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Principles of Economics

Model #5: AD/AS/LRAS Model, Part I

Introduction

In the notes file *prin-model4*, we used the AD/AS model to forecast how events change equilibrium in the short run. In these notes, we will:

1st:

Claim that in the long run, equilibrium real GDP cannot be different from full employment real GDP.

2nd:

Therefore, if equilibrium real GDP differs from its full employment level in the short run, then there must be a *transition* from the short run to the long run in which real GDP returns to its full employment level.

3rd:

Describe 3 possible transitions from the short run to the long run—a *natural* transition and 2 *government-induced* transitions.

4th:

Graph the transitions using an AD/AS model, with an LRAS line added to it.

5th:

Use the AD/AS/LRAS model to trace all of the parts of the business cycle, from start to finish.

And Now, a Note

Macroeconomists are not in full agreement regarding how the economy works. Our descriptions in this set of notes try to follow the mainstream view—the view that you will most likely encounter in the business world. (The textbook calls this view the “Keynesian” view.) Time limitations prevent us from discussing other views of how the economy works.

Why do economists believe that real GDP must eventually return to its full employment level?

Consider an economy in which real GDP is (temporarily) **above** its full employment level. This means that the economy’s factors of production—land, labor, and capital—are being used beyond their long term ability to produce stuff, and that some event must therefore bring the economy back to long run equilibrium. (Consider the starship Enterprise; it can temporarily cruise at speeds of warp 10, but too long at that speed and the ship will overheat, forcing it back down to a slower speed.)

Now consider an economy in which real GDP is temporarily **below** its full employment level. This means that there are factors of production that are unemployed or underemployed. Economists believe that producers will not let these valuable factors lay idle forever (and the unemployed will not let themselves stay out of work forever), and that conditions will eventually arise which will get the unemployed factors working again. And when they work, production rises back to its full employment level.

We'll discuss these transitions from the short run to the long run in more detail below.

An overheated economy and the transition back to full employment GDP—a closer look

Many economists believe that the U.S. economy in November 2000 was operating above its full employment level of real GDP, with factors of production—especially labor—being used beyond their long run capacities. How will the economy cool down?

There are two possibilities—the economy will cool down *without* government interference, or it will cool down *with* government interference.

Cooling down **without** government interference: a *hard landing*

Consider an overheated economy, with an unemployment rate below the full employment rate. This means that there are shortages of labor and that workers are overworked.

Transition, version 1:

1st: Workers demand and get higher wages, driving production costs up.

2nd: Producers are forced to raise prices to cover their higher costs—*inflation rises*.

3rd: Higher inflation causes money demand to rise.

4th: Higher money demand (and a constant money supply) drives interest rates up.

5th: Higher interest rates reduce investment expenditures, and reduce net exports by appreciating the dollar.

6th, part A: Producers respond to the lower expenditures by reducing production—*real GDP falls* back to its full employment level.

6th, part B: As real GDP falls, producers need less labor, so they lay off workers or cancel overtime or both—the *unemployment rate rises* back to its full employment level.

Summary: During the transition, inflation rises, real GDP and real national income fall, and unemployment rises. None of this stuff is very good, especially the higher inflation. We have a hard landing.

Cooling down with Central Bank interference: a *soft landing*

Consider an overheated economy, with an unemployment rate below the full employment rate. This means that there are shortages of labor and that workers are overworked. If government does nothing, then the transition (version 1) described above will occur. Suppose however, that the Central Bank wishes to avoid the inflation that would occur if the version 1 transition takes place. Observe:

Transition, version 2:

1st: (Before workers have time to demand higher wages) The Central Bank reduces the nominal money supply, causing the real money supply to fall

2nd: A smaller real money supply drives interest rates up.

3rd: Higher interest rates reduce investment expenditures, and reduce net exports by causing the dollar to appreciate.

4th, part A: Producers respond to the lower expenditures by reducing production and cutting prices—*real GDP falls* back to its full employment level.

5th, part B: As real GDP falls, producers need less labor, so they lay off workers or cancel overtime or both—*the unemployment rate rises* back to its full employment level.

Summary: During the transition, inflation falls, real GDP and real national income fall, and unemployment rises. The economy has cooled off without inflation! We have a soft landing.

