Economics 21 **Spring 2016**

AS-AD Model

The Aggregate Demand Curve is "simply" the reduced form equation for Y from IS-LM[1]:

$$Y = \frac{Z_0 + \frac{(i_2 + nx_2)}{l_2}\frac{M^S}{P}}{(1 - MPS) + \frac{l_1}{l_2}(i_2 + nx_2)}$$

where we reverse the equation and solve for P in terms of Y:

$$P = \frac{\frac{(i_2+nx_2)}{l_2}M^S}{[(1\text{-}MPS)+\frac{l_1}{l_2}(i_2+nx_2)]\cdot Y - Z_0}$$

It is worth noting a few things about the above equation:

1) It contains more variables than Blanchard's Eq. 7.3 (p. 138) would lead you to believe. It includes all of the private sector exogenous variables in Z_0 (like c_0, i_0, and nx_0), which shift the AD curve in the same way as the government policy variables g_0 and t_0.

2) The AD curve is **non-linear** because Y is in the denominator, which is a MAJOR headache. Because of this (even without the complicated aggregate supply equation below), it is impossible to solve the AS-AD model explicitly for the two endogenous variables P and Y no matter how much math you know[2]. We will, therefore, use the following linear approximation:

(1) $Y = d_0Z_0 + d_1(M^S - P)$

solving for P, the equation looks like

(1a) $\mathbf{P = (d_0/d_1)Z_0 + M^S - (1/d_1)Y}$

where:

a) increases in Z_0 and M^S shift the AD curve up by (d_0/d_1) and 1 respectively
b) changes in the subscript 1 and 2 parameters in IS-LM (like i_1 or i_2) alter d_0 and d_1 (but we will ignore this).

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[1] Note that the equations below includes the fact that NX is now a negative function of r (ie. everywhere there was an i_2 in IS-LM Release1.0, there is now a $(i_2 + nx_2)$).

[2] The correct way to solve the model would be with numerical methods, but this would require us to know the values for the various parameters.

The Aggregate Supply Curve is derived from the labor market, but it too is complicated especially with our new souped-up version of Blanchard's model.

For us, Blanchard's equation 7.2 (p. 134) would equal:

$$P = P^e \frac{A^e}{A}[1 + m_0 - (1 - \frac{Y/A}{L})] \cdot F[1 - \frac{Y/A}{L}, z]$$

which when we substitute $(1 - \alpha(1 - \frac{Y/A}{L}) + z)$ for F[•] becomes an even bigger mess. [**Be careful**: small case z has **nothing** to do with large case Z_0]

So, we will approximate this by:

(2) $\mathbf{P = P^e + s_1 \cdot (Y - Y_n)}$

!!Reduced Form Equations!!

There are two endogenous variables, P and Y, and two equations, (1a) and (2). Until we introduce dynamics, P^e is an exogenous variable:

(3) $$Y = \frac{d_0 Z_0 + d_1(M - P^e) + d_1 s_1 Y_n}{1 + d_1 s_1}$$

(4) $$P = \frac{P^e + s_1(d_0 Z_0 + d_1 M - Y_n)}{1 + d_1 s_1}$$

It is the introduction of dynamics that makes the model interesting and important[3]. If we assume that P^e follows adaptive expectations, then $P^e_t = P_{t-1}$. The model now moves over time as P^e chases after last year's P. The introduction of dynamics means that we need to keep track of time: Y, P, and P^e now all have time subscripts. Equations (3) and (4) solve for Y_t and P_t respectively, but on the right hand side P^e_t equals P_{t-1}. This means that P^e is now an endogenous variable (it equals last year's price level which changes over time).

Finally, if you look carefully at equations (3) and (4), you will realize that we cannot solve the model without initial conditions. In order to find Y_1 and P_1 we need to know P^e_1, which means we need to know P_0.

The way the model works is as follows:

1) We start with some initial values, Y_0 and P_0

[3] Otherwise all that the model is doing is telling you the overall price level, P, which in and of itself is not that interesting.

2) P^e_1 then equals P_0
3) We use this value and values of all the exogenous variables in equations (3) and (4) to solve for Y_1 and P_1
4) The solution to P_1 in equation (4) gives us the value for P^e_2
5) We use this value of P^e_2 in equations (3) and (4) to solve for Y_2 and P_2
6) $P^e_3 = P_2$ and return to Step 3)