

Third TA Session:

Open Economy under Fleming (1962)

Macroeconomics 2

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Highlights

- Mundell-Fleming model of open economy
 - Monetary policy in fixed exchange rate regime
 - Monetary policy in floating exchange rate regime

Primer on Open Economy

- Most macro models we assume to this point assume closed economy
- Closed economy assumes no external market for goods and capital
- This assumption is unrealistic if talking about country-level dynamic
- Think of both closed economy and small open economy as two different extremes; both are useful as stepping stones to more intricate macro models

Key Features of Small Open Economy

- Private expenditure (on consumption and investment) varies directly with disposable income and inversely with the interest rate
- Interest rate varies directly with income-velocity of circulation of money
- Country in question is small enough such that $r = r^*$ (interest rate determination does not impact global interest rate)
- Wages are assumed to remain constant in LCU (i.e. supply of domestic outputs are perfectly elastic. This is key to the model)
- Emphasis on **small** here
 - Is it realistic for us to assume that change in Federal Reserve's interest rate would not affect global interest rate?
 - Similarly, effect of changes in US' and China's balance of payment positions is non-negligible

Basic Setup

- Based on Fleming's 1962 paper
- Consider the following setup

$$Y \equiv X + S + B \quad (1)$$

$$Z \equiv X + S \quad (2)$$

$$V \equiv \frac{Y}{M} \quad (3)$$

$$N \equiv Y - T \quad (4)$$

$$T = T(Y), \quad 0 < T_y < 1 \quad (5)$$

$$X = X(N, R), \quad X_r < 0, 0 < X_n(1 - T_y) < 1 \quad (6)$$

$$R = R(V), \quad R_v > 0 \quad (7)$$

$$B = B(Z, F), \quad 0 < -B_z < 1, B_f > 0 \quad (8)$$

$$C = \quad (9)$$

Fiscal Policy under Fixed Exchange Rate (1)

- Rewrite the systems of equations, with focus on dY

$$\begin{aligned} Y &= X(N, R(V)) + S + B(Z, F) \\ dY &= \frac{\partial Y}{\partial X} dX + \frac{\partial Y}{\partial S} dS + \frac{\partial Y}{\partial B} dB \end{aligned} \quad (10)$$

- Now, we need to focus on each component (dX, dS, dB) in the equation (9)

$$\begin{aligned} dX &= X_n dN + X_r dR \\ &= X_n (1 - T_y) dY + X_r \left(\frac{R_v}{M} dY \right) \end{aligned} \quad (11)$$

Fiscal Policy under Fixed Exchange Rate (2)

$$\begin{aligned} dB &= B_z dZ \\ &= B_z \left\{ X_n(1 - T_y)dY + X_r \left(\frac{R_v}{M} dY \right) + dS \right\} \end{aligned} \quad (12)$$

- Rearranging equation (10) and (11) into equation (9), we obtain the $\left(\frac{dY}{dS}\right)_{00}$ in Fleming (1962)

$$\begin{aligned} [1 + B_z] dS &= \left[1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\} \right] dY \\ \left(\frac{dY}{dS} \right)_{00} &= \frac{1 + B_z}{1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\}} > 0 \end{aligned} \quad (13)$$

Fiscal Policy under Fixed Exchange Rate (3)

Impact of fiscal policy on taxation under fixed exchange rate

$$\begin{aligned} dT &= T_y dY \\ \left(\frac{dT}{dS} \right)_{00} &= \frac{T_y(1 + B_z)}{1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\}} < 1 \end{aligned} \quad (14)$$

Fiscal Policy under Fixed Exchange Rate (4)

Impact of fiscal policy on private consumption under fixed exchange rate

$$\begin{aligned}
 dX &= X_n dN + X_r dR \\
 &= \left(X_n(1 - T_y) + \frac{X_r R_v}{M} \right) dY \\
 \frac{dX}{dS} &= \left(X_n(1 - T_y) + \frac{X_r R_v}{M} \right) \frac{1 + B_z}{1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\}} \quad (15)
 \end{aligned}$$

Multiplying (14) by the factor of $\frac{\frac{1}{(1+B_z)\left(X_n(1-T_y)+\frac{X_r R_v}{M}\right)}}{\frac{1}{(1+B_z)\left(X_n(1-T_y)+\frac{X_r R_v}{M}\right)}}$, we obtain

$$\left(\frac{dX}{dS} \right)_{00} = \frac{1}{\frac{1}{(1+B_z)\left(X_n(1-T_y)+\frac{X_r R_v}{M}\right)} - 1} \quad (16)$$

Fiscal Policy under Fixed Exchange Rate (5)

Impact of fiscal policy on total consumption under fixed exchange rate¹

$$\begin{aligned}dZ &= \frac{\partial Z}{\partial X}dX + \frac{\partial Z}{\partial S}dS \\ \left(\frac{dZ}{dS}\right)_{00} &= \frac{\partial Z}{\partial X} \frac{dX}{dS} + \frac{\partial Z}{\partial S} \\ &= \frac{(1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\}}{1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\}} + 1 \\ &= \frac{1}{1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v}{M} \right\}} > 0\end{aligned}\quad (17)$$

¹Notice the tiny difference between the result in (16) and the result in Fleming (1962). I am not entirely sure which part did I get wrong but I have reworked the algebra around 5 times and still end up with the same result

Fiscal Policy under Floating Exchange Rate

- Let us revisit equation (9)-(12) but with a slight tweak; now $dB + dC = 0$, $dM = 0$, but $dF \neq 0$

$$\begin{aligned}dX &= X_n dN + X_r dR \\&= X_n(1 - T_y)dY + X_r \left(\frac{R_v}{M} dY \right)\end{aligned}\tag{18}$$

$$dB = -dC = -C_r \left(\frac{R_v}{M} dY \right)\tag{19}$$

$$\begin{aligned}dS &= \left[1 - X_n(1 - T_y) - (X_r - C_r) \left(\frac{R_v}{M} \right) \right] dY \\ \left(\frac{dY}{dS} \right)_{10} &= \frac{1}{1 - X_n(1 - T_y) - (X_r - C_r) \frac{R_v}{M}}\end{aligned}\tag{20}$$

Monetary Policy under Fixed Exchange Rate Regime (1)



- Rewrite the systems of equations, with focus on dY

$$\begin{aligned} Y &= X(N, R(V)) + S + B(Z, F) \\ dY &= \frac{\partial Y}{\partial X} dX + \frac{\partial Y}{\partial B} dB \end{aligned} \quad (21)$$

- Now, we need to focus on each component (dX, dS, dB) in the equation (9)

$$\begin{aligned} dX &= X_n dN + X_r dR \\ &= X_n (1 - T_y) dY + X_r \left(\frac{R_v}{M} dY - \frac{R_v Y}{M^2} dM \right) \end{aligned} \quad (22)$$

Monetary Policy under Fixed Exchange Rate (2)

$$\begin{aligned} dB &= B_z dZ \\ &= B_z \left\{ X_n(1 - T_y)dY + X_r \left(\frac{R_v}{M} dY - \frac{R_v Y}{M^2} dM \right) \right\} \end{aligned} \quad (23)$$

- Rearranging equation (22) and (23) into equation (21), we obtain the $\left(\frac{dY}{dM}\right)_{01}$ in Fleming (1962)

$$\begin{aligned} \frac{[1 + B_z](X_r R_v)}{M} dM &= \left[1 - (1 + B_z) \left\{ X_n(1 - T_y) + \frac{X_r R_v Y}{M} \right\} \right] dY \\ \left(\frac{dY}{dM} \right)_{01} &= -\frac{X_r R_v Y}{M} \left[\frac{1}{\frac{1}{1+B_z} - X_n(1 - T_y) + \frac{X_r R_v Y}{M}} \right] \end{aligned} \quad (24)$$

Monetary Policy under Floating Exchange Rate

- Let us revisit equation (21)-(24) but with a slight tweak; now $dB + dC = 0$, $dS = 0$, but $dF \neq 0$

$$\begin{aligned}dX &= X_n dN + X_r dR \\&= X_n(1 - T_y)dY + X_r \left(\frac{R_v}{M} dY - \frac{R_v Y}{M^2} dM \right) \\dB = -dC &= -C_r \left(\frac{R_v}{M} dY - \frac{R_v Y}{M^2} dM \right) \quad (25)\end{aligned}$$

$$\begin{aligned}\frac{R_v Y(C_r - X_r)}{M^2} dM &= \left[1 - X_n(1 - T_y) + (C_r - X_r) \left(\frac{R_v}{M} \right) \right] dY \\ \left(\frac{dY}{dM} \right)_{11} &= \frac{R_v Y(C_r - X_r)}{M^2} \left[\frac{1}{1 - X_n(1 - T_y) + (C_r - X_r) \frac{R_v}{M}} \right] \quad (26)\end{aligned}$$

Discussions: Difference Between Fixed and Floating Exchange Rate

$$\left(\frac{dY}{dM}\right)_{11} - \left(\frac{dY}{dM}\right)_{01} = \frac{R_v Y}{M^2} \left[\frac{C_r - X_r}{1 - X_n(1 - T_y) + (C_r - X_r)\frac{R_v}{M}} + \frac{1}{\frac{1}{1+B_z} - X_n(1 - T_y) + \frac{X_r R_v}{M}} \right] > 0 \quad (27)$$

- Effect of monetary policy is more effective (in the sense that the effect size is higher) under floating exchange rate regime relative to fixed exchange rate regime
- Intuition