Aggregate demand and aggregate supply

(Chapter 34 in Mankiw and Taylor)
The macro-economy in the short run

- Economic growth is not constant
- There are ups and downs – recessions and booms
  - With real incomes, inflation and unemployment changing
- What explains these “business cycles”?
- What if anything can policymakers do to prevent periods of falling real income and rising unemployment?
- To analyse these short run dynamics, we use the Aggregate Demand - Aggregate Supply model
Economic Fluctuations

• Economic activity
  – Fluctuates from year to year

• Recession
  – Economic contraction
  – Period of declining real incomes and rising unemployment

• Depression
  – Tends to be classified as a severe recession
Economic Fluctuations

• Three key facts about economic fluctuations

1. Economic fluctuations are irregular and unpredictable
   • The ‘business cycle’

2. Most macroeconomic quantities fluctuate together
   • Recessions – economy-wide phenomena

3. As output falls, unemployment rises
This figure shows real GDP in panel (a), investment spending in panel (b), and unemployment in panel (c) for the U.S. economy using quarterly data since 1965. Recessions are shown as the shaded areas. Notice that real GDP and investment spending decline during recessions, while unemployment rises.
A Look at Short-Run Economic Fluctuations: US Investment

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What explains these short run fluctuations?

• Classical economic theory
  – Our analysis of economic growth, the financial system, interest rates, money and inflation has been about the long run
  – Two main building blocks:
    • Classical dichotomy
      – Separation of variables into real and nominal variables
    • Monetary neutrality
      – Changes in the money supply affect nominal variables, but do not affect real variables
      – Hence, we could examine the determinants of real variables, like real GDP and unemployment, without reference to nominal variables like money and prices
Short-Run Economic Fluctuations

• Short-run
  – Assumption of monetary neutrality - no longer appropriate
  – Real and nominal variables are highly intertwined
  – Changes in the money supply
    • Can temporarily push real GDP away from its long-run trend

We therefore need a new short run model
Short-Run Economic Fluctuations

• AD-AS model
  – Model of aggregate demand (AD) & aggregate supply (AS)
  – Most economists use it to explain short-run fluctuations in economic activity
    • Around its long-run trend
    • Focuses on the relationship between prices and real GDP
      – Recall, under the classical dichotomy there would be no relationship between these two variables
Short-Run Economic Fluctuations

• Aggregate-demand curve
  – Shows the quantity of goods and services
  – That households, firms, the government, and customers abroad
  – Want to buy at each price level
  – Downward sloping
Short-Run Economic Fluctuations

• **Aggregate-supply curve**
  – Shows the quantity of goods and services
  – That firms choose to produce and sell
  – At each price level
  – Upward sloping
Economists use the model of aggregate demand and aggregate supply to analyse economic fluctuations. On the vertical axis is the overall level of prices. On the horizontal axis is the economy’s total output of goods and services. Output and the price level adjust to the point at which the aggregate-supply and aggregate-demand curves intersect.
Aggregate-Demand Curve

- $Y = C + I + G + NX$

- Three effects explain why the AD curve slopes downward:
  - Wealth effect ($C$)
  - Interest-rate effect ($I$)
  - Exchange-rate effect ($NX$)

- Assumption: government spending ($G$)
  - Fixed by policy
Wealth Effect

• Price level & consumption (C): wealth effect
  – Decrease in price level
    • Increases real value of money
    • Consumers feel wealthier
    • Increase their consumer spending
    • Increase in quantity demanded of goods & services
Interest rate effect

• Price level & investment (I): interest-rate effect

  – Decrease in price level
    • Decreases interest rate
      – Because, recall, as households need to hold less money at lower prices they reduce their money demand
    • Stimulates spending on investment goods
    • Increase in quantity demanded of goods & services
ER effect

• Price level & net exports (NX): exchange-rate effect
  – Decrease in U.K. price level
    • Decreases interest rate, as discussed
    • U.K. pound depreciates as NCO↑ and supply of pounds on FX markets increases
    • Stimulates U.K. net exports
    • Increase in quantity demanded of goods & services
In summary, the AD curve slopes downward as

• A fall in price level
  – Increases quantity of goods and services demanded
  – Because:
    1. Consumers are wealthier - stimulates the demand for consumption goods
    2. Interest rates fall - stimulates the demand for investment goods
    3. Currency depreciates - stimulates the demand for net exports
The Aggregate-Demand Curve

- A rise in price level
  - Decreases the quantity of goods and services demanded
  - Because:
    1. Consumers are poorer – depresses consumer spending
    2. Higher interest rates fall - depresses investment spending
    3. Currency appreciates – depresses net exports
A fall in the price level from $P_1$ to $P_2$ increases the quantity of goods and services demanded from $Y_1$ to $Y_2$. There are three reasons for this negative relationship. As the price level falls, real wealth rises, interest rates fall, and the exchange rate depreciates. These effects stimulate spending on consumption, investment, and net exports. Increased spending on any or all of these components of output means a larger quantity of goods and services demanded.

