Notes on Phillips Curve and Expectations Theory

Phillips Curve Analysis

The **Phillips curve** is used to analyze the relationship between inflation and unemployment.

We begin the discussion of the Phillips curve by focusing on the work of three economists: A. W. Phillips, Paul Samuelson, and Robert Solow.

Phillips Curve Analysis

The Phillips Curve

- In 1958, A. W. Phillips of the London School of Economics published a paper in the economics journal Economica: "The Relation Between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1861–1957."

- Phillips collected data about the rate of change in money wages, sometimes referred to as wage inflation, and about unemployment rates in the United Kingdom over almost a century.

Phillips Curve Analysis

The Phillips Curve

An inverse relationship

The curve, which came to be known as the Phillips curve, is downward sloping, suggesting that the rate of change of money wage rates (wage inflation) and unemployment rates are inversely related.

The Original Phillips Curve

Phillips Curve Analysis

The Phillips Curve

An inverse relationship

Policy makers concluded
from the Phillips curve
that lowering both wage
inflation and
unemployment was
impossible; they could
do only one or the other.
So the combination of
low wage inflation and
low unemployment was
unlikely. This was the
bad news.

The Original
Phillips Curve

Phillips Curve Analysis

The Phillips Curve

An inverse relationship

The good news was that rising unemployment and rising wage inflation did not go together either. Thus, the combination of high unemployment and high wage inflation was unlikely.
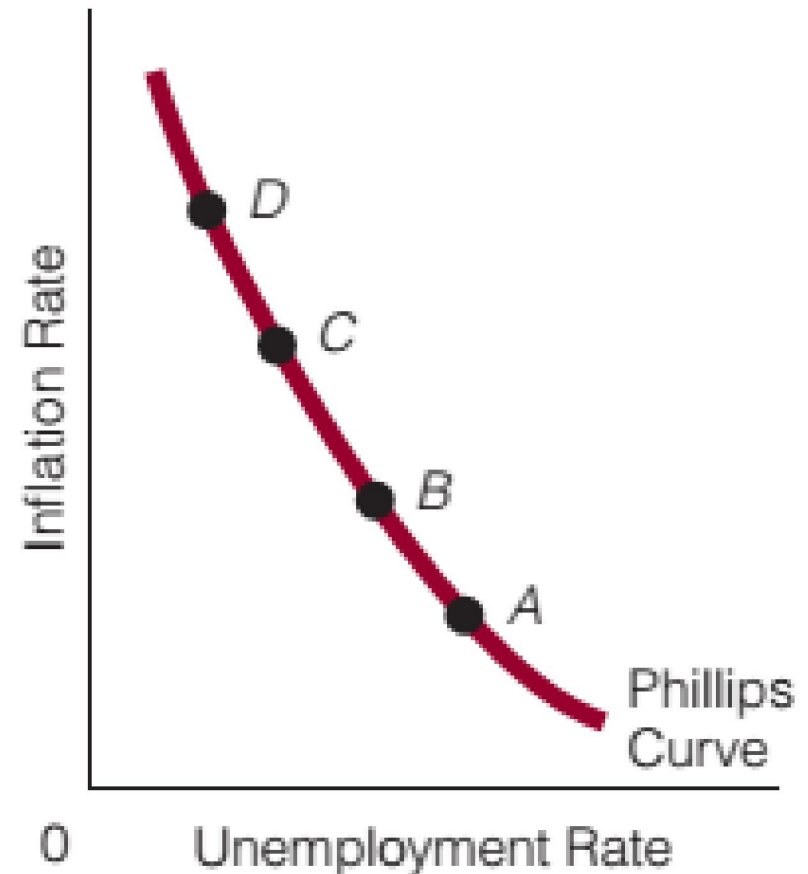
Phillips Curve Analysis

Samuelson and Solow: The Americanization of the Phillips Curve

- In 1960, two American economists, Paul Samuelson and Robert Solow, published an article in the American Economic Review in which they fit a Phillips curve to the U.S. economy from 1935 to 1959.

- In addition to using American data instead of British data, they measured price inflation rates (instead of wage inflation rates) against unemployment rates. They found an inverse relationship between (price) inflation and unemployment.

Phillips Curve Analysis

Samuelson and Solow: The Americanization of the Phillips Curve

Samuelson and Solow's early work using American data showed that the Phillips curve was downward sloping. Economists reasoned that **stagflation** ─ the simultaneous occurrence of high rates of inflation and unemployment ─ was extremely unlikely and that the Phillips curve presented policy makers with a menu of choices: point A, B, C, or D

Phillips Curve Analysis

Samuelson and Solow: The Americanization of the Phillips Curve

Getting the economy to the desired point was simply a matter of reaching the right level of aggregate demand.
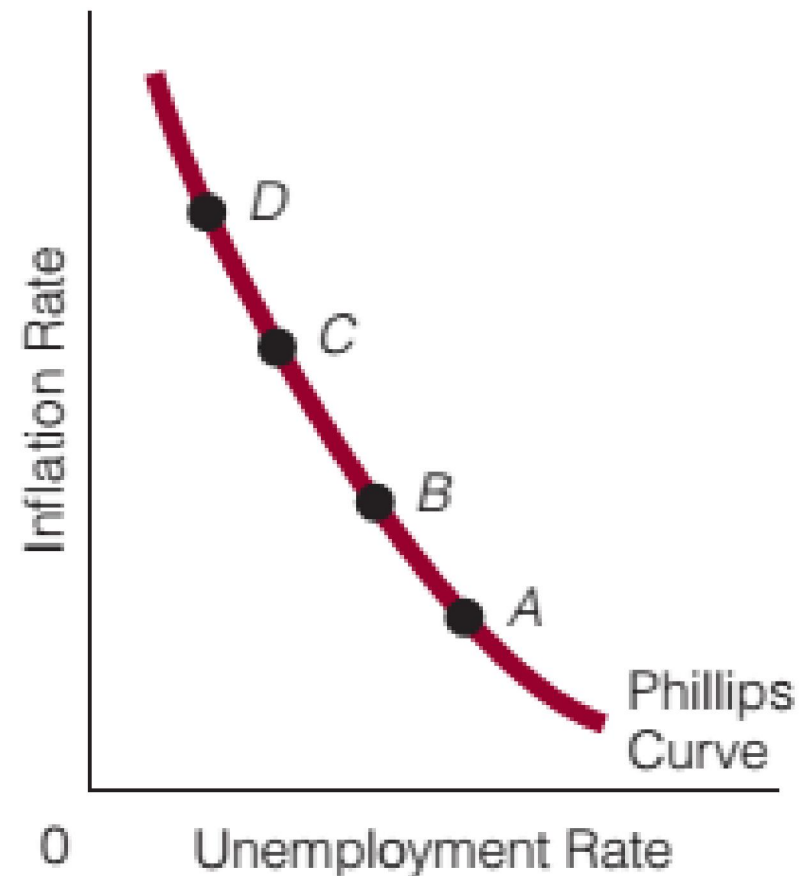
The Controversy

Things aren't always as we think

The Diagram That Raises Questions:

Inflation and Unemployment, 1961–2003: The period 1961–1969 clearly depicts the original Phillips curve trade-off between inflation and unemployment. The later period, 1970–2003, as a whole, does not. However, some subperiods do, such as 1976–1979. The diagram presents empirical evidence that stagflation may exist; an inflation–unemployment trade-off may not always hold.
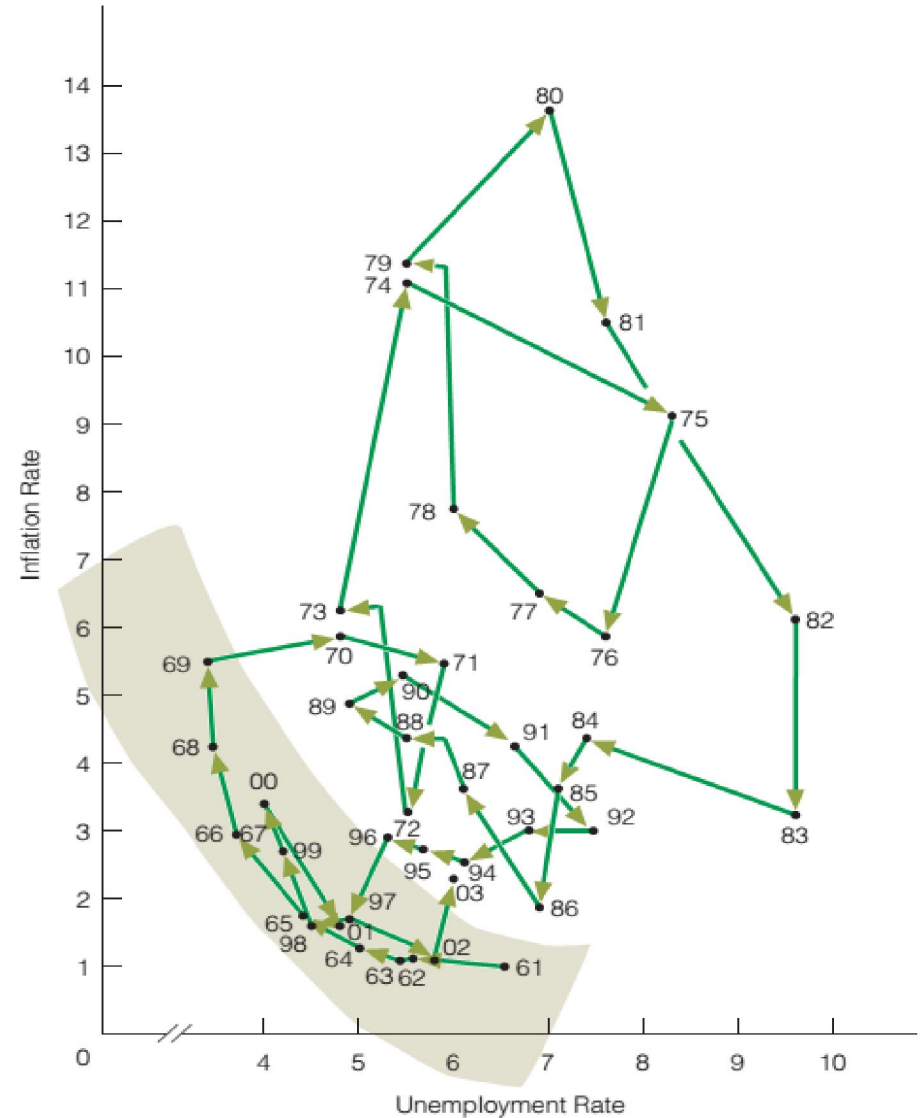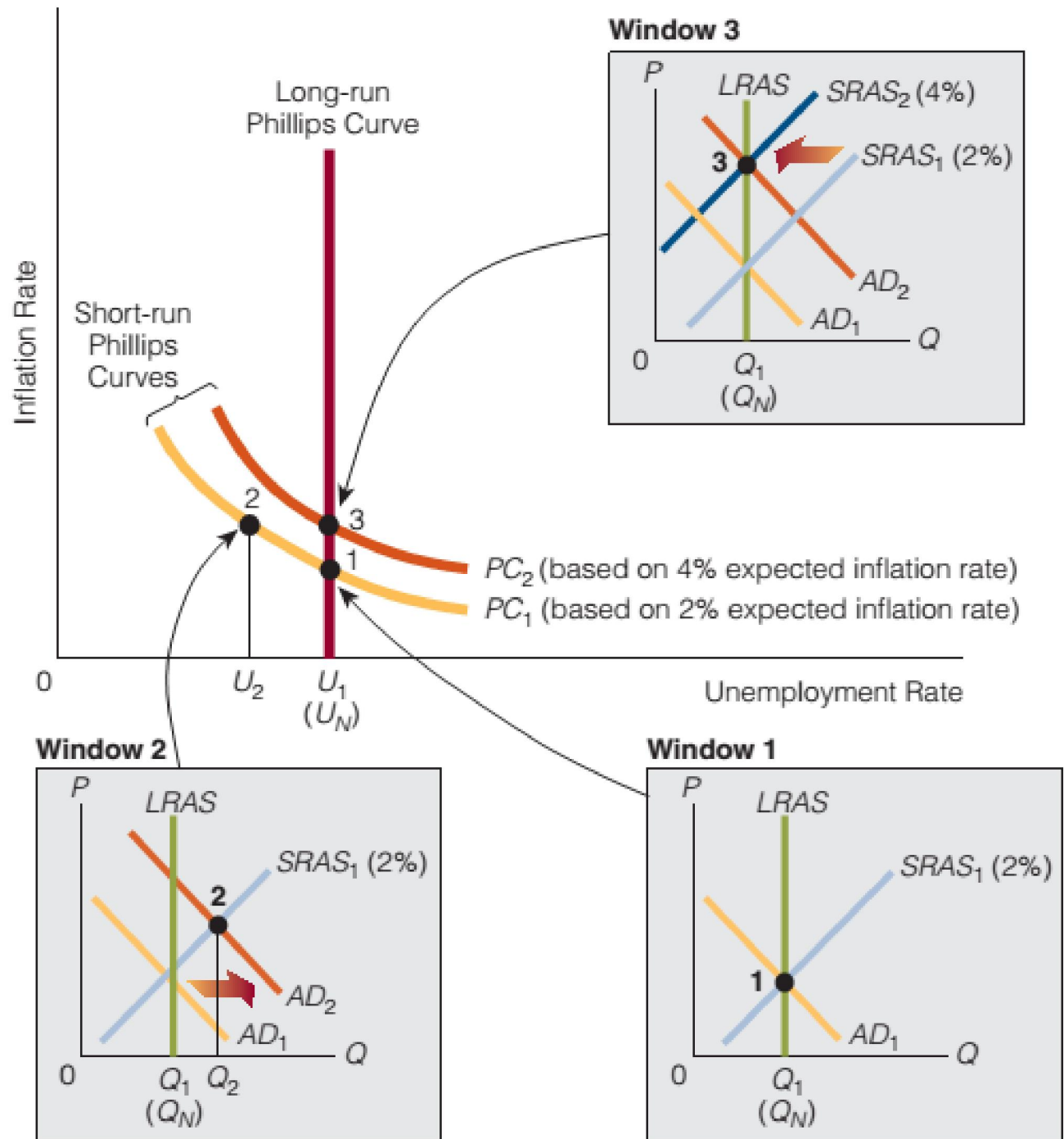
Friedman and the Natural Rate Theory

- Milton Friedman, in his presidential address to the American Economic Association in 1967 (published in the American Economic Review), attacked the idea of a permanent downward-sloping Phillips curve.

- Friedman's key point was that there are two Phillips curves, not one: a short-run Phillips curve and a long-run Phillips curve.

- Friedman said, "There is always a temporary tradeoff between inflation and unemployment; there is no permanent tradeoff." Specifically, there is a trade-off in the short run, but not in the long run.

- Friedman's discussion not only introduced two types of Phillips curves but also opened the macroeconomics door wide, once and for all, to expectations theory: the idea that people's expectations about economic events affect economic outcomes.

Short-Run and Long-Run Phillips Curves

Starting at point 1 in the main diagram, and assuming that the expected inflation rate stays constant as aggregate demand increases, the economy moves to point 2. As the expected inflation rate changes and comes to equal the actual inflation rate, the economy moves to point 3. Points 1 and 2 lie on a short-run Phillips curve. Points 1 and 3 lie on a long-run Phillips curve.

Window 3

P — LRAS, SRAS$_2$ (4%), SRAS$_1$ (2%), AD$_2$, AD$_1$, Q

3

0, Q_1 (Q_N)

Inflation Rate

Long-run Phillips Curve

Short-run Phillips Curves

2, 3, 1

PC$_2$ (based on 4% expected inflation rate)
PC$_1$ (based on 2% expected inflation rate)

0, U_2, U_1 (U_N)

Unemployment Rate

Window 2

P — LRAS, SRAS$_1$ (2%), AD$_2$, AD$_1$, Q

2

0, Q_1 (Q_N), Q_2

Window 1

P — LRAS, SRAS$_1$ (2%), AD$_1$, Q

1

0, Q_1 (Q_N)

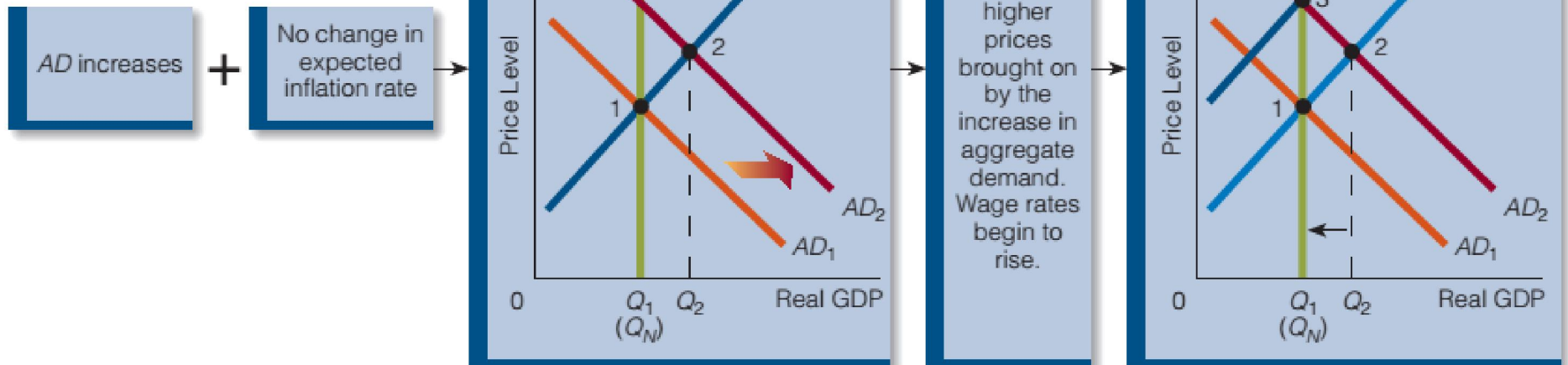# Friedman and the Natural Rate Theory

- Thus, the short-run Phillips curve exhibits a trade-off between inflation and unemployment, whereas the long-run Phillips curve does not. This idea is implicit in what has come to be called the **Friedman natural rate theory** (or **the Friedman fooling theory**).

- According to this theory, in the long run, the economy returns to its natural rate of unemployment, and it moved away from the natural unemployment rate in the first place only because workers were fooled (in the short run) into thinking the inflation rate was lower than it was.

Friedman and the Natural Rate Theory

Mechanics of the Friedman Natural Rate Theory

The Friedman Natural Rate Theory

1. Wages and prices are flexible.
2. Expectations are formed adaptively.

AD increases **+** No change in expected inflation rate →

Economy moves from point 1 to 2, from Q_1 (Q_N) to Q_2. There is a short-run increase in Real GDP.

In time, workers revise their expected inflation rate upward in response to the higher prices brought on by the increase in aggregate demand. Wage rates begin to rise. →

SRAS curve begins to shift left, ultimately intersecting AD_2 at point 3. Economy has returned to Q_1 (Q_N).

How do people form their expectations?

- Implicit in the Friedman natural rate theory is an assumption about how individuals form their expectations. Essentially, the theory holds that individuals form their expected inflation rate by looking at *past inflation rates* — which corresponds to **Adaptive Expectations**.

- **Adaptive Expectations** are expectations that individuals form from past experience (looking over their shoulders) and modify slowly as the present and the future become the past (i.e., as time passes).

- So, with adaptive expectations, individuals look to the past—they look over their shoulders to see what has happened—in formulating their best guess as to what will happen.

- Some economists have argued this point. They believe that people form their expected inflation rate not by using adaptive expectations, but by means of **rational expectations.**

Rational Expectations and New Classical Theory

Rational Expectations

- In the early 1970s, a few economists, including Robert Lucas of the University of Chicago (winner of the 1995 Nobel Prize in Economics), began to question the short-run trade-off between inflation and unemployment. Essentially, Lucas combined the natural rate theory with rational expectations.

- **Rational expectations** holds that individuals form the expected inflation rate not only on the basis of their past experience with inflation (looking over their shoulders), but also on their predictions about the effects of present and future policy actions and events (looking around and ahead).

Rational Expectations and New Classical Theory

Rational Expectations

- In short, the expected inflation rate is formed by looking at the past, present, and future.

- To illustrate, suppose the inflation rate has been 2 percent for the past seven years. Then, the Central Bank officials speak about "sharply stimulating the economy." Rational expectationists argue that the expected inflation rate might immediately jump upward based on the current announcement by the chairman.

Rational Expectations and New Classical Theory

Rational Expectations

- A major difference between adaptive and rational expectations is the speed at which the expected inflation rate changes.

- If the expected inflation rate is formed adaptively, then it is slow to change. Because it is based only on the past, individuals wait until the present becomes the past before changing their expectations.

- If the expected inflation rate is formed rationally, it changes quickly because it is based on the past, present, and future.

Rational Expectations and New Classical Theory

New Classical Economics and Four Different Cases

New classical theory holds that individuals have rational expectations and that prices and wages are flexible. With these two points in mind, we apply new classical theory to four cases (or settings):

- Case 1: Policy correctly anticipated

- Case 2: Policy incorrectly anticipated (bias upward)

- Case 3: Policy incorrectly anticipated (bias downward)

- Case 4: Policy unanticipated

Each setting relates to a different perspective that individuals have with respect to economic policy. We discuss monetary policy, but everything we say with respect to monetary policy in the upcoming discussion also holds for demand-side fiscal policy.

Rational Expectations and New Classical Theory

CASE 1: Policy correctly anticipated

We assume that rational expectations hold, that wages and prices are flexible, that any policy action is anticipated correctly, and that the economy is in long-run equilibrium. The actual price level is 100, and the expected price level (which the $SRAS_1$ curve is based on) is also 100.
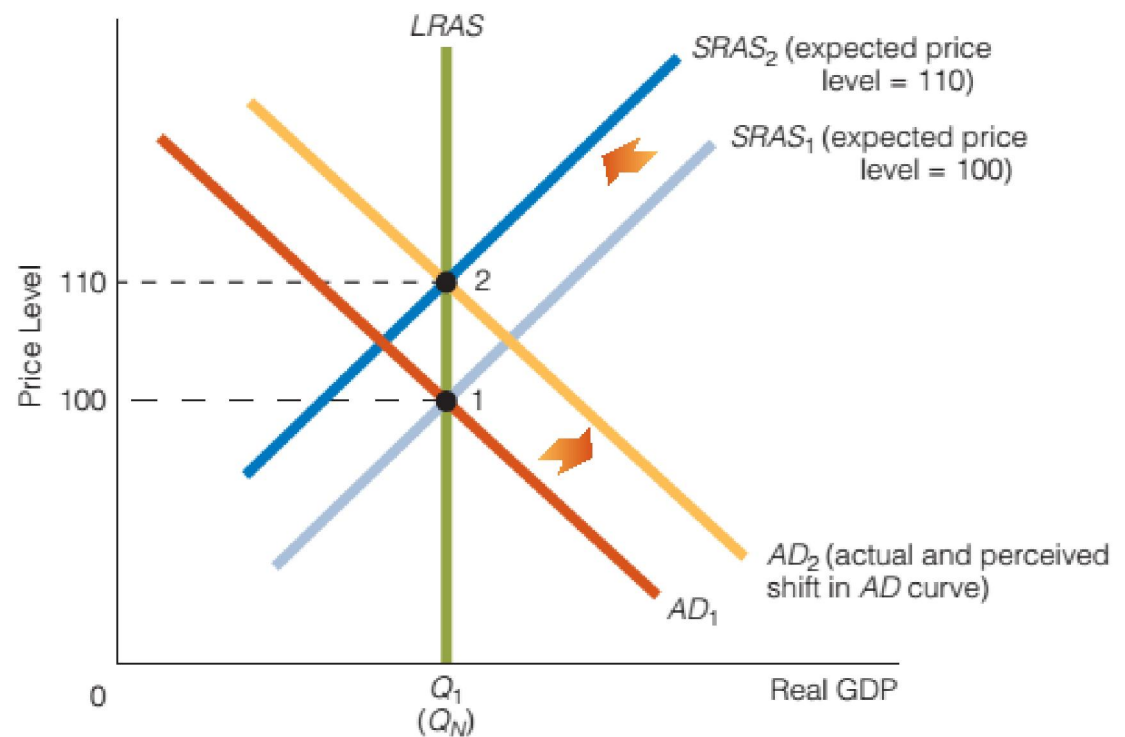
Rational Expectations and New Classical Theory
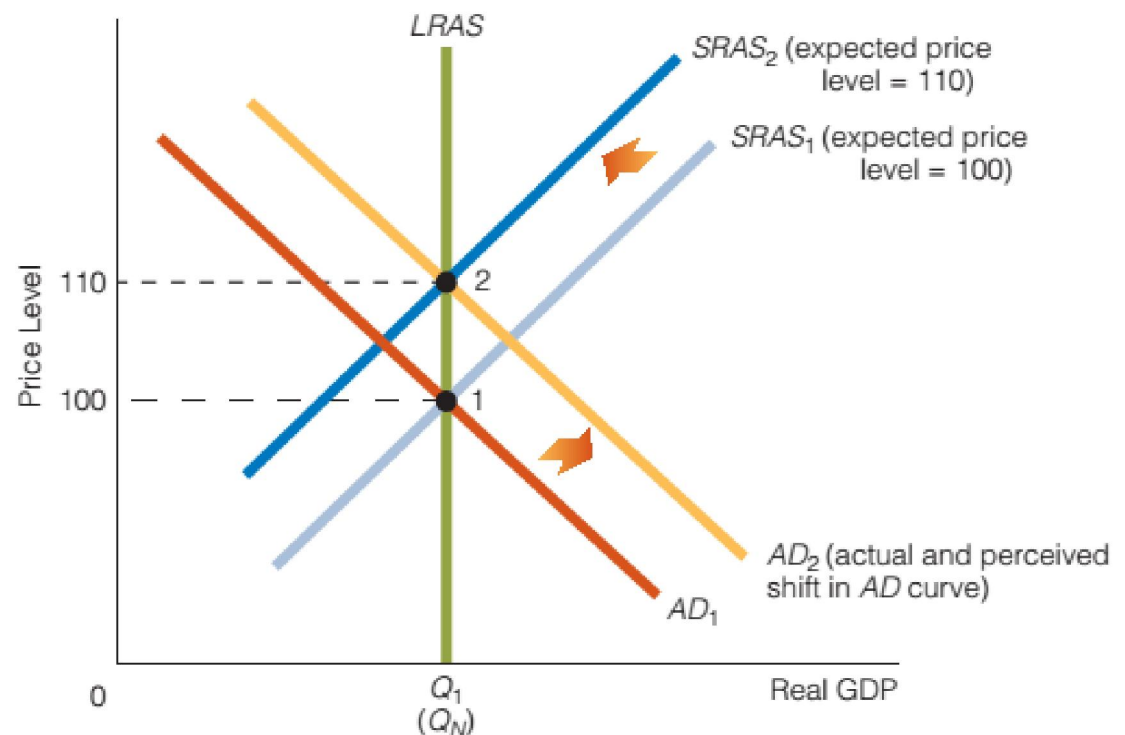
CASE 1: Policy correctly anticipated

