Y- income
S-Savings
T-Tax
M-Import
X-Export
I-investment
G-Govt Expenditure
C-consumption
AE=E=aggregate expenditure
Yd- disposable income

W=withdrawal(leak)
J-injection

more leak

Theme-2
The Basic Keynesian Model of Output Determination

Let us now build our basic Keynesian model, step-by-step:

1. The economy is described by a set of data. These are the macroeconomic variables that we discussed earlier.
2. The level of economic activity is measured through a system of national accounts, compiled in three alternative ways (income, output and expenditure).
3. Macroeconomic theory seeks to explain how an economy reaches a state of equilibrium where the greatest possible output is produced, how full employment is achieved with price stability, and external balance (in the balance of payments) is maintained.
4. The circular flow model gives us a basic notion what a macroeconomic equilibrium means; it is one where **total output = total income = total expenditure**. If this is not so, something will have to change.
5. Equilibrium implies $Y = AE$ where $AE = C + I + G + (X - M)$

   inj=leak
   $$S + T + M = I + G + X \text{ where } S = Y_d - C \text{ and } Y_d = Y - T$$
   $$Y_d - C + T = I + G + X - M$$
   $$Y_d + T = C + I + G + (X - M)$$
   $$Y = C + I + G + (X - M)$$

6. Leakages from the circular flow can cause the level of expenditure to be less than output or income. The money spent on buying domestically produced goods and services is not enough to pay for all the goods and services produced. Some goods remain unsold and firms will adjust their production plans accordingly. These leakages take place when people save, the government imposes taxes and goods are imported from foreign countries.
7. However, at the same time there are injections into the systems in addition to consumption spending in the form of investment by firms, government expenditure and export of goods and services to foreign countries.
8. Leakages threaten to upset the overall level of equilibrium output, injections restore equilibrium. However, the magnitude of leakages and injections are crucial.
9. There are then two ways we can think of macroeconomic equilibrium:

   $$\mathbf{Y = E} \quad \text{or} \quad \mathbf{W = J} \quad \text{i.e.} \quad \mathbf{S + T + M = I + G + X} \qquad \dots (1)$$

   where W = (withdrawals) leakages and J = injections
10. Now if $\mathbf{E < Y}$ we said something will have to change to restore equilibrium. What is that something? To Keynes it was output itself that would have to change, prices would not. This is the crucial argument in Keynesian theory.
11. But why do prices not fall when firms' find inventories piling up in their warehouses? Or why do prices not increase when demand begins to increase? To Keynesian prices are "sticky" in the short-run and do not adjust instantaneously to changes in demand. The assumption is not tenable in the long-run.

Case 1: $\mathbf{E < Y}$

In this case all output produced is not bought. Inventories pile up in warehouses. Firms will cut back on planned production for the subsequent year. To produce less they will employ fewer people and fewer intermediate products. This in turn will have an impact on other firms who will

also begin to cut planned production, employment and intermediate goods. The vicious cycle continues to pull the economy into a spiraling contraction until expenditure is equal to the output produced. This may be shown as:

$$E < Y \longrightarrow Y \downarrow \quad \ldots\ldots\ldots\ldots \quad (2)$$

To Keynes, a deficiency in expenditure or in other words the lack of demand that is the cause of output to be below full employment levels and consequently, unemployment. Output is essentially demand determined and the solution to unemