

CHAPTER 10

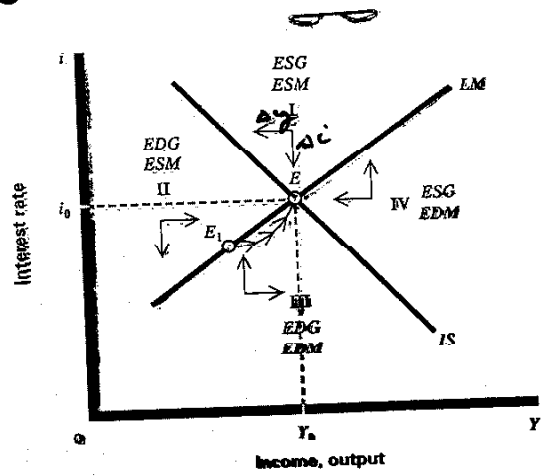


FIGURE 10-14
 DISEQUILIBRIUM AND DYNAMICS IN THE GOODS AND MONEY MARKETS. Income and interest rates adjust to the disequilibrium in goods markets and assets markets. Specifically, interest rates fall when there is an excess supply of money and rise when there is an excess demand. Income rises when aggregate demand for goods exceeds output and falls when aggregate demand is less than output. The system converges over time to the equilibrium at E.

TABLE 4-1
 DISEQUILIBRIUM AND ADJUSTMENT

region	GOODS MARKET		MONEY MARKET	
	disequilibrium	adjustment: output	disequilibrium	adjustment: interest rate
I	ESG	Falls	ESM	Falls
II	EDG	Rises	ESM	Falls
III	EDG	Rises	EDM	Rises
IV	ESG	Falls	EDM	Rises

See also handout.

$$\begin{aligned} \Delta y &= f(ESG, ESM) \\ \Delta i &= g(ESG, ESM) \end{aligned} \left. \vphantom{\begin{aligned} \Delta y \\ \Delta i \end{aligned}} \right\} \text{system of nonlinear difference equations.}$$

10.1.3

FORMAL TREATMENT OF THE IS-LM MODEL



Our exposition so far has been verbal and graphical. We now round off the analysis with a more formal treatment of the IS-LM model.

see also
handout.

Equilibrium Income and the Interest Rate

The intersection of the IS and LM schedules determines equilibrium income and the equilibrium interest rate. We now derive expressions for these equilibrium values by using the equations of the IS and LM schedules. Recall from earlier in the chapter:



IS schedule:
$$Y = \alpha_G(\bar{A} - bi) \tag{6}$$

and the equation describing money market equilibrium as



LM schedule:
$$i = \frac{1}{h} \left(kY - \frac{\bar{M}}{\bar{P}} \right) \tag{11a}$$

The intersection of the IS and LM schedules in the diagrams corresponds to a situation in which both the IS and LM equations hold—the same interest rate and income levels assure equilibrium in both the goods and the money market. In terms of the equations, this means we can substitute the interest rate from the LM equation (11a) into the IS equation (6):

$$Y = \alpha_G \left[\bar{A} - \frac{b}{h} \left(kY - \frac{\bar{M}}{\bar{P}} \right) \right]$$

Collecting terms and solving for the equilibrium level of income, we obtain

$$Y_0 = \gamma \bar{A} + \gamma \frac{b \bar{M}}{h \bar{P}} \tag{12}$$

where $\gamma = \alpha_G / (1 + kb\alpha_G/h)$. Equation (12) shows that the equilibrium level of income depends on two exogenous variables: autonomous spending, \bar{A} , including fiscal policy parameters (J, G, TR); and the real money stock, \bar{M}/\bar{P} . Equilibrium income is higher the higher the level of autonomous spending, \bar{A} , and the higher the stock of real balances.

The equilibrium rate of interest, i_0 , is obtained by substituting the equilibrium income level, Y_0 , from equation (12) into the equation of the LM schedule (11a):

$$i_0 = \frac{k}{h} \gamma \bar{A} - \frac{L}{h + kb\alpha_G} \frac{\bar{M}}{\bar{P}} \tag{13}$$

Equation (13) shows that the equilibrium interest rate depends on the parameters of fiscal policy captured in the multiplier and the term \bar{A} and on the real money stock. A higher real money stock implies a lower equilibrium interest rate.

For policy questions we are interested in the precise relation between changes in fiscal policy or changes in the real money stock and the resulting changes in equilibrium income. Monetary and fiscal policy multipliers provide the relevant information.

formal analysis

feat 10.5.4

i	Y	\bar{A}	\bar{M}/\bar{P}	
$+b$	1.0	α_g	0	\leftarrow IS curve
$+1.0$	$-\frac{k}{h}$	0	$-\frac{1}{h}$	\leftarrow M curve

2 eqts 2 unknowns

general approach in
macro model building.

	\bar{A}	\bar{M}/\bar{P}
Y eq	γ	$\gamma \frac{b}{h}$
i eq	$\gamma \frac{k}{h}$	$-\frac{1}{h + kb\alpha_g}$

Remember:

$$I = \bar{I} - b i \quad b > 0 \quad ; \quad \alpha_g = \frac{1}{1-c} > 0$$

$$L = k Y - h i \quad k > 0 ; h > 0$$

The Fiscal Policy Multiplier

The fiscal policy multiplier shows how much an increase in government spending changes the equilibrium level of income, holding the real money supply constant. Examine equation (12) and consider the effect of an increase in government spending on income. The increase in government spending, $\Delta \bar{G}$, is a change in autonomous spending, so that $\Delta \bar{A} = \Delta \bar{G}$. The effect of the change in \bar{G} is given by

$$\frac{\Delta Y_0}{\Delta \bar{G}} = \gamma \quad \gamma = \frac{\alpha_G}{1 + k\alpha_G \frac{b}{h}} \quad (14)$$

The expression γ is the fiscal or government spending multiplier once interest rate adjustment is taken into account. Consider how this multiplier, γ , differs from the simpler expression α_G that applied under constant interest rates. Inspection shows that γ is less than α_G since $1/(1 + k\alpha_G b/h)$ is a fraction. This represents the dampening effect of increased interest rates associated with a fiscal expansion in the IS-LM model.

We note that the expression in equation (14) is almost zero if h is very small and will be equal to α_G if h approaches infinity. This corresponds, respectively, to vertical and horizontal LM schedules. Similarly, a large value of either b or k serves to reduce the effect of government spending on income. Why? A high value of k implies a large increase in money demand as income rises and hence a large increase in interest rates required to maintain money market equilibrium. In combination with a high b , this implies a large reduction in private aggregate demand.

The Monetary Policy Multiplier

The monetary policy multiplier shows how much an increase in the real money supply increases the equilibrium level of income, keeping fiscal policy unchanged. Using

	ΔG	ΔM	$(\Delta G + \Delta M)$
Δi	+	-	≈ 0
Δy	+	+	+

↑
1970 - 1980

"accommodating monetary policy"