MULTIPLIER THEORY

When there is a change in the autonomous spending it brings about a change in the equilibrium level of income by an amount which is more than the change in the autonomous spending. The factor by which the change in autonomous spending is to be multiplied in order to get change in equilibrium level of income is called multiplier.

Types of multiplier

- Investment multiplier
- Government expenditure multiplier
- Tax multiplier
- Balance budget multiplier

INVESTMENT MULTIPLIER

The multiple amounts of change brought to the equilibrium level of income due to the change in the level of autonomous investment is called investment multiplier, also known as Keynesian investment multiplier.

Equilibrium condition for national income is given by

$$Y = C + I$$

$$\Rightarrow Y = a + bY + A$$

$$\Rightarrow Y - bY = a + A$$

$$\Rightarrow (1- b)Y = a + A$$

$$\Rightarrow Y = \frac{a+A}{1-b}$$

The equilibrium income before change in investment.

$$Y_0 = \frac{a+A}{1-b} \qquad \ldots.(1)$$

When the investment increases by ΔA so the new level of investment will be A + ΔA. So, the new equilibrium will be

$$\Rightarrow Y = a + bY + A + \Delta A$$
$$\Rightarrow Y - bY = a + A + \Delta A$$
$$\Rightarrow (1- b)Y = a + A + \Delta A$$
$$\Rightarrow Y = \frac{a+A+\Delta A}{1-b}$$

The equilibrium income after change in investment.

$$\Rightarrow Y_1 = \frac{a+A+\Delta A}{1-b} \qquad \ldots.(2)$$

The amount of change in equilibrium of income can be seen by subtracting equation 1 from equation 2

$$\Delta Y = Y_1 - Y_0$$
$$\Rightarrow \frac{a+A+\Delta A}{1-b} - \frac{a+A}{1-b}$$
$$\Rightarrow \frac{a+A+\Delta A-a-A}{1-b}$$
$$\Rightarrow \frac{1}{1-b} . \Delta A$$
$$\Delta Y = \frac{1}{1-mpc} . \Delta A$$

When the investment changes by ΔA then the equilibrium level of income changes by $\frac{1}{1-mpc} . \Delta A$.

Here the multiplier is $\frac{1}{1-mpc}$ or $\frac{1}{mps}$ and the investment multiplier is $\frac{1}{1-mpc} . \Delta A$

Size of the investment multiplier depends on the mpc. Multiplier effect will be higher if mpc is higher.

GOVERNMNET EXPENDITURE MULTIPLIER

The factor by which the change in government expenditure is to be multiplied in order to get the change in equilibrium level of national income is called government expenditure multiplier.

Equilibrium condition for national income is given by

$$Y = C + I + G$$

$$\Rightarrow Y = a + bY + A + G_0$$

$$\Rightarrow Y - bY = a + A + G_0$$

$$\Rightarrow (1- b)Y = a + A + G_0$$

$$\Rightarrow Y = \frac{a+A+G_0}{1-b}$$

The equilibrium income before change in government expenditure.

$$Y_0 = \frac{a+A+G_0}{1-b} \quad ....(1)$$

When the government expenditure increases by ΔG_0 so the new level of government expenditure will be $G_0 + \Delta G_0$. So, the new equilibrium will be

$$\Rightarrow Y = a + bY + A + G_0 + \Delta G_0$$

$$\Rightarrow Y - bY = a + A + G_0 + \Delta G_0$$

$$\Rightarrow (1- b)Y = a + A + G_0 + \Delta G_0$$

$$\Rightarrow Y = \frac{a+A+G_0+\Delta G_0}{1-b}$$

The equilibrium income after change in government expenditure.

$$\Rightarrow Y_1 = \frac{a+A+G_0+\Delta G_0}{1-b} \quad ....(2)$$

The amount of change in equilibrium of income can be seen by subtracting equation 1 from equation 2

$$\Delta Y = Y_1 - Y_0$$

$$\Rightarrow \frac{a+A+G_0+\Delta G_0}{1-b} - \frac{a+A+G_0}{1-b}$$

$$\Rightarrow \frac{a+A+G_0+\Delta G_0-a-A-G_0}{1-b}$$

$$\Rightarrow \frac{1}{1-b} \cdot \Delta G_0$$

$$\Delta Y = \frac{1}{1-b} \cdot \Delta G_0$$

When the government expenditure by ΔG_0 then the equilibrium level of income changes by $\frac{1}{1-mpc} \cdot \Delta G_0$

Here the multiplier is $\frac{1}{1-mpc}$ or $\frac{1}{mps}$ and the government expenditure multiplier is $\frac{1}{1-mpc} \cdot \Delta G_0$

Size of the government expenditure multiplier depends on the mpc. Multiplier effect will be higher if mpc is higher.

TAX MULTIPLIER

In a three sector model, government can impose tax to meet its expenditure.

The factor by which the change in tax rate is to be multiplied in order to get the change in equilibrium level of national income is called tax multiplier.

