

Chapter 7 Review Questions

1. How is the IS curve derived and what factors determine its slope? What happens to the slope of the IS curve if consumption is interest elastic?

The IS curve represents equilibrium in the goods market (real part of the economy).

Consumption is a linear function of disposable income.

$$C = a + c(Y - T)$$

Investment is negatively related to the interest rate and determined by a set of autonomous factors Θ .

$$I = I(r, \Theta)$$

Government spending and lump sum taxes are exogenously determined by the fiscal authority (government).

$$G = \bar{G}$$

$$T = \bar{T}$$

Equilibrium in the goods market is where supply = demand, or output = expenditure.

$$Y = a + c(Y - T) + I(r, \Theta) + G$$

$$Y = \frac{a - cT + I(r, \Theta) + G}{1 - c}$$

Alternatively output equals the product of the multiplier ($k = 1/1 - c$) and the sum of autonomous expenditures ($AE = a - cT + I(r, \Theta) + G$).

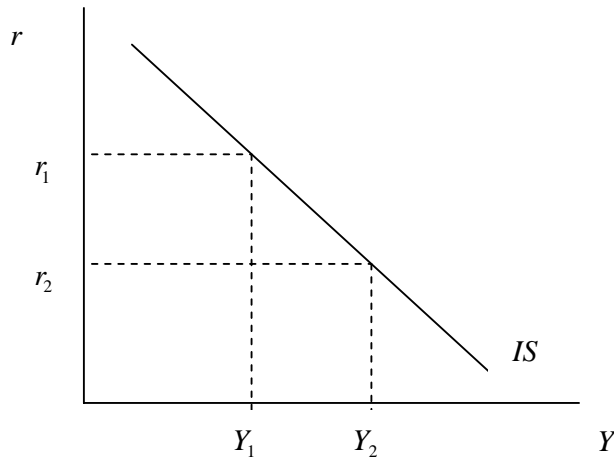
$$Y = kAE$$

The IS curve plots the relationship between equilibrium output and interest rates. An increase in interest rates reduces investment and autonomous expenditure, which leads to a multiplied reduction in output.

$$\frac{\Delta Y}{\Delta r} = k \frac{\Delta AE}{\Delta r} = k \frac{\Delta I(r, \Theta)}{\Delta r}$$

$$\text{If } \frac{\Delta I(r, \Theta)}{\Delta r} = -\phi \text{ then } \frac{\Delta Y}{\Delta r} = -\phi k$$

The IS curve plots an inverse relationship between interest rates and output. The gradient of the IS curve is determined by the multiplier and the interest sensitivity of investment.



Suppose consumption is interest elastic due to the substitution and income effects of interest rate changes (i.e. most people are net borrowers so an increase in interest rates has both a negative income and substitution effect on current consumption.)

$$C = a + c(Y - T) - \gamma r$$

Autonomous consumption, and hence autonomous expenditures, is now also determined by interest rates.

$$\frac{\Delta Y}{\Delta r} = k \frac{\Delta AE}{\Delta r} = -k(\phi + \gamma)$$

The slope of the IS curve is now flatter because autonomous expenditures are more sensitive to interest rate changes. This means a given change in interest rates has a larger impact on equilibrium output.

2. How is the LM curve derived and what factors determine its slope? What happens to the LM curve if there is an increase in the cost of liquidating financial assets?

The LM curve represents equilibrium in the money market, or where demand and supply of money are equal.

The money supply is set by the monetary authority.

$$M^s = \bar{M}$$

The demand for money is a positive function of income (transactions) and a negative function of interest rates (cost of liquidity preference).

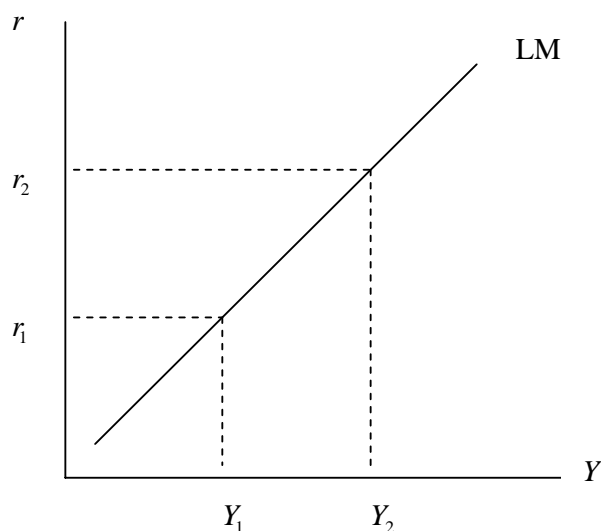
$$M^d = aY - br$$

The LM curve plots the combination of income and interest rates where: $M^s = M^d$

$$\bar{M} = aY - br$$

$$r = \frac{1}{b}(aY - \bar{M})$$

The slope of the LM curve is $\frac{\Delta r}{\Delta Y} = \frac{a}{b}$



The slope is determined by two factors.

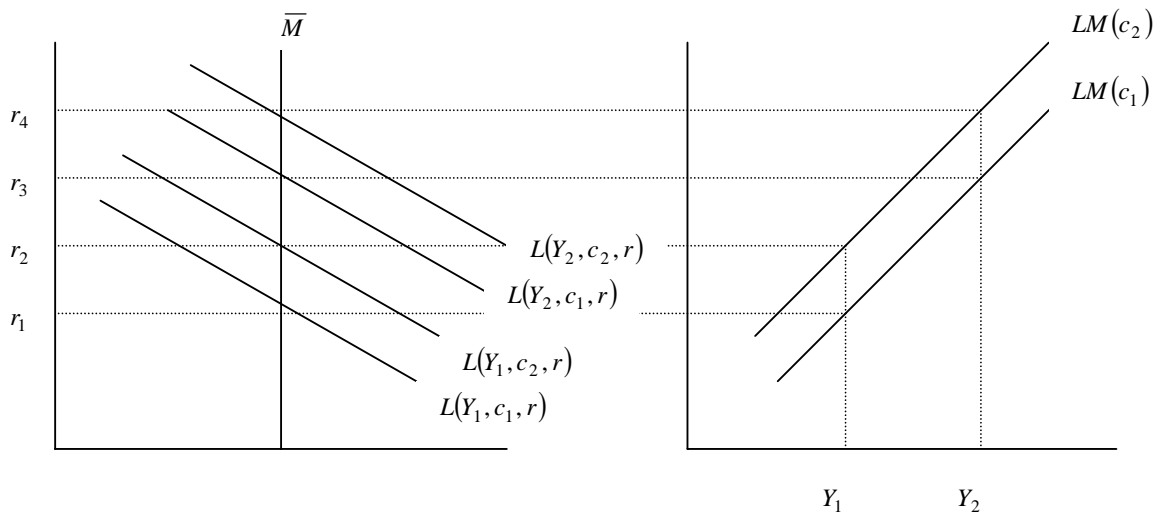
Parameter a is the income sensitivity of the demand for money. As this increases a given change in income leads to a larger increase in the demand for money. The interest rate will then have to rise by a larger amount in order to restore equilibrium to the money market. The LM curve becomes steeper.

