One of the basic questions in macro-economics is Why output fluctuates around its potential level. Growth is highly uneven. In business cycle, booms and recessions, output rises and falls relative to the trend of potential output. In this chapter, an explanation has been given for these fluctuations in real output relative to trend. The key of this model is the mutual interaction between output and spending. Spending determines output and income, but output and income also determine spending.

In this simple Keynesian model of income determination we assume for the time being that prices do not change at all and that firms are willing to sell any amount of output at the given level of prices. Thus, the aggregate supply curve is assumed to be flat (entirely). The chapter develops the theory of aggregate demand.

28 Thursday

The important finding of this chapter is that because of the feedback between spending and output, increases in autonomous spending (viz, increased government expenditure), generate further increase in aggregate demand

Aggregate Demand and Equilibrium Output:

Aggregate demand is the total amount of goods demanded in the economy. So,

$$AD = C + I + G + NX \quad \ldots \quad (1)$$

where C = Consumption; I = investment, G = Govt's expenditure, $NX = X - M$ = Net export,

Output is at its equilibrium level when the quantity of output produced is equal to the quantity demanded. Thus, an economy is at equilibrium when

$$Y = AD = C + I + G + (X - M) \quad \text{--- (2)}$$

When AD is not equal to output, there is unplanned inventory investment or disinvestment. That is,

$$IU = Y - AD \quad \text{--- (3)}$$

where IU is unplanned additions to inventory. If $Y > AD$, there is unplanned inventory investment, $IU > 0$. As more inventory piles up, firms cut back on production until output and aggregate demand are again in equilibrium. Conversely, if output is below aggregate demand, inventories are drawn down until

Saturday 30

equilibrium is restored.

Consumption Function and Saving Function:

Consumption constitutes the largest part of aggregate demand and there is a direct link between Consumption and income. For simplicity, here we omit the government and foreign trade, therefore setting both G and NX equal to zero.

Demand for consumption goods increases with income; Families with higher incomes consume more than families with lower income, and countries where income is higher have higher levels of total consumption. The relationship between consumption and income is described by the Consumption Function.

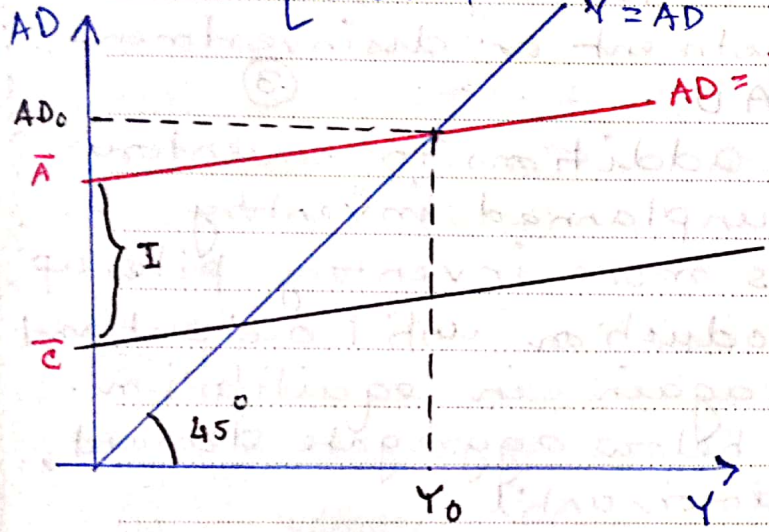
The consumption function can be written as

$C = \bar{C} + cY$, $\bar{C} > 0 \Rightarrow$ autonomous consump^n

$0 < c < 1 \Rightarrow c =$ marginal propensity to consume.

..... (4)

We can draw a consumption function based on this equation:



The variable $\bar{C}$, the intercept, represents the level of consumption when income is zero. For every dollar increase in income, the level of consumption increases by $\$c$. For ex, if c is 0.9, then for every $\$1$ increase in income, consumption rises by 90 cents. The slope of the consumption function is $c = \frac{\Delta C}{\Delta Y}$. Along the consumption function the level of consumption rises with income. The marginal propensity to consume, c, is greater than ~~zero~~ and less than one. It means that out of a dollar increase in income, only a fraction, c, is spent on consumption and the rest goes for savings.

So the fraction $(1-c)$ of increased dollar income, that is not spent on consumption must be saved. So income is either spent or saved. Therefore, the saving function is

$S \equiv Y - C$ ..... (5)

Equation (5) tells that saving is equal to income minus consumption.

Monday 1

The Savings function is ~~together with eq.~~

~~The Consumption function (4), and Saving function (5) together~~ Called the budget constraint. The Saving function relates the level of saving to the level of income. Substituting the Consump^n function in equation (4) into the budget Constraint in equation (5) yields the saving function:

$$S \equiv Y - C = Y - \bar{C} - cY = -\bar{C} + (1-c)Y \quad \cdots (6)$$

Here, saving is an increasing function of the level of income because the marginal propensity to save (MPS), $s = 1-c$, is positive.

In other words, saving increases as income rises. For instance, suppose $c = 0.9$, then $s = 1-c = 0.1$. So, 90 cents out of each extra dollar of income is Consumed and 10 cents is saved.

Tuesday 2

Consumption, Aggregate Demand and Autonomous Spending:

We have analysed one component of aggregate demand, and its link to income. Now we add investment, government spending and taxes, and foreign trade to our model, but we assume for the moment that each is autonomous, that is, determined outside the model and specially independent of the level of income. When, $I = \bar{I}$; $G = \bar{G}$; $T = \overline{TA}$ and $TR = \overline{TR}$ and $NX = \overline{NX}$, Consumption depends only on disposable income.

$$Y_D = Y - TA + TR \quad \cdots (7)$$

$$C = \bar{C} + cY_D = \bar{C} + c(Y + TR - TA) \quad \cdots (8)$$

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31					1	2
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17	18	19	20	21	22	23
24	25	26	27	28	29	30

Aggregate demand is the sum of consump^{n} demand, investment demand, Government spending, and net exports. Continuing to assume that the government sector and foreign trade are exogenous,

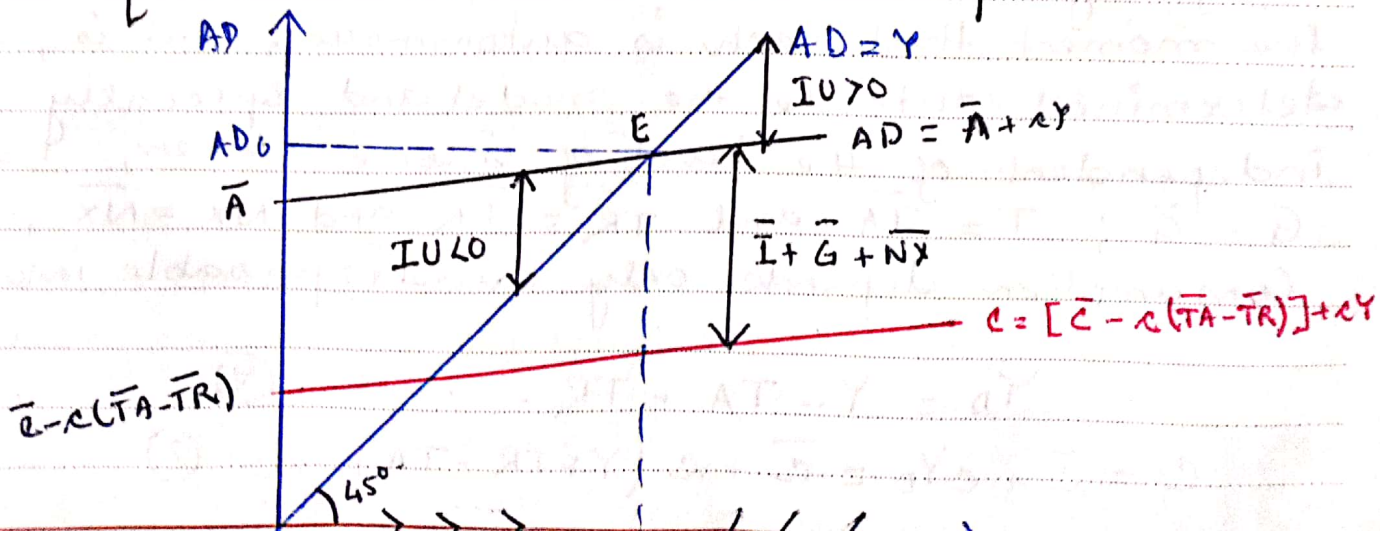
$$AD = C + I + G + NX$$
$$= \bar{C} + c(Y - \bar{T}A + \bar{T}R) + \bar{I} + \bar{G} + \bar{NX}$$
$$= [\bar{C} - c(\bar{T}A - \bar{T}R) + \bar{I} + \bar{G} + \bar{NX}] + cY$$
$$= \bar{A} + cY \quad \ldots (9)$$

This function is shown in diagram (2). A part of aggregate demand, $\bar{A} = \bar{C} - c(\bar{T}A - \bar{T}R) + \bar{I} + \bar{G} + \bar{NX}$, is independent on the level of income, constitutes the autonomous demand. Another part, induced demand, depends on the level of income. It increases with the level of income because

4 Thursday

consumption demand increases with income. The AD schedule is obtained by adding (vertically) the demand for consumption, investment, government spending, and net exports at each level of income.

Equilibrium Income and Output:



The above figure determines the equilibrium level of income and output. The equilibrium takes place at a point where aggregate demand equals output. In fig, we have drawn a 45° line at each point on this line AD = Y. Only at point E and at the corresponding equilibrium level of income and output (Y_0), does aggregate demand exactly equal output. At that level of output and income, planned spending precisely matches production.

The arrows on the horizontal axis in figure 2 indicate how the economy reaches equilibrium. At any level of income below Y_0, firms find demand exceeds output and inventories are declining, and they therefore increase

Saturday 6

Conversely for output levels above Y_0, firms find inventories piling up and therefore cut production. As the arrows show, this automatic process leads to the output level Y_0 at which current production actually matches planned investment spending and unintended inventory changes (IU) are therefore equal to zero.

The determination of equilibrium output in Fig 2 can also be derived algebraically by eq using equation (9) and the equilibrium condition in the goods market, which tells that output is equal to aggregate demand:

$$Y = AD \quad \ldots \quad (10)$$

Substituting the AD equation in (10), we have the following equilibrium condition:

$$Y = \bar{A} + cY \quad \ldots (11)$$

or, $Y - cY = \bar{A}$

or, $Y(1-c) = \bar{A}$

or, $Y = Y_0 = \frac{1}{1-c} \cdot \bar{A} \quad \ldots (12)$

Y_0 = Equilibrium output.

Fig (2) sheds light in equation (12). The position of AD schedule is characterized by its slope, c (marginal propensity to consume), and intercept, $\bar{A}$ (autonomous spending). Given the intercept, a steeper AD function (higher MPC) implies a higher level of income. Similarly, for a given MPC, a higher level of autonomous spending, $\bar{A}$, implies a higher equilibrium level of income.

8 Monday

Equation (12) shows the level of output as a function of the marginal propensity to consume and autonomous spending. This equation can be used to explain how does the equilibrium income change when autonomous expenditure changes by some extent.

Savings and Investment and Equilibrium:

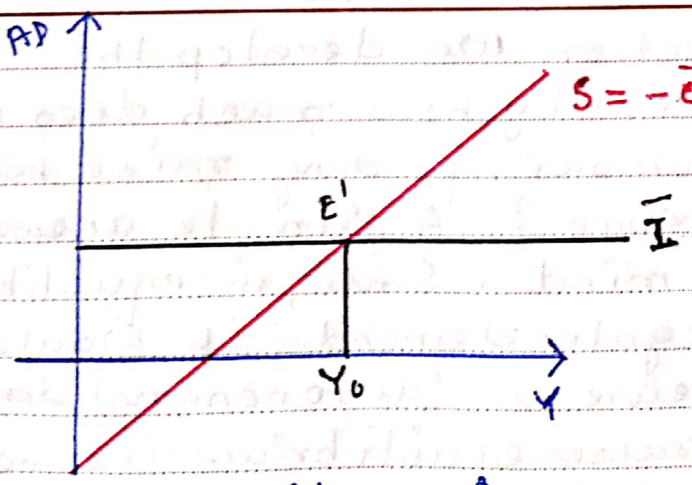
There is a useful alternative formulation of the equilibrium condition that aggregate demand is equal to output. In equilibrium, planned investment equals saving. This condition is applied to an economy in which there is no government and no foreign trade.

To understand the relationship, we can return to fig 2. When $\bar{G} = 0$, and $\bar{N}x = 0$, the vertical distance between the AD and consumption schedule in the figure is equal to investment spending, $\bar{I}$. At E, $Y = AD$. From national income accounting, we know that $Y = C + S$. Without government and foreign trade, AD equals to consumption plus investment, $Y = C + I$. Putting these two relations together, we have

$$C + S = C + I$$

or, $$S = I$$

Therefore, at the equilibrium level of income, planned saving equals to planned investment



If we include government and foreign trade in the analysis, we get a more complete picture relating investment to saving and also to net exports. Now income can be spent, saved, or paid in taxes, so $Y = C + S + TA - TR$ and $AD = C + I + G + NX$. Therefore in equilibrium, $Y = AD$

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$$\therefore Y(1-c) = \bar{A}$$

$$\therefore Y = Y_0 = \frac{1}{1-c} \cdot \bar{A} \quad \ldots (12)$$

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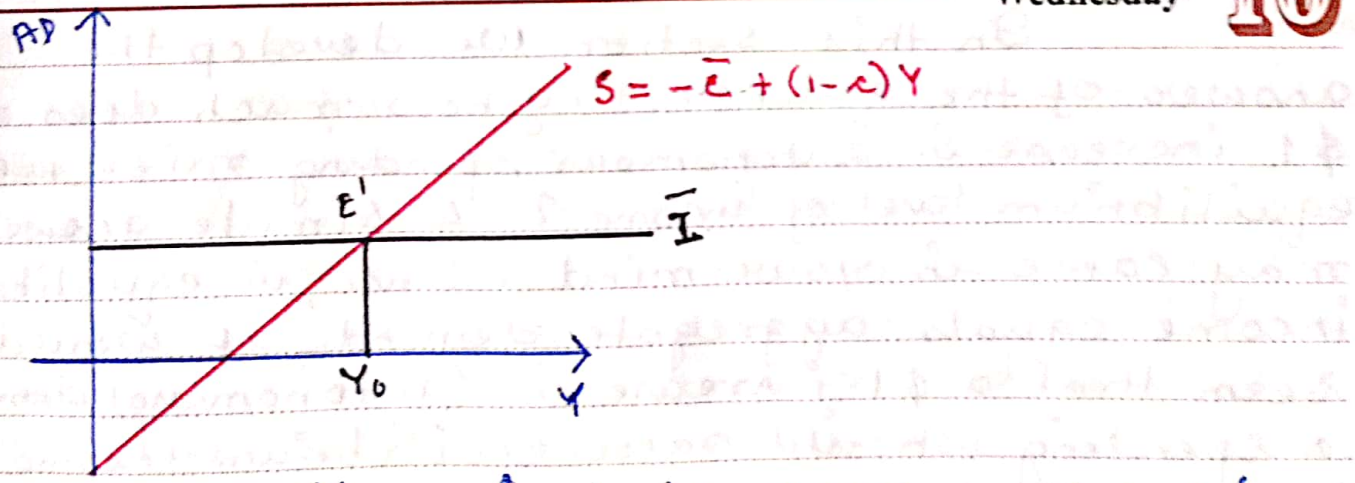

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Or $C + I + G + NX = C + S + TA - TR$

or, $I = S + (TA - TR - G) - NX$ ..(14)

That is, investment equals private savings (S) plus government budget surplus minus net exports. In other words, equation (14) also shows total ~~investment~~ domestic saving has three purposes: part of S may be used by the business sector to finance investment, part may be borrowed by the government to meet its budget deficit and part may be borrowed by foreigners to pay for their trade deficit.

$$S = I + (G + TR - TA) + NX \quad ..(14a).$$

12 Friday

THE MULTIPLIER:

In this section we develop the answer of the question, by how much does a $1 increase in autonomous spending raise the equilibrium level of income? A simple answer may came in your mind. Since, in equilibrium, income equals aggregate demand, it would seem that a $1 increase in (autonomous) demand or spending should raise equilibrium income by $1. But the answer is wrong. Let us explain why.

Suppose first that output increased by $1 to match the level of autonomous spending. This increase in output and income would in turn raise the consumption spending because the level of income has risen. But how much

$$1 + c + c^2 + c^3 + \cdots = \frac{1}{1-c}.$$

Consumption will rise? We know that out of an additional dollar of income, a fraction c is consumed. Assume, then, that production increases further to meet this induced expenditure; that is, that output and income increase by $1+c$. That will still leave us with an excess demand because the expansion in production and income by $1+c$ will give rise to further induced spending (ie, consumption). This process will continue.

In Table 1, we lay out the steps in the chain more clearly. The first round starts off with an increase in autonomous spending, $\Delta\bar{A}$. Next, we allow an expansion of production to meet exactly that increase in demand. Production accordingly expands by $\Delta\bar{A}$.

Sunday 14

This increase in production gives rise to an equal increase in income and, therefore, via the marginal propensity to consume, c, gives rise in the second round to increased expenditure of size $c \cdot \Delta\bar{A}$. Assume again that production expands to meet this increase in spending. The production adjustment this time is $c\Delta\bar{A}$, and so is the increase in income. This gives rise to a third round of induced spending equal to the marginal propensity to consume times the increase in income, $c(c \cdot \Delta\bar{A}) = c^2\Delta\bar{A}$. Since c is less than one, $c^2 < c$, and therefore induced expenditure in the third round are smaller than those in the second round.

15 Monday

TABLE : 1 The Multiplier

ROUND	INCREASE IN DEMAND IN THIS ROUND	INCREASE IN PRODUCTION IN THIS ROUND	TOTAL INCREASE IN INCOME ALL ROUNDS
1	$\Delta\bar{A}$	$\Delta\bar{A}$	$\Delta\bar{A}$
2	$c.\Delta\bar{A}$	$c.\Delta\bar{A}$	$(1+c)\Delta\bar{A}$
3	$c^2\Delta\bar{A}$	$c^2\Delta\bar{A}$	$(1+c+c^2)\Delta\bar{A}$
4	$c^3.\Delta\bar{A}$	$c^3.\Delta\bar{A}$	$(1+c+c^2+c^3)\Delta\bar{A}$
...	...	...	...
			$= \frac{1}{1-c}.\Delta\bar{A}$

16 Tuesday

If we write out the successive rounds of increased spending, starting with the initial increase in autonomous demand, we obtain

$$\Delta AD = \Delta\bar{A} + c\Delta\bar{A} + c^2\Delta\bar{A} + c^3.\Delta\bar{A} + \ldots$$
$$= \Delta\bar{A}\,(1 + c + c^2 + c^3 + \ldots) \quad \ldots (15)$$

This is an infinite geometric series, so the equation simplifies to

$$\Delta AD = \frac{1}{1-c}.\Delta\bar{A} = \Delta Y_0 \quad \ldots (16)$$

From equation (16), therefore, we find the cumulative change in aggregate spending is equal to a multiple of the increase in autonomous spending. The multiple $1/1-c$ is called the multiplier. The multiplier is the

amount by which equilibrium output changes when autonomous aggregate demand increases by one unit. In this case, omitting the government sector and foreign trade, we define the multiplier as α, where

$$\alpha = \frac{1}{1-c} \quad \ldots (17)$$

The equation shows that the larger the marginal propensity to consume, the larger the multiplier. This is because a high MPC implies that a larger fraction of an additional dollar of income will be consumed, and thus, added to aggregate demand, thereby causing a larger induced increase in demand.

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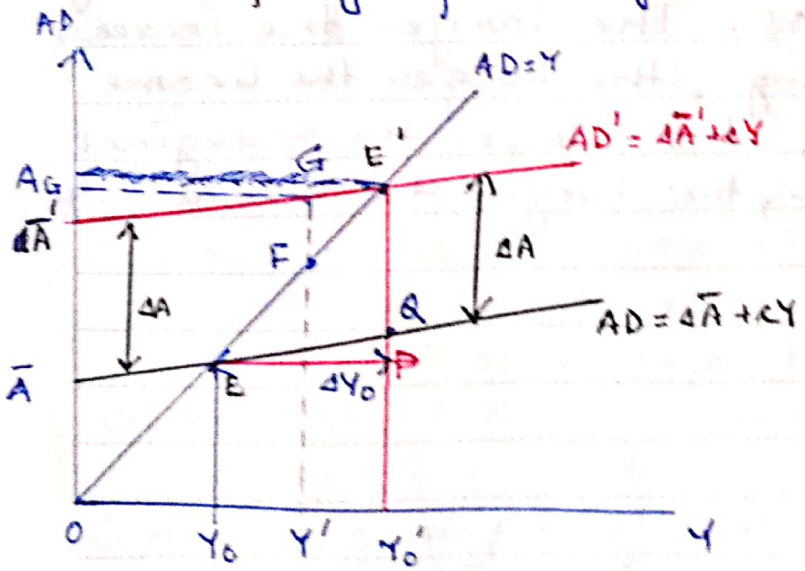
We can also express the multiplier concept graphically.



The initial equilibrium is at point E, with an income level Y_0. Now autonomo spending increases from $\bar{A}$ to $\bar{A}'$. This is represented by a parallel upward shift of the AD schedule to AD'. This means at each level of income, AD is higher by an amount $\Delta\bar{A} = \bar{A}' - \bar{A}$

Aggregate demand now exceeds the initial level of output, Y_0. Consequently, inventories

begin to run down. Firms will respond to the increase in demand and declining inventories by expanding production, say, to income level Y'. This expansion in production gives rise to induced expenditure, increasing aggregate demand to the level AG. At the same time, the expansion reduces the gap between aggregate demand and output to the vertical distance FG. The gap between demand and output is reduced because MPC < 1.

