Here we are going to consider only the first two elements. We will see the microfoundaitons part when we will discuss about Real Business Cycle Theory.

Even if we are going to build a dynamic AD-AS model most of the qualitative results we have found before (in terms of what happens to output and prices after a change in the AD or the AS curve) we still apply here. However, by incorporating dynamic explicitly we will be able to trace out more directly the effects over time of various shocks and policy changes on output, inflation, and other endogenous variables

<u>The main equations of the AD-AS dynamic model</u>

The first equation of the model is an IS curve. It represents the demand for goods and service in period t (we know that we can derive the AD from the IS-LM model, here we are going to do the same):

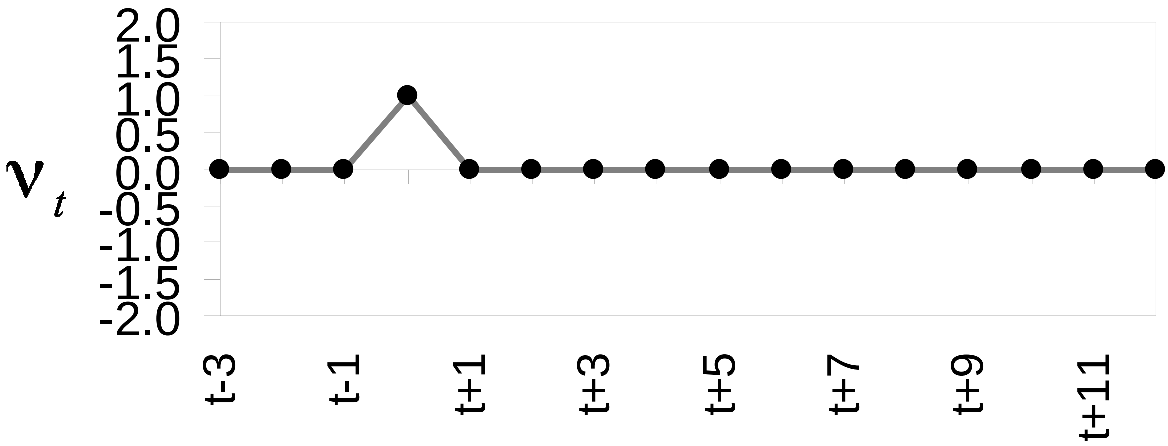
$$Y_t = \bar{Y}_t - \alpha(r_t - \rho) + \varepsilon_t \qquad 1)$$

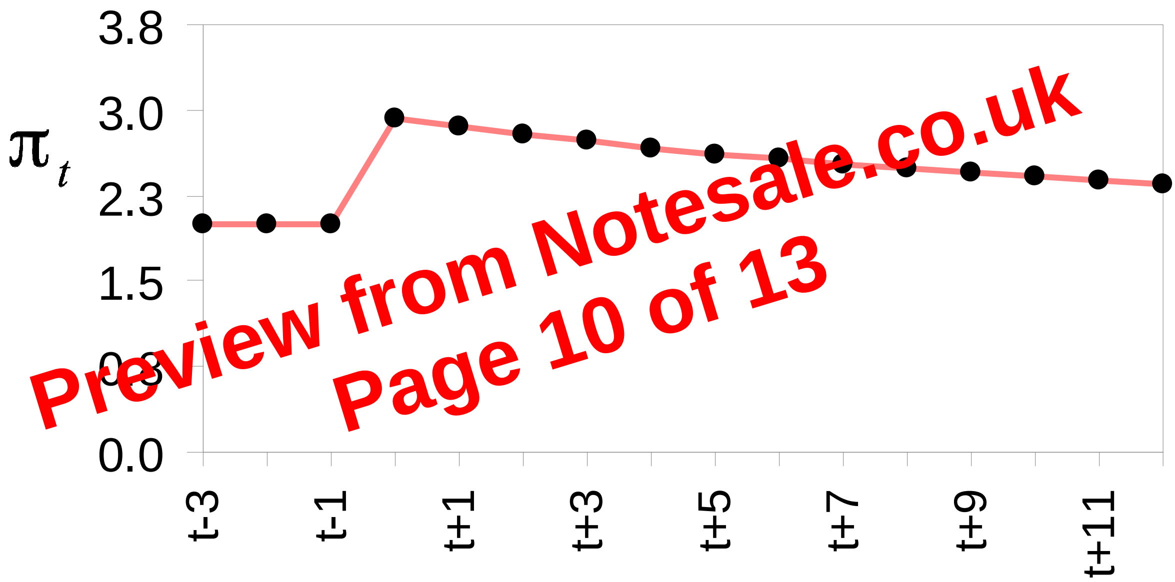
What is what? Y_t is total output at time t. $\bar{Y}_t$ is the natural level of output in period t. r_t is the real interest rate in period t. ρ is the natural interest rate (the same as in the Taylor Rule of Lecture 9 but here it is a real interest rate) that we assume for simplicity to be constant (it does not have a subscript t). $\alpha > 0$ is a constant. Finally ε_t is a demand exogenous shock, so it is a random variable that is in average zero (this does not mean that it is zero, it is zero on average. For example a random variable can take value +5 with probability 0.5 and -5 with probability 0.5. In average the value of that random variable is 0.5×5+0.5×(-5) =0. Here we have something similar, the demand shock can be positive or negative by in average will be zero).

Equation 1) implies a negative relationship between the real interest rate and real output as in the usual IS curve. Notice that the natural interest rate is the rate that will prevail in the economy if there are no demand shocks ($\varepsilon_t = 0$) and the output is at the natural level $Y_t = \bar{Y}_t \Rightarrow r_t = \rho$. The second equation of the model is the Fisher equation:

$$r_t = i_t - E_t\pi_{t+1} \qquad 2)$$

Where i_t is the nominal interest rate in period t and $E_t\pi_{t+1}$ is the expectation formed at time t for next period inflation. This is a truly dynamic equation because it links variables at two different points in time (time t and t+1). The third equation is the Phillips curve (that is also equivalent to an aggregate supply curve as we know from Lecture 12-13):





The first graph is the evolution over time of the aggregate supply shock, 1 in period t and zero everywhere else. The second one is the evolution over time of the response of equilibrium inflation to the aggregate supply shock, where the values at time t and at time t+1 are calculated above (the values in other periods after t+1 are calculated in the same way).

We can do the same for the other endogenous variables in the model and represent those impulse responses into a similar graph. For example for real output and the nominal interest rate