Parameter b signifies the interest sensitivity of money demand. This determines the size of the interest rate response required to restore money market equilibrium as income rises. As this parameter increases the LM curve becomes flatter, because for any change in income the required interest rate change is smaller.

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The form of LM curve we have used has abstracted from the cost of liquidating assets. (This is explained in chapter 5).

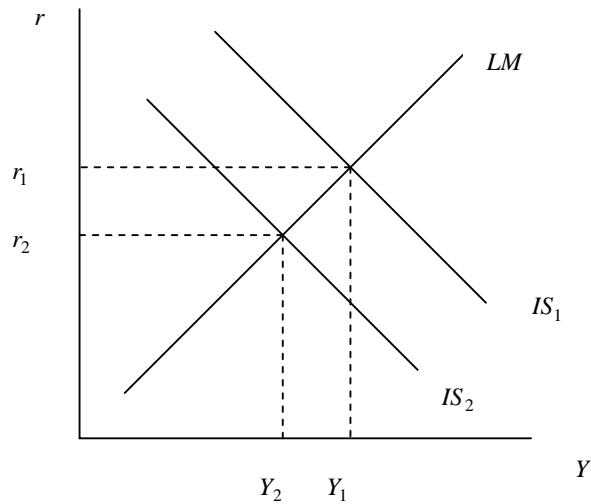
An increase in the cost of liquidating increases average money holdings at each level of income. Therefore, at each money supply equilibrium interest rates are higher so the LM curve shifts upwards.



3. Using the IS-LM model, explain how the equilibrium rate of interest and level of output will respond to the following:

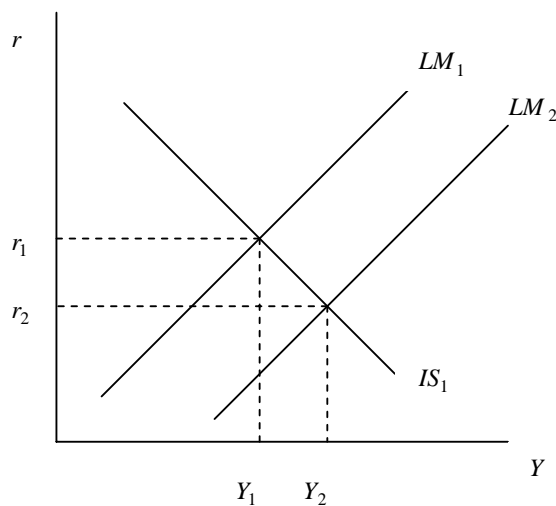
a. *Expectations of a future increase in unemployment*

If consumption is forward-looking, then an expected increase in future unemployment will lead to a fall in current consumption and a leftward shift in the IS curve. At the current level of interest rates there is now a position of excess supply in the money market, which leads to an increase in bond prices and a fall in interest rates. The economy settles at a lower interest rate and level of income.



b. Financial deregulation leading to the abolition of reserve-asset ratios

A reduction in the reserve-asset ratio increases the money multiplier and leads to an increase in money supply at each level of high powered money stock. The LM curve will then shift downwards as the equilibrium level of interest rates is lower at each level of output. The reduction in interest rates leads to an increase in investment and a multiplied increase in income. Overall interest rates are lower and equilibrium output is higher.



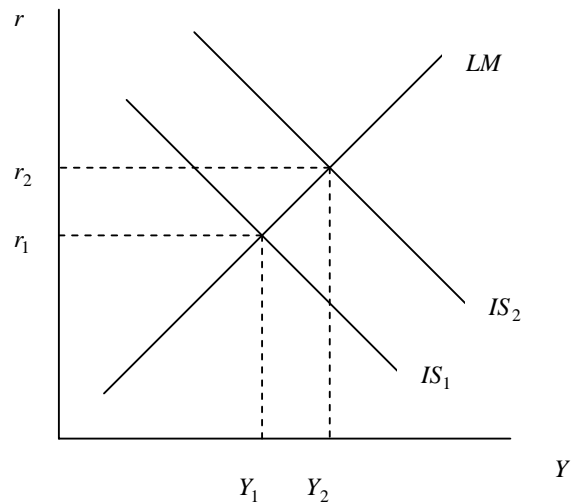
c. A fall in corporate profits

This would be expected to lead to a fall in investment. This could be because of lower internal funds available to spend on investment projects or lower business optimism.

