

# **EC9012 MACROECONOMICS**

## **WEEK 5 - PROBLEM SET 3**

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## PROBLEM SET 3

1. QUESTION - 6 -

2. QUESTION - 5 -

3. QUESTION - 3 -

## QUESTION - 6 -

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***"Inflation is always and everywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output."***



## QUESTION - 1 -

The quantity equation is an identity that expresses the link between the number of transactions that people make and how much money they hold.  
We write it as:

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The left hand-side of the equation tells us about the money used to make these transactions. **M** represents the quantity of money in the economy. **V** represents the transactions velocity of the money, which is the rate at which money circulates in the economy.

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- [►] The velocity of money is a measurement of the rate at which money is exchanged in an economy. It is the number of times that money moves from one entity to another.
- [►] If we assume that velocity in the quantity equation is constant, then we can view the quantity equation as the theory of nominal GDP.
- [►] If the velocity **V** is constant, then a change in the quantity of money (**M**) causes a proportionate change in nominal GDP (**PY**). If the output is determined by factors of production and the production technology, we can conclude that the quantity of money determines the price level.

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If the velocity is constant and the change in prices equals inflation  $\pi$ :

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The quantity theory predicts one-to-one relationship between changes in money growth rate and inflation rate. In the money growth rate exceeds the economic growth in output then the price level will rise rapidly leading to inflation.

Empirical evidence across countries also shows that the high inflation and high money growth rates move together as the quantity theory predicts.

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Nominal interest rate is the sum of real interest rate and the inflation. If real interest rates are unaffected by inflation but are only determined by savings and investment, then nominal interest rates change one-to-one with the inflation rate. If inflation increases by 1 percent, then nominal interest rates increase by 1 percent.

The empirical data across countries also show that in high inflation countries, nominal interest rates are also higher.

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The real interest rate is the difference between the nominal interest rate and the inflation rate. The nominal interest rate is 11 percent but we need to solve for the inflation rate. We do this with the quantity identity expressed in percentage change form.

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$$\% \text{ Change in } M + \% \text{ Change in } V = \% \text{ Change in } P + \% \text{ Change in } Y$$

If Change in V is zero, since velocity is constant:

$$\% \text{ Change in } M = \% \text{ Change in } P + \% \text{ Change in } Y$$

$$14 \text{ percent} + \% \text{ Change in } P + 5 \text{ percent}$$

$$\% \text{ Change in } P = 9 \text{ percent. Inflation is 9 percent.}$$

Using the Fisher equation.  $i = r + \pi$ ,  $11\% = r + 9\%$  Real interest rate ( $r$ ) equals 2%.

## QUESTION - 5 -

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How will the following events affect the demand for money? In each case, specify whether there is a shift of the demand curve or a movement along the demand curve and its direction.

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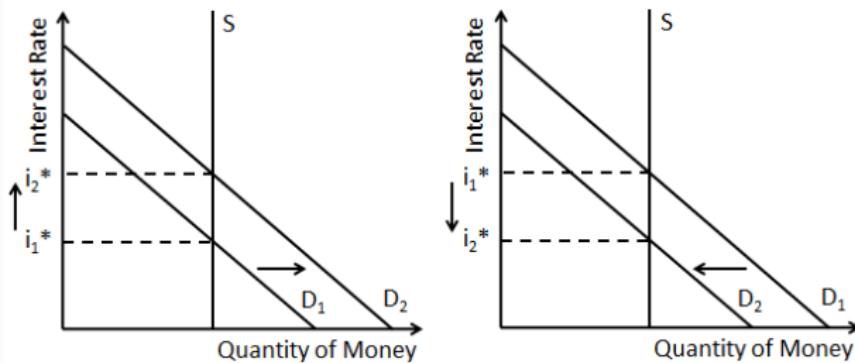
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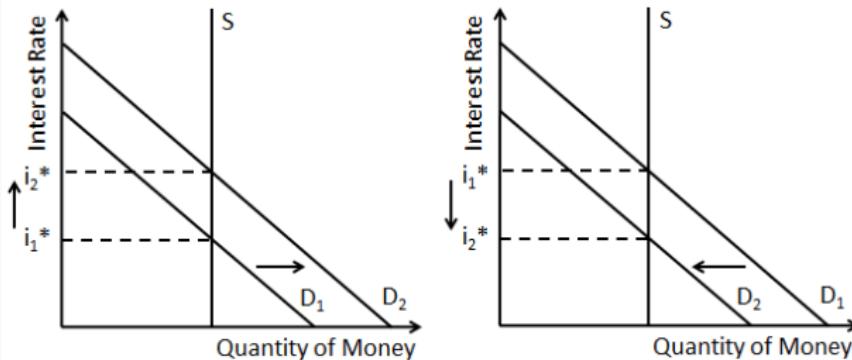


