Economics 442
Spring 2019
University of Wisconsin-Madison

Menzie D. Chinn
Social Sciences 7418

Aggregate Demand – Aggregate Supply

1. Basics

For ***aggregate demand***: Consider the solution to the IS-LM model.

(1) $$Y = \hat{\gamma}\left[\Lambda_0 + \frac{b_2}{h}\left(\frac{M_0}{P}\right) - \frac{b_2\mu_0}{h}\right]$$

Where the price level P is now *allowed to vary*. This means that there are different levels of aggregate demand for different price levels (Figure 1)

Notice that increases in government spending (increases in Λ) will shift out the AD curve, while decreases in M will shift in the AD curve (Figure 2).

For ***aggregate supply***, start with a wage setting equation, where wages are set as a function of expected price level, the unemployment rate, and other exogenous factors, such as unemployment benefits:

(2) $$W = P^e F(\underset{-}{u}, \underset{+}{z})$$

The price of output is set as a markup over cost of production – for simplicity assumed to equal the wage rate.

(3) $$P = (1+\mu)W$$

Substituting (3) into (2) yields:

(4) $$P = P^e(1+\mu)F(u,z)$$

In order to express the price level as a function of output (Y), re-express (4):

(5) $$P = P^e(1+\mu)F\left(\left[1-\frac{Y}{L}\right], z\right)$$

Where we use the definition of unemployment.

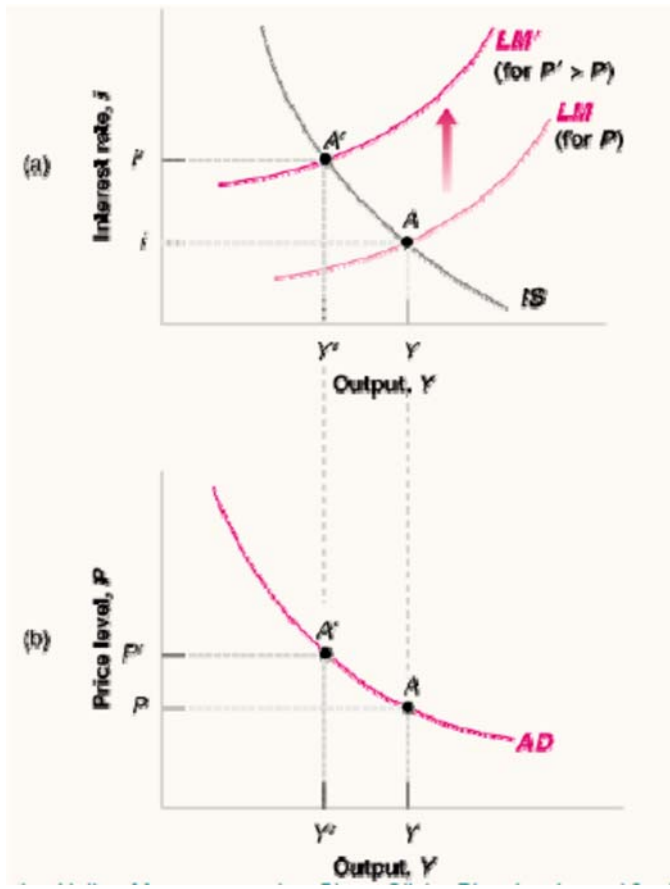

Figure 1: Derivation of AD

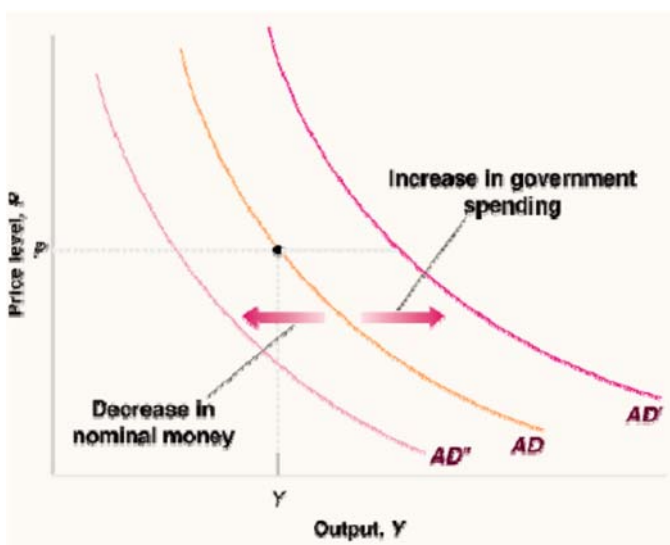

Figure 2: Shifts in AD

$$u \equiv \frac{U}{L} \equiv \frac{L-N}{L} \equiv 1 - \frac{N}{L} = 1 - \frac{Y}{L} \quad \text{(if Y=N)}$$

The last item after the equal sign uses the assumption that output is a direct function of employment. Equation (5) is depicted as follows.