As a result the IS curve will shift inwards and equilibrium output and interest rates will fall. This can be represented with the same diagram in part a.

d. A house price boom

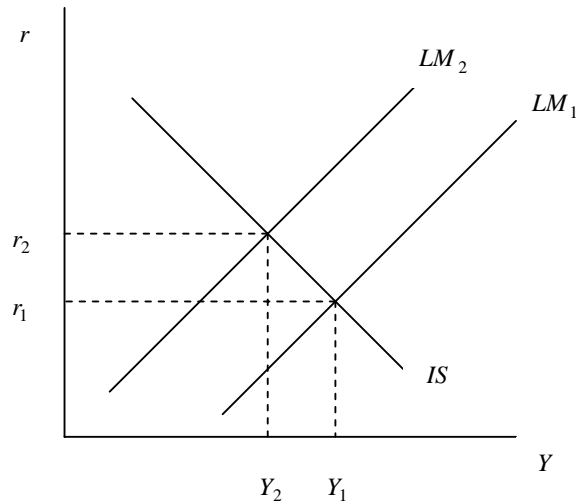
An increase in house prices leads to an increase in asset wealth, and if it can be liquidated through mortgage equity withdrawal consumption will rise. The IS curve will then shift outwards. At the existing level of interest rates there is now excess demand in the money market. As a result bonds are sold, and falling bond prices push up interest rates and crowds out some of the initial increase in output. Overall, output and interest rates are higher.



e. A program of investment in new ATMs

This will lower the cost of liquidating bank deposits, so would be expected to reduce the demand for money. Consequently, the LM curve will shift downwards and put downward pressure on interest rates. This is because lower money demand will lead to an increase in bond purchases and a rise in bond prices. As a result of the lower interest rates investment will be stimulated and output will increase. The new equilibrium position in the economy sees lower interest rates and higher output. The same diagram used in part b applies.

Suppose the cost of liquidating financial assets were to increase. Therefore average money holdings would rise and the money market equilibrium will yield higher interest rates at each level of output. The LM curve would shift upwards, the rise in interest rates will lead to a contraction in investment. The new equilibrium would result in higher interest rates and lower output.

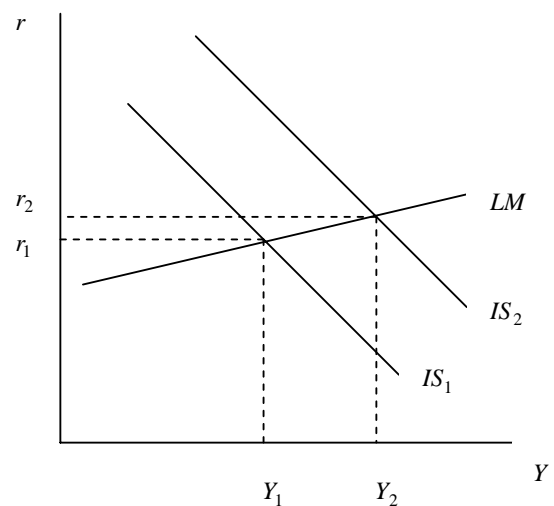
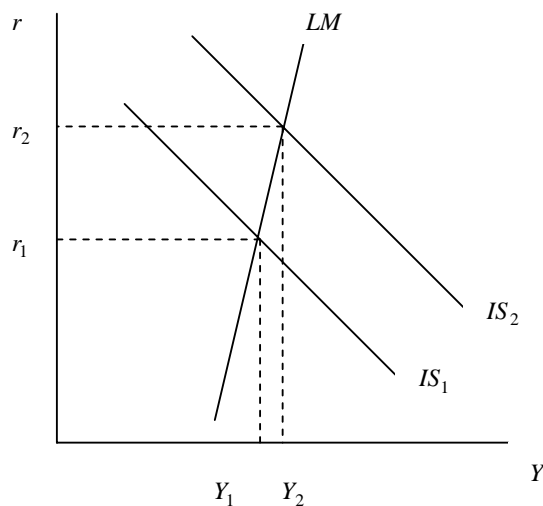


4. How is the effectiveness of monetary and fiscal policy affected by?

a. The slopes of the IS and LM curves

The effectiveness of fiscal policy and the slope of the LM curve

A fiscal expansion consists of either a reduction in taxes or a rise in government spending. As a result the IS curve shifts horizontally to the right. As output increases the money market moves into a position of excess demand which forces the interest rate up. The issue is how much the interest rate must rise in order to restore equilibrium- as this determines how much investment is crowded out and the overall effect of policy on equilibrium output.

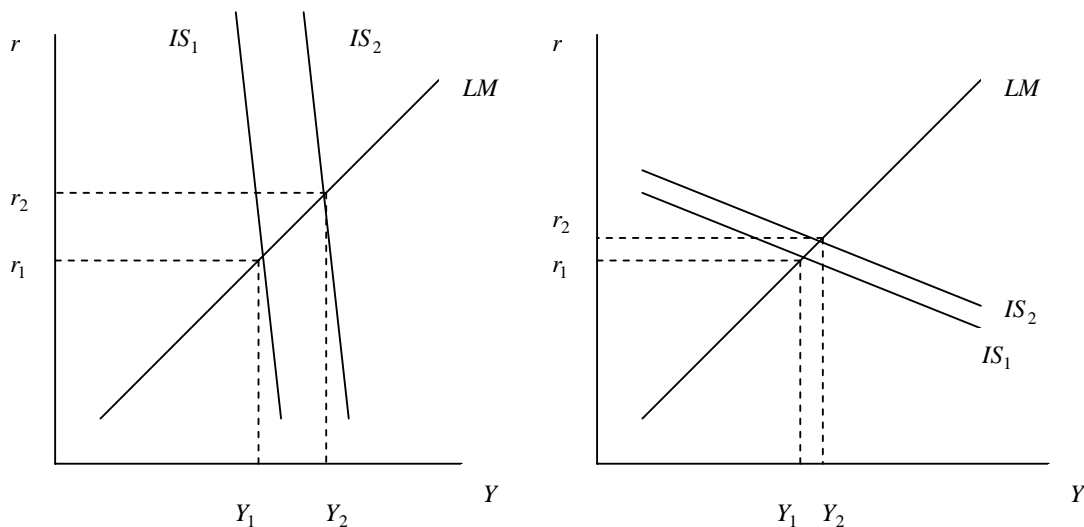


When the demand for money is interest inelastic, the interest rate must rise considerably to remove excess money demand. As a result the LM curve is steep and the crowding out effect is strong. If though the demand for money is relatively interest elastic only a small rise in interest rates are required to restore equilibrium in the money market. Consequently the LM curve is flatter and the crowding out effect is weaker. In this case fiscal policy has a larger impact on equilibrium output.

The effectiveness of fiscal policy and the slope of the IS curve

An expansive fiscal policy leads to a rightward shift in the IS curve and an increase in equilibrium interest rates. The rise in interest rates leads to some crowding out of investment which limits the impact of fiscal policy on equilibrium output.