1. A decrease in the price level . . .

2. . . . increases the quantity of goods and services demanded
Aggregate-Demand Curve

• The AD curve might shift because of:
  – Changes in consumption
  – Changes in investment
  – Changes in government purchases
  – Changes in net exports

• Recall, these are the four expenditure components of real GDP
  – \( Y = C + I + G + NX \)
Shifts to the AD Curve

- Changes in consumption, $C$
  - Events that change how much people want to consume at a given price level
    - Changes in taxes, wealth
  - Increase in consumer spending
    - Aggregate demand curve shifts to the right
Shifts to the AD Curve

• Changes in investment, I
  – Events that change how much firms want to invest at a given price level
    • Better technology
    • Tax policy
    • Money supply (as it lowers the interest rate in the short run – we will discuss this more in the next lecture)
  – Increase in investment
    • Aggregate demand curve shifts to the right
Shifts to the AD Curve

• Changes in government purchases, G
  – Policy makers – change government spending at a given price level
    • Build new roads
  – Increase in government purchases
    • Aggregate demand curve shifts to the right
Shifts to the AD Curve

• Changes in net exports, NX
  – Events that change net exports for a given price level
    • Recession in Europe
    • International speculators – change in exchange rate
  – Increase in net exports
    • Aggregate demand curve shifts to the right
### Why Does the Aggregate-Demand Curve Slope Downward?

1. **The Wealth Effect**: A lower price level increases real wealth, which stimulates spending on consumption.
2. **The Interest-Rate Effect**: A lower price level reduces the interest rate, which stimulates spending on investment.
3. **The Exchange-Rate Effect**: A lower price level causes the real exchange rate to depreciate, which stimulates spending on net exports.
### Why Might the Aggregate-Demand Curve Shift?

1. **Shifts Arising from Changes in Consumption:** An event that makes consumers spend more at a given price level (a tax cut, a stock-market boom) shifts the aggregate-demand curve to the right. An event that makes consumers spend less at a given price level (a tax hike, a stock-market decline) shifts the aggregate-demand curve to the left.

2. **Shifts Arising from Changes in Investment:** An event that makes firms invest more at a given price level (optimism about the future, a fall in interest rates due to an increase in the money supply) shifts the aggregate-demand curve to the right. An event that makes firms invest less at a given price level (pessimism about the future, a rise in interest rates due to a decrease in the money supply) shifts the aggregate-demand curve to the left.

3. **Shifts Arising from Changes in Government Purchases:** An increase in government purchases of goods and services (greater spending on defense or highway construction) shifts the aggregate-demand curve to the right. A decrease in government purchases on goods and services (a cutback in defense or highway spending) shifts the aggregate-demand curve to the left.

4. **Shifts Arising from Changes in Net Exports:** An event that raises spending on net exports at a given price level (a boom overseas, speculation that causes an exchange-rate depreciation) shifts the aggregate-demand curve to the right. An event that reduces spending on net exports at a given price level (a recession overseas, speculation that causes an exchange-rate appreciation) shifts the aggregate-demand curve to the left.
Aggregate Supply Curve

- **AS**: the total quantity of goods and services that firms produce and sell at a given price level
  - Importantly, its shape depends on the *time horizon*

- **Long run aggregate-supply curve, LRAS**
  - Price level doesn’t affect long-run determinants of GDP:
    - It is the supplies of labour, capital, natural resources and technology that matter
    - So the classical dichotomy/monetary neutrality holds
    - Real variables (GDP) do not depend on nominal ones (prices)

- **Short run**
  - Aggregate-supply curve is upward sloping
In the long run, the quantity of output supplied depends on the economy’s quantities of labour, capital, and natural resources and on the technology for turning these inputs into output. Because the quantity supplied does not depend on the overall price level, the long-run aggregate-supply curve is vertical at the *natural rate* of output.
LR Aggregate Supply Curve

