Notes lecture 1

The IS/LM model for an open economy is based on a fixed price level (very sticky prices) and consists of a goods market and a money market. The goods market is

$$Y \equiv C + I + G + X - \varepsilon Q \tag{1.1}$$

where $\varepsilon = \frac{P^* E}{P}$ is the real exchange rate, $E = \frac{SEK}{\$}$ the nominal exchange rate and *Q* the volume of imports. *C* is consumption, *I* investments, *G* government expenditure in real terms and *X* exports, such that nominal GNP is $PY \equiv PC + PI + PG + PX - P^* EQ$. The components are determined by the respective functions

$$\begin{aligned} C &= C(Y, r) \\ I &= I(r) \\ G &= \bar{G} \\ X &= X(\varepsilon, Y^*) \\ Q &= Q(\varepsilon, Y) \end{aligned} \tag{1.2}$$

where r is the real rate of interest ($r = i - E(\pi)$), where *E* is the expectations operator and $\pi = \frac{P - P_{-1}}{P_{-1}}$ the rate of inflation, i.e. the relative change in the aggregate price level. Assuming $\varepsilon = \varepsilon(r)$ we obtain by substitution of (1.2) into (1.1) the IS curve

$$Y = Y(r) \tag{1.3}$$

which is a negatively sloping curve showing (*Y,r)* for which the goods market is in equilibrium.

The money market is described by the demand for real balances

$$\frac{\bar{M}}{\bar{P}} = YL(i) \tag{1.4}$$

for fixed money supply and price level. Assuming stable prices (*I=r)* we obtain the LM curve as

$$Y = Y(r) \tag{1.5}$$

which is a positively sloping curve showing *(Y,r)* for which the money market is in equilibrium. The two equations determine (*Y,r)*, the point where the two curves intersect at the stable price level. The aggregate demand curve

$$Y = Y(P) \tag{1.6}$$

shows equilibrium (*Y,r)* at different price levels. The curves below show a graphical solution.

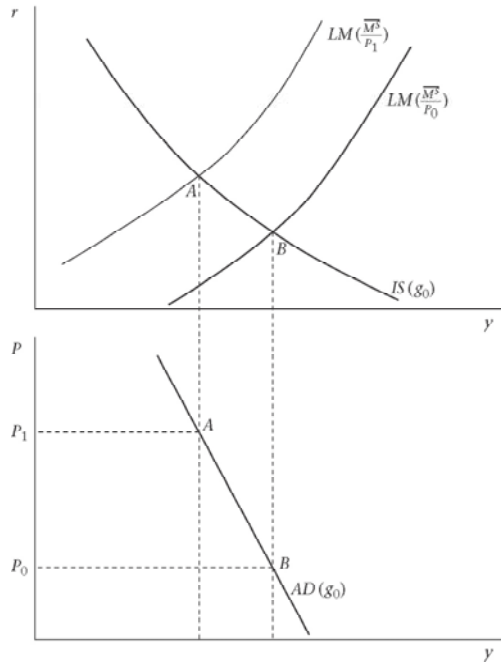

Diagram 1. Derivation of AD curve.

To complete the model requires an aggregate supply schedule. In the intermediate textbooks there are several versions. For instance, in (Robert E Hall and John B. Taylor, 1997) the Phillips curve is based on model with staggered wage contracts, very similar to the Phillips curve in (Wendy Carlin and David Soskice, 2006) or in (Olivier Blanchard, 2003) which are based on a Wage Setting/Price Setting model, both leading to a positively sloping supply curve, which can also be obtained from models based on misperceptions. One such model is the model developed by (Milton Friedman, 1968) and (Edmund S. Phelps, 1967) in which workers are unaware of the general price level and form (adaptive) expectations about the real wage. A positive demand shock make workers misperceive the real wage and supply too much labor to the market. The implication is increase in output, lower productivity and a lower real wage. The model implies a positively sloping aggregate supply curve as shown in the graphs below.

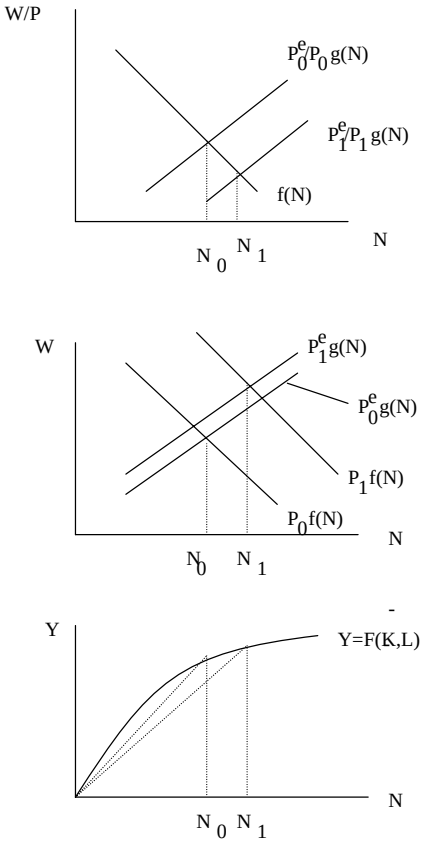

Diagram 2. Derivation of positively sloping aggregate supply curve in Friedman/Phelps model.

The upper diagram shows how equilibrium employment and real wage change in response to an aggregate demand shock. $f(N)$ is the labor demand schedule (marginal product of labor at a fixed capital stock). The supply schedule $\frac{P^e}{P} g(N)$ shows how the supply changes due to misperceptions, i.e. when $P^e \neq `P$. The middle diagram shows employment and nominal wage rate and $pf(N)$ is the value of the marginal product. $g(N)$ is the labor supply curve and $P^e g(N)$ the expected value of the supply. A positive demand increases the general price level (since prices are flexible in this model) but $P^e < P$ such that the workers are fooled and supply too much labor.

Another misperception model is the Lucas island model with rational instead of adaptive expectations. Lucas also used a policy rule instead of discretionary policy, see (Robert E. Lucas, Jr., 1973). Lucas policy rule was stochastic deviations from a constant growth in money supply: $\Delta m_t = g + u_t$ defined in logarithms and hence 100g being the percentage rate of change (the systematic part of policy) and u_t being a random variable. In Lucas model firms are aware of the price in their own market but not on markets outside. As they observe a change in the price they don't know if the change is in the relative price, on their market relative to other markets, in case they should change their output, or whether it is an aggregate price change, being the same as in other markets and due to a monetary policy change, in which case they should leave output

unaltered. Each time they observe a price change in their market they try to figure out whether it is relative or absolute and estimates a probability due to the observations of historical shocks. Hence, every shock, being relative or aggregate, implies a certain effect on output and the price level, again implying a positively sloping aggregate supply curve.

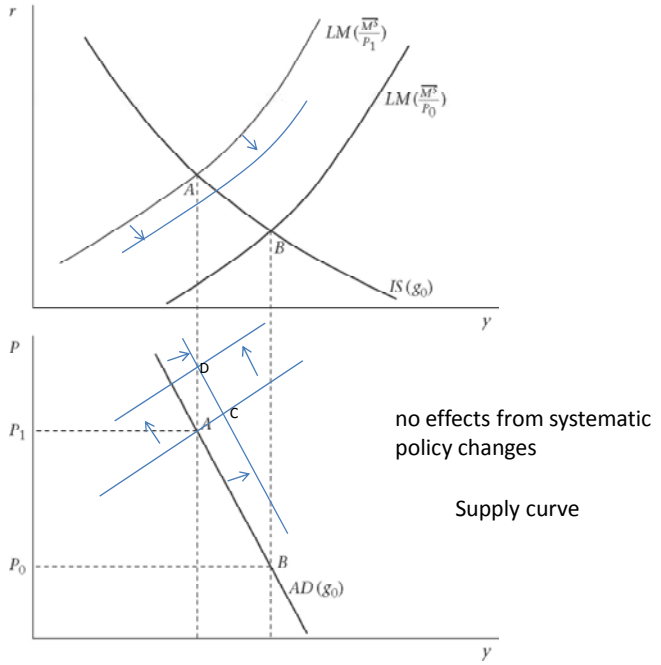

Diagram 3. Aggregate supply.

In diagram 3 a positively sloping aggregate supply curve (often referred to as the short run aggregate supply curve) intersects with the AD curve at B. A positive demand shock increases the price level and output as shown at point C and due to the response of workers and firms in the misperceptions models. In Lucas model there would be no effects from systematic changes in the policy, i.e. in the growth parameter *g* in his model. After the shocks are observed the economy returns to the original equilibrium B or eventually to the equilibrium D, whether the shock is transitory or permanent.

References

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