If investment was relatively interest inelastic the IS curve would be steep. Therefore, the rise in interest rates would have small crowding out effects. If though investment was interest elastic the IS curve would be flatter. Therefore crowding out is stronger and fiscal policy is less effective.

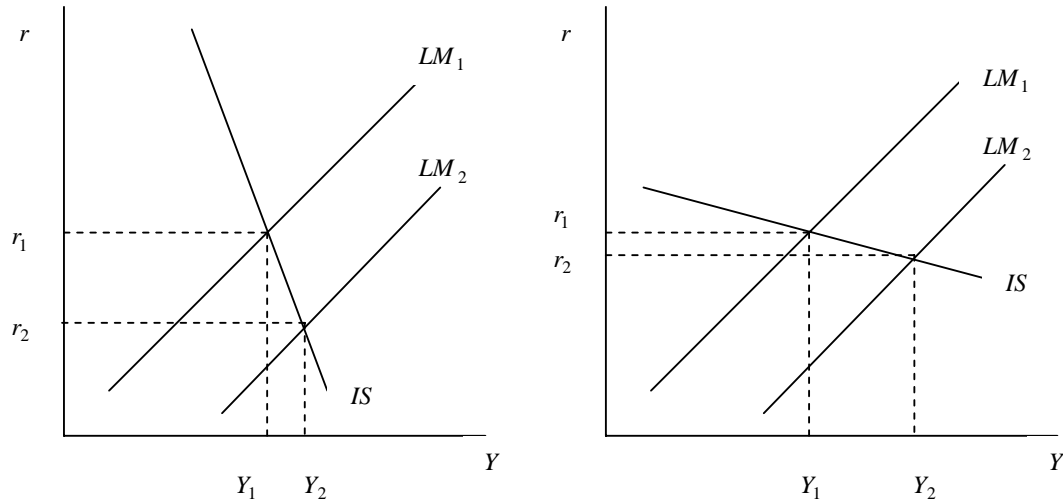


The effectiveness of monetary policy and the slope of the IS curve

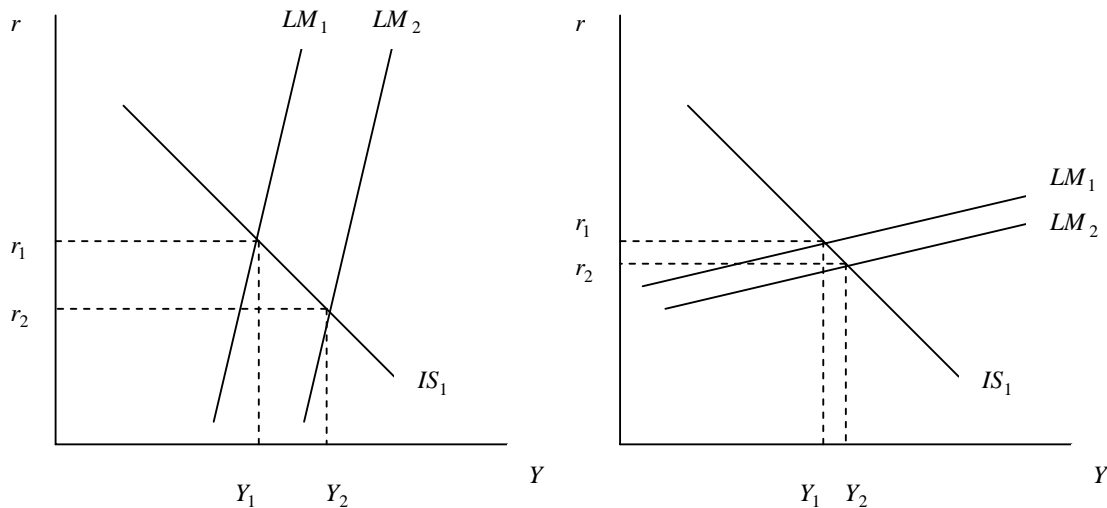
An expansion in the money supply leads to the private sector holding larger money balances than demanded at the prevailing interest rate, the money market is in a position of excess supply. Excess money holdings are used to purchase bonds which forces bond prices upwards and interest rates downwards. Because equilibrium interest rates are now lower at every level of output the LM curve shifts downwards.

The impact of lower interest rates on investment depends on the interest elasticity of investment. When investment is interest elastic the IS curve is relatively flat and

output expands strongly. When investment is interest inelastic the IS curve is steeper and the reduction in interest rates is less influential on equilibrium output.



The effectiveness of monetary policy and the slope of the LM curve



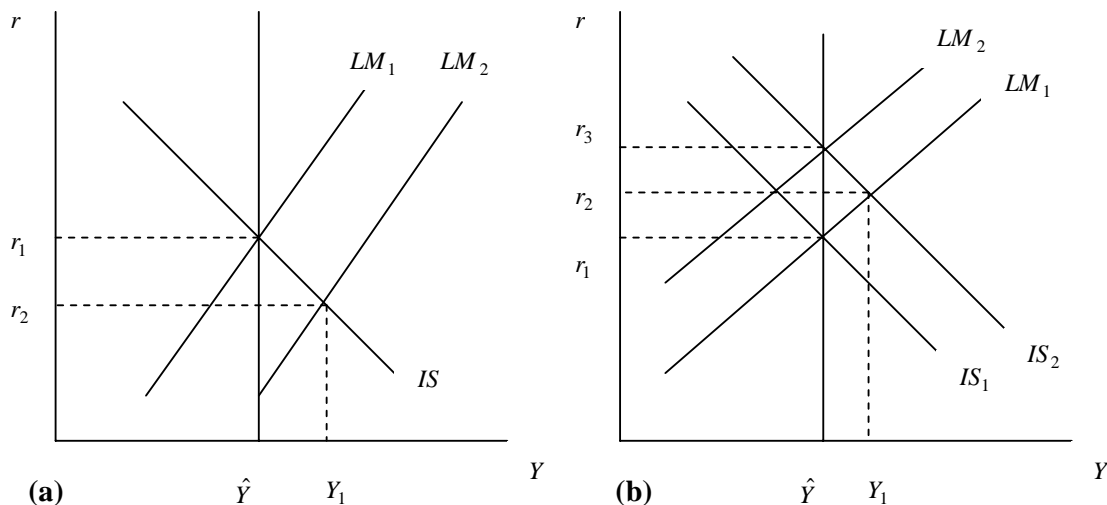
Following an expansion in the money supply how is the excess supply in the money market corrected? When the demand for money is interest inelastic the LM curve is steep. Here, interest rates must fall considerably to encourage the private sector to hold the extra money balances. A larger fall in interest rates means that the LM curve shifts downwards to a greater extent encouraging a larger increase in investment and equilibrium output.

