Macroeconomics: BSc Year One

A Model of Aggregate Demand

We have, in summation, found:

$$y_d = c + i + g$$
$$c = a + by$$
$$i = I_0 - h(r^m - \dot{P}^e)$$
$$g = \bar{g}$$

Putting these together, we get:

$$y^d = a + by + I_0 - h(r^m - \dot{P}^e) + g\ ,$$

showing that aggregate demand is influenced by real income, real interest on bonds, expected inflation, and government expenditure. $\dot{P}^e$ is assumed, like government expenditure, to be exogenous.

Real Income

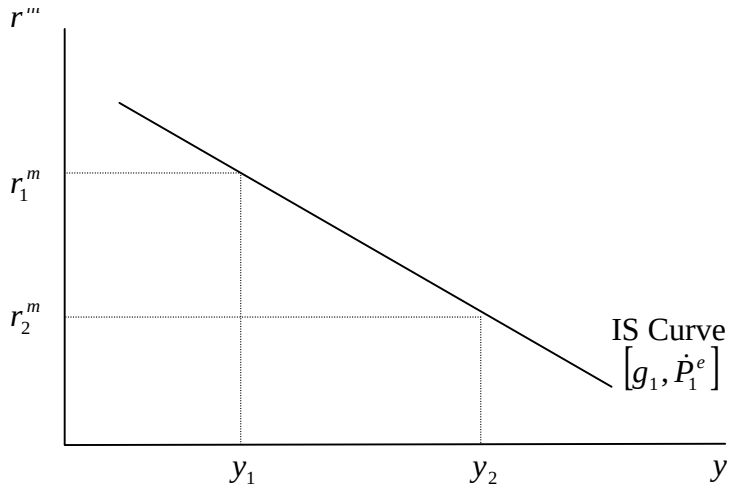
y^d represents the actual expenditure in the economy, and in every economy it must be true that actual expenditure, actual income and actual output are equal. From this, we gather that $y^d = y$, on the provision that aggregate demand is the demand for only those goods produced in that time period. This gives the equilibrium condition, and from this we get the equation:

$$y^d = y = \frac{a + I_0 + \bar{g} - h(r^m - \overline{\dot{P}^e})}{1 - b}$$

which is often described as the IS curve, as in a closed economy with no government it shows how saving (income minus consumption) varies with investment.

Imagine that $\overline{\dot{P}^e}$ and $\bar{g}$ are fixed at $\dot{P}_1^e$ and g_1. Assuming that the rate of interest is at r_1^m, we can say that:

$$\begin{aligned} y^d &= y_1 \\ &= c_1 + i_1 + g_1 \\ &= (a + by_1) + (I_0 - h(r_1^m - \dot{P}_1^e) + g_1 \end{aligned}$$



At another point on the curve, we can say that, initially, as incomes change, consumption will stay the same (due to 'sticky' consumption), but interest rates will rise. Consumption will then rise over time according to the equation $c = a + by$, but because, by definition, $0 < b < 1$, consumption will not rise by as much as income:

$$\begin{aligned} y^d &= y_2 \\ &= c_2 + i_2 + g_1 \\ &= (a + by_2) + (I_0 - h(r_2^m - \dot{P}_1^e) + g_1 \end{aligned}$$

where, because $i_2 > i_1$ and $c_2 > c_1$, we can see that $y_2 > y_1$. We have thus shown that a rise in interest rates leads to a corresponding fall in the equilibrium level of aggregate demand.

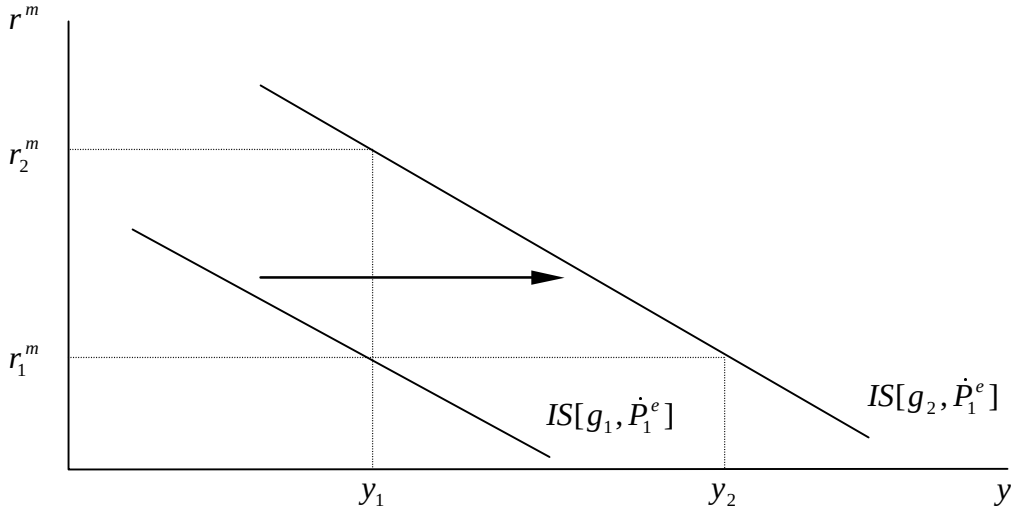
Influences on the IS Curve

There are two influences on the position of the IS curve, from those variables set to be exogenous above - government expenditure and expected inflation.

Government Expenditure

We can see that $\frac{dy}{dg} = \frac{1}{1-b} < 0$, from the equation we had for equilibrium income. Therefore, if government expenditure increases, income will also, giving a horizontal shift to the right.

Meanwhile, we can also find that $\frac{dr^m}{dg} = \frac{1}{h} < 0$, and so any increase in government expenditure will also lead to a vertical shift upwards.



We can show this algebraically by holding r^m constant:

$y_2 = c_2 + i_1 + g_2$ (note y_2 is higher; c_2 is also higher, but not by as much)

$\dot{y} = \dot{c} + \dot{g}$

$= b\dot{y} + \dot{g}$ $\Rightarrow \frac{\dot{y}}{\dot{g}} = \frac{1}{1-b}$

Expected Inflation

We can see that $\frac{dy}{d\dot{P}^e} = \frac{h}{1-b} > 0$, implying that a rise in inflation will lead to a rise in income.

However, effects on interest rates are more interesting; we can see that $\frac{dr^m}{d\dot{P}^e} = 1$, with the implication that any rise in expected inflation will be matched by the percentage change in income rates.

This result can easily be explained; to be on the IS curve, the equation for equilibrium aggregate demand ($y_1 = c_1 + i_1 + g_1$) must be true. After shifting the curve through changes in expected inflation, we can state that income, consumption and government expenditure will stay the same, so initial investment must be the same as final investment:

$I_0 - h(r_1^m - \dot{P}_1^e) = I_0 - h(r_2^m - \dot{P}_2^e)$

$r_1^m - \dot{P}_1^e = r_2^m - \dot{P}_2^e$

Therefore, if inflation increases by 5% points, the interest rate must increase by the same amount to keep investment the same.