Equation Sheet - ECON 312

2 The Measurement of Income, Prices and Unemployment

$$Y \equiv C + I + G + NX \tag{2.1}$$

$$Y \equiv C + S + R - F \tag{2.2}$$

$$Y \equiv C + S + T \tag{2.3}$$

$$\begin{array}{rcl} C + S + T & \equiv & C + I + G + NX \\ -C & & -C \\ \hline S + T & \equiv & I + G + NX \end{array} \tag{2.4}$$

$$T - G \equiv (I + NX) - S \tag{2.5}$$

$$U = \frac{\text{number of unemployed}}{\text{civilian employed } + \text{unemployed}}$$

$$\begin{array}{ll} \text{General Linear Form:} & U = \overline{U} - h\left[100\frac{Y}{Y^N} - 100\right] \\ \text{Numerical Example:} & U = 6.0 - 0.5\left[100\frac{Y}{Y^N} - 100\right] \end{array} \tag{2.6}$$

3 The Simple Keynesian Theory of Income Determination

$$E \equiv C + I + G + NX \tag{3.1}$$

$$\begin{array}{c} \text{General Linear Form} \\ C = C_a + c(Y - T) \end{array} \tag{3.2}$$

$$\begin{array}{rcl} & & \text{General Linear Form} \\ S & = & Y - T - C = Y - T - C_a - c(Y - T) \\ & = & -C_a + (1 - c)(Y - T) \end{array} \tag{3.3}$$

$$E_p = C + I_p + G + NX \tag{3.4}$$

$$E_p = C_a + c(Y - T) + I_p + G + NX \tag{3.5}$$

$$A_p = E_p - cY = C_a - cT_a + I_p + G + NX \tag{3.6}$$

$$\begin{array}{ll} \text{General Linear Form} & \text{Numerical Example} \\ E_p = A_p + cY & E_p = 1,500 + 0.75Y \end{array} \tag{3.7}$$

$$\begin{array}{rcl} \text{income}(Y) & \equiv & \text{expenditure}(E) \\ & \equiv & \text{planned expenditure}(E_p)+ \\ & & \text{unplanned inventory investment}(I_u) \end{array} \tag{3.8}$$

$$\text{Equilibrium situation:} \quad Y = E_p \tag{3.9}$$

$$(1 - c)Y = sY = A_p \tag{3.10}$$

$$\begin{array}{ll} \text{General Linear Form} & \text{Numerical Example} \\ sY = A_p & 0.25Y = 1,500 \end{array} \tag{3.11}$$

$$\begin{array}{ll} \text{General Linear Form} & \text{Numerical Example} \\ Y = \frac{A_p}{s} & Y = \frac{1,500}{0.25} = 6,000 \end{array} \tag{3.12}$$

$$\begin{array}{rll} & \text{General Linear Form} & \text{Numerical Example} \\ \text{Take new situation} & Y_1 = \frac{A_{p1}}{s} & Y = \frac{2,000}{0.25} = 8,000 \\ \text{Subtract old situation} & Y_0 = \frac{A_{p0}}{s} & Y = \frac{1,500}{0.25} = 6,000 \\ \hline \text{Equals change in income} & \Delta Y = \frac{\Delta A_p}{s} & \Delta Y = \frac{500}{0.25} = 2,000 \end{array} \tag{3.13}$$

$$\begin{array}{ll} \text{General Linear Form} & \text{Numerical Example} \\ \text{Multiplier}(k) = \frac{\Delta Y}{\Delta A_p} = \frac{1}{s} & \frac{\Delta Y}{\Delta A_p} = \frac{1}{0.25} = 4.0 \end{array} \tag{3.14}$$

$$\text{Change in equilibrium:} \quad \Delta Y = \frac{\Delta A_p}{s} \tag{3.15}$$

$$\text{Surplus:} \quad T - G \equiv I + NX - S$$

$$\Delta Y = \Delta T - \Delta G \equiv \Delta I + \Delta NX - \Delta S \tag{3.16}$$

$$\begin{array}{ll} \text{General Linear Form} & \text{Numerical Example} \\ \Delta Y = \frac{\Delta A_p}{s} = \frac{-c\Delta T_a}{s} & \Delta Y = \frac{(-0.75)(-667)}{0.25} = \frac{500}{0.25} = 2,000 \end{array} \tag{3.17}$$

$$\begin{array}{ll} \text{General Linear Form} & \text{Numerical Example} \\ \frac{\Delta Y}{\Delta T_a} = \frac{\Delta A_p}{s\Delta T_a} = \frac{-c\Delta T_a}{s\Delta T_a} = \frac{-c}{s} & \frac{\Delta Y}{\Delta T_a} = \frac{-0.75}{0.25} = -3.0 \end{array} \tag{3.18}$$

$$\text{Balanced Budget Mutiplier } = \frac{1}{s} + \frac{-c}{s} = \frac{1-c}{s} = 1.0 \tag{3.19}$$