The low interest responsiveness of money demand gives a clue as to why monetary policy is effective in this situation. The removal of excess supply requires an increase in money demand- which comes mainly from the transactions perspective through a larger rise in income. If the demand for money was perfectly inelastic, the LM curve would be vertical. The only way the money market equilibrium can be restored is for output to rise sufficiently so that the demand for money increases to restore balance.

When the demand for money is more interest elastic monetary policy is less effective in influencing equilibrium output. Only a relatively small reduction in interest rates is required to re-equilibrate the money market following an expansion in supply. Therefore the LM curve is flatter and only shifts downwards by a small magnitude.

When the demand for money is perfectly elastic the economy is often in a position known as the liquidity trap. Here the interest rate has fallen to such a low level that the private sector finds the compensation from holding bonds is not sufficiently attractive to forgo the benefits of liquidity (holding money). An expansion in the money supply will have no impact on the interest rate and the LM curve, which is in this case is horizontal, will fail to shift downwards. Monetary policy in this case would be completely ineffectual.

b. A positive relationship between prices and the deviation of output from its full employment level



The Neoclassical IS-LM model assumes that there is a full employment level of output \hat{Y} such that prices respond in the same direction as the deviation of actual output to this level, $\pi = \pi(Y - \hat{Y})$. Because prices are no longer fixed then this has a long run implication for monetary and fiscal policies.

In panel (a) the case of a monetary policy expansion is shown. The LM curve shifts downwards and equilibrium interest rates fall and output expands. However, because

output is above its full employment level prices begin to rise. This has the consequence of reducing the real value of the money stock which pushed the economy back towards its original equilibrium. Therefore, in the long run monetary policy is neutral. The money stock is higher, but as the price level has risen the real money supply and real variables in the economy are left unchanged.

Panel (b) considers the case of a fiscal expansion. The IS curve shifts rightwards and equilibrium output rises above the full employment level. The subsequent increase in prices will lower the stock of real money shifting the LM curve upwards and moving the economy back to equilibrium. In terms of levels, price adjustment means that fiscal policy is neutral in the long run, but not in terms of composition. Either government spending (if an increase in government spending) or consumption (if a cut in taxes) will be higher, but higher equilibrium interest rates will crowd out an equal amount of investment.

The effectiveness of both policies depends on how quickly prices adjust, and whether or not the policy has an impact on the full employment level of output. If prices adjust slowly, perhaps due to imperfect competition factors in labour and product markets, output in the short run can deviate from its full employment level for a considerable period of time. Hysteresis type effects might also lead to an outward shift in the full employment level of output (increased productivity from using previously unemployed factors of production, higher participation due to greater job opportunities) may make the effects of policy more permanent in the medium to long run.

More advanced problems

5. Consider the following:

$$C = 400 + 0.4Y_d$$

$$Y_d = Y - T$$

$$T = 100$$

$$I = 400 - 1000r$$

$$G = 100$$

$$(M/P)_d = 3Y - 10000r$$

$$M = 1000$$

$$P = 1$$

Where C is consumption, Y_d is disposable income, Y is income, T is the level of lump sum taxes, I is investment, r is the interest rate, G is government spending, $(M/P)_d$ is real money demand, M is the money supply and P is the price level.

a. Calculate the IS and LM curves and find the equilibrium level of interest rates and income. What is the level of investment in equilibrium?

The IS curve:

$$Y = C + I + G$$

$$Y = 400 + 0.4 * (Y - 100) + 400 - 1000r + 100$$

$$Y(1 - 0.4) = 860 - 1000r$$

$$Y = 1433\frac{1}{3} - 1666\frac{2}{3}r$$

The LM curve:

$$1000 = 3Y - 10000r$$

$$Y = 333\frac{1}{3} + 3333\frac{1}{3}r$$

Equilibrium is where IS = LM

$$1433\frac{1}{3} - 1666\frac{2}{3}r = 333\frac{1}{3} + 3333\frac{1}{3}r$$

$$1100 = 5000r$$

$$r = 1100/5000 = 0.22$$

$$I = 400 - 1000 * (0.22) = 180$$

$$Y = 1433\frac{1}{3} - 1666\frac{2}{3} * (0.22) = 1066\frac{2}{3} \text{ (from the IS curve)}$$

or

$$Y = 333\frac{1}{3} + 3333\frac{1}{3} * (0.22) = 1066\frac{2}{3} \text{ (from the LM curve)}$$

b. Concerned that the current level of investment is too low the government announces an expansionary fiscal policy and increases government spending by 200. Find the new equilibrium values of output, interest rates. By how much has investment been crowded out?

Government spending increases to 200 giving the new IS curve:

$$Y = 1600 - 1666\frac{2}{3}r$$

Equilibrium is where IS = LM

$$1600 - 1666\frac{2}{3}r = 333\frac{1}{3} + 3333\frac{1}{3}r$$

$$1266\frac{2}{3} = 5000r$$

Equilibrium interest rates are

$$r = 1266\frac{2}{3} / 5000 = 0.253333$$

Investment in equilibrium is:

$$I = 400 - 1000 * (0.253333) = 146\frac{2}{3}$$

Equilibrium output:

$$Y = 1600 - 1666\frac{2}{3} * (0.253333) = 1177.7777 \text{ (from the IS curve)}$$

or

$$Y = 333\frac{1}{3} + 3333\frac{1}{3} * (0.253333) = 1177.7777 \text{ (from the LM curve)}$$

Following the fiscal expansion there is an increase in output and interest rates, but investment is crowded out.

c. The level of income in b is the full employment level. What might be expected to happen if the government doesn't increase government spending by 200 as in b?