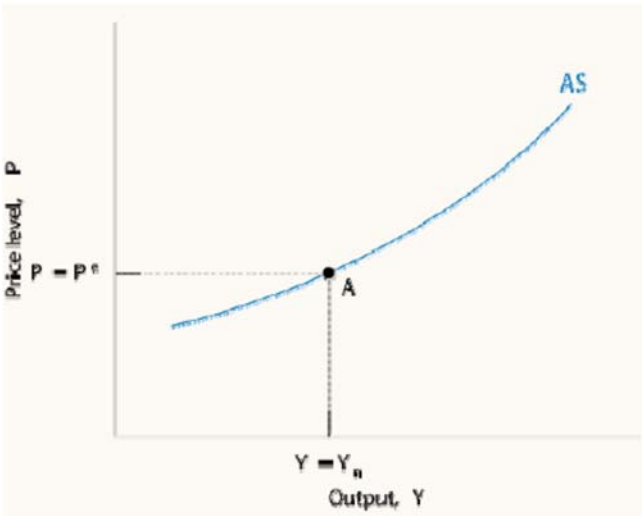

Figure 3: Derivation of AS

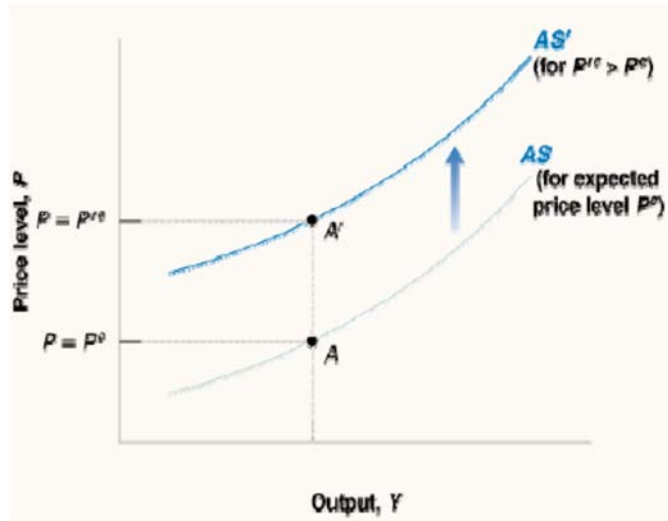

Figure 4: Shifts in AS

The AS curve is upward sloping because as wages rise as unemployment declines (for a given expected price level). Should the expected price level rise, then the AS curve shifts up.

2. Equilibrium, Short and Medium

Putting together AD and AS, one obtains the short run equilibrium denoted in Figure 5. In this case, both supply and demand side factors interact to determine output and the price level. Once again, note that this short run equilibrium is for a given expected price level.

In order to make the model useful for examining the effects over the medium run, one needs to explain how the price level is determined. For simplicity, we will typically use adaptive expectations, $P^e = P_{-1}$, that is that the expected price level equals last period's price level.

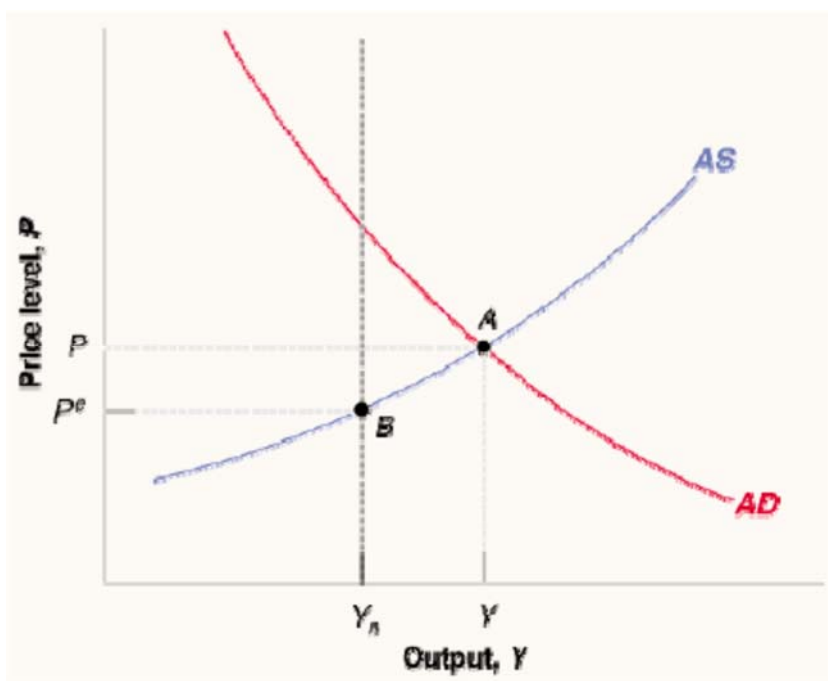

Figure 5: Short run AD-AS equilibrium, natural output

As we move from the period depicted in Figure 5 to the next period, the expected price level rises (Figure 6); the AS curve shifts up to AS' (the AS curve intersects the Y_n line at P^e since by definition output equals the natural rate when the expected price level equals the actual).
Notice the equilibrating price level (point A') now exceeds the new expected price level. Come the next period, the AS curve would have to shift up again. As long as output exceeds Y_n, then P will exceed the expected price level, and the AS curve will keep on shifting up, until finally equilibrium output equals Y_n. The model has a self-equilibrating character.

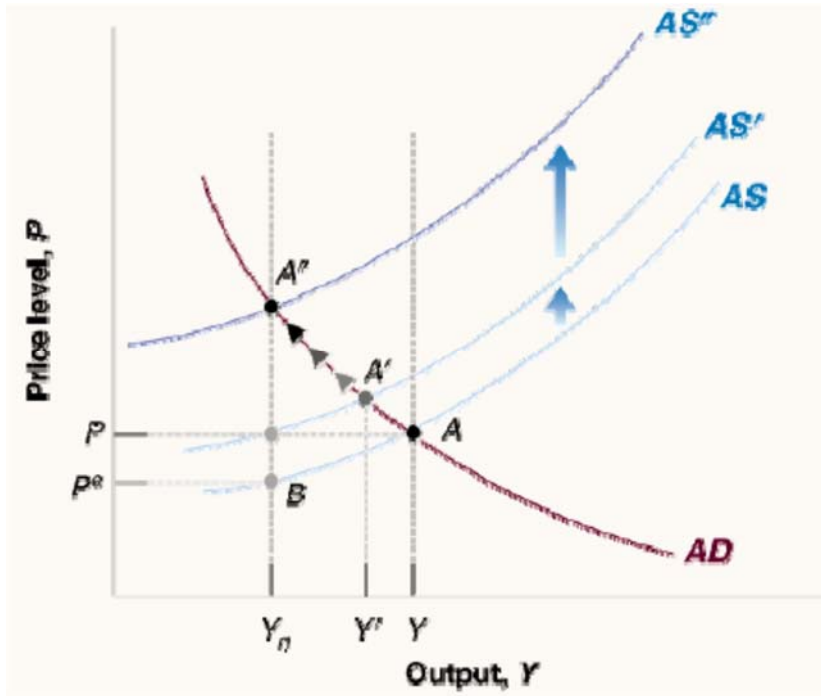

Figure 6: Price and output adjustment over time

3. Policy Effects, Short and Medium Run

Consider first a monetary expansion (Figure 7). The AD curve shifts to AD'; equilibrium moves from point A to A' in the short run. Since output exceeds the natural rate, then the price level exceeds the expected price level, and over time, the AS curve continues to shift up, until output equals Y_n is restored. In Figure 8, a fiscal contraction is depicted. The AD curve shifts in, so equilibrium moves from A to A'. At A', the price level is below the expected price level; hence, in the next period, the expected price level falls. This continues over time as long as output is below Y_n, shifting down the AS curve until finally reaching AS', and restoring output to Y_n at equilibrium A'.

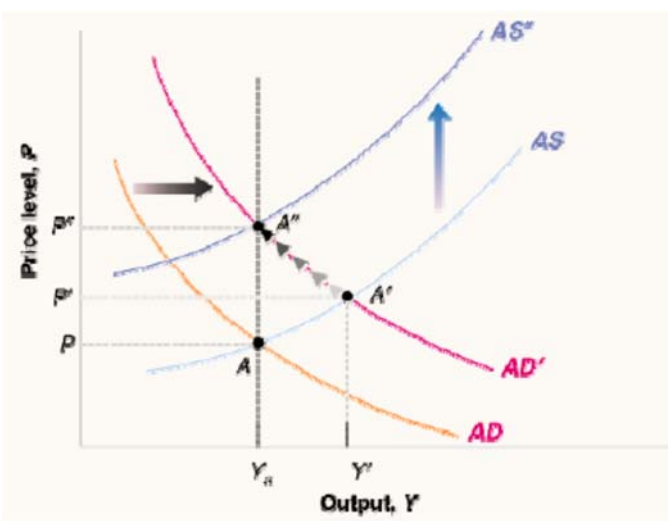

Figure 7: Response to expansionary policy

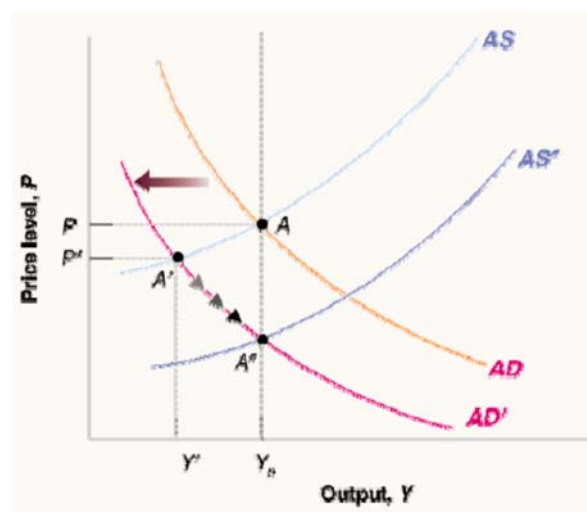

Figure 8: Response to contractionary policy

While Figures 7 and 8 appear to be direct opposites in terms of outcomes, this interpretation is not completely correct. Monetary policy (Figure 7) will in the medium run result in an unchanged distribution of economic activity (consumption, investment, government spending). Fiscal policy (Figure 8) would result in a changed distribution of expenditures. ***An important point***: in the medium run when prices can fully adjust, monetary policy is neutral with respect to both the level and composition of GDP.

In Figure 7, it's useful to consider what would happen if the monetary authorities attempted to keep output at Y'. What actions would the monetary authority have to undertake?

4. Oil Shocks

Assume one is starting at medium run equilibrium, point A. An oil shock pushes up the AS curve (increasing the markup, in equation 5) in the short run, so equilibrium is at A'. In the medium run, Y_n decreases to Y'_n. Y' exceeds the new level of natural output, so now the AS curve continues to rise until output is restored at Y'_n , at point A''.

Notice that a supply shock results in a permanently lower level of output and a permanently higher level of the price level. Monetary and fiscal policies cannot offset these effects indefinitely. If they tried to do so, the result with be continuously rising prices.

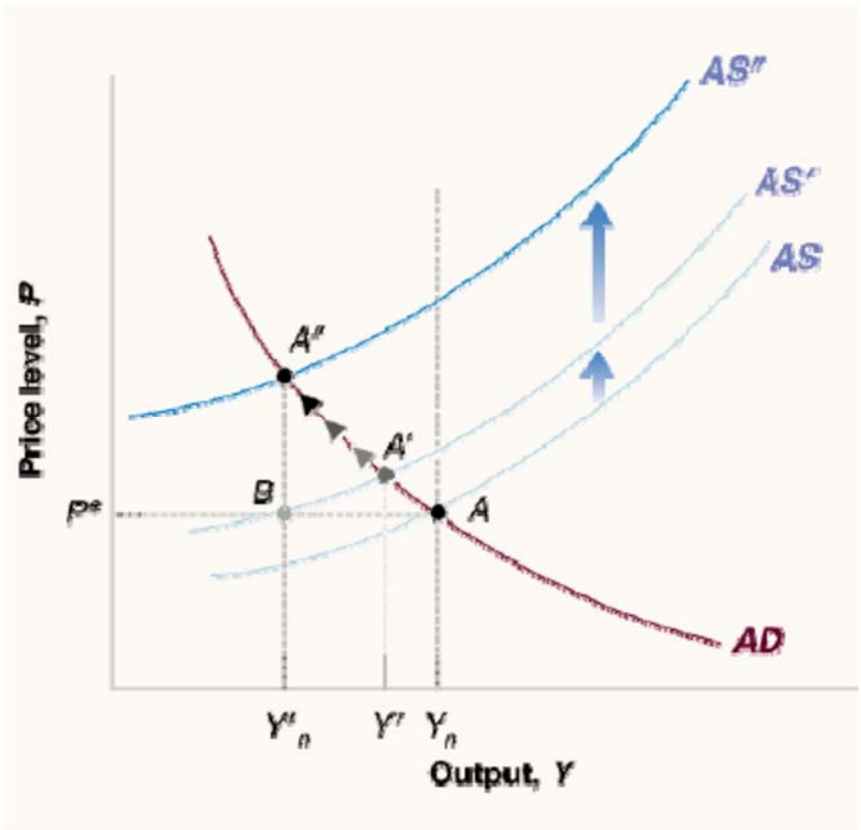

Figure 9: Response to price shock

5. Context: Schools of Macroeconomic Thought

The model described in the textbook is sometimes called the Neoclassical Synthesis (in older language), because it is Keynesian in the short run, Classical in the medium run. A Classical model would arise if the AS curve were perfectly vertical at Y_n. A New Classical version of this model would result if P^e always equaled the P (plus or minus a random error) that sets AD to Y_n. A New Keynesian model looks a lot like this Neoclassical Synthesis, except that the AS curve shifts in part due to changes in P^e, but is constrained in part by nominal rigidities (like long term wage contracts).