Equation Sheet - ECON 312

2 The Measurement of Income, Prices and Unemployment

$$Y \equiv C + I + G + NX \quad (2.1)$$

$$Y \equiv C + S + R - F \quad (2.2)$$

$$Y \equiv C + S + T \quad (2.3)$$

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

$$T - G \equiv (I + NX) - S \quad (2.5)$$

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

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

3 The Simple Keynesian Theory of Income Determination

$$E \equiv C + I + G + NX \quad (3.1)$$

General Linear Form

$$C = C_a + c(Y - T) \quad (3.2)$$

General Linear Form

$$\begin{array}{rcl} S & = & Y - T - C = Y - T - C_a - c(Y - T) \\ & = & -C_a + (1 - c)(Y - T) \end{array} \quad (3.3)$$

$$E_p = C + I_p + G + NX \quad (3.4)$$

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

$$A_p = E_p - cY = C_a - cT_a + I_p + G + NX \quad (3.6)$$

General Linear Form	Numerical Example	
$E_p = A_p + cY$	$E_p = 1,500 + 0.75Y$	(3.7)

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

Equilibrium situation: $Y = E_p$ (3.9)

$$(1 - c)Y = sY = A_p \quad (3.10)$$

General Linear Form	Numerical Example	
$sY = A_p$	$0.25Y = 1,500$	(3.11)

General Linear Form	Numerical Example	
$Y = \frac{A_p}{s}$	$Y = \frac{1,500}{0.25} = 6,000$	(3.12)

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

(3.13)

General Linear Form	Numerical Example
Multiplier$(k) = \frac{\Delta Y}{\Delta A_p} = \frac{1}{s}$	$\frac{\Delta Y}{\Delta A_p} = \frac{1}{0.25} = 4.0$

(3.14)

Change in equilibrium: $\Delta Y = \frac{\Delta A_p}{s}$ (3.15)

Surplus: $T - G \equiv I + NX - S$

$$\Delta Y = \Delta T - \Delta G \equiv \Delta I + \Delta NX - \Delta S \quad (3.16)$$

General Linear Form	Numerical Example
$\Delta Y = \frac{\Delta A_p}{s} = \frac{-c\Delta T_a}{s}$	$\Delta Y = \frac{(-0.75)(-667)}{0.25} = \frac{500}{0.25} = 2,000$

(3.17)

General Linear Form	Numerical Example	
$\frac{\Delta Y}{\Delta T_a} = \frac{\Delta A_p}{s\Delta T_a} = \frac{-c\Delta T_a}{s\Delta T_a} = \frac{-c}{s}$	$\frac{\Delta Y}{\Delta T_a} = \frac{-0.75}{0.25} = -3.0$	(3.18)

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

Appendix to Chapter 3

$$T = T_a + tY \quad (1)$$

$$Y_D = Y - T = Y - T_a - tY = (1-t)Y - T_a \quad (2)$$

$$Y = E_p \quad (3)$$

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

$$[s(1-t)+t]Y = A_p \quad (5)$$

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)

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

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

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

$$NX = NSX_a - nxY \quad (10)$$

$$A_p = C_a - cT_a + I_p + G - NX_a \quad (11)$$

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

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

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

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

4 The IS-LM Model

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

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

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

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

5 Monetary Policy, Fiscal Policy, and the Government Budget

$$T - G \equiv (I + NX) - S \quad (5.1)$$

$$T = tY \quad (5.2)$$

$$\text{budget surplus } = T - G = tY - G \quad (5.3)$$

$$\text{natural employment surplus } = tY^N - G \quad (5.4)$$

$$S + (T - G) \equiv (I + NX) \quad (5.5)$$

$$S + T - G - NX = I \quad (5.6)$$

Appendix to Chapter 5

$$\text{multiplier } = \frac{1}{\text{marginal leakage rate}} \quad (1)$$

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)

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

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

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

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

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

$$k_1 = \frac{1}{\frac{1}{k} + \frac{bh}{f}} \quad (10)$$

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

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

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.**
$Y = k(A'_p - br)$	$\left(\frac{M}{P}\right) = hY - fr$