Thus with MPC < 1, a sufficient expansion in output will restore the balance between AD and Y. In figure, the new equilibrium is indicated by point E', and the corresponding level of income is Y_0'. The change in income required is therefore $\Delta Y_0 = Y_0' - Y_0$.

The magnitude of the income change depends on two factors. The larger the increase in autonomous spending, the larger the income change. Furthermore, the larger the marginal propensity to consume, the larger the income change.

THE GOVERNMENT SECTOR:

Sunday 21

The government plays an important role in an economy. The government can directly influence the equilibrium income in two separate ways. First, government purchases of goods and services, G, are a component of aggregate demand. Second, taxes and transfers affect the relation between output and income, Y, and the disposable income, Y_D. In this chapter/section, we are concerned with the way in which government purchases, taxes, and transfers affect the equilibrium level of income.

Disposable income (Y_D) is the net income available for spending by households after they receive transfers from and pay taxes to the govt. So, $Y_D = Y + TR - TA$. Fiscal Policy is the

Monday 22

policy of the government with regard to the level of government purchases, the level of transfers, and the tax structure. We assume that the government purchases a constant amount, G; that it makes a constant amount of transfers, TR; and that it imposes a proportional income tax, collecting a fraction, t, of income:

$$G = \bar{G} \qquad TR = \bar{TR} \qquad TA = tY \quad \ldots (18)$$

Taking the fiscal policy into consideration, we can rewrite the consumption function by substituting the values of TR and TA in equation (8), as

$$C = \bar{C} + c(Y + \bar{TR} - tY)$$
$$= \bar{C} + c\bar{TR} + c(1-t)Y \quad \ldots (19)$$

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20 Saturday

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$$= \bar{C} + c\bar{TR} + c(1-t)Y \quad \ldots(19)$$

Equation (19) shows the presence of transfers raises autonomous consumption spending by the MPC out of disposable income c, times the amount of transfers. Income taxes, by contrast, lower consumption spending at each level of income.

While mpc remains c, the marginal propensity to consume out of income is now $c(1-t)$, where $(1-t)$ is the fraction of income left after taxes. For example, if $c = 0.8$, and $t = 0.25$, the mpc out of income, $c(1-t)$, is 0.6 $\{= 0.8(1-0.25)\}$

Combining the aggregate demand identity with equation (18) and (19), we have

$$\begin{aligned} AD &= C + I + G + NX \\ &= \left[\bar{C} + c\bar{TR} + c(1-t)\bar{Y}\right] + \bar{I} + \bar{G} + \bar{NX} \\ &= \left(\bar{C} + c\bar{TR} + \bar{I} + \bar{G} + \bar{NX}\right) + c(1-t)Y. \\ &= \bar{A} + c(1-t)Y \qquad \cdots (20) \end{aligned}$$

where $\bar{A} = \bar{C} + c\bar{TR} + \bar{I} + \bar{G} + \bar{NX}$.

The slope of the AD schedule is flatter because households now have to pay part of every dollar of income in taxes and are left with only $(1-t)$ of that dollar.

Equilibrium Income:

Now we are going to determine the equilibrium income when the government sector is included. The equilibrium condition for the goods market, $Y = AD$, and using equation

(20), write the equilibrium condition as

$$Y = \bar{A} + c(1-t)Y$$

We can solve this equation for Y_0, the equilibrium level of income, by collecting terms in Y:

$$Y[1-c(1-t)] = \bar{A}$$

or, ~~$Y_0 = \frac{1}{1-c(1-t)} \bar{A}$~~

or, $$Y_0 = \frac{1}{1-c(1-t)} (\bar{C} + c\bar{TR} + \bar{I} + \bar{G} + \bar{NX})$$

or, $$Y_0 = \frac{\bar{A}}{1-c(1-t)} \quad \ldots (21)$$

Comparing equation (21) with equation (12), we see that the government sector makes a substantial difference. It raises the autonomous spending by the amount of government purchases, G, and by the amount of induced spending out of net transfers, $c\bar{TR}$; in addition, the presence of the income tax lowers the multiplier.