Cooling down with fiscal policy interference: another version of a *soft landing*

Consider an overheated economy, with an unemployment rate below the full employment rate. This means that there are shortages of labor and that workers are overworked. If government does nothing, then transition version 1 described above will occur. Suppose further that the Central Bank remains passive, doing nothing. Well, we can still have a soft landing if the legislative and executive branches act properly. Observe:

Transition, version 3:

1st: The executive and legislative branches reduce government spending (G and/or transfer payments) and/or raise taxes (before workers have time to demand higher wages).

2nd: The tightened fiscal policy reduces aggregate demand.

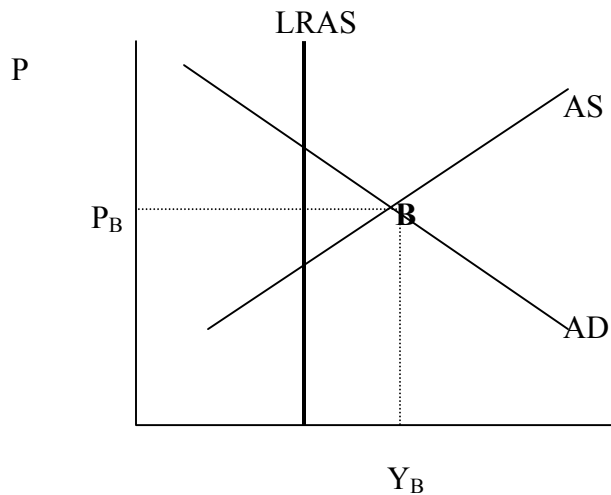
4th, part A: Producers respond to the lower demand by reducing production and cutting prices—*real GDP falls* back to its full employment level.

5th, part B: As real GDP falls, producers need less labor, so they lay off workers or cancel overtime or both—*the unemployment rate rises* back to its full employment level.

Summary: During the transition, inflation falls, real GDP and real national income fall, and unemployment rises. The economy has cooled off without inflation! We have another version of a soft landing.

Graphs of the three transitions described above, using an AD/AS/LRAS model

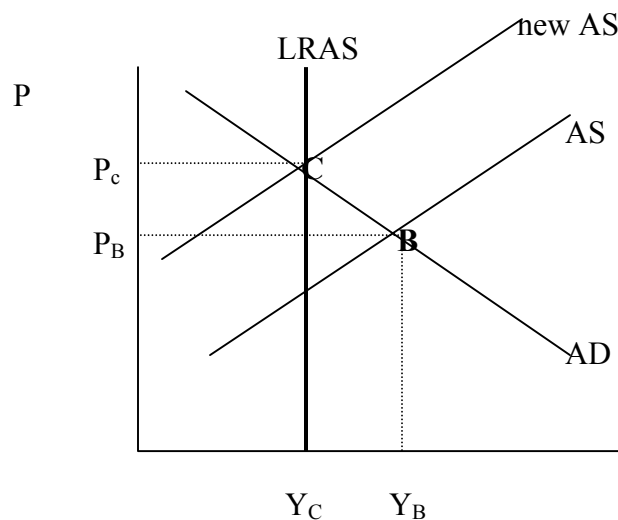
We know that equilibrium in the economy is where the AD curve intersects the (short run) AS curve. Let's add a vertical line, labeled "LRAS" (which is an abbreviation for "long run aggregate supply") indicating the level of full employment GDP. Point B on the graph below illustrates an economy in short run equilibrium above the full employment level of real GDP.



We know that output level Y_B is unsustainable in the long run; Y will fall in one of three ways (transition 1 or transition 2 or transition 3). Let's graph them all.