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Any decrease in the interest rate will lead to an increase in the quantity of money demanded (a movement down the money demand curve)

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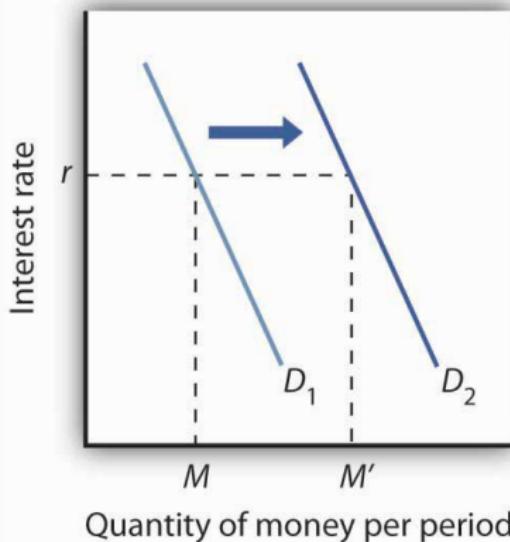
When the holiday shopping season starts, consumers anticipate an increase in expenditures and so, at each income level, increase the demand for money. The money demand curve shifts to the right.

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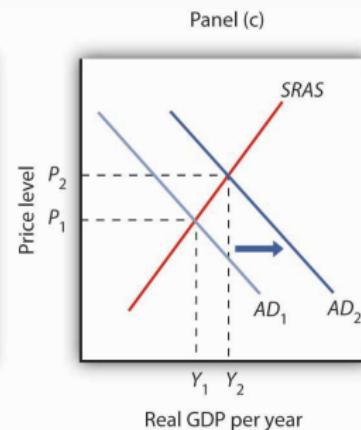
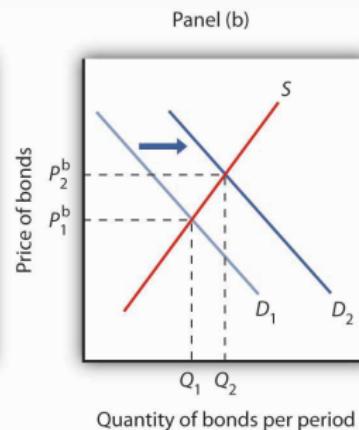
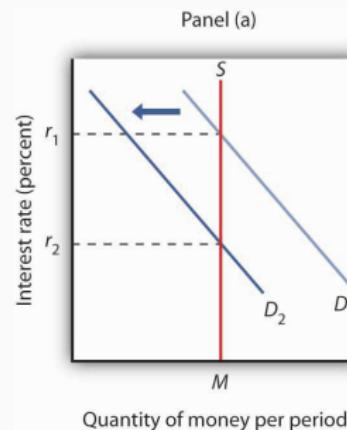
With the credit cards, demand for money declines, assuming that households put more money in savings instead of holding currency. The money demand curve shifts to the left.

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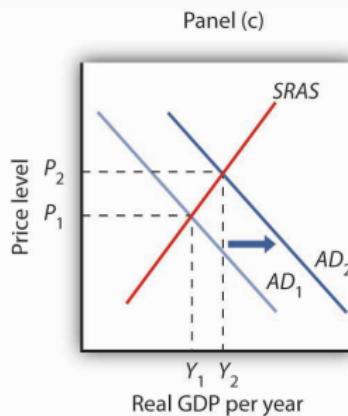
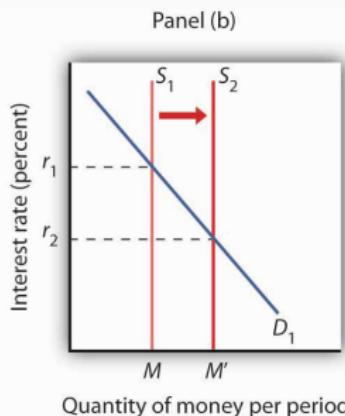
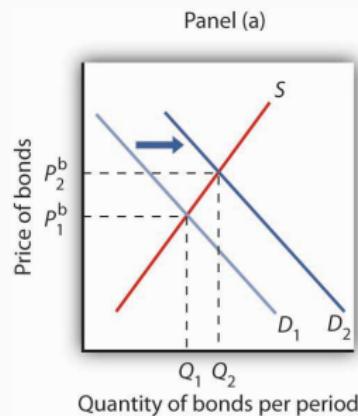
When the Fed engages in open-market operations, it will change the money supply (the money supply curve will shift). This will affect the interest rate and consequently the quantity of money demanded. An open-market purchase of U.S. Treasury bills by the Fed will increase the money supply, lowering the interest rate and increasing the quantity of money demanded. This is a downward movement along the money demand curve.