The CB increases the money supply, and the AD curve shifts rightward. Because policy is anticipated correctly, individuals know that the new long-run equilibrium price level will be 110. Knowing this, they change their expected price level to 110.
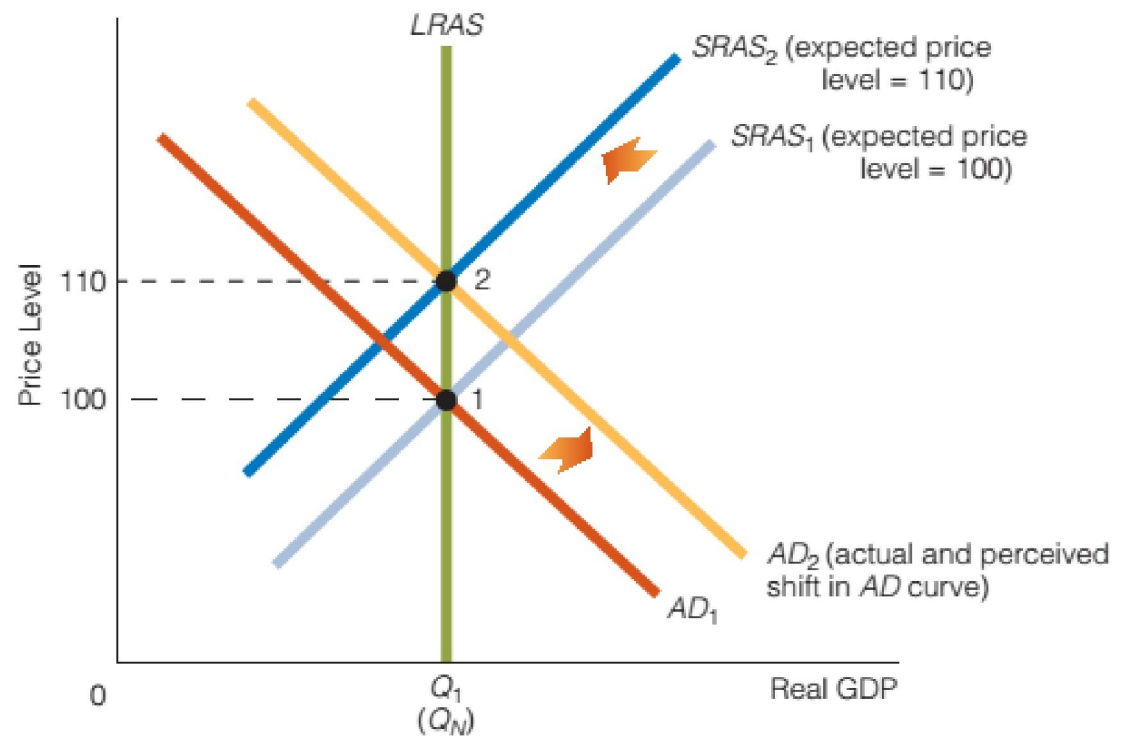
Rational Expectations and New Classical Theory
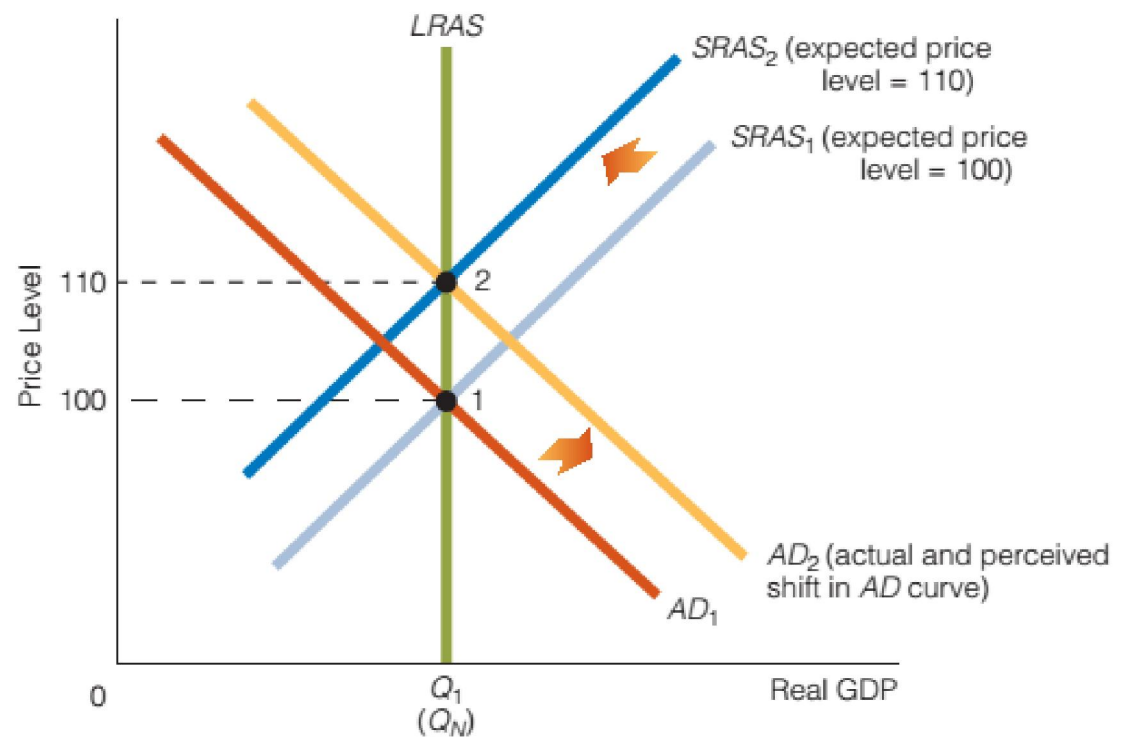
CASE 1: Policy correctly anticipated

As a result, the $SRAS$ curve shifts leftward from $SRAS_1$ to $SRAS_2$. Keep in mind that the AD and $SRAS$ change at the same time. In other words, the AD curve shifts rightward at the same time the $SRAS$ curve shifts leftward.

Rational Expectations and New Classical Theory
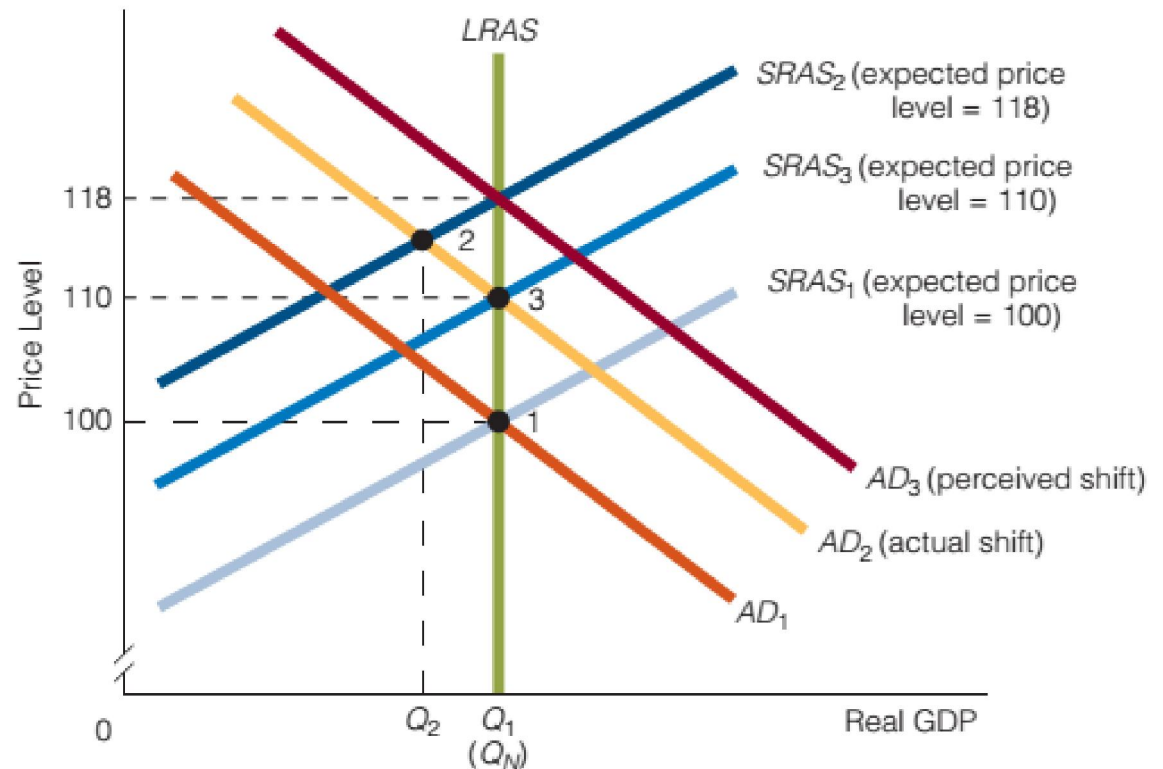
CASE 1: Policy correctly anticipated

The result is that the CB's action leads to a higher price level but does not change Real GDP. The CB's action is ineffective at changing Real GDP; thus we have the policy ineffectiveness proposition (PIP) holding.

Rational Expectations and New Classical Theory

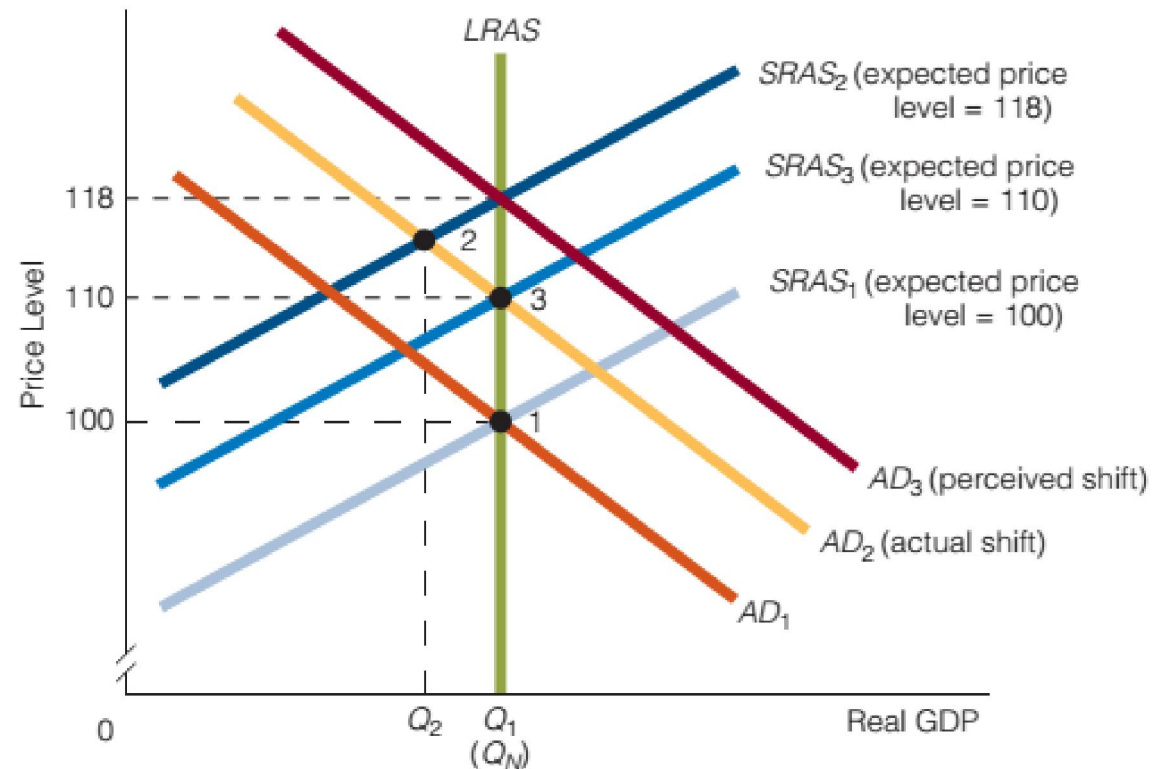## CASE 2: Policy incorrectly anticipated (bias upward)

(1) The economy starts in long-run equilibrium at point 1 and $P_A = P_{EX}$. (2) The CB increases the money supply, and the AD curve actually shifts rightward from AD_1 to AD_2. (3) Individuals have incorrectly anticipated the CB's action. They believe the CB has increased the money supply more than it actually has, and so they believe the AD curve has shifted from AD_1 to AD_3. This is a mistake.

Rational Expectations and New Classical Theory

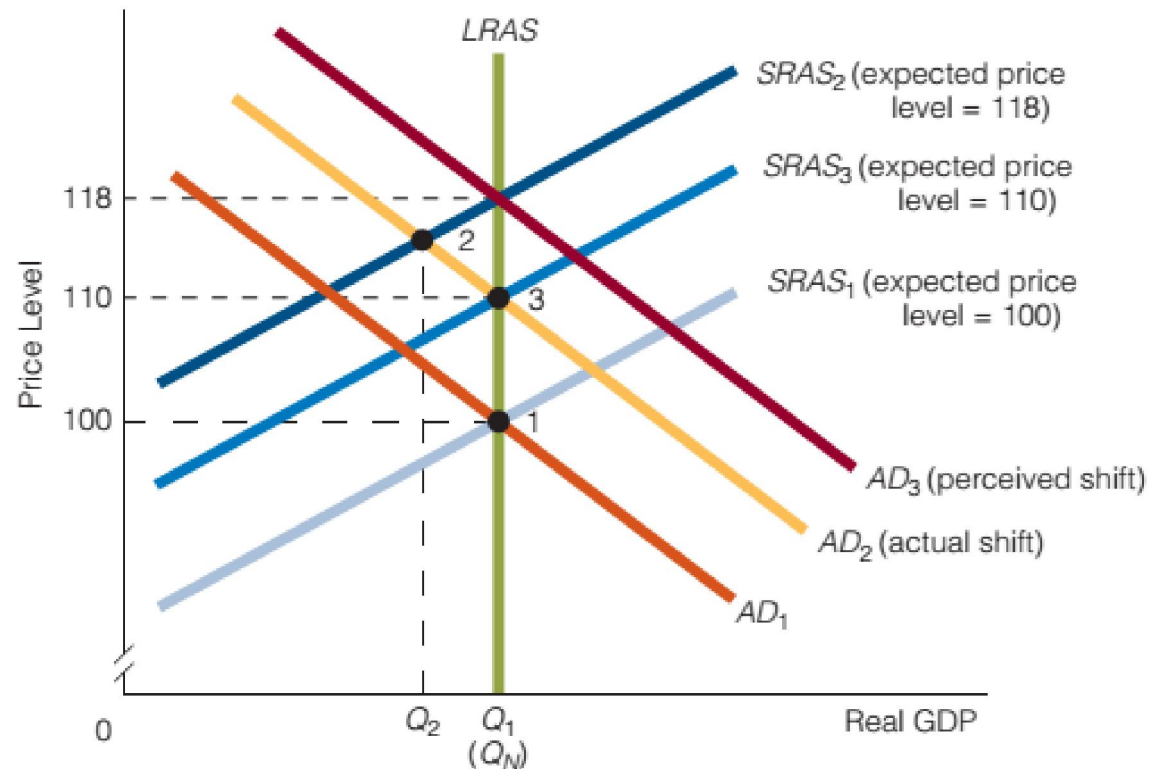## CASE 2: Policy incorrectly anticipated (bias upward)

(4) Mistakenly assuming that the AD curve has shifted rightward from AD_1 to AD_3, individuals think the new actual price level will end up being 118, where the AD_3 curve intersects the $LRAS$ curve. Accordingly, they change their expected price level to 118, and the $SRAS$ curve shifts leftward from $SRAS_1$ to $SRAS_2$.

Rational Expectations and New Classical Theory

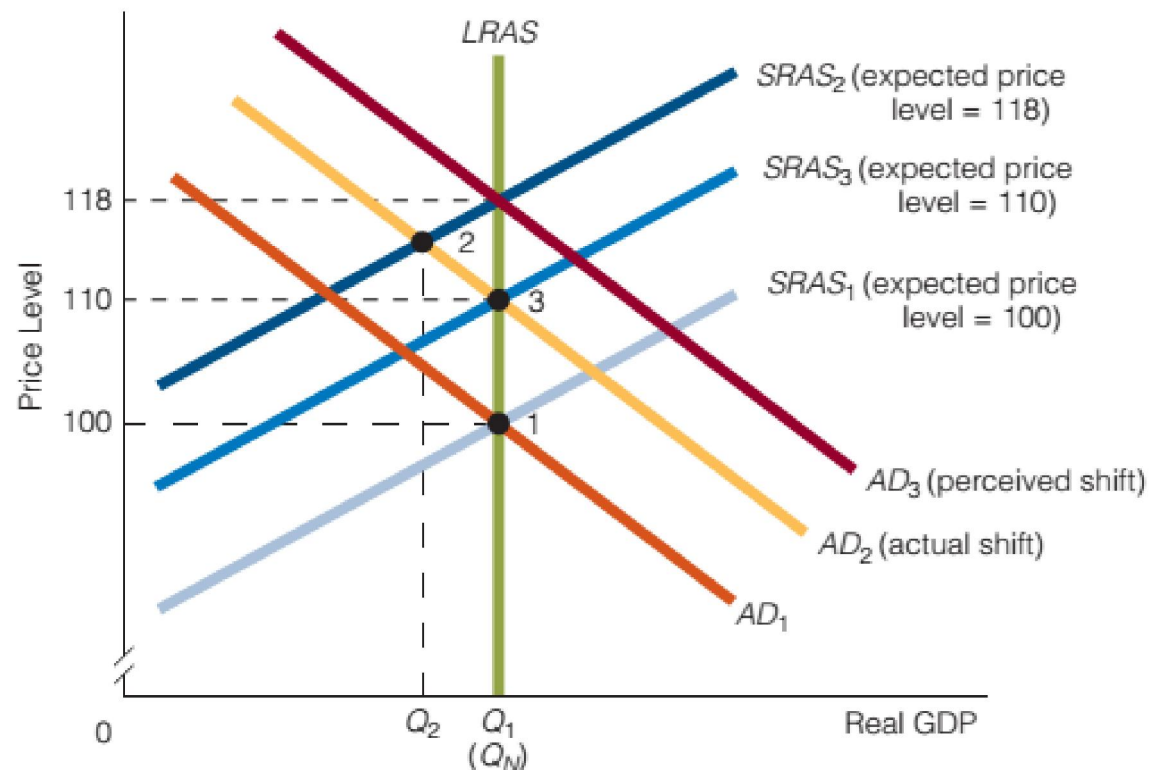## CASE 2: Policy incorrectly anticipated (bias upward)

(5) The short-run equilibrium for the economy turns out to be at point 2. This is an odd result since this implies that expansionary monetary policy has actually led to a decline in Real GDP. (6) Eventually, individuals figure out that they made a mistake—that the real AD curve is AD_2, not AD_3.

Rational Expectations and New Classical Theory

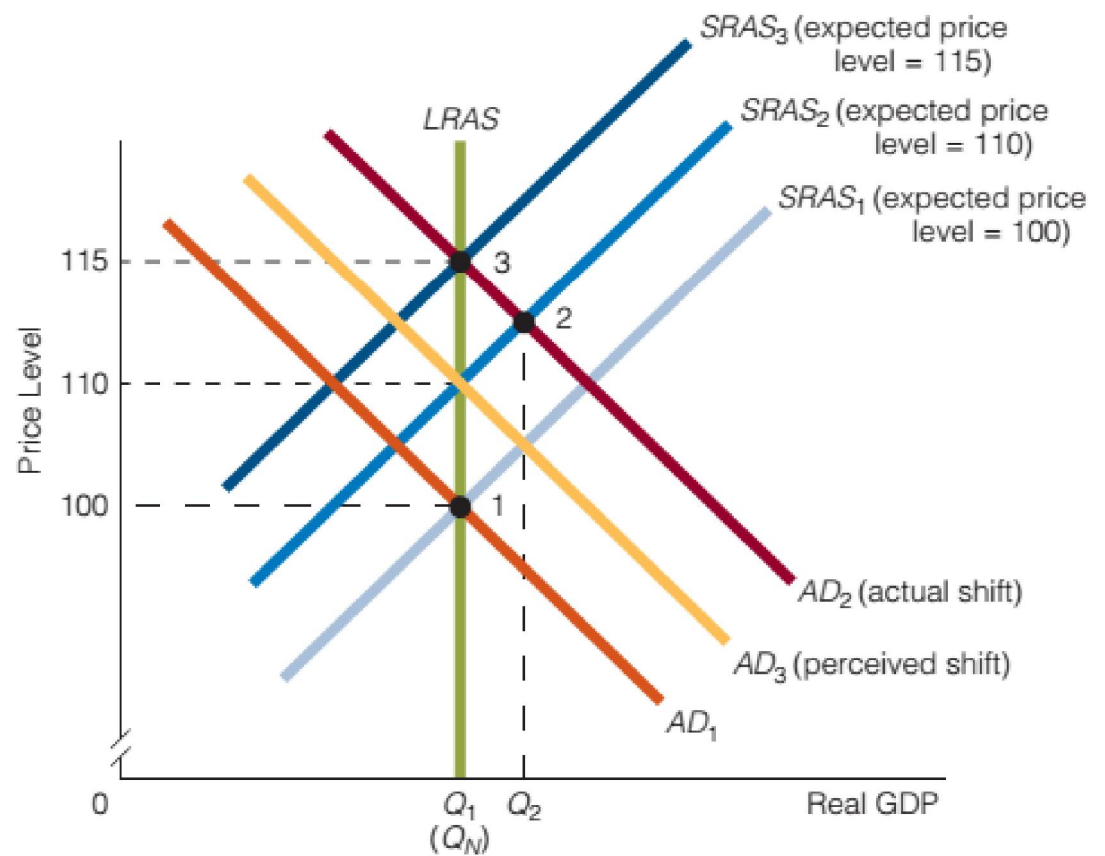## CASE 2: Policy incorrectly anticipated (bias upward)

So the new long-run equilibrium will be 110, not 118 (as earlier believed). As a result, individuals now readjust their expected price level down from 118 to 110. Accordingly, the $SRAS$ curve shifts rightward from $SRAS_2$ to $SRAS_3$. The economy is now in long-run equilibrium at point 3, and the expected price level is equal to the actual price level.

Rational Expectations and New Classical Theory

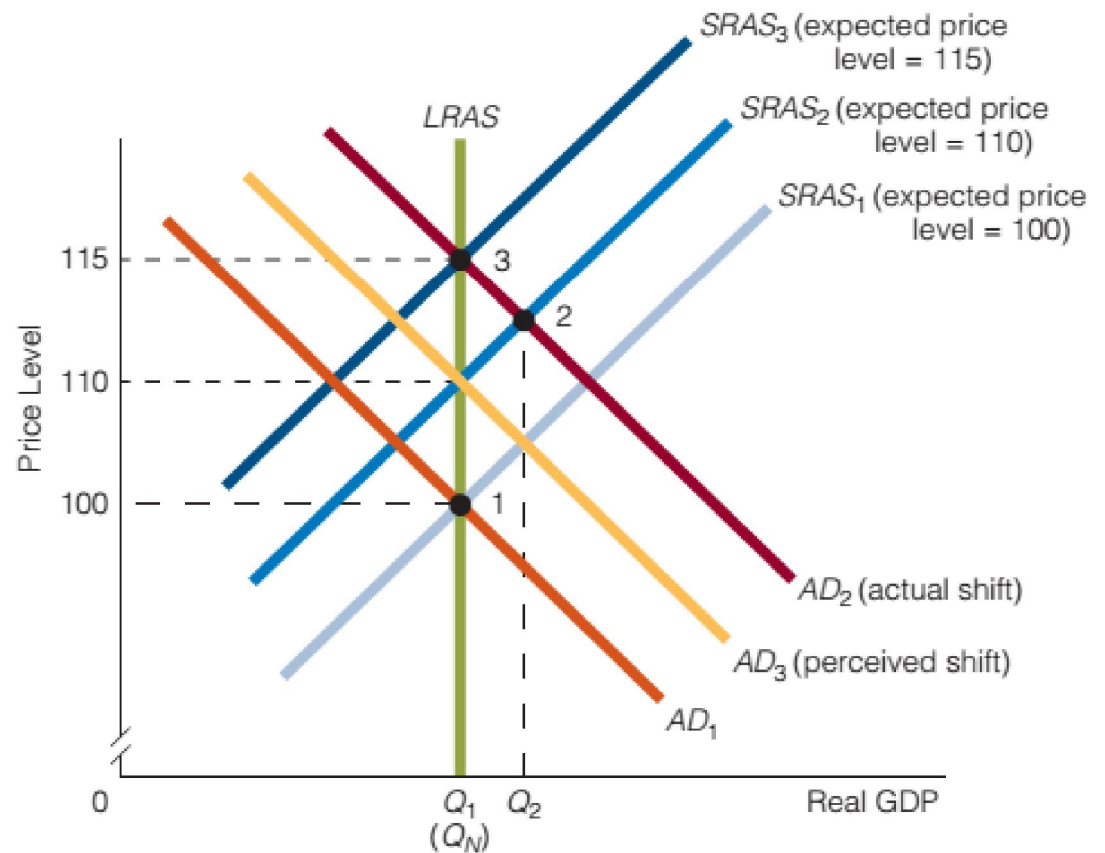## CASE 3: Policy incorrectly anticipated (bias downward)

An economy starts in long-run equilibrium at point 1. The expected price level is equal to the actual price level. The CB increases the money supply, and the AD curve shifts rightward from AD_1 to AD_2. However, individuals mistakenly believe the AD curve has shifted rightward by less, from AD_1 to AD_3.

Rational Expectations and New Classical Theory

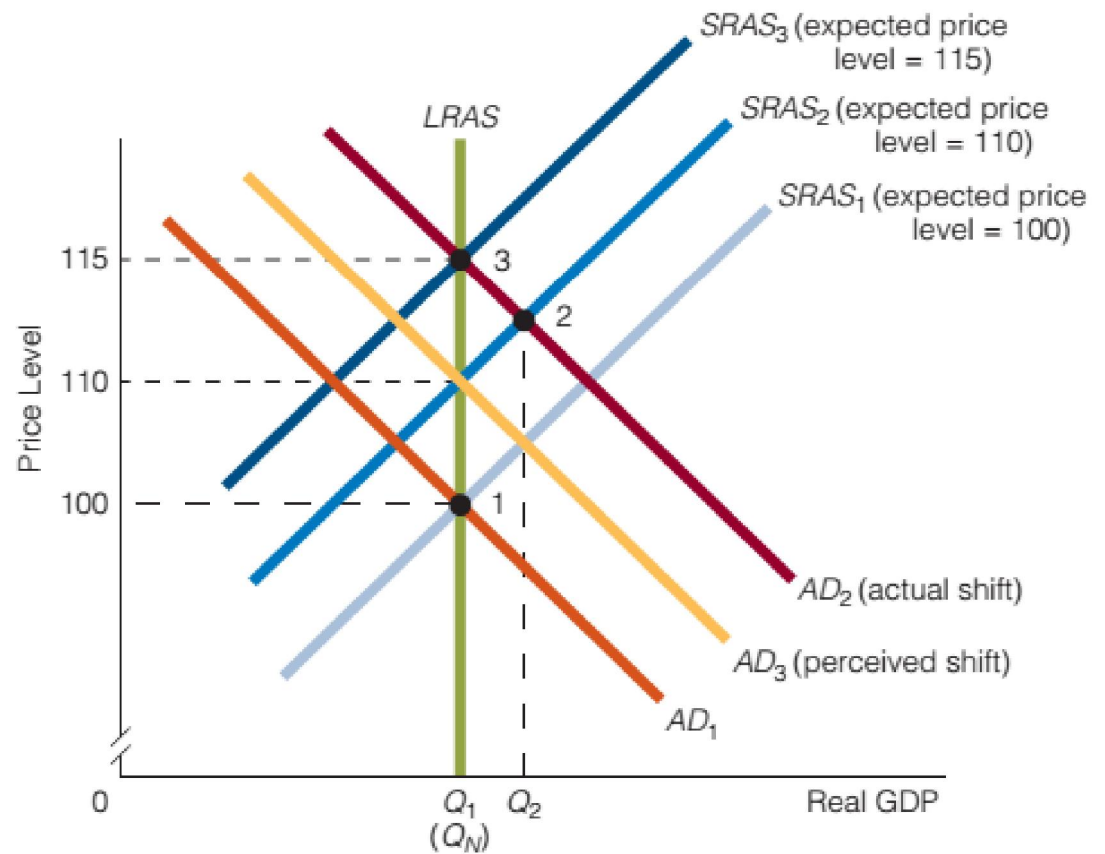## CASE 3: Policy incorrectly anticipated (bias downward)

As a result of this mistake, individuals mistakenly believe that the new long-run equilibrium price level will be 110. They then change their expected price level to 110, and the $SRAS$ curve shifts leftward from $SRAS_1$ to $SRAS_2$. The short-run equilibrium in the economy comes at point 2. Eventually, individuals realize their mistake.

Graph labels:
- $SRAS_3$ (expected price level = 115)
- $SRAS_2$ (expected price level = 110)
- $SRAS_1$ (expected price level = 100)
- LRAS
- Price Level (y-axis): 115, 110, 100
- AD_2 (actual shift)
- AD_3 (perceived shift)
- AD_1
- Real GDP (x-axis): Q_1 (Q_N), Q_2

Rational Expectations and New Classical Theory

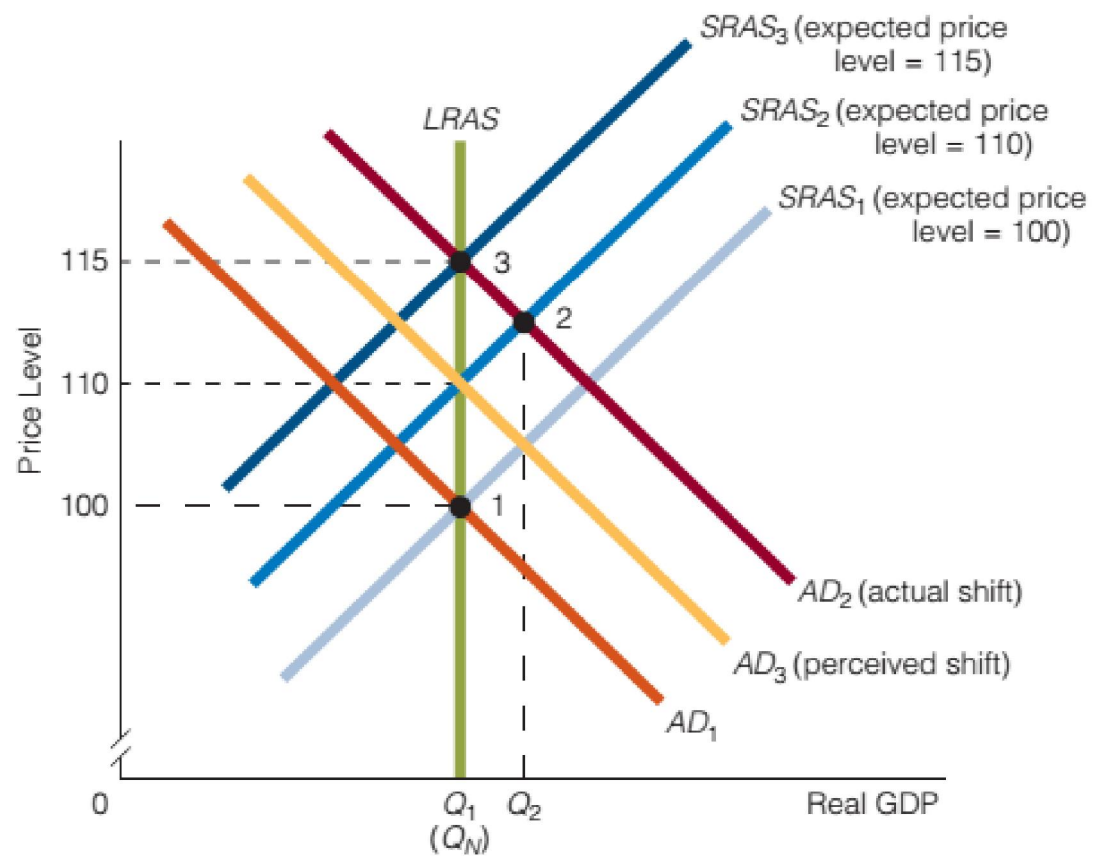## CASE 3: Policy incorrectly anticipated (bias downward)

They come to understand that AD_2 is the only operational AD curve in the economy and that the long-run equilibrium price level consistent with AD_2 is 115. They revise their expected price level from 110 to 115, and the $SRAS$ curve shifts leftward from $SRAS_2$ to $SRAS_3$. The economy moves into long-run equilibrium at point 3.

$SRAS_3$ (expected price level = 115)

$SRAS_2$ (expected price level = 110)

$SRAS_1$ (expected price level = 100)

LRAS

Price Level

115

110

100

AD_2 (actual shift)

AD_3 (perceived shift)

AD_1

0

Q_1 (Q_N) Q_2

Real GDP

Rational Expectations and New Classical Theory

## CASE 3: Policy incorrectly anticipated (bias downward)

An economy starts in long-run equilibrium at point 1. The expected price level is equal to the actual price level. The CB increases the money supply, and the AD curve shifts rightward from AD_1 to AD_2. However, individuals mistakenly believe the AD curve has shifted rightward by less, from AD_1 to AD_3.

SRAS₃ (expected price level = 115)
SRAS₂ (expected price level = 110)
SRAS₁ (expected price level = 100)
LRAS
AD₂ (actual shift)
AD₃ (perceived shift)
AD₁

Rational Expectations and New Classical Theory

CASE 4: Policy unanticipated

An economy starts in long-run equilibrium at point 1. The CB increases the money supply, and the AD curve shifts rightward from AD_1 to AD_2. The policy action by the Fed is unanticipated; so individuals mistakenly believe that the AD curve in the economy has not shifted. Thus there is no reason for them to believe that the price level will soon change and therefore no reason for them to revise their expected price level.
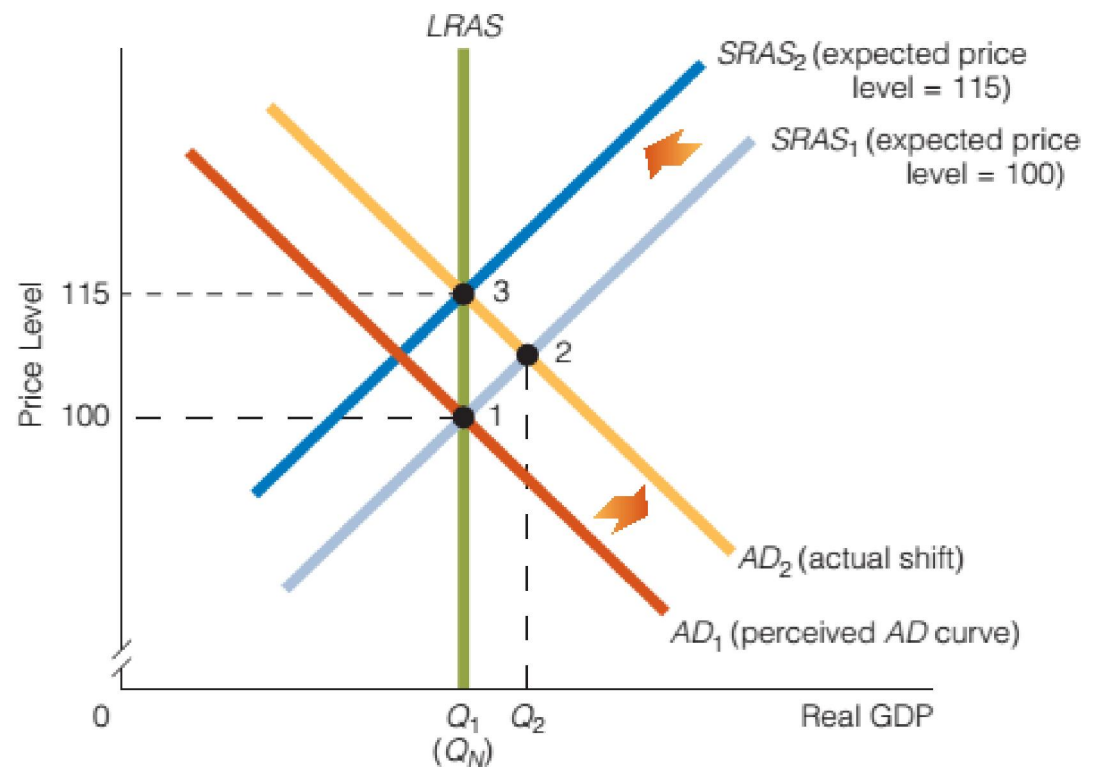
# Rational Expectations and New Classical Theory