Equilibrium condition for national income is given by

$$Y = C + I + G$$

$$\Rightarrow Y = a + b(Y-T) + A + G_0$$

$$\Rightarrow Y = a + bY - bT + A + G_0$$

$$\Rightarrow Y - bY = a + A + G_0 - bT$$

$$\Rightarrow (1- b)Y = a + A + G_0 - bT$$

$$\Rightarrow Y = \frac{a+A+G_0- bT}{1-b}$$

The equilibrium income before change in tax rate.

$$\Rightarrow Y_0 = \frac{a+A+G_0- bT}{1-b} \quad ....(1)$$

When the tax rate increases by ΔT so the new level of tax will be T + ΔT. So, the new equilibrium will be

$$Y = C + I + G$$

$$\Rightarrow Y = a + b[Y-(T + \Delta T)] + A + G_0$$

$$\Rightarrow Y = a + bY - bT - b.\Delta T + A + G_0$$

$$\Rightarrow Y - bY = a + A + G_0 - bT - b.\Delta T$$

$$\Rightarrow (1- b)Y = a + A + G_0 - bT - b.\Delta T$$

$$\Rightarrow Y = \frac{a+A+G_0- bT- b.\Delta T}{1-b}$$

The equilibrium income after change in tax rate.

$$\Rightarrow Y_1 = \frac{a+A+G_0- bT- b.\Delta T}{1-b} \quad ....(2)$$

The amount of change in equilibrium of income can be seen by subtracting equation 1 from equation 2

$$\Delta Y = Y_1 - Y_0$$

$$\Rightarrow \frac{a+A+G_0- bT- b.\Delta T}{1-b} - \frac{a+A+G_0- bT}{1-b}$$

$$\Rightarrow \frac{a+A+G_0-bT-b.\Delta T-a-A-G_0+bT}{1-b}$$

$$\Rightarrow \frac{-b\Delta T}{1-b}$$

$$\Rightarrow \frac{-b}{1-b} \cdot \Delta T$$

$$\Delta Y = \frac{-b}{1-b} \cdot \Delta T$$

$$= - \frac{mpc}{1-mpc} \cdot \Delta T$$

Increase in tax rate decrease the equilibrium level of income.

When the tax rate changes by ΔT then the equilibrium level of income changes by $- \frac{mpc}{1-mpc} \cdot \Delta T$

Here the multiplier is $\frac{-mpc}{1-mpc}$ or $\frac{-mpc}{mps}$ and the tax multiplier is $\frac{-mpc}{1-mpc} \cdot \Delta T$

Size of the tax multiplier depends on the mpc. Multiplier effect will be higher if mpc is higher.

BALANCED BUDGET MULTIPLIER

If the amount of income of the Government is equal to the expenditure of the Government then it is called balanced budget.

Equilibrium condition for national income is given by

$$Y = C + I + G$$

$$\Rightarrow Y = a + b(Y-T) + A + G_0$$

$$\Rightarrow Y = a + bY - bT + A + G_0$$

$$\Rightarrow Y - bY = a + A + G_0 - bT$$

$$\Rightarrow (1- b)Y = a + A + G_0 - bT$$

$$\Rightarrow Y = \frac{a+A+G_0-bT}{1-b}$$

The equilibrium income before increase in government expenditure and tax

$$\Rightarrow Y_0 = \frac{a+A+G_0-bT}{1-b} \quad \ldots.(1)$$

Now the govt expenditure is increase by ΔG_0 and the tax is increased by ΔT, such that $\Delta G_0 = \Delta T$ (balanced budget). The new level of government expenditure will be $G_0 + \Delta G_0$ and new level of tax will be $T + \Delta T$. So, the new equilibrium will be

$$Y = C + I + G$$

$$\Rightarrow Y = a + b[Y-(T + \Delta T)] + A + G_0 + \Delta G_0$$

$$\Rightarrow Y = a + bY - bT - b.\Delta T + A + G_0 + \Delta G_0$$

$$\Rightarrow Y - bY = a + A + G_0 + \Delta G_0 - bT - b.\Delta T$$

$$\Rightarrow (1- b)Y = a + A + G_0 + \Delta G_0 - bT - b.\Delta T$$

$$\Rightarrow Y = \frac{a+A+G_0+\Delta G0 - bT - b.\Delta T}{1-b}$$

The equilibrium income after change in government expenditure and tax.

$$\Rightarrow Y_1 = \frac{a+A+G_0+\Delta G0 - bT - b.\Delta T}{1-b} \quad \ldots.(2)$$

The amount of change in equilibrium of income can be seen by subtracting equation 1 from equation 2

$$\Delta Y = Y_1 - Y_0$$

$$\Rightarrow \frac{a+A+G_0+\Delta G0 - bT - b.\Delta T}{1-b} - \frac{a+A+G_0-bT}{1-b}$$

$$\Rightarrow \frac{a+A+G_0+\Delta G_0 - bT - b.\Delta T - a - A - G_0 + bT}{1-b}$$

$$\Rightarrow \frac{\Delta G_0 - b\Delta T}{1-b}$$

$$\Rightarrow \frac{\Delta G_0 - b\Delta G_0}{1-b} \quad \text{(because } \Delta G_0 = \Delta T\text{)}$$

$$\Rightarrow \frac{(1-b)\Delta G_0}{1-b}$$

$$\Rightarrow \Delta Y = \frac{(1-b)}{1-b} \cdot \Delta G_0$$

$$\Delta Y = 1.\ \Delta G_0$$

Here the value of balanced budget multiplier is 1. When change in government expenditure is equal to the change in tax and the change is in same direction then the equilibrium level of income also changes by the same amount and in the same direction.

Q. C = 100 + .5Y

I = 100

G = 100

T = 100

ΔI = 100

ΔG = 50

ΔT = 50

Find

1. Investment multiplier
2. Government multiplier
3. Tax multiplier
4. Balanced budget multiplier.