Friday 26

Income taxes lower the multiplier, that is seen in equation (21). If MPC = 0.8, and t = 0 then the value of the multiplier, $\frac{1}{1-c(1-t)} = \frac{1}{1-0.8}$ = 5. But with the same mpc if t = 0.25, the value of the multiplier becomes half, ie, $\frac{1}{1-0.8(1-0.25)} = 2.5$. Income taxes reduce the

multiplier because they reduce the induced increase of consumption out of changes in income.

Income Taxes as Automatic Stabilizers:

The proportional income tax is one example of automatic stabilizers. An automatic stabilizer is any mechanism in the economy that automatically – that is, without case-by-case government intervention – reduces the amount by which output changes in response to a change in autonomous demand.

One explanation of the business cycle is that it is caused by shifts in autonomous demand, especially investment. Sometimes investors become too optimistic and

28 Sunday

investment is high, and, so is output. But sometimes they are pessimistic, and so both investment and output are low.

Swings in investment demand have a smaller effect on output when automatic stabilizers, such as a proportional income tax that reduces the multiplier, are in place. This means that in the presence of automatic stabilizers output would fluctuate less than it would without them.

Like proportional income tax there is another automatic stabilizer, unemployment benefit. Unemployment benefits, enable the unemployed to continue consuming even though they do not have a job, so TR rises when Y falls.

Automatic Stabiliser: Proportional income tax reduces income by the amount by which output increases in response to an increase in autonomous demand.

This means that demand falls less when someone becomes unemployed and receives benefits than it would if there were no benefits. This, too, makes the multiplier smaller and output more stable.

Effect of a Change in Fiscal Policy:

We now concentrate on the effects of changes in fiscal policy on the equilibrium level of income. The effects are shown in fig 4. The initial level of income is Y_0. An increase in Government purchases (by ΔG) shifts the AD schedule upward by an amount of ΔG. At the initial level of income and output, the demand for goods exceeds output, and, accordingly, firms expand production until the new equilibrium, at point E', is reached.

The change in equilibrium income will equal to the change in aggregate demand, or

$$\Delta Y_0 = \Delta \bar{G} + c(1-t)\Delta Y_0$$

where $\bar{C}$, $\overline{TR}$, $\bar{I}$, and $\overline{NX}$ are constant by assump^n. Thus the change in equilibrium is

$$\Delta Y_0 = \frac{1}{1-c(1-t)} \Delta G$$

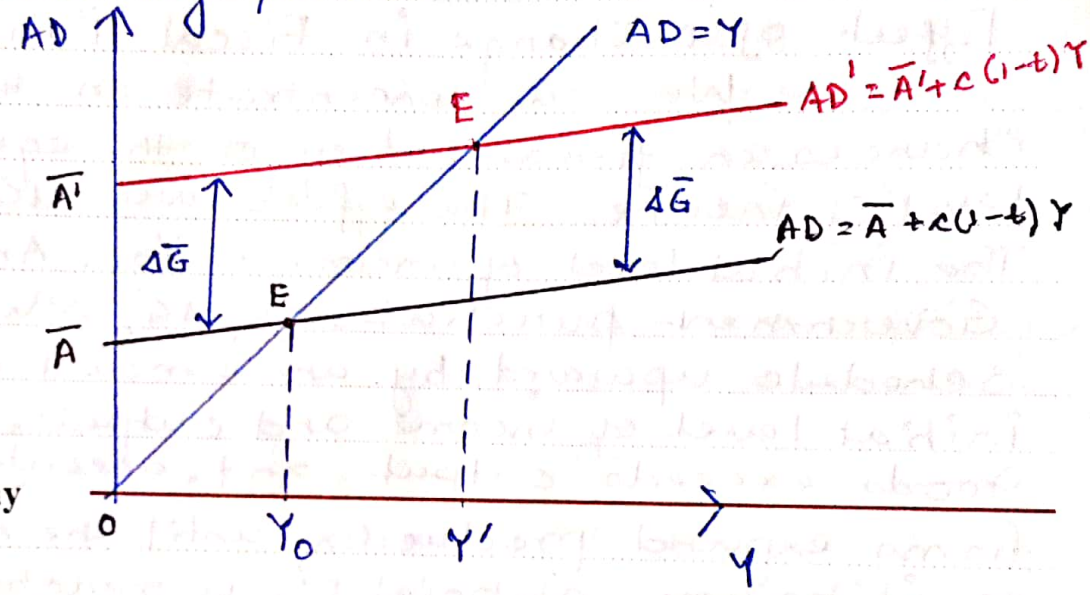
$$= \alpha_G \Delta G \quad \ldots (22)$$

where, $\alpha_G = \frac{1}{1-c(1-t)} \quad \ldots (23)$

$\Delta Y_0 = \Delta G + c(1-t)\Delta G + c^2(1-t)^2 \Delta G + \ldots$

$= \Delta G \left(1 + c(1-t) + c^2(1-t)^2 + \ldots\right) = \Delta G \cdot \frac{1}{1-c(1-t)}$

Thus, a $1 increase in government purchase will lead to an increase in income in excess of a dollar. With $c = 0.8$ and $t = 0.25$, we would have a multiplier of 2.5. A $1 increase increase in government spending raises equilibrium income by $2.50.



Suppose that instead of raising government spending on goods and services, $\bar{G}$, the government increases transfer payments, $\bar{TR}$. Autonomous spending, $\bar{A}$, will increase by only $c\Delta\bar{TR}$, so output will rise by $\alpha_G \times c\Delta\bar{TR}$. The multiplier for transfer payments is smaller than that of government spending - by a factor c - because ~~that~~ part of any increase in $\bar{TR}$ is saved.

If the government raises marginal tax rates, two things happen. The direct effect is that aggregate demand will be reduced since the increased taxes reduce disposable income and therefore consumption. In addition, the

multiplier will be smaller, so shocks will have a smaller effect on aggregate demand.

The fiscal policy helps to stabize the economy. When the economy is in a recession, or growing slowly, taxes should be cut or spending increased to get output to rise. And when the economy is booming, taxes should be increased or government spending cut to get back down to full employment.

The Budget:

The budget is the annual statement of income and expenditure of the government of a country. Most of the countries are suffering from deficit budget, where expenditure exceeds income. Now the question arises, Is there a reason for concern over a budget deficit? The feare is that the government's borrowing makes it difficult for private persons firms to borrow and invest and thus slows the economy's growth.

Saturday 4

The budget surplus is the excess of the government's revenues, taxes, over its total expenditures, consisting of purchases of goods and services and transfer payments:

$$BS \equiv TA - \bar{G} - \overline{TR} \quad \ldots (24)$$

A negative budget, an excess of expenditure over revenues, is a budget deficit.

In case of proportional income tax

, $TA = tY$ and then

$$BS = tY - \bar{G} - \overline{TR} \quad \cdots (24a)$$

Fig 6 below shows the budget surplus as a function of the level of income for given $\bar{G}$, $\overline{TR}$, and income tax rate, t. At low levels of income the budget is in deficit ($\bar{G} + \overline{TR} > tY$). At high levels of income, the budget shows a surplus. Since $tY > \bar{G} + \overline{TR}$.

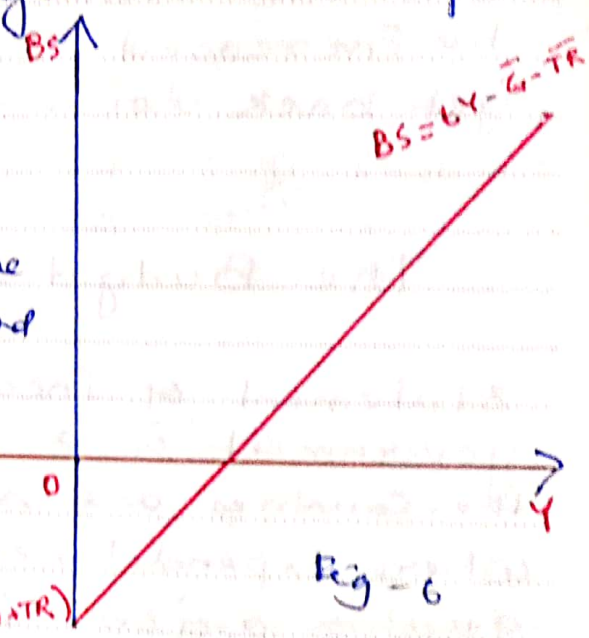


Fig - 6

Fig also shows that the budget deficit depends not only on the government's policy choices, reflected in the tax rate (t), purchases ($\bar{G}$), and transfers ($\overline{TR}$), but also on anything else that shifts the level of income. For instance, suppose there is an increase in investment demand that increases the level of output. Then the budget deficit will fall or the surplus will rise because tax revenues have risen.

6 Monday

In time of recessions the government's tax receipts are low but the transfer payments through unemployment benefits become high. As a result, budget deficit rises during recessions.