**Patinkin Model** **EES&OR 341** **May 21, 1997**

Four markets

- Labor Services
- Commodities (Goods and Services)
- Bonds
- Money

Solve for Quantities supplied, Quantities Demanded, Prices of Each Commodity

Demand Quantity, Supply Quantity, and Equilibrium Condition in Each Market

$$N_D(\frac{w}{p},\ K_0) \quad = \quad N_S(\frac{w}{p}) \qquad \text{Labor}$$

$$C(Y - T,\ r,\ \frac{M_0^H}{p}) + I(Y,\ r,\ \frac{M_0^F}{p}) + G \quad = \quad Y \qquad \text{Goods and Services}$$

$$B_D(Y-T,\ r,\ \frac{M_0^H}{p}) \quad = \quad B_S(Y,\ r,\ \frac{M_0^F}{p}) \qquad \text{Bonds (and Stocks)}$$

$$L(Y-T,\ r,\ \frac{M_0}{p}) \quad = \quad \frac{M_0}{p} \qquad \text{Money}$$

Overall Economic Output (Aggregate Production Function)

$$Y \quad = \quad f(N,\ K_0)$$

Three of the first four equations are independent; Walras Law shows that the sum of excess demands, summed across the four markets, is identically zero.

For fixed T, G, $M_0$ , solve for Y, r, p, w. Three independent equations, four unknown. Thus equation system has a range of solutions. In fact, one can select values of any of the variables and solve for the other three (although for some selected values, no equilibrium will exist).

Selecting $K_0$ and adding the equation for overall economic output closes the system and gives a solution with the number of equations and equal to the number of unknowns.

How do we know that sum of excess demand is zero?
Budget Constraints for members of the economy:

Consumers
$$C + T^H + \Delta B_D^H + \frac{\Delta M^H}{p} = \frac{w}{p} N_S + pay^F + pay^G$$

Firms
$$I + \frac{\Delta M^F}{p} + T^F = Y - \frac{w}{p} N_D + \Delta B_S^F - pay^F$$

Government
$$G - T^F - T^H = \Delta B_S^G + \frac{\Delta M}{p} - pay^G$$

Sum up over three elements and combine to obtain:

$$[C + I + G - Y] + [\frac{\Delta M^H}{p} + \frac{\Delta M^F}{p} - \frac{\Delta M}{p}] + [\Delta B_D^H - \Delta B_S^F - \Delta B_S^F] + [\frac{w}{p} (N_D - N_S)] = 0$$

But at beginning of time Bond holdings equal bond supply, money holdings equals money supply. This gives Walras Law:

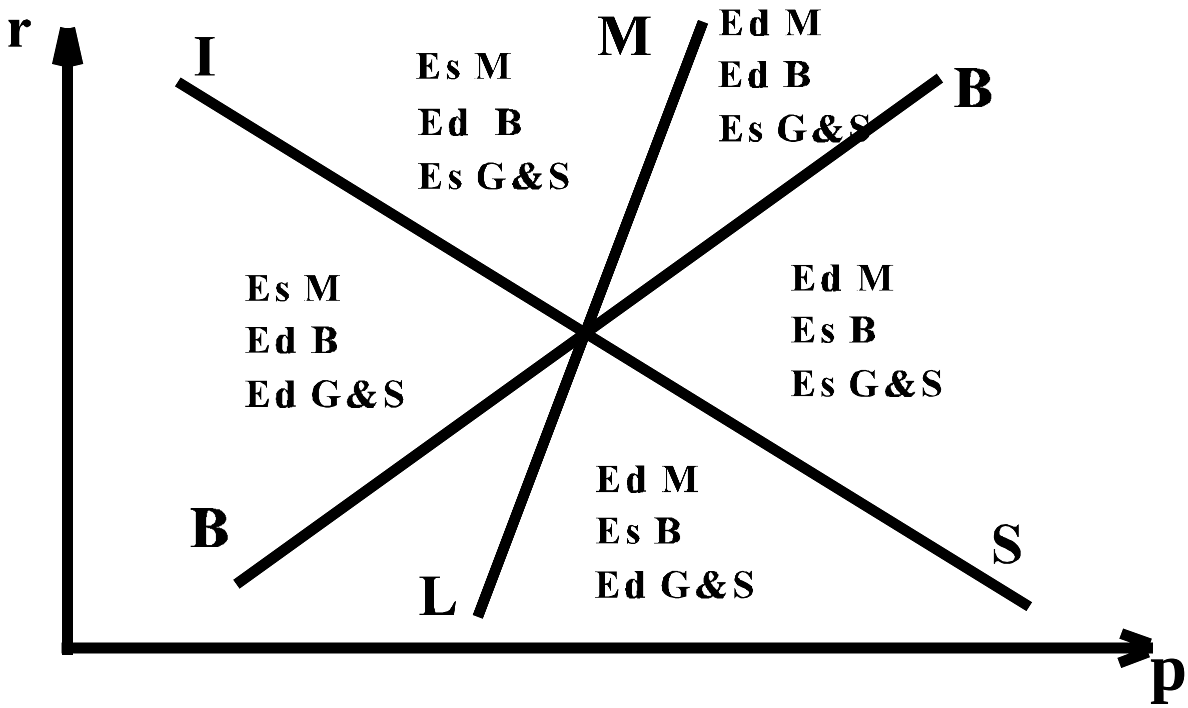
$$[C + I + G - Y] + [\frac{M^H}{p} + \frac{M^F}{p} - \frac{M}{p}] + [B_D^H - B_S^F - B_S^F] + [\frac{w}{p} (N_D - N_S)] = 0$$

Can be rewritten for involuntary unemployment. Consumers rationally anticipate the actual level of employment. Then the budget constraint for the consumer includes as income w/p $N_D$.

Walras Law becomes

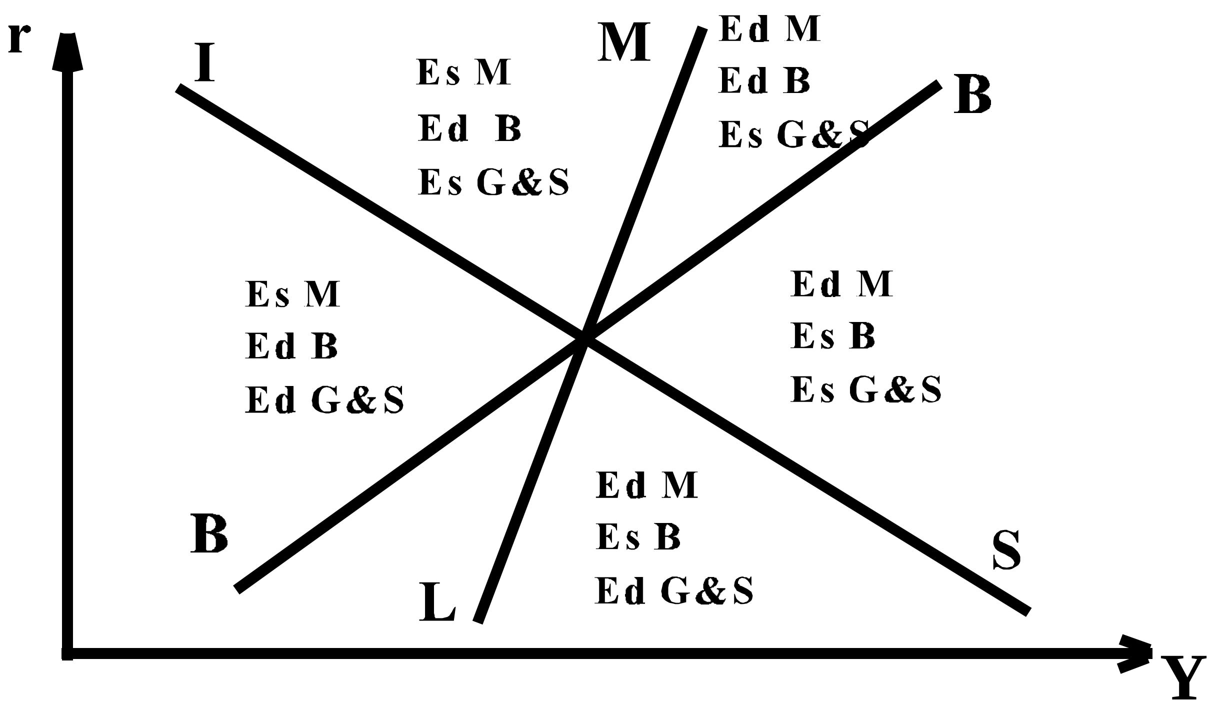
$$[C + I + G - Y] + [\frac{M^H}{p} + \frac{M^F}{p} - \frac{M}{p}] + [B_D^H - B_S^F - B_S^F] = 0$$

Full employment w/p, Y
Fix Y, solve for equilibrium
Use three equations (two are independent; thus any two can define solution).




For fixed Y (full employment Y), there is some price level and interest rate that would be an equilibrium of the system.

Fix P, solve for equilibrium
Use three equations (two are independent; thus any two can define solution).




For fixed P, there is some level of economic output and interest rate that would be an equilibrium of the system.

Note that may be above or below the full employment level of output for that given P. If below, there will be involuntary unemployment of labor, wage rates and prices will tend to decline. This moves equilibrium toward right, increasing output.

If above full employment level, excess demand for G&S, prices tend to decline.