If output is below the full employment, $Y < \hat{Y}$ then prices would be expected to fall $P \downarrow$, but by how much? The full employment level is taken from part b.

$$\hat{Y} = 1177.7777$$

What is equilibrium interest rate r at $\hat{Y} = 1177.7777$? From the IS curve,

$$Y = 1433\frac{1}{3} - 1666\frac{2}{3}r$$

$$1177.7777 = 1433\frac{1}{3} - 1666\frac{2}{3}r$$

$$\hat{r} = (1433\frac{1}{3} - 1177.7777) / 1666\frac{2}{3} = 0.153333$$

From the LM schedule, the real money supply required to deliver interest rates of 15.3% is:

$$\frac{M}{P} = 3 * (1177.7777) - 10000 * (0.153333) = 2000$$

Therefore, the price level needs to fall to:

$$\frac{1000}{P} = 2000 \Rightarrow P = \frac{1}{2}$$

As a result of lower interest rates investment expands :

$$I = 400 - 1000 * (0.153333) = 246\frac{2}{3}$$

6. Suppose the government changes the tax system away from lump sum taxes to a proportional income tax. Tax revenue is now equal to tY where t is the marginal tax rate.

a. Write down the new consumption function and derive the IS curve

Consumption is still a linear function of disposable income $Y^d = (1-t)Y$

$$C = a + c(1-t)Y$$

Substituting into the IS curve using a similar form for investment and government spending

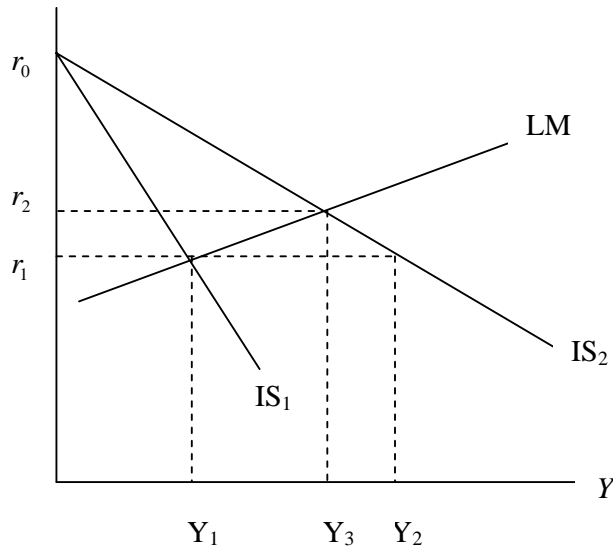
$$Y = a + c(1-t)Y + I(r, \Theta) + G$$

$$Y(1 - c(1 - t)) = a + I(r, \Theta) + G$$

$$Y = \frac{a + I(r, \Theta) + G}{1 - c(1 - t)}$$

b. Use the IS-LM diagram to show how changes in marginal tax rate affect the equilibrium level of output?

Changes in the tax rate lead to pivots in the IS curve. For a given level of autonomous expenditure, the multiplier effect on output would be greater when the tax rate is lower. This leads to pivots because if interest rates are high autonomous expenditures (investment) are lower, so the effect of the tax rate cut on output is smaller. Likewise, as interest rate falls the rise in autonomous expenditures has a greater effect the higher the multiplier (lower the tax rate).



$$Y_1 = \frac{a + I(r_1, \Theta) + G}{1 - c(1 - t_1)}, Y_2 = \frac{a + I(r_1, \Theta) + G}{1 - c(1 - t_2)}, t_1 > t_2$$

At the interest rate r_1 , a cut in taxes would lead to a pivot in the IS curve and output increases to Y_2 . However, the money market is now in a position of excess demand, hence interest rates rise, investment is crowded out and the economy moves to a new level of equilibrium output at Y_3 .

7. The economy is characterised by the following set of relations:

$$C = 100 + 0.8Y_d$$

$$Y_d = Y - tY$$

$$t = 1/6$$

$$I = 100 - 1000r$$

$$G = 100$$

$$M_d = 2Y - 9000r$$

$$M = 300$$

Where C is consumption, Y_d is disposable income, Y is income, t is the tax rate, I is investment, r is the interest rate, G is government spending, M_d is money demand and M is money supply.

a. Derive the IS and LM schedules

The IS curve, $Y = C + I + G$:

$$Y = 100 + 0.8 * (Y - \frac{1}{6}Y) + 100 - 1000r + 100$$

$$Y(1 - \frac{2}{3}) = 300 - 1000r$$

$$Y = 900 - 3000r$$

The LM curve, $M = M_d$:

$$2Y = 300 + 9000r$$

$$Y = 150 + 4500r$$

b. Calculate the equilibrium level of income (Y) and interest rate (r) in the economy.

Equilibrium income and interest rates are where the IS and LM curves intersect representing a general equilibrium of the goods and money markets.

$$900 - 3000r = 150 + 4500r$$

$$750 = 7500r$$

The equilibrium interest rate is

$$r = 750/7500 = 0.1 \text{ or } 10\%$$

The equilibrium level of output is

$$Y = 900 - 3000 * (0.1) = 600 \text{ from the IS curve}$$

$$Y = 150 + 4500 * (0.1) = 600 \text{ from the LM curve}$$

c. At the equilibrium in (i) the economy is below its full employment level of output $Y^ = 750$. By how much does the government have to increase its expenditure in order to reach this level of income? What is the budget deficit/surplus at this point? What is the new equilibrium rate of interest and how much is investment crowded out?*

If $\hat{Y} = 750$ then what is the equilibrium interest rate?

From the LM curve:

$$2 * (750) = 300 + 9000r$$

$$1200 = 9000r$$

$$r = 1200 / 9000 = 0.13333$$

Given this interest rate, what level of G will generate $\hat{Y} = 750$?

From the IS curve

$$750 = 100 + 0.8 * (750 - \frac{1}{6}(750)) + 100 - 1000 * (0.13333) + G$$

$$G = 183\frac{1}{3}$$

Hence the required increase in government spending is $\Delta G = 183\frac{1}{3} - 100 = 83\frac{1}{3}$.

The budget deficit is the difference between government spending and tax revenues,
 $G - T$

$$\text{If } Y = 750 \text{ then } T = \frac{1}{6} * (750) = 125$$

$$\text{Government deficit } (G - T) = 183\frac{1}{3} - 125 = 58.3333$$

$$\text{At the new equilibrium interest rate } I = 100 - 1000 * (0.13333) = -33\frac{1}{3}$$

There is actually disinvestment, implying at these interest rates the existing capital stock is above its optimal level.

d. Suppose the government decides against a fiscal expansion and decides to implement a monetary expansion. What increase in the money supply would be required to reach the target $Y^ = 750$. What is the government deficit/surplus at that point?*

A monetary expansion to achieve $Y^* = 750$

Given the original IS curve, what interest rate is required to meet the target?

$$750 = 900 - 3000r$$

$$r = 150/3000 = 0.05$$

What money supply will achieve this interest rate?

From the LM curve:

$$M = 2 * (750) - 9000 * (0.05) = 1050$$

Hence the required increase in the money supply is $\Delta M = 1050 - 300 = 750$

The government deficit:

$$G = 100 \text{ and } T = \frac{1}{6}(750) = 125$$

$$(G - T) = 100 - 125 = -25$$

A surplus! Although government spending hasn't changed tax revenues have risen due to the higher level of equilibrium output.

Incidentally, lower interest rates mean that investment is higher at

$$I = 100 - 1000(0.05) = 50.$$

e. The government's fiscal rules imply that it must run a balanced budget. What combination of fiscal policy (increasing G) and monetary policy (increasing M) would enable it to reach the full employment level of output whilst maintaining the balanced budget?

What combination of monetary and fiscal policy will achieve the full employment level of output and maintain a balanced fiscal budget?

$$\text{At } Y = 750 \text{ then } T = \frac{1}{6}(750) = 125$$

Hence, balanced budget requires $G = 125$ implying $\Delta G = 125 - 100 = 25$

Substituting this into the IS curve:

$$750 = 100 + 0.8 * (750 - \frac{1}{6}(750)) + 100 - 1000r + 125$$

$$1000r = 75$$

$r = 75/1000 = 0.075$ This is the interest rate that is simultaneously consistent with $G = T$ and $Y^* = 750$.

From the LM curve:

$$M = 2 * (750) - 9000 * (0.075) = 825$$

Hence, the change in the money supply required to achieve the interest rate that satisfied full employment and a balanced budget is $\Delta M = 825 - 300 = 525$

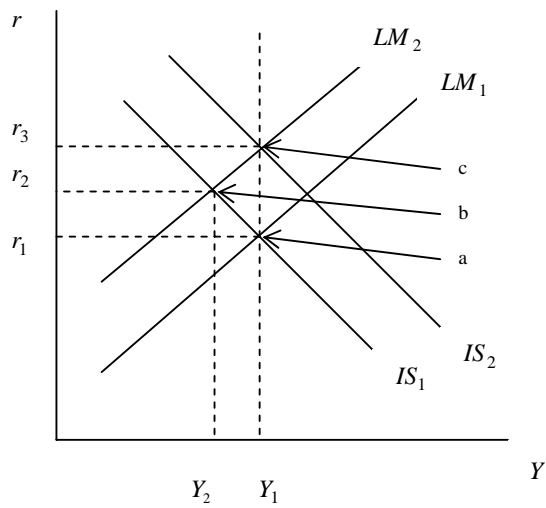
9. *What policies could the government use to keep income at its previous level following:*

a. an increase in credit card fraud

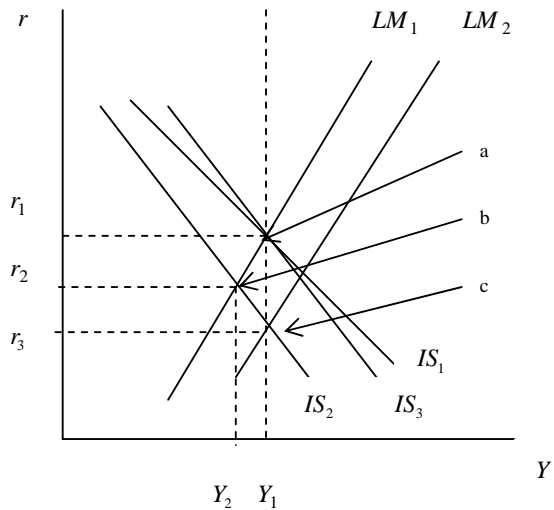
Credit cards are a way of drawing on current accounts. As a result of increasing fraud the demand for money (liquidity preference) rises at each income level. The LM curve shifts upwards as the domestic interest rates are higher at each level of output. Therefore the economy moves from equilibrium a to equilibrium b, and output falls from Y_1 to Y_2 .

There are two ways in which this could be offset. One would be an expansive monetary policy to lower equilibrium interest rates and reverse the shift in the LM curve. This would move the economy back to point a. Here credit card fraud increases the demand for money, so an expansion in the money supply means that the private sector can hold extra money balances without having to sell bonds- which would force up interest rates.

Alternatively, there could be an expansion in the IS curve through perhaps a rise in government spending or a tax cut. This will move the economy to point c. This fiscal expansion directly offsets the output effect of the credit card fraud.



b. An increase in the marginal propensity to save



This is the same as a fall in the marginal propensity to consume, which creates an inward pivot in the IS curve from IS_1 to IS_2 . This is because the multiplier effect of the autonomous expenditures is reduced by greater leakages from savings. As a result the economy moves from point a to point b and output falls.

To reverse this, the government could unleash a fiscal expansion and shift the IS curve to IS_3 , or move the economy to point c through an expansionary monetary

policy. In doing so they must however note that the multiplier is now lower because of the higher saving propensity.

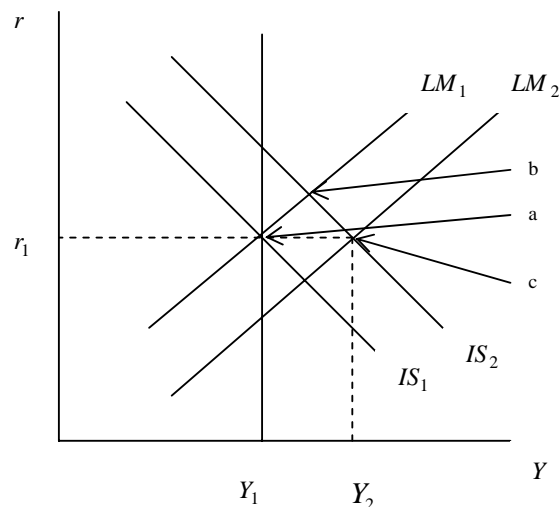
An alternative would be to try and directly offset the impact of the higher saving propensity and prevent the IS curve from pivoting. If there are proportional income taxes then the IS curve may take the following form.

$$Y = \frac{a + I + G}{1 - c(1 - t)}$$

Following a fall in the propensity to consume, c , the IS curve can be prevented from pivoting if the multiplier is left unchanged. This could be achieved through a compensating fall in the tax rate t . Although households save a larger proportion of their disposable income, a tax cut will increase the level of disposable income leaving consumption unchanged.

10. Using the IS-LM model, suggest a suitable policy mix to achieve the following:

a. an increase in income whilst keeping interest rates constant

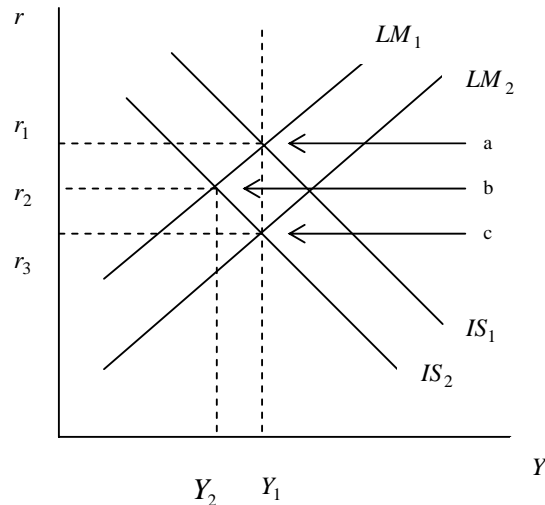


This could be achieved by a fiscal expansion (either a rise in government spending or a reduction in taxes) with the interest rate accommodated by an expansion in monetary policy.

The fiscal expansion will shift the IS curve to the right. The increase in output will lead to an increase in the demand for money for transactions purposes. To achieve this, the private sector will sell bonds, lowering bond prices and forcing up interest rates. Therefore the economy moves from point a to point c . In order to prevent this,

policy-makers must increase the money stock sufficiently so that the private sector can satisfy their liquidity preference without selling bonds. This will shift the LM curve downwards and the economy will move to point *c*. Output expands further, because the subsequent fall in interest rates reverses the crowding out effects of the initial fiscal expansion on investment.

b. a decline in the fiscal deficit while keeping output constant



To close a fiscal deficit will require either an increase in taxes or a reduction in government spending. Either of these will shift the IS curve inwards. However, to prevent this from reducing output the government will need to unleash a monetary expansion and shift the LM curve downwards.

This example demonstrates why coordinating monetary and fiscal policies might be offer advantages when an economy needs to correct a fiscal deficit. The fiscal retrenchment will reduce out and move the economy from point *a* to point *b*. Therefore, unless monetary policy is simultaneously loosened, moving the economy to point *c*, output will fall.

This might be a consideration when choosing to delegate monetary policy to an independent central bank- because monetary and fiscal policies are now operated by separate bodies coordinating them to such extent may become difficult. In this case the fiscal authority may be discouraged from attempting to deal with a deficit in the first place if it knows that an offsetting monetary policy stance isn't necessarily forthcoming.

c. an increase in the share of investment in GDP

See the answer to part b. Here a fiscal retrenchment and a monetary expansion keeps output at the same level, but lowers the prevailing domestic interest rate in

equilibrium. As a result investment expands and represents a higher proportion of GDP. If the fiscal contraction was a rise in taxes, household consumption will be lower, or alternatively the fiscal contraction represented a fall in government spending as a proportion of output.

11. It is argued that the following equation is a more accurate description of investment behaviour:

$$I = \bar{I} + \beta Y$$

Investment is equal to a fixed quantity \bar{I} and positively related to income Y .

a. What factors might justify this form of investment function?

First, this functional form suggests that investment is insensitive to interest rates. This is not an unconventional thought. First, interest rates may not represent the true cost of capital which also needs to take into consideration elements such as depreciation and capital gains. It is also widely considered that interest sensitivity is low in its own right, and changes in output are much more significant.

For example, if the economy is expected to enter into a severe recession- firms may be unwilling to undertake large investment projects regardless of how low current rates of interest actually are. Vice-versa, if the economy is expanding strongly firms may be willing to undertake investment projects even if the interest rate is rising.

There are various reasons as to why investment might be positively related to income. It is widely acknowledged that indicators of business optimism and confidence are important drivers of investment, and these in themselves tend to be procyclical. Also, q valuations of investment projects are likely to rise if the economy is performing well, and this is an indicator that the economy will continue to perform well in the future.

Finally, it might be argued that because financial markets are imperfect due to asymmetric information, the availability of credit may be a more important factor than the cost of credit. When current output is strong, it would be expected that firms will have greater profitability and can therefore finance more investment projects from internal funds.

b. Using this new investment equation, construct an IS curve. What happens to the size of the multiplier?

Substituting the new investment equation into the typical form gives:

$$Y = a + c(Y - T) + \bar{I} + \beta Y + G$$

$$Y(1 - c - \beta) = a - cT + \bar{I} + G$$

$$Y = \frac{a - cT + \bar{I} + G}{1 - c - \beta}$$

$$Y = kAE \quad \text{where } k = \frac{1}{1 - c - \beta} \text{ and } AE = a - cT + \bar{I} + G$$

Note, that because investment now responds positively to output movements the multiplier in the economy is much greater. Changes in autonomous expenditure than generate output movements will now have feedbacks through both consumption and investment.

c. Using the new IS curve, examine the effects of fiscal policy on equilibrium output.

Fiscal policy is very effective, for two reasons. First, the multiplier is larger, so for a given fiscal expansion the rightward shift in the IS curve is much greater. Second, because investment is interest insensitive there is no crowding out effect. So, overall fiscal policy can have a significant impact on the economy. In fact, in this case fiscal policy actually crowds in, rather than crowds out, investment expenditures.