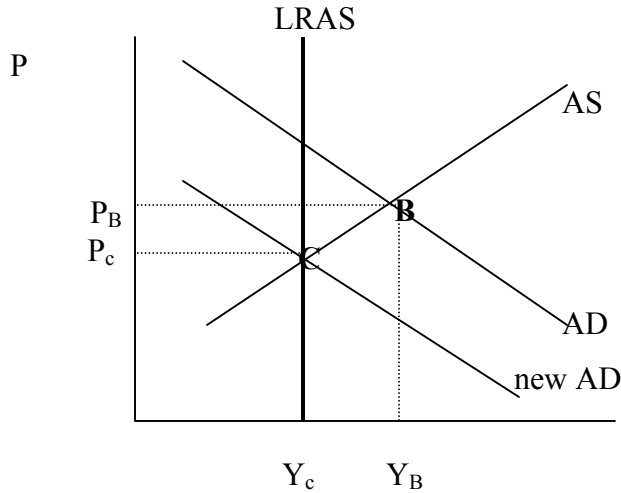
Transition 1 graphed:

Higher production costs cause the (short run) AS curve to shift up, forcing prices up. Long run equilibrium is restored at point C:



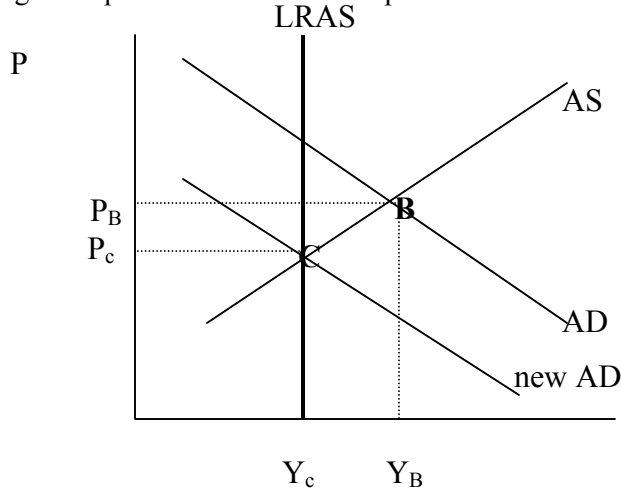
Transition 2 graphed:

A reduced money supply changes money market equilibrium, forcing interest rates up and aggregate demand down. Graphically, this is an leftward shift of the AD curve. Long run equilibrium is restored at point C:



Transition 3 graphed:

The tight fiscal policy reduces aggregate demand; graphically, this is a downward shift of the IS curve. Long run equilibrium is restored at point C:



Warning! Though the graphs of transition 2 and transition 3 are identical, all else is NOT identical! (In particular, interest rates are higher (at point C compared to point B) in transition 2, whilst they are lower in transition 3. More about this in part II of the notes)

A recessionary gap and the transition back to full employment GDP—a closer look

The U.S. economy in November 1982 was operating below its full employment level of real GDP, with factors of production—especially labor—being used below their long run capacities. This is known as a recessionary gap. How will the economy move back to full employment GDP?

There are two possibilities—the economy will recover without government interference, or it will recover with government interference.

Recovery without government interference:

Consider an anemic economy, with an unemployment rate above the full employment rate. This means that there are unemployed and underemployed workers.

Transition, version 4:

1st: Unemployed workers accept lower wages (lower than their pre-unemployment levels of pay) to get work, driving production costs down and *reducing the unemployment rate*.

2nd: Producers are forced to reduce prices as competition drives prices down—*inflation falls*.

3rd: Lower inflation (and a passive Central Bank) causes money demand to fall.

4th: A lower money demand drives interest rates down.

5th: Lower interest rates increase investment expenditures, and increase net exports by causing the dollar to depreciate.

6th, part A: Producers respond to the higher expenditures by increasing production—*real GDP rises* back to its full employment level.

Summary: During the transition, inflation falls, real GDP and real national income rise, and unemployment falls.

Some economists believe that this natural recovery can take a long time to occur, since unemployed workers are often reluctant to take pay cuts (below their old pre-unemployment levels of pay) to regain employment.

Recovery with Central Bank interference:

Consider an anemic economy, with an unemployment rate above the full employment rate. This means that there are unemployed and underemployed workers. If government does nothing, then the transition (version 4) described above will occur. Suppose however, that the Central Bank wishes to avoid the possible long recovery time that would occur if the version 4 transition takes place. Observe:

Transition, version 5:

1st: (Before the unemployed get around to accepting pay cuts) The Central Bank increases the nominal money supply, causing the real money supply to rise

2nd: A larger real money supply drives interest rates down.

3rd: Lower interest rates increase investment expenditures, and net exports rise due to a depreciated dollar.

4th, part A: Producers respond to the higher expenditures by increasing output and raising prices—*real GDP rises* back to its full employment level.

