

## Cooleconomics

### Macroeconomics

#### A Short Run Model of a Closed Economy: the IS-LM model

##### Equilibrium in a closed economy (no NX) in the short run:

In short run equilibrium, two important conditions are met:

- Condition 1. real Aggregate demand = real GDP, or  $C + I + G = Y$

--This is known as *product market equilibrium*.

- Condition 2. real Money demand = real Money Supply, or  $L(r, Y) = M^s/P$

--This is known as *money market equilibrium*

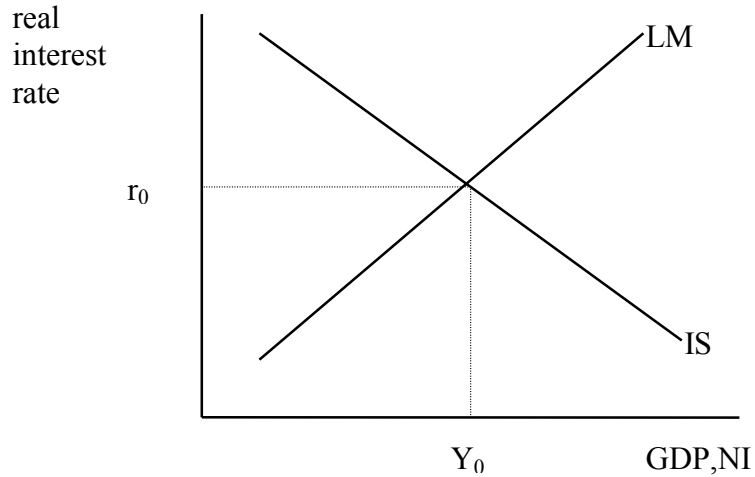
It is sometimes useful to view the short run economy using a graph, known as an *IS-LM diagram*. The IS-LM diagram lets us view the product market separately from the money market on one graph; this may help us to better understand the short run effects of fiscal and monetary policy on the economy.

##### Important Assumption: Sticky Prices

For now, we'll assume that the average price level is *constant* when using the IS-LM model. This is a simplification, but it emphasizes an important truth; *prices tend to rise or fall less in the short run than in the long run*.

**And Now, the IS-LM Model (for a closed economy)**

*Preview:*



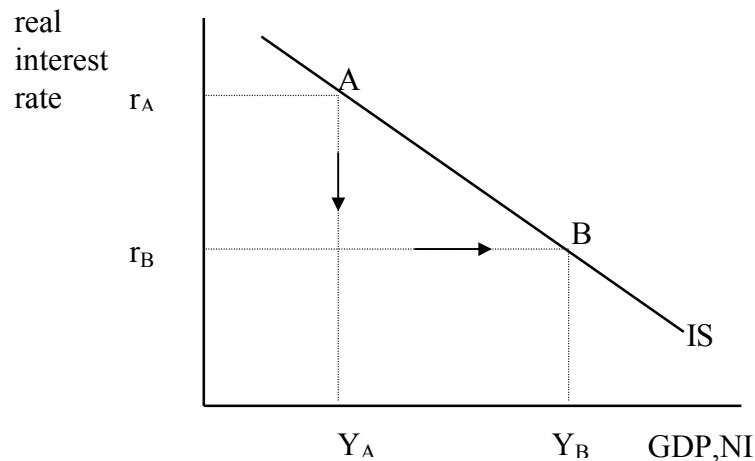
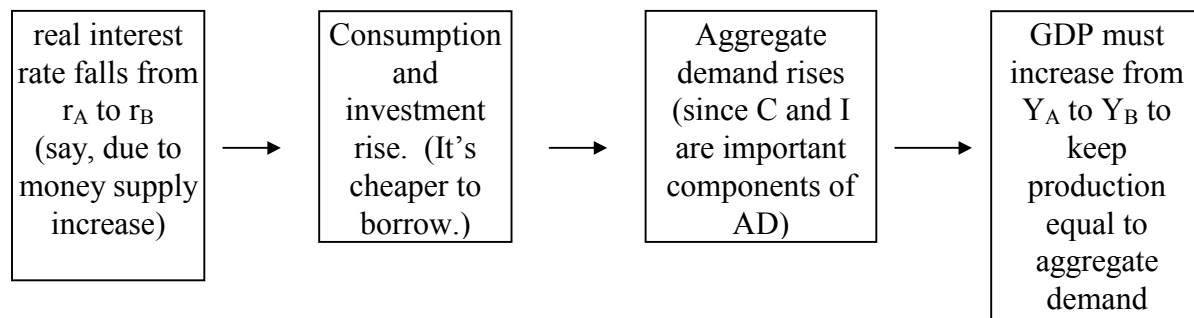
**The IS Curve:** The IS curve depicts all combinations of the *real interest rate* and *real GDP* at which aggregate demand equals output. It depicts *product market equilibrium*.

The IS curve depicts all  $(r, Y)$  combinations such that  $C + I + G = Y$ .

The IS curve slopes downward. Why? Pick a point on the upper portion of the IS curve—say, point A depicted below. Notice that the real interest rate is at level  $r_A$ , and the GDP level is at  $Y_A$ .

Now suppose that something happens in the economy (say, an increase in the money supply) which reduces the real interest rate to  $r_B$ . What must happen to GDP in order to keep aggregate demand equal to GDP—to maintain product market equilibrium? Answer: GDP must increase, bigger than its level at  $Y_A$ . Here's why:

### Why The IS Curve Slopes Downward

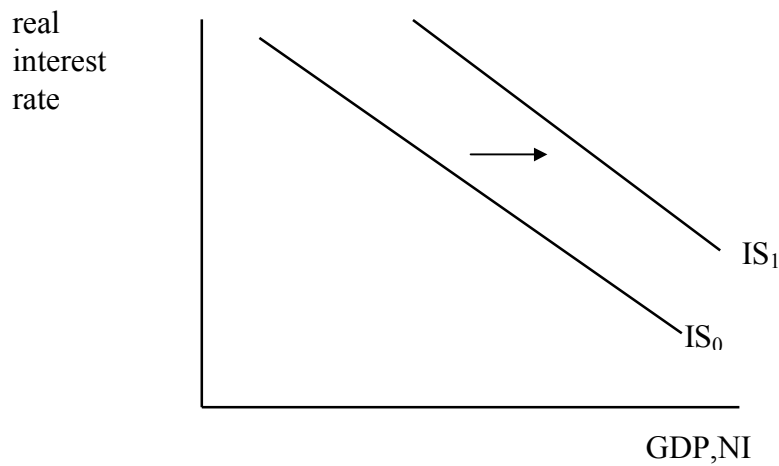


Shifting the IS Curve: Events that increase or decrease aggregate demand at any real interest rate cause the IS curve to shift—leftward if aggregate demand diminishes, rightward if aggregate demand increases. Here’s a list:

*Events that shift the IS curve to the right:*

1. A cut in household tax rates
2. An increase in household transfer payments
3. An increase in government purchases
4. Increased consumer confidence
5. Increased “animal spirits” confidence of CEOs
6. Increased wealth

*(Symmetrically opposite events would cause a leftward shift of the IS curve.)*



## And Now, the LM curve

**The LM curve** shows all combinations of the real interest rate and real GDP at which the *real money supply* equals *real money demand*. (Note: real money demand is sometimes called the *demand for real balances*.)

In order to understand the LM curve, we must understand the money market—real money supply and real money demand. So let's review:

Real Money Supply : First, a definition. The real money supply equals the nominal money supply divided by the average price level:

real money supply = nominal money supply / average price level

$$= \frac{M_s}{\bar{P}}$$

Note 1: We assume that the nominal money supply is precisely controlled by the Central Bank

Note 2: Notice the “bar” above the P. That’s because for the time being, we are assuming that the price level is fixed.

Combining the implications of note 1 and note 2:

*The Central Bank Has Complete Control of the Real Money  
Supply if prices are assumed constant*

(In the next set of notes, “macro-ISLM-part2.doc,” we’ll allow prices to rise and fall. In this more realistic case we will see that the Fed does not have complete control of the real money supply.)

Real Money Demand (a.k.a. the demand for real balances): Real money demand is the demand for the ability to make transactions—to buy stuff. If one wants to buy stuff in an economy, one needs money—currency, checks, and the like. Hence, the real demand for money is primarily a demand for the ability to buy stuff—products if one is a consumer, and resources if one is a producer.

*Important things that influence real money demand:*

1. The real interest rate.

Ceteris paribus, the higher the real interest rate, the lower will be the economy's real money demand. Reason: the lure of high returns on bonds, CDs, and other non-money assets encourages people to trade their cash and checks for these assets.

2. The level of real national income (Y)

Ceteris paribus, the higher the level of real national income, the higher will be the economy's real money demand. Reason: households with more income desire to buy more stuff, necessitating more real money holdings.

**And now, back to the LM curve:**

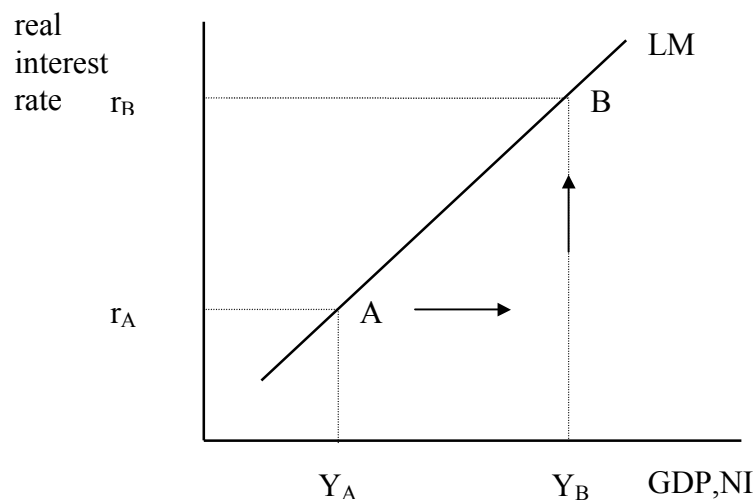
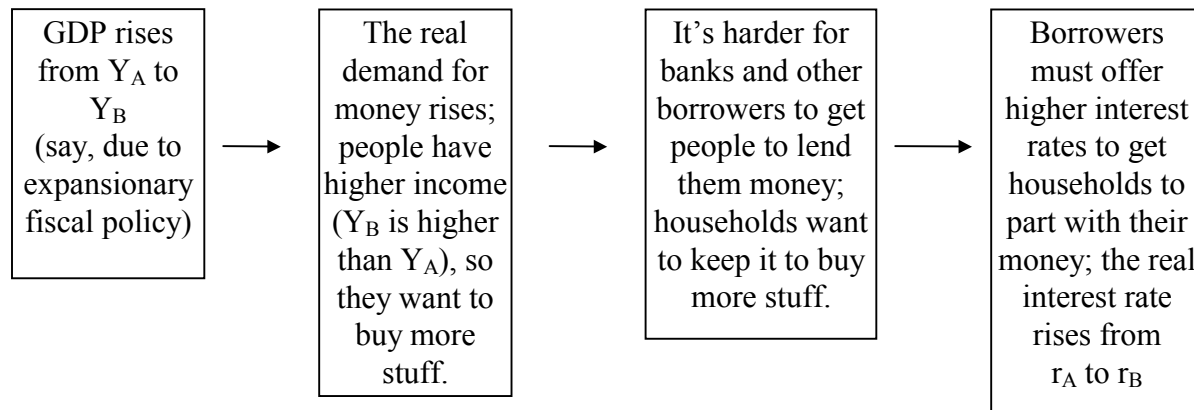
The LM curve depicts all  $(r, Y)$  combinations such that  $L(r, Y) = \frac{M_s}{P}$ ,  
for a given level of the nominal money supply

### The LM curve slopes upward. Why?

Pick a point on the lower portion of the LM curve—say, point A depicted below. Notice that the real interest rate is at level  $r_A$ , and the GDP level is at  $Y_A$ .

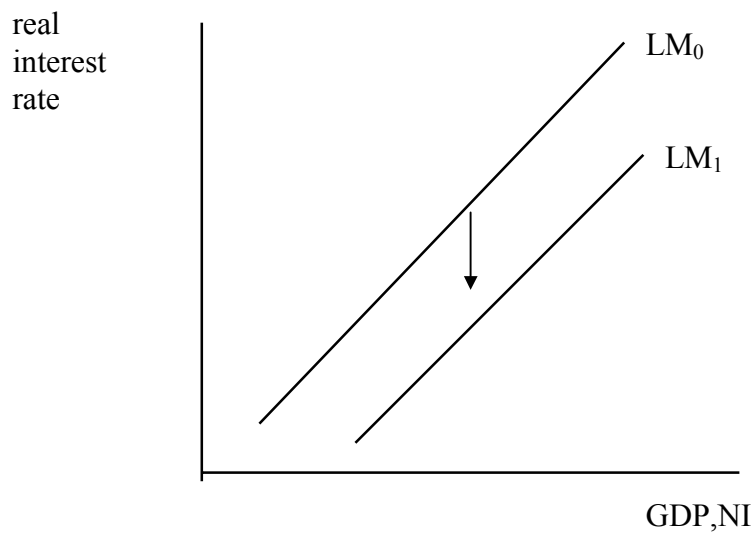
Now suppose that something happens in the economy (say, an increase in government purchases) that causes producers to increase output to  $Y_B$ . Meanwhile, the nominal money supply remains constant. What must happen to the real interest rate in order to keep real money demand equal to the real money supply—to maintain money market equilibrium? Answer: the real interest rate must increase, higher than its level at  $r_A$ . Here's why:

### Why The LM Curve Slopes Upward



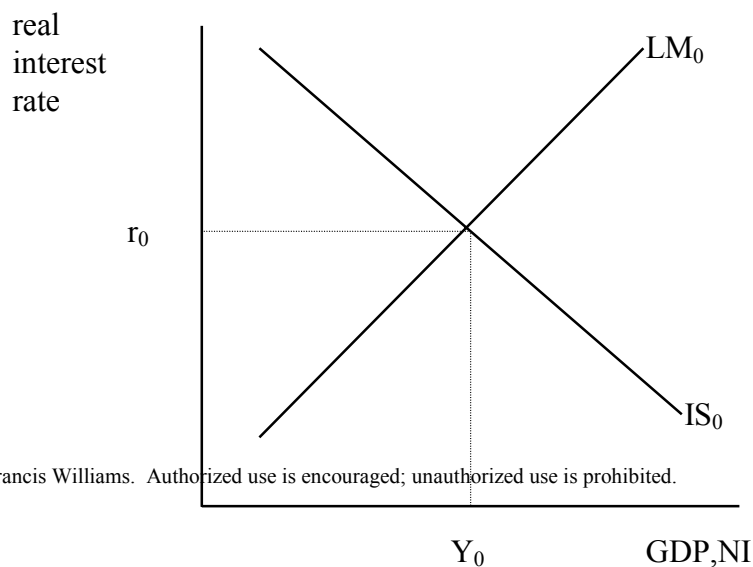
Shifting the LM curve: Monetary policy—a change in the nominal money supply—causes the LM curve to shift.

Example: Suppose the Central Bank increases the nominal money supply. This fact, along with our assumption of a fixed price level, means that there's a greater amount of stuff with which to make transactions—cash, checks, and the like. Hence it becomes easier for borrowers to get households to part with some of their cash and checks, since the households have plenty of it. The real interest rate falls. *The LM curve shifts down, illustrating a lower interest rate at any level of GDP:*



(Note: A reduction in the nominal money supply will cause symmetrically the opposite result.)

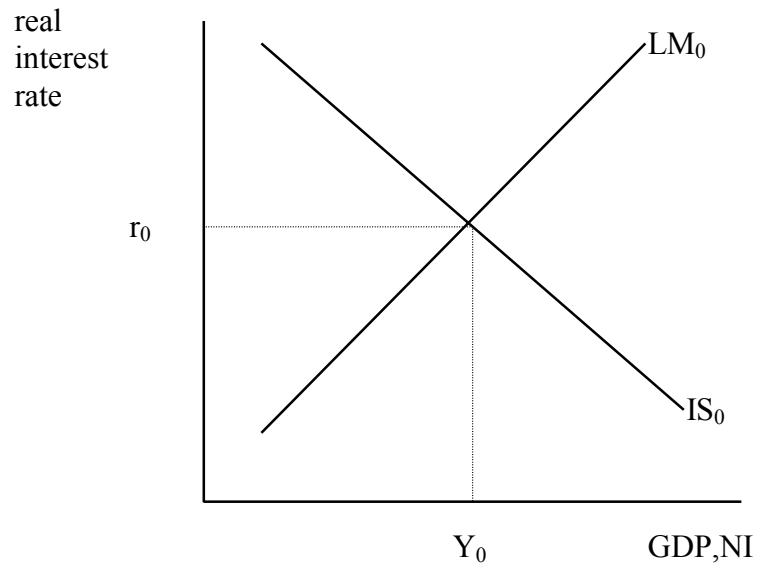
**So here's the complete model. Now, let's do some forecasting! Cowabunga!**



**Forecast # 1: Expansionary Fiscal Policy (Answers on next page)**

Suppose that government cuts household tax rates (keeping government spending constant)

Draw the effects of this policy on the graph below (assuming that Ricardian equivalence does not hold and that the money supply is constant):



What has happened to:

Consumption:

Investment:

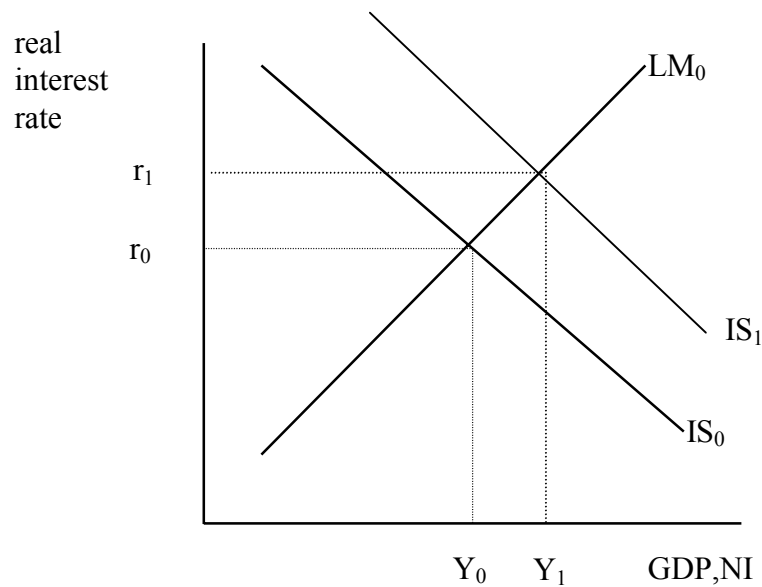
The budget deficit:

The unemployment rate:

### Forecast # 1: Expansionary Fiscal Policy: Answers

Suppose that government cuts household tax rates (keeping government spending constant)

Draw the effects of this policy on the graph below (assuming that Ricardian equivalence does not hold and that the money supply is constant):



What has happened to:

Consumption: *Rises due to higher disposable income*

Investment: *Falls due to higher interest rate*

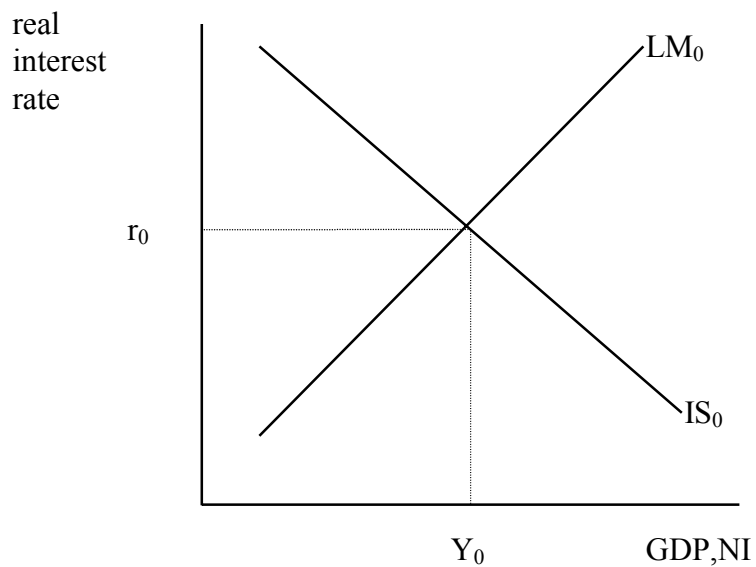
The budget deficit: *Higher; gap between taxes and government spending is larger if taxes are cut.*

The unemployment rate: *Lower; more production requires more workers.*

**Forecast # 2: Expansionary Monetary Policy (Answers on next page)**

Suppose that the Central Bank increases the nominal money supply

Draw the effects of this policy on the graph below:



What has happened to:

Savings:

Investment:

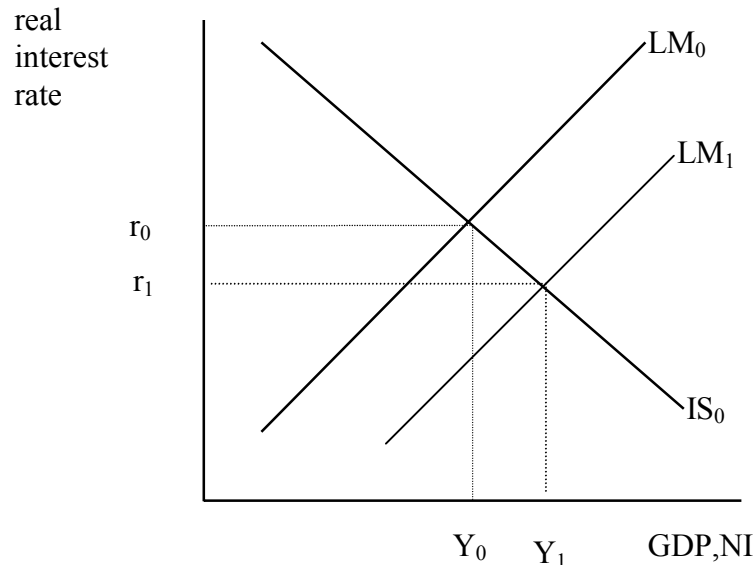
The budget deficit:

The unemployment rate:

## Forecast # 2: Expansionary Monetary Policy Answers

Suppose that the Central Bank increases the nominal money supply

Draw the effects of this policy on the graph below:



What has happened to:

**Savings:** *Probably higher. Although interest rates have fallen, reducing the return to savings, there is greater income, encouraging greater savings. The effect of the income probably exceeds the effect of the interest rates.*

**Investment:** *Higher due to lower interest rates (a lower cost of borrowing to buy new homes and capital equipment)*

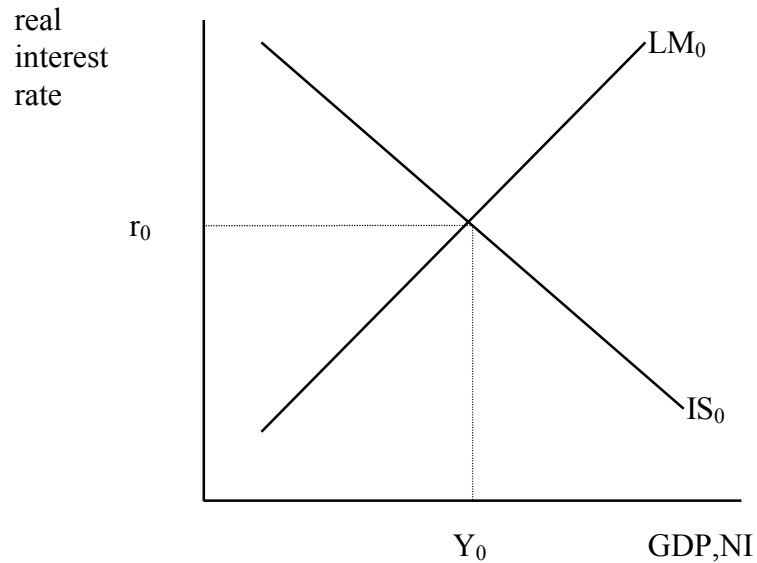
**The budget deficit:** *Shrinks, because a larger economy causes tax revenues to rise, making the gap between government spending and tax revenues shrink.*

**The unemployment rate:** *Lower, since greater production requires more workers.*

**Forecast # 3: Countercyclical fiscal policy (Answers on next page)**

Suppose that the government immediately cuts tax rates to offset declining consumer confidence