- LRAS curve is vertical at the *natural rate of output*
  - Production of goods and services
  - That an economy achieves in the long run
    - When unemployment is at its normal rate
  - Also called *potential* output or *full-employment* output, but can be subtle differences between these concepts
Shifts in the LRAS curve

• The LRAS curve might shift because of:

  – Any change in the natural rate of output
  – Changes in labour
    • immigration, births…
    • changes in frictional and structural unemp. due to government policy (minimum wage etc.)
  – Changes in capital
    • Increases in K increase productivity
  – Changes in natural resources
  – Changes in technological knowledge
Shifts in the LRAS curve

• Changes in labour
  – Quantity of labour increases
    • Aggregate supply – shifts right
  – Natural rate of unemployment – increases
    • Aggregate supply – shifts left

• Changes in capital
  – Capital stock increases
    • Aggregate supply – shifts right
  – Physical and human capital
Shifts in the LRAS curve

• Changes in natural resources
  – New discovery of natural resource
    • Aggregate supply shifts right
  – Weather
  – Availability of natural resources
Shifts in the LRAS curve

• Changes in technology
  – New technology, for given labour, capital and natural resources
    • Aggregate supply shifts right
  – International trade
  – Government regulation
• Bringing together the AD curve and the long run AS curve
• … we now have a model of the long run behaviour of the macro-economy
Long-Run Growth and Inflation

• In long run: both AD and LRAS curve shift
  – Continual shifts of LRAS curve to right
    • Technological progress
  – AD curve shifts to right
    • Monetary policy
    • The BoE increases money supply over time

– Result:
  • Continuing growth in output
  • Continuing inflation (if AD>LRAS)
As the economy becomes better able to produce goods and services over time, primarily because of technological progress, the long-run aggregate-supply curve shifts to the right. At the same time, as the BoE increases the money supply, the aggregate-demand curve also shifts to the right. In this figure, output grows from $Y_{1990}$ to $Y_{2000}$ and then to $Y_{2010}$, and the price level rises from $P_{1990}$ to $P_{2000}$ and then to $P_{2010}$. Thus, the model of aggregate demand and aggregate supply offers a new way to describe the classical analysis of growth and inflation.
Short Run Aggregate Supply Curve

• In the short-run:
  – Increase in overall level of prices in economy
    • Tends to raise the quantity of goods and services supplied
  – Decrease in level of prices
    • Tends to reduce quantity of goods and services supplied
In the short run, a fall in the price level from $P_1$ to $P_2$ reduces the quantity of output supplied from $Y_1$ to $Y_2$. This positive relationship could be due to sticky wages, sticky prices, or misperceptions. Over time, wages, prices, and perceptions adjust, so this positive relationship is only temporary.
SRAS Curve

• Three theories explain why the AS curve slopes upward in short-run:
  – Sticky-wage theory
  – Sticky-price theory
  – Misperceptions theory

• As we shall see, these three market imperfections all involve output deviating from its natural level because the actual price level differs from the level expected
The short run or “surprise” AS curve

• When the price level rises above the level expected, output rises above its natural rate
• When the price level falls below the level expected, output falls below its natural rate
• **Sticky-wage theory**
  – Nominal wages - slow to adjust to changing economic conditions
    • Long-term contracts: workers and firms
    • Slowly changing social norms
    • Notions of fairness - influence wage setting
  – Nominal wages - based on expected prices
    • Don’t respond immediately when actual price level – different from what was expected
SRAS Curve

• Sticky-wage theory
  – Explains an upward sloping SRAS curve since:
    – If price level < expected
      • Firms – incentive to produce less output as $W/P$ is higher than expected, so firms’ costs have risen so hire fewer labourers
    – If price level > expected
      • Firms – incentive to produce more output as $W/P$ is lower than expected, making labour cheaper to hire and use
SRAS Curve

• **Sticky-price theory**
  – Prices of some goods & services
    • Slow to adjust to changing economic conditions
    • Menu costs
      – Costs to adjusting prices
  – Explains an upward sloping SRAS curve since:
    • If prices are lower than expected (say due to a surprise monetary contraction) then some firms have higher prices than desired
    • Leads to depressed sales and lower output
SRAS Curve

• Misperceptions theory
  – Changes in the overall price level can temporarily mislead suppliers about changes in individual (i.e. their) markets
    – Mistakenly they infer changes in *absolute* prices as a change in *relative* prices
• Suppliers - respond to changes in level of prices
  – Change the quantity supplied of goods and services
• Explains an upward sloping SRAS curve since:
  – If P is lower than expected, some suppliers might think this represents a fall in relative demand for their product, so they respond by producing less
SRAS Curve: in summary

- All three theories imply that:

  \[
  \text{Quantity of output supplied} = \text{Natural rate of output} + a(\text{Actual price level} - \text{Expected price level})
  \]

  - where \(a\) determines how much output responds to unexpected changes in the price level
  - But in the long run, actual prices = expected prices and SRAS = LRAS = vertical
Shifts to the SRAS curve

• The short-run AS curve might shift because of:
  – Changes in labour, capital, natural resources, or technological knowledge
    • i.e. all those factors that explained movements in the LRAS curve (since they shift SRAS and LRAS), but also
  – Expected price level increases and the SRAS curve shifts to the left (up)
    – i.e. SRAS curve depends on sticky wages, sticky prices and misperceptions. Since these are all set based on expectations of prices, when price expectations change the SRAS shifts
    – In the short run expectations are fixed and economy is at the intersection of the AD and SRAS curves
    – But we will see that, in the long run, expectations shift to ensure intersection of the AD and LRAS curves
Why Does the Short-Run Aggregate-Supply Curve Slope Upward?

1. *The Sticky-Wage Theory*: An unexpectedly low price level raises the real wage, which causes firms to hire fewer workers and produce a smaller quantity of goods and services.

2. *The Sticky-Price Theory*: An unexpectedly low price level leaves some firms with higher-than-desired prices, which depresses their sales and leads them to cut back production.

3. *The Misperceptions Theory*: An unexpectedly low price level leads some suppliers to think their relative prices have fallen, which induces a fall in production.
### Table 2

**The Short-Run Aggregate-Supply Curve: Summary**

<table>
<thead>
<tr>
<th>Why Might the Short-Run Aggregate-Supply Curve Shift?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <em>Shifts Arising from Changes in Labor:</em> An increase in the quantity of labor available (perhaps due to a fall in the natural rate of unemployment) shifts the aggregate-supply curve to the right. A decrease in the quantity of labor available (perhaps due to a rise in the natural rate of unemployment) shifts the aggregate-supply curve to the left.</td>
</tr>
<tr>
<td>2. <em>Shifts Arising from Changes in Capital:</em> An increase in physical or human capital shifts the aggregate-supply curve to the right. A decrease in physical or human capital shifts the aggregate-supply curve to the left.</td>
</tr>
<tr>
<td>3. <em>Shifts Arising from Changes in Natural Resources:</em> An increase in the availability of natural resources shifts the aggregate-supply curve to the right. A decrease in the availability of natural resources shifts the aggregate-supply curve to the left.</td>
</tr>
<tr>
<td>4. <em>Shifts Arising from Changes in Technology:</em> An advance in technological knowledge shifts the aggregate-supply curve to the right. A decrease in the available technology (perhaps due to government regulation) shifts the aggregate-supply curve to the left.</td>
</tr>
<tr>
<td>5. <em>Shifts Arising from Changes in the Expected Price Level:</em> A decrease in the expected price level shifts the short-run aggregate-supply curve to the right. An increase in the expected price level shifts the short-run aggregate-supply curve to the left.</td>
</tr>
</tbody>
</table>
“Business cycles”

- We can now use the AR-AS model to analyse fluctuations in economic activity and understand their causes.
- ... and begin to think about policy actions to minimise harmful short run fluctuations.
  - More on this in the next lecture.
  - So let’s just see how far we get today!
Causes of Economic Fluctuations

• Assumption
  – Economy begins in long-run equilibrium

• Long-run equilibrium:
  – Intersection of AD and LRAS curves
    • Output - natural rate
    • Actual price level
  – Intersection of AD and short-run AS curve at this point too, since
    • Expected price level = Actual price level
The long-run equilibrium of the economy is found where the aggregate-demand curve crosses the long-run aggregate-supply curve (point A). When the economy reaches this long-run equilibrium, the expected price level will have adjusted to equal the actual price level. As a result, the short-run aggregate-supply curve crosses this point as well.
Causes of Economic Fluctuations

- **Shift in aggregate demand**
  - Wave of pessimism (credit crunch) – Aggregate demand shifts left
  - Short-run fluctuations: the *business cycle*
    - Output falls
    - Price level falls
  - Long-run
    - Short-run aggregate supply curve shifts right
    - Output reverts to its natural rate (so does this mean there's no need for government to intervene?)
    - Price level falls (to offset shift in AD)
A Contraction in Aggregate Demand

A fall in aggregate demand is represented with a leftward shift in the aggregate-demand curve from $AD_1$ to $AD_2$. In the short run, the economy moves from point A to point B. Output falls from $Y_1$ to $Y_2$, and the price level falls from $P_1$ to $P_2$. Over time, as the expected price level falls, the short-run aggregate-supply curve shifts to the right from $AS_1$ to $AS_2$, and the economy reaches point C, where the new aggregate-demand curve crosses the long-run aggregate-supply curve. In the long run, the price level falls to $P_3$, and output returns to its natural rate, $Y_1$. 

1. A decrease in aggregate demand . . .

2. . . . causes output to fall in the short run . . .

3. . . . but over time, the short-run aggregate-supply curve shifts . . .

4. . . . and output returns to its natural rate.
Four Steps for Analysing Macroeconomic Fluctuations

1. Decide whether the event shifts the aggregate demand curve or the aggregate supply curve (or perhaps both).
2. Decide in which direction the curve shifts.
3. Use the diagram of aggregate demand and aggregate supply to determine the impact on output and the price level in the short run.
4. Use the diagram of aggregate demand and aggregate supply to analyze how the economy moves from its new short-run equilibrium to its long-run equilibrium.
Two Big Shifts in Aggregate Demand: The Great Depression and World War II

• Early 1930s: large drop in real GDP
  – The Great Depression
    • Largest economic downturn in U.S. history
  – From 1929 to 1933
    • Real GDP fell by 27%
    • Unemployment rose from 3 to 25%
    • Price level fell by 22%
  – Cause: decrease in aggregate demand
    • Decline in money supply (by 28%)
    • Decreasing: C and I
Two Big Shifts in Aggregate Demand: The Great Depression and World War II

• Early 1940s: large increase in real GDP
  – Economic boom
  – World War II

  • More resources to the military
  • Government purchases increased
  • Aggregate demand – increased 1939 - 1944
  • Doubled the economy’s production of goods and services
  • 20% increase in the price level
  • Unemployment fell from 17 to 1%
Over the course of U.S. economic history, two fluctuations stand out as especially large. During the early 1930s, the economy went through the Great Depression, when the production of goods and services plummeted. During the early 1940s, the United States entered World War II, and the economy experienced rapidly rising production. Both of these events are usually explained by large shifts in aggregate demand.
Causes of Economic Fluctuations

• Shift in aggregate supply
  – Firms – increase in production costs
    • Aggregate supply curve shifts to the left
      – As for a given price level firms want to supply less
  – Short-run - stagflation
    • Output falls
    • Price level rises
  – Long-run, if AD is held constant
    • Short-run AS shifts back to right
    • Output reverts to its natural rate
    • Price level - falls
When some event increases firms’ costs, the short-run aggregate-supply curve shifts to the left from AS₁ to AS₂. The economy moves from point A to point B. The result is stagflation: Output falls from Y₁ to Y₂, and the price level rises from P₁ to P₂.
Accommodating an Adverse Shift in Aggregate Supply

- Consider an oil price increase
  - Firms – increase in production costs
    - Aggregate supply curve – shifts left
  - Short-run
    - Output falls
    - Price level rises
  - Long-run, policymakers – shift AD to right
    - Output – natural rate
    - Price level – rises
Faced with an adverse shift in aggregate supply from AS$_1$ to AS$_2$, policymakers who can influence aggregate demand might try to shift the aggregate-demand curve to the right from AD$_1$ to AD$_2$. The economy would move from point A to point C. This policy would prevent the supply shift from reducing output in the short run, but the price level would permanently rise from P$_1$ to P$_3$. 

1. When short-run aggregate supply falls . . .

2. . . . policymakers can accommodate the shift by expanding aggregate demand . . .

3. . . . which causes the price level to rise further . . .

4. . . . but keeps output at its natural rate.
Oil and the Economy

- Economic fluctuations in the U.S.
  - Since 1970, originated in the oil fields of the Middle East
- Some event - reduces the supply of crude oil flowing from Middle East
  - Price of oil - rises around the world
  - Aggregate-supply curve – shifts left
  - Stagflation
    - Mid-1970s
    - Late-1970s