5th, part B: As real GDP rises, producers need more labor, so they hire workers—the *unemployment rate falls* back to its full employment level.

Summary: During the transition, inflation rises, real GDP and real national income rise, and unemployment falls. The economy has recovered, perhaps more quickly than if government did nothing!

Recovering with fiscal policy interference:

Consider an anemic economy, with an unemployment rate above the full employment rate. This means that there are unemployed and underemployed workers. If government does nothing, then transition version 4 described above will occur. Suppose further that the Central Bank remains passive, doing nothing. Well, we can still have a fast recovery if the legislative and executive branches act properly. Observe:

Transition, version 6:

1st: The executive and legislative branches increase government spending (G and/or transfer payments) and/or cut taxes (before workers get around to accepting pay cuts).

2nd: The fiscal policy increases aggregate demand.

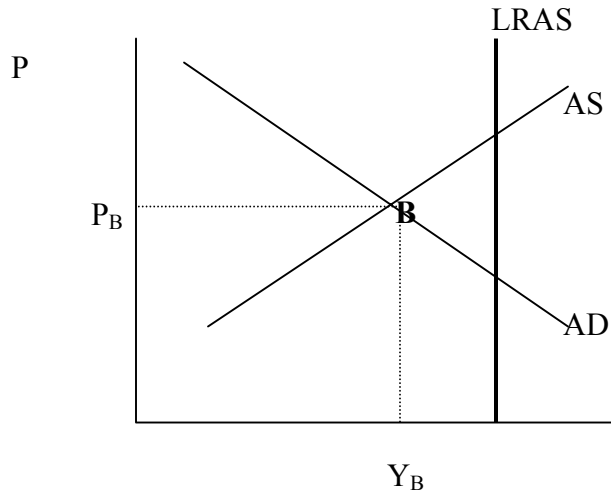
4th, part A: Producers respond to the higher expenditures by increasing production and prices—*real GDP rises* back to its full employment level.

5th, part B: As real GDP rises, producers need more labor, so they hire workers—the *unemployment rate falls* back to its full employment level.

Summary: During the transition, inflation rises, real GDP and real national income rise, and unemployment falls. The economy has recovered quickly!

Graphs of the transitions 4-6 described above, using an AD/AS/LRAS model

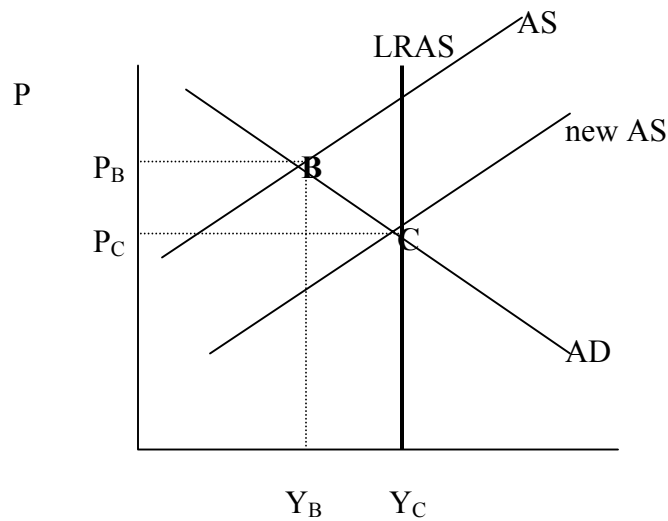
We know that equilibrium in the economy is where the AD curve intersects the AS curve. Let's add a vertical line, labeled "LRAS," indicating the level of full employment GDP. Point B on the graph below illustrates an economy in short run equilibrium below the full employment level of real GDP.



We know that output level Y_B is unsustainable in the long run; Y will rise in one of three ways (transition 4 or transition 5 or transition 6). Let's graph them all.