Appendix to Chapter 3

$$T = T_a + tY \tag{1}$$

$$Y_D = Y - T = Y - T_a - tY = (1-t)Y - T_a \tag{2}$$

$$Y = E_p \tag{3}$$

induced saving+
induced tax revenue =
autonomous planned spending (A_p) (4)

$$[s(1-t)+t]Y = A_p \tag{5}$$

General Linear Form	Numerical Example
$Y = \frac{A_p}{s(1-t)+t}$	$Y = \frac{2{,}000}{0.25(0.8)+0.2} = \frac{2{,}000}{4} = 5{,}000$

(6)

$$\Delta Y = \frac{\Delta A_p}{s(1-t)+t} \tag{7}$$

$$\text{multiplier } \frac{A_p}{\text{marginal leakage rate}} = \frac{1}{s(1-t)+t} \tag{8}$$

$$\text{Budget Surplus: } = T - G = T_a + tY - G \tag{9}$$

$$NX = NSX_a - nxY \tag{10}$$

$$A_p = C_a - cT_a + I_p + G - NX_a \tag{11}$$

$$Y = \frac{A_p}{\text{marginal leakage rate}} = \frac{C_a - cT_a + I_p + G - NX_a}{s(1-t)+t+nx} \tag{12}$$

$$\Delta Y = \frac{\Delta A_p}{\text{marginal leakage rate}}$$

$$\Delta A_p = \Delta C_a - c\Delta T_a + \Delta I_p + \Delta G + \Delta NX_a$$

$$\text{balanced budget multiplier } = \frac{1-c}{\text{marginal leakage rate}}$$

4 The IS-LM Model

$$\left(\frac{M}{P}\right)^D = hY - fr = 0.5Y - 200r$$

$$\left(\frac{M}{P}\right)^D = hY - fr$$

$$\frac{M^S}{P} = \left(\frac{M}{P}\right)^D = 0.5Y - 200r \tag{4.1}$$

$$\text{velocity } (V) = \frac{Y}{M^S/P} = \frac{PY}{M^S}$$

5 Monetary Policy, Fiscal Policy, and the Government Budget

$$T - G \equiv (I + NX) - S \tag{5.1}$$

$$T = tY \tag{5.2}$$

$$\text{budget surplus } = T - G = tY - G \tag{5.3}$$

$$\text{natural employment surplus } = tY^N - G \tag{5.4}$$

$$S + (T - G) \equiv (I + NX) \tag{5.5}$$

$$S + T - G - NX = I \tag{5.6}$$

Appendix to Chapter 5

$$\text{multiplier } = \frac{1}{\text{marginal leakage rate}} \tag{1}$$

General Linear Form	Numerical Example	
$Y = kA_p$	$Y = 4.0A_p$	(2)
$A_p = A'_p - br$	$A_p = A'_p - 100r$	(3)
$Y = k(A'_p - br)$	$Y = 4.0(A'_p - 100r)$	(4)
$\left(\frac{M^S}{P}\right) = \left(\frac{M^S}{P}\right)^d = hY - fr$	$\left(\frac{M^S}{P}\right) = 0.5Y - 200r$	(5)
$Y = \frac{\frac{M^S}{P} + fr}{h}$	$Y = \frac{2{,}000 + 200r}{0.5}$	(6)

$$r = \frac{hY - \frac{M^S}{P}}{f} \tag{6a}$$

$$Y = k(A_0 - br) = k\left[A'_p + \frac{bhY}{f} + \frac{b}{f}\left(\frac{M^S}{P}\right)\right] \tag{7}$$

$$Y\left(\frac{1}{k} + \frac{bh}{f}\right) = A'_p + \frac{b}{f}\left(\frac{M^S}{P}\right)$$

$$Y = \frac{A'_p + \frac{b}{f}\left(\frac{M^S}{P}\right)}{\frac{1}{k} + \frac{bh}{f}} \tag{8}$$