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### Money Demand Curve

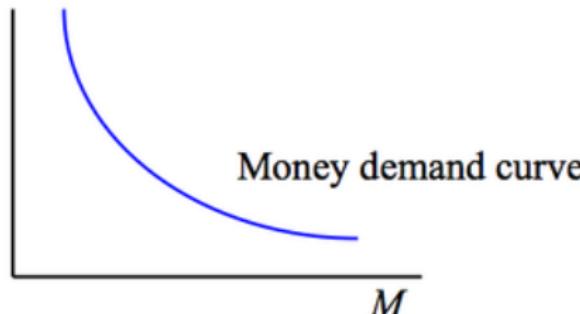
Nominal Demand

$$M^D = P \times L(i, y)$$

Real Demand

$$\frac{M^D}{P} = L(i, y)$$

Interest rate  
 $i$



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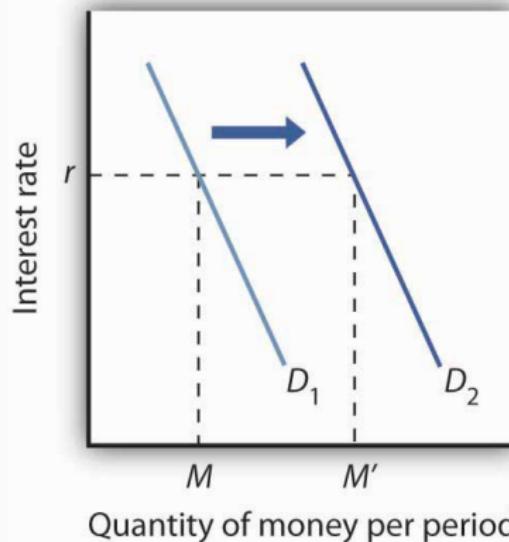
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## **QUESTION - 3 -**

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Suppose a policymaker is in office for two periods. Output is given by

$$y = y^n + b(\pi - \pi^e), \quad b > 0 \quad (1)$$

each period. There are two possible types of policymaker, **type-1** and **type-2**. A type-1 policymaker, which occurs with probability  $p$ , maximizes social welfare, which for simplicity is given by

$$(y_1 - \frac{a}{2}\pi_1^2) + (y_2 - \frac{a}{2}\pi_2^2), \quad a > 0 \quad (2)$$

A type-2 policymaker, which occurs with probability  $1-p$ , cares only about inflation, and so sets inflation to zero in both periods. Assume  $0 < p < \frac{1}{2}$

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Substituting eq-1  $(y = y^n + b(\pi - \pi^e))$  we get

$$W = \left( y^n + b\pi_1 - b\pi_1^e - \frac{a}{2} \pi_1^2 \right) + \left( y^n + b\pi_2 - b\pi_2^e - \frac{a}{2} \pi_2^2 \right) \quad (4)$$

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Substituting eq-1  $(y = y^n + b(\pi - \pi^e))$  we get

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Consider a possible equilibrium where a type-1 policymaker always chooses  $\pi_1 \neq 0$ . In this situation, what is  $\pi_2^e$  if  $\pi_1 \neq 0$ ? What value of  $\pi_1$  does a type-1 policymaker choose? What is the resulting level of social welfare over the two periods?

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Since the type 1 policymaker never chooses  $\pi_1 = 0$ , there is no doubt in the second period that the policymaker is of type 1, since a type 2 policymaker would have picked  $\pi_1 = 0$ . Therefore, people will expect the policymaker to maximize social welfare in the second period and so

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$$W = 2y^2 - b\pi_1^e \quad (5)$$

### QUESTION 3-C

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### QUESTION 3-C

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Since the public expects the policymaker to select  $\pi_2 = b/a$  with probability  $p$  and  $\pi_2 = 0$  with probability  $(1-p)$ , we have

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$$\pi_2^e = p(b/a) + (1-p)0 = p(b/a) \quad (6)$$

Therefore, substituting  $\pi_1 = 0$ ,  $\pi_2 = b/a$ , and  $\pi_2^e = p(b/a)$  into equation-4, we get

$$W = 2y^n - b\pi_1^e + \frac{b^2}{a} \left( \frac{1}{2} - p \right) \quad (7)$$

### QUESTION 3-D

In light of your answers to (b) and (c), what is the equilibrium? In what sense, if any, does concern about reputation lower average inflation in this environment?

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Since  $0 < p < 1/2$ , the value of  $\mathbf{W}$  given by equation-7 is larger than the value of  $\mathbf{W}$  given by equation-5 because the term  $(b2/a)[(1/2)p]$  is positive.

Thus, a type 1 policymaker would select  $\pi_1 = 0$ . Notice also that as  $p$  gets smaller,  $\mathbf{W}$  gets larger.

This implies that a strong reputation as a policymaker who is tough on inflation can allow a type 1 policymaker to achieve higher social welfare by first selecting  $\pi_1 = 0$