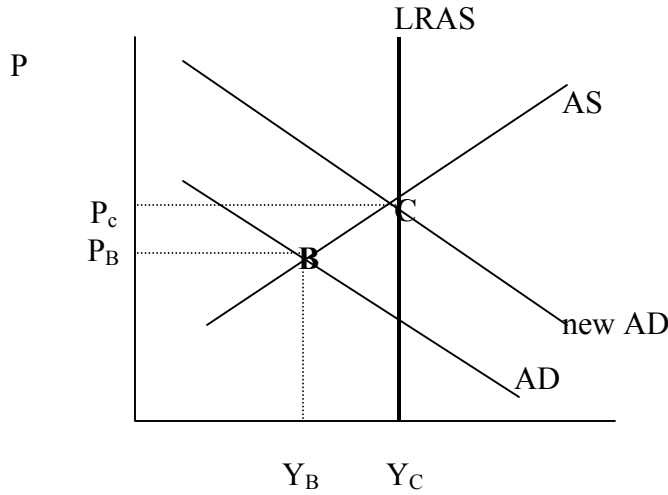
Transition 4 graphed:

Lower wages reduce production costs, forcing the AS (short run) curve down. Long run equilibrium is restored at point C:



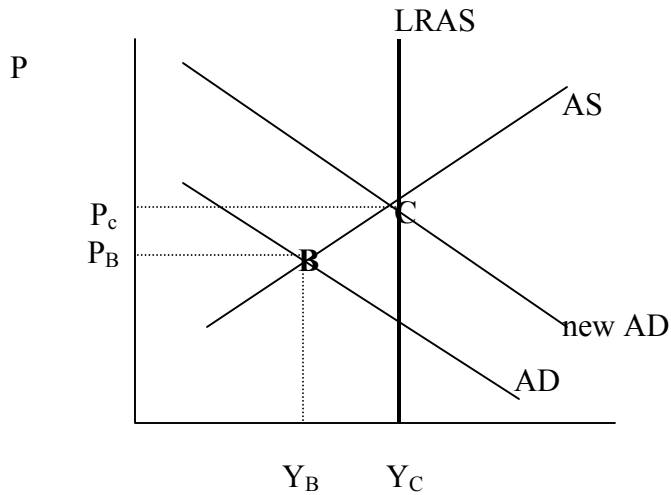
Transition 5 graphed:

A larger money supply changes money market equilibrium, forcing interest rates down and aggregate demand up. Graphically, this is an upward shift of the AD curve. Long run equilibrium is restored at point C:



Transition 6 graphed:

The loosened fiscal policy increases aggregate demand; graphically, this is an upward shift of the AD curve. Long run equilibrium is restored at point C:



Warning! Though the graphs of transition 5 and transition 6 are identical, all else is NOT identical! In particular, interest rates are lower (at point C compared to point B) in transition 5, whilst they are higher in transition 6.

The Whole Enchilada: Analysis of Business Cycles Using the AD/AS/LRAS model

For our purposes, a business cycle occurs in the following sequence:

1st: The economy begins at rest in long run equilibrium (at point A on an AD/AS/LRAS graph). Then, an event occurs.

2nd: Short run effects: The economy is affected by the event over 6-12 months, as Y, P and other things change. (On an AD/AS/LRAS graph, the economy moves from point A to point B.)

3rd: Transition: Over 12-24 months, other things (described in transitions 1-6) occur to bring the economy back to full employment real GDP. (On an AD/AS/LRAS graph, the economy moves from point B to point C.)

4th: The economy has returned to full employment real GDP. (But the COMPOSITION of aggregate expenditures (the portion of Y attributed to C, I, G, and (EX-IM)) may be different from its original composition. More on this in part II of the notes.)

There are tons and tons of different possible business cycles. It is impossible to review them all. Let's do a few to give you the idea. You should then be able to analyze all sorts of business cycles on your own.

Business cycle example #1: A permanent reduction in the personal savings rate. (No government intervention in the transition from short run to long run.)

1st: The economy begins at rest in long run equilibrium. Then, households permanently reduce their savings rates.

2nd: Short run effects.