CASE 4: Policy unanticipated

As a result, the *SRAS* curve does not shift and in the short run, the economy moves to point 2. In time, individuals revise their expected price level upward, and the *SRAS* curve shifts leftward. The economy moves back into long-run equilibrium at point 3.
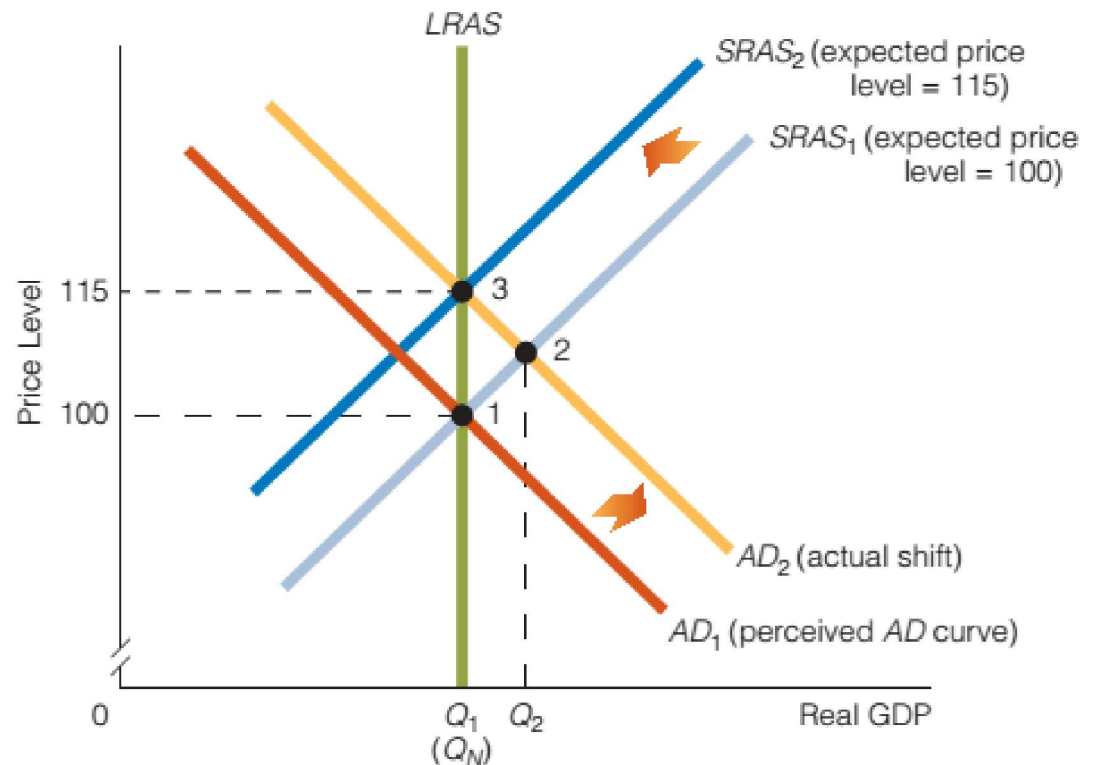
Rational Expectations and New Classical Theory

Comparing Case 3 and Case 4
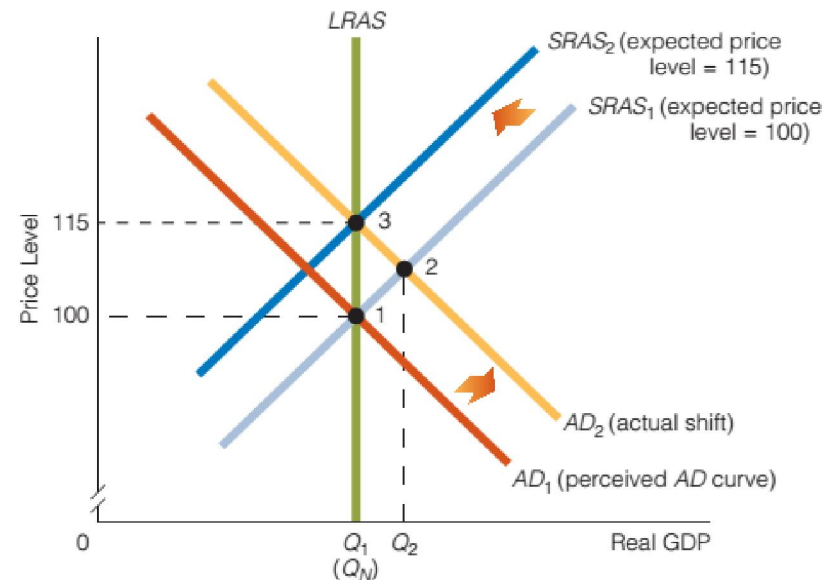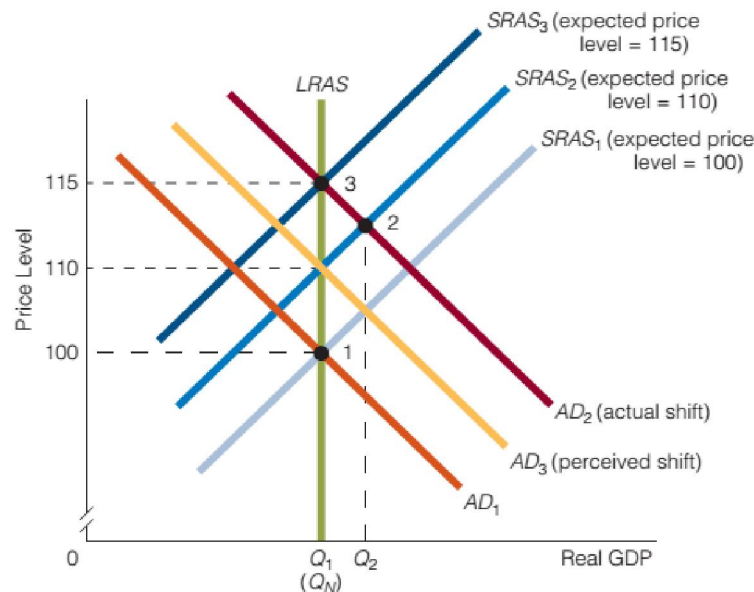
Both cases led to the same conclusion: An increase in the money supply could increase Real GDP in the short run. So how could two very different assumptions lead to the same short-run outcome? The answer is that Q_2 in Case 4 represents a higher Real GDP level than Q_2 in Case 3.

New Keynesians and Rational Expectations

- The new classical theory assumes that wages and prices are flexible. In this theory, an increase in the expected price level results in an immediate and equal rise in wages and prices, and the aggregate supply curve immediately shifts to the long-run equilibrium position.

- In response to the new classical assumption of flexible wages and prices, a few economists developed what has come to be known as the new Keynesian rational expectations theory.

- This theory assumes that rational expectations are a reasonable characterization of how expectations are formed, but it drops the new classical assumption of complete wage and price flexibility.

- According to this theory, long-term labor contracts often prevent wages and prices from fully adjusting to changes in the expected price level. In other words, prices and wages are somewhat sticky, rigid, or inflexible.

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New Keynesians and Rational Expectations

Starting at point 1, an increase in aggregate demand is correctly anticipated. As a result, the short-run aggregate supply curve shifts leftward, but not all the way to $SRAS_2$ (as would be the case in the new classical theory). Instead it shifts only to $SRAS'_2$ because of some wage and price rigidities; the economy moves to point $2'$ (in the short run), and Real GDP increases from Q_N to Q_A. If the policy had been unanticipated, Real GDP would have increased from Q_N to Q_{UA}.