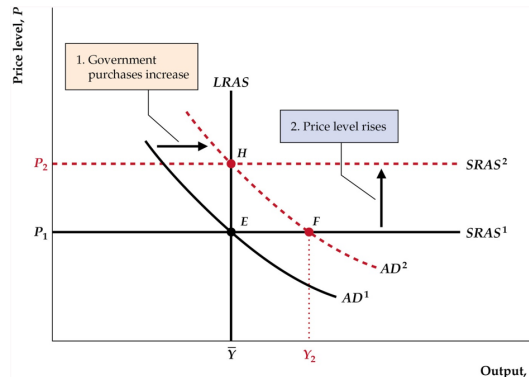
Taxes in the Keynesian Model

▶ A lump-sum reduction in current taxes has effects similar to those of an expansion in G

▶ The Keynesian argument is that private consumption depends partly on current income

$$\text{current income} = Y - T$$

$$C = C^d(Y - T)$$

▶ If current income increases, so does consumption. This reduces desired saving and expands the IS curve

▶ Keynesians reject Ricardian Equivalence

▶ The only difference with respect to an increase in G is that now C will be a larger fraction of total expenditure (as opposed to G)
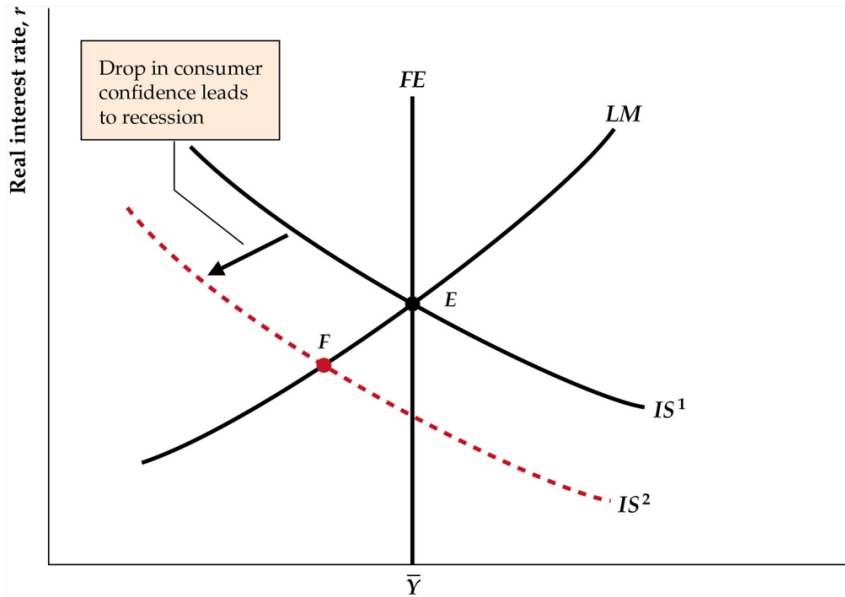
4. Keynesian Business Cycle Theory

Keynesian Business Cycle Theory

▶ We have analyzed the effects of fiscal and monetary policy in the Keynesian model

▶ Recall that every business cycle theory tries to answer two questions: (1) what are the causes of business cycles?, and (2) how should policymakers respond?

▶ Keynesians believe that **aggregate demand shocks** are the primary source of business cycle fluctuations

▶ These are shocks that shift either the *IS* or the *LM* curves

  ▶ Changes in the money supply or in the demand for money

  ▶ Changes in consumer confidence

  ▶ Changes in expectations regarding investment (future marginal product of capital)

  ▶ Changes in government purchases or taxes

Keynesian Business Cycles

▶ Keynesians believe that recessions arise because there is "not enough demand"

  ▶ vs. Classicals, who believe that recessions arise due to "not enough supply"

▶ Keynesian theory accounts for several business cycle facts

  1. Aggregate demand shocks cause recurrent fluctuations in output

  2. The theory predicts that employment is procyclical

  3. The theory correctly accounts for that fact that money is procyclical is leading

  4. Spending in investment and durable goods is procyclical and volatile

  5. Inflation is procyclical and lagging

▶ Keynes believed that **animal spirits**, waves of pessimism and optimism were a key source of business cycles

Keynesian Recessions

Keynesian Business Cycles

Are there any business cycle facts that are not matched by the Keynesian theory?

▶ Average labor productivity is procyclical in the data

▶ But diminishing marginal returns imply that ALP should fall in response to a positive demand shock

▶ To explain procyclical ALP, Keynesians modify their model to account for **labor hoarding**

▶ This is modeled as reduced utilization of labor during recessions

▶ Thus ALP can be procyclical even if the production function is stable

Macroeconomic Stabilization

- **Macroeconomic stabilization** is the use of fiscal and monetary policies to moderate the business cycle

    - This is also known as *aggregate demand management*

- Keynesians favor government actions to stabilize the economy

- Due to frictions (real wage rigidity and nominal price rigidity), recessions are not the economy's best response to shocks and cause desequilibrium in the labor market

    - Unemployed people would like to work but cannot find a job

    - Well-being of the unemployed would be increased if government acts to reduce the intensity and lentgh of recessions

Macroeconomic Stabilization

Consider a drop in consumer confidence that causes a recession

▶ Pessimism leads to an autonomous drop in consumption, which contracts the *IS* curve

▶ Equilibrium shifts from *E* to *F*

▶ **Scenario 1**: govt does nothing, prices eventually fall and the *LM* curve expands, moving the economy to *H* after a certain amount of time

▶ **Scenario 2**: Fed expands money supply, which expands *LM* and makes economy achieve *H* immediately

▶ **Scenario 3**: Federal government increases purchases, restoring the *IS* curve and returning to *E* immediately
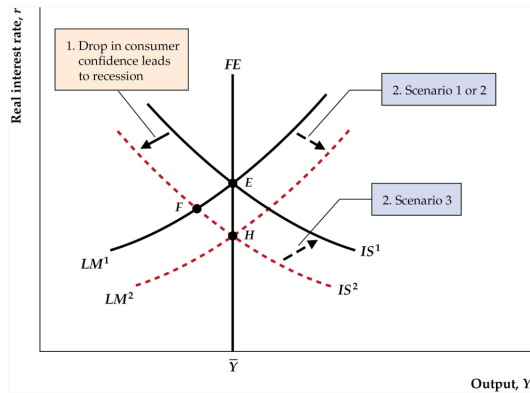
Macroeconomic Stabilization

- ▶ In all these scenarios, economy eventually returns to full employment output $\bar{Y}$

- ▶ Monetary or fiscal policy allow this return to be much faster, instead of waiting for prices to adjust (which could take some time)

- ▶ What is the drawback of using policy vs. doing nothing?

  - ▶ With policy, price level is higher in the long-run

- ▶ Which one is better, monetary or fiscal policy?

  - ▶ When $G \uparrow$, the full employment composition of expenditure changes, with lower consumption and investment
  - ▶ Fiscal policy stabilization leads to a higher real interest rate in the long-run
  - ▶ Monetary policy has a smaller effect on the composition of expenditure
  - ▶ Fiscal policy may also lead to future tax burdens

Difficulties of Macroeconomic Stabilization (MS)

- ▶ MS is difficult in practice

  - ▶ How to measure how far we are from full employment?

  - ▶ We do not even have a perfect measure of what full employment is!

  - ▶ This is always a source of debate within and outside the Fed

- ▶ Even if we know that we are not at full employment, how much policy is needed?

  - ▶ Larry Summers and Olivier Blanchard warned in early 2021 that too much fiscal stimulus post-COVID could lead to excess inflation

- ▶ Implementation lags

- ▶ MS may be better suited to fight major recessions, not to fine tune the business cycle
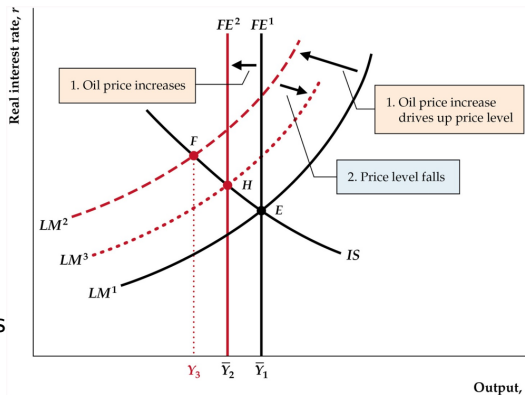
Supply Shocks in the Keynesian Model

► Oil price shock of 1973, which led to a recession and surge in prices made Keynesians rethink the assumption of aggregate demand shocks

► Keynesian model can be extended to allow for supply shocks

► Keynesians think that supply shocks are possible, but are not the major source of aggregate fluctuations

Supply Shocks in the Keynesian Model

Consider an oil shock that makes it costlier to produce

▶ Productivity falls, and so the *FE* curve shifts to the left
▶ If this is a large shock, firms may increase prices by a lot $P \uparrow$
▶ This lowers real money supply and causes the *LM* curve to shift to the left
▶ The economy is in **stagflation**: a recession with inflation
▶ Eventually prices fall a bit and the economy moves to the new long-run equilibrium H

Supply Shocks in the Keynesian Model

▶ Stagflation is a tricky situation for stabilization policy

▶ Either fiscal or monetary policy can restore full-employment output …but raise inflation even further

▶ Alternatively, monetary and fiscal policy can be used to lower inflation …and worsen the recession

Classical vs. Keynesian Theories

Category	Classical View	Keynesian View
How fast does the price level adjust to restore general equilibrium?	Quickly	Slowly
What type of model is appropriate?	A model with microeconomic foundations	An aggregate model
Are supply shocks important?	They are the most important shocks	Aggregate demand shocks are more important
What is the role for government intervention in the economy?	Government intervention is usually unwarranted	Government intervention is vital
Do inflation and inflation expectations matter?	Yes, they matter	No, they do not matter much
What type of model is best?	A dynamic model	A static model is fine
What model of unemployment is appropriate?	A matching model of unemployment	A disequilibrium model of unemployment
Where is the equilibrium in the labor market?	Where the labor supply curve intersects the labor demand curve	Where the efficiency wage hits the labor demand curve
Does a shift in labor supply affect the *FE* line?	Yes	No

Appendix: Basic Efficiency Wage Model as in Katx 1986

▶ Firms are perfectly competitive and have production function

$$y = AF[E(w)L]$$

where y is output, A is productivity, $E(w)$ is the effort function, and L is the quantity of labor

▶ The firm's problem is then

$$\max_{w,L} AF[E(w)L] - wL$$

▶ The first-order conditions are:

$$w: \quad AF'[E(w)L]E'(w)L - L = 0$$
$$L: \quad AF'[E(w)L]E(w) - w = 0$$

Appendix, continued

From the FOC for L, we can write the marginal product of labor as the ratio of wage to effort

$$AF'[E(w)L] = \frac{w}{E(w)}$$

Replace in the FOC for w to obtain

$$E'(w) = \frac{E(w)}{w}$$

The marginal effort generated by an increase in the wage must equal average effort per dollar

▶ In the example in the slides, we have that $AF[E(w)L] = E(w)L$, and therefore $AF'[E(w)L] = 1$