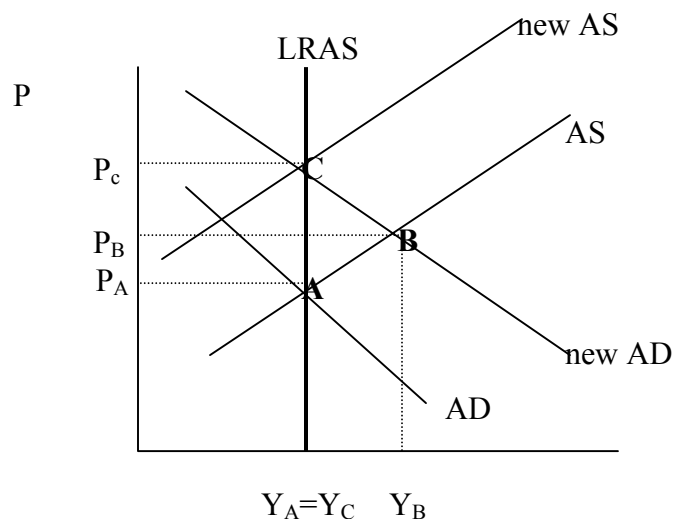
Consumption rises, causing an increase in aggregate demand. The AD curve shifts to the right, and the economy moves from A to B. Y rises beyond its full employment level and P rises. Unemployment falls.

3rd: Transition:

Overworked workers demand and get higher wages, pushing up production costs—the AS curve shift up. Producers are forced to raise prices. Higher prices push interest rates up even higher. Higher interest rates cause investment to go down even more. Even the higher consumption is tempered by the higher interest rates (though it is still higher than its original level at point A). Producers respond to the now waning spending by reducing production and workers. The economy moves from point B to point C.

4th: Output returns to its full employment level, but inflation is higher.

Graph of business cycle example #1:



Business cycle example #2: Reverse mania causes the stock market to crash and remain low for a long long time. Government intervenes by cutting household taxes to hasten transition from short run to long run

1st: The economy begins at rest in long run equilibrium. Then, the stock market crashes and stays low for a long long time.

2nd: Short run effects.

Consumption falls (the wealth effect), causing a reduction in aggregate demand. The AD curve shifts to the left, and the economy moves from A to B. Y falls below its full employment level and P falls. Unemployment rises.

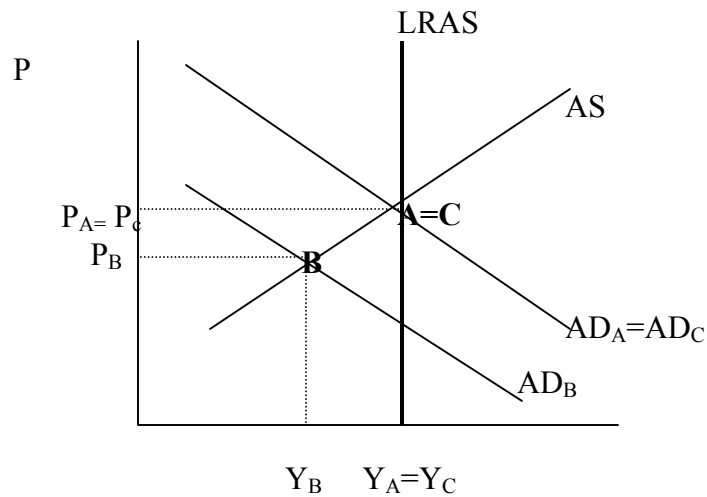
3rd: Transition:

Government cuts taxes, restoring consumption to its original level before the crash. The AD curve shifts back to where it was before the crash. Prices and Y return to their pre-crash levels.

4th: Output returns to its full employment level. Prices are unchanged from point A.

More analysis: The proper response by the fiscal and monetary authorities may have prevented the Great Depression and all of its associated suffering.

Graph of business cycle example #2:



Business cycle example #3: Government forces all employers to pay for all of their workers' health care costs. (No government intervention in the transition from short run to long run.)

1st: Economy begins in long run equilibrium as A. Then, the unfunded government mandate drives production costs higher.

2nd: Short run effects: Higher production costs force firms to raise prices. The AS (short run) curve shifts up. Firms respond by reducing output and laying off workers, so real GDP falls and unemployment rises. The economy moves from point A to point B.

3rd: Transition: The unemployed offer to work for less than their previous pay rates. Production costs fall back to their original levels, allowing firms to reduce prices to their original levels--the AS curve shifts back to where it was originally. Real GDP returns to its original level.

4th: The economy is back at full employment. Workers have their health care "paid" by their employers, but workers' wages have fallen. (Indeed, if we were using equations to do this model then we would see that workers wages fall by exactly the cost of the health care. So who really pays?)

Here's a graph of business cycle #3:

