Lecture: IS-LM

The LM Curve

Describes equilibrium in the money market. We begin with why people demand money. The following is basically Keynes' approach as specified in 'The General Theory' (the book he published in 1936)

Transactions motive People desire money to finance their expenditures or transactions varies with Y The greater is Y the greater will be the number of transactions and the greater the demand for money.
Precautionary motive. This provides a cushion against the uncertainty of life and when and where you will be called upon to pay cash. varies (with R?)
Speculative demand. People keep money aside for 'a good thing'. varies with R. (the nominal rate of interest)

The argument for the last two is simple (and also a little simplified). If people keep money back for speculative or precautionary purposes then they do not receive the 'interest' they could get if they invested it (this is less true know than in 1936 when Keynes formulated the theory, now you can get interest on money you keep in a current account. Arguably the real cost is the difference between the current account and the deposit account rate of interest as in (6.2) below, lets ignore this for the time being)

Note: TD, transactions demand, SD speculative demand. We have assumed precautionary demand does not vary with R. R= rate of interest (nominal) and Y=GDP.

Hence the demand for money will be a log-linear function like:

$$\ln(MD_t) = \beta_0 + \beta_1 \ln(Y_t) + \beta_2 R_t + \beta_3 \ln(MD_{t-1}) \quad (1)$$

In the Bank of England model of the UK economy we have the following long-run equation:

$$\ln(MD) = \ln(Y) + 0.02(RD - RS) + 0.78\ln(NFW/Y) \quad (2)$$

where RD-RS = deposit rate - London clearing bank's base rate.

Turning back to (1). This represents the demand for money. *Equilibrium* in the money market will exist when money demand equals the money supply. As we saw earlier we can assume, with some inaccuracy perhaps, that the Central Bank (the ECB in the Eurozone) can control the money supply. Let us suppose it sets it at MS_1. We will work with a simpler version of (1) without lags, equilibrium will then require:

$$\ln(MS_1) = \ln(MD) = \beta_0 + \beta_1 \ln(Y) + \beta_2 R \quad (3)$$

Rearranging we can see that this becomes:

$$\ln(MS_1) - \beta_0 - \beta_1 \ln(Y) = \beta_2 R$$
$$\text{or } \ln(MS_1)/\beta_2 - \beta_0/\beta_2 - \beta_1/\beta_2 \ln(Y) = R \quad (4)$$

This says that given a fixed money supply and given a specific value for Y there will be a unique value of R which secures equilibrium in the money markets. This relationship in (4) which specifies the combinations of R and Y which secure equilibrium in the money markets is known as the LM curve. Intuitively we have

Key paragraph; $Y_1 \rightarrow TD_1$; $R_1 \rightarrow SD_1$ If we have equilibrium in the money market then $TD_1 + SD_1 = MS_1$. Right now what happens if Y *increases* to Y_2? $Y_2 \rightarrow TD_2$ (where $TD_2 > TD_1$). Hence with a fixed money supply

in order to retain equilibrium in the money market SD will have to fall which will require a higher rate of interest. Equilibrium in the money market means that with a higher level of GDP we must have a higher level of R. We will derive the LM curve diagrammatically. But note the following. The LM curve slopes upwards. An increase in the money supply means that for a given level of interest rate and hence a fixed speculative demand, there will be more for transactions purposes and the new equilibrium will require an increase in Y. Diagrammatically the LM curve shifts to the right with an increase in the money supply.

The IS Curve

We have covered equilibrium in the money markets. We now turn to equilibrium in the real side of the market - the goods market. We can measure GDP by counting up how much people spend or by counting up their income, the two are the same. Total income = Total expenditure = Total output. Let us concentrate on total income in a *closed economy* (no imports or exports). People do three things with their income: they spend it, they pay direct taxes with it or they save it:

$$Y = C + S + T \qquad (1)$$

[Note we have started with equation 1 as the first equation]. On the expenditure side, there are in a closed economy three sources of expenditure:

$$Y = C + I + G \qquad (2)$$

Now lets simplify things still further. Let us assume a balanced budget (T=G). It does not take a genius to see that all of this implies that:

$$I + G = S + T \qquad (3)$$

We have done nothing startling so far and indeed (3) can hardly be a condition for equilibrium. It is a truism, it is true by definition. But this alone should give you cause to pause a minute and think. Why should it be that investment which is largely done by firms should equal savings which is primarily done by households? Why should two decisions made by two different sets of people be equal always and all the time? The answer is of course is that we fiddle the figures. Any mars bars left on the shelf at the end of the year which the shop keeper had expected to sell are part of his stocks or inventories and counted as investment. Not an investment he/she expected to make, not a ***planned*** investment but an investment none the less. The same is true for unsold cars, cranes, aeroplanes, etc, etc. The firm who makes steel pipes and sells less than expected engages in ***unplanned investment.*** Now it should be obvious that a plausible definition of equilibrium is when everyone's plans are realised. In this case planned investment equals actual investment ($I^p = I$) and planned saving equals actual savings ($S^p = S$) (I have not followed the argument through but it is pretty obvious that in certain cases consumers will not be able to buy what they will have planned in which case there will be unplanned saving). Now when everyone's plans are realised and (3) holds, as it always does, we have the following definition for equilibrium in 'the goods market' or 'the real economy'.

$$I^p + G = S^p + T \qquad (4)$$

We have already analysed what people plan to save, it is the reverse of what they plan to consume. In the simple Keynesian function it is a function of disposable income (YD, income left after paying taxes):

$$S^p = a^* + (1-b)YD \qquad (5)$$

$$S^p = a^* + (1-b)(1-t)Y \qquad (6)$$

[t is the tax rate, in Slovakia say 0.2]. a* is autonomous saving [the amount which will be saved if there is no income, may be negative]. The key point and it is a pretty obvious one is that planned saving is an increasing function of Y. In addition:

$$T = tY \qquad (7)$$

Now lets turn to planned investment, our previous analysis suggested that this would be an decreasing function of the rate of interest (R). We are simplifying here. I am not distinguishing between the real and the nominal rate of interest and I am not considering all the other things that may impact on investment.

$$I^P = c + dR \qquad (8)$$

remember that because an increase in R causes a fall in I^P d will be negative. We will assume G is exogenous, i.e its value is fixed and is therefore outside the scope of the analysis. Right, now using (4), (6), (7) and (8), we can see that equilibrium in the goods market requires:

$$c + dR + G = a^* + (1-b)(1-t)Y + tY$$

Rearranging we have:

$$dR = a^* + (1-b)(1-t)Y - c + tY - G$$

$$R = a^*/d + (1-b)(1-t)/dY - c/d + t/dY - G/d \qquad (9)$$

Now $(1-b)(1-t)/d < 0$ (because $d<0$). Hence an increase in the rate of interest will need a lower level of Y to retain equilibrium. Again I am aware that the above argument is a bit convoluted, so lets give it an intuitive spin:

Key paragraph: An increase in interest rates will cause a reduction in planned investment. To maintain equilibrium we must have a reduction in the total of planned savings and taxation. This requires a reduction in Y. The IS curve associates higher interest rates with lower Y.

$R \rightarrow \downarrow I^P$ Hence to stay in equilibrium we need $\downarrow S^P$ which will only come about of $Y\downarrow$

Just one final note before we do this diagramtically. According to (8) what impact will an increase in G have on R? What further impact will this have on I?

What is the minimum you must know? The IS curve is the combinations of R and Y which results in equality between planned I + G and planned S +T. An increase in G shifts the IS curve outwards. An increase in t swivels it inwards.

The LM curve is the combinations of R and Y which results in equality between planned the demand for money and the supply. It slopes upwards. An increase in the money supply shifts the LM curve outwards.