Draw the effects of this policy on the graph below:



What has happened to:

Consumption:

Investment:

The budget deficit:

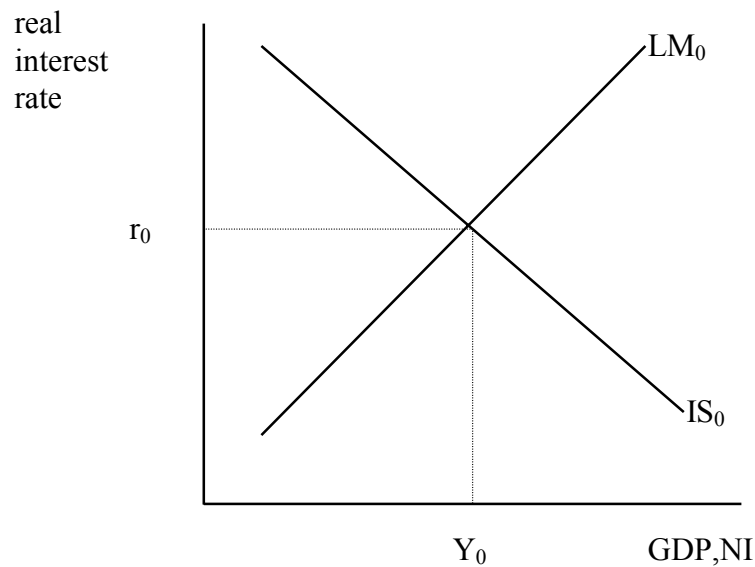
The unemployment rate:

**Forecast # 3: Countercyclical fiscal policy (Answers on next page)**

Suppose that the government immediately cuts tax rates to offset declining consumer confidence

Draw the effects of this policy on the graph below:

*Lower consumer confidence would tend to reduce consumption and shift the IS curve to the left; lower taxes tend to increase consumption and shift the IS curve to the right. So if taxes are cut in the precise amount to offset the decline in consumer confidence, the IS curve will not shift at all!*



What has happened to:

Consumption: *Unchanged. Lower consumer confidence is offset by lower taxes.*

Investment: *Unchanged. Interest rates are unchanged.*

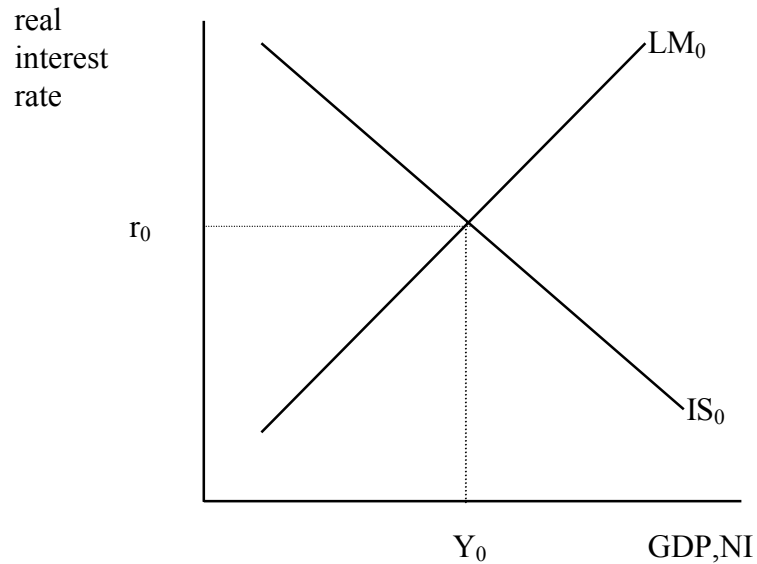
The budget deficit: *Higher, since taxes have been cut.*

The unemployment rate: *Unchanged, since production is unchanged.*

**Forecast # 4: Expansionary fiscal policy and a non-accommodating Central Bank  
(answers on next page)**

Suppose that household taxes are cut. The Central bank reacts by shrinking the money supply, in an effort to keep unemployment unchanged.

Draw the effects of this policy on the graph below:



What has happened to:

Private savings:

Investment:

The budget deficit:

The unemployment rate: