

IS–LM Review Sheet - Econ 136

The LM curve

The LM curve tells you all combinations of Y and r that equilibrate the money market, given the economy's nominal money supply M and price level P . That is, the LM curve is the set of all Y and r combinations that satisfy the **money market equilibrium condition**, real money demand must equal the given real money supply:

$$\frac{M^d}{P}(Y, r) = \frac{M}{P}. \quad (1)$$

Notice the real money supply—the right hand side of (1)—is fixed when drawing the LM; any change in the real money supply *shifts* the entire curve. Assuming real money demand depends positively on the amount of real transacting Y and negatively on the opportunity cost of holding money r , the LM is an upward sloping curve, with steepness depending on how sensitive real money demand is to changes in r . Here's an example of how to find the equation of the LM.

Example 1: Suppose the money market satisfies:

1. $M = \$5,000$
2. $P = 2$
3. $\frac{M^d}{P} = 5Y - 1,000r$

Substituting these values into Eq. (1) results in:

$$5Y - 1,000r = 2,500.$$

To simplify, solve for Y as a function of r :

$$5Y = 2,500 + 1000r;$$

so the equation of the LM in this sample economy is:

$$\boxed{Y = 500 + 200r}.$$

Graphically, it's a line with intercept 500 on the Y axis and a slope of 200 (that is, every time r goes up by 1, Y goes up by 200 units).

The IS curve

The IS curve tells you all combinations of Y and r that equilibrate the output market, given that firms are willing to supply any amount that's demanded. That is, the IS is the set of all Y and r combinations that satisfy the **output market equilibrium condition** that total demand given income Y and the cost of borrowing r must equal total supply:

$$Y^d(Y, r) = Y. \quad (2)$$

Notice the Y on the left hand side stands for income (because consumption demand depends on income) while the Y on the right hand side stands for total supply. We are justified in using the same symbol for both things because according to the basic national income accounting identity, whatever quantity is supplied creates income of the same amount. In turn, total demand (Y^d) can be broken up into the sum of consumption demand, investment demand, government demand, and net foreign demand:

$$Y^d(Y, r) \equiv C^d + I^d + G^d + NX^d, \quad (3)$$

where NX stands for net exports (that is, exports minus imports), so how much more foreign countries demand from us than we demand from them. Here's an example of how to find the equation of the IS.

Example 2: Suppose the output market satisfies:

1. $C^d = 1000 + .5(Y - T)$, where $T = 600$
2. $I^d = 500 - 100r$
3. $G^d = 600$
4. $NX^d = 200$

Notice consumption demand depends on after tax income $Y - T$ and investment demand depends on the cost of borrowing r , that's why total demand (Y^d) depends on both Y and r . Adding the 4 components of total demand together after substituting in the value of T we find total demand is:

$$Y^d = [700 + .5Y] + [500 - 100r] + 600 + 200,$$

which simplifies to

$$Y^d = 2,000 + .5Y - 100r.$$

Now use the output market equilibrium condition, Eq. (2) above, to find the IS. If firms will supply whatever is demanded, then

$$2,000 + .5Y - 100r = Y.$$

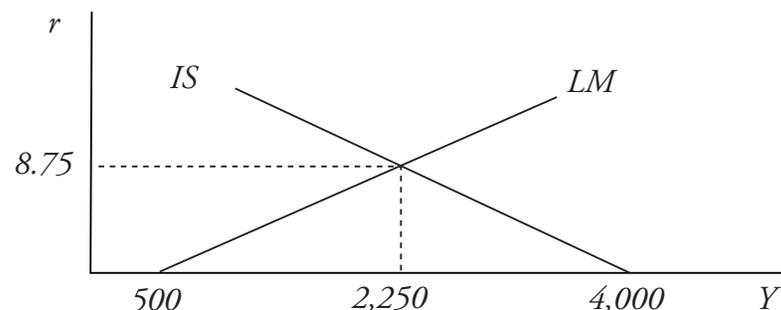
To simplify, solve for Y as a function of r :

$$.5Y = 2,000 - 100r;$$

so the equation of the IS curve in this sample economy is

$$\boxed{Y = 4,000 - 200r}.$$

Graphically, it's a line with intercept of 4,000 on the Y axis and a slope of -200 (that is, every time r increases by 1, Y goes down by 200 units).



Putting it together, in our sample economy the IS and LM curves look like the above. They intersect at $Y = 2,250$ and $r = 8.75$.¹ [Of course this is a very unrealistic interest rate since $8.75 = 875\%$!] This is the **short run (SR) equilibrium** of the economy: where both the money market and the output market are in equilibrium. A SR equilibrium also is a **long run (LR) equilibrium** if there is full employment, i.e., if the labor market also is in equilibrium. In particular, the above SR equilibrium also is a LR equilibrium if and only if there is enough demand for full employment, i.e., if and only if 2,250 is the full employment output level Y^{FE} .

¹To find the crossing place, you need to find where $Y = 500 + 200r$ (on the LM) and $Y = 4000 - 200r$ (on the IS). Solving these 2 equations in 2 unknowns, i.e., putting the 2 together, we see that at the crossing place:

$$500 + 200r = 4000 - 200r,$$

hence $r = 8.75$. Plugging this value for r into either the IS or LM equation shows $Y = 2250$.