$$Y = k_1 A'_p + k_2\left(\frac{M^S}{P}\right) \tag{9}$$

$$k_1 = \frac{1}{\frac{1}{k} + \frac{bh}{f}} \tag{10}$$

$$k_2 = \frac{b/f}{\frac{1}{k} + \frac{bh}{f}} = \left(\frac{b}{f} k_1\right) \quad (11)$$

$$Y = k_1 A'_p + k_2 \left(\frac{M^S}{P}\right) \quad (12)$$

IS Curve	**LM Curve**
$r = \frac{1}{b} A'_p - \frac{1}{kb} Y$	$r = \frac{h}{f} Y - \frac{1}{f} \frac{M^S}{P}$
Spending Market Eqlb.	**Money Market Eqlb.**
$Y = k(A'_p - br)$	$(\frac{M}{P}) = hY - fr$

6 International Trade, Exchange Rates and Macroeconomic Policy

$$S + (T - G) - NX = I \quad (6.1)$$

Current Account Balance + Capital Account Balance
= Balance of Payments (6.2)

Change in net international investment postion
= Current account balance (6.3)

$$e = e' \times \frac{P}{P^f}$$

Real Exchange Rate = Nominal Exchange Rate
× Ratio of domestic price level to foreign price level (6.4)

$$1 = e' \times \frac{P}{P^f} \quad (6.5)$$

$$e' = \frac{P^f}{P} \quad (6.6)$$

$$\frac{\Delta e'}{e'} = p^f - p$$

Growth Rate of Nominal Exchange Rate =
Growth Rate of Foreign Price Level
−Growth Rate of Domestic Price Level (6.7)

$$E = C + I + G + NX \quad (6.8)$$

$$NX = NX_a - nxY \quad (6.9)$$

General Linear Form	Numerical Example
$NX = NX_a - nxY - ue$	$NX = 1,000 - .1Y - 2e$

(6.10)

7 Aggregate Demand, Aggregate Supply and the Self-Correcting Economy

$$M^s V = PY \quad (7.1)$$

8 Inflation: Its Causes and Cures

$$X = PY \quad (8.1)$$

$$x = p + y \quad (8.2)$$

$$y = x - p \quad (8.3)$$

Appendix to Chapter 8

$$\text{Deviation of output ratio} = 100\frac{Y}{Y^N} - 100$$

General Linear Form	Numerical Example	
$p = p^e + g\hat{Y} + z$	$p = p^e + 0.5\hat{Y}$	(1)

General Linear Form	Numerical Example	
$p^e = jp_{-1} + (1-j)p^e_{-1}$	$p^e = p_{-1}$	(2)

General Linear Form	Numerical Example
$p^e = jp_{-1} + (1-j)p^e_{-1} + g\hat{Y} + z$	$p^e = p_{-1} + 0.5\hat{Y}$

(3)

$$x \equiv p + y \quad (4)$$

$$x - y^N \equiv p + y - y^n \quad (5)$$

$$\hat{x} \equiv p + \hat{Y} - \hat{Y}_{-1} \quad (6)$$

$$\hat{Y} \equiv \hat{Y}_{-1} + \hat{x} - p \quad (7)$$

$$p = jp_{-1} + (1-j)p^e_{-1} + g(\hat{Y}_{-1} + \hat{x} - p) + z \quad (8)$$

General Linear Form
$p = \frac{1}{1+g}\left[jp_{-1} + (1-j)p^e_{-1} + g(\hat{Y}_{-1} + \hat{x}) + z\right]$
Numerical Example
$p = \frac{2}{3}\left[p_{-1} + 0.5(\hat{Y}_{-1} + \hat{x})\right]$ (9)

$$p_{-1} = p^e_{-1} = \hat{x} = \hat{Y}_{-1} = 0$$

$$\begin{aligned} p &= \frac{1}{1+g}\left[p^e_{-1} + 0.5(\hat{Y}_{-1} + \hat{x}) + z\right] \\ &= \frac{2}{3}\left[p^e_{-1} + 0.5(\hat{Y}_{-1} + \hat{x})\right] \end{aligned} \quad (10)$$

General Linear Form	Numerical Example	
$U = U^N - h\hat{Y}$	$U = U^N - 0.4\hat{Y}$	(11)

General Linear Form	Numerical Example	
$U = U_{-1} - h(y - y^N)$	$U = U_{-1} - 0.4(y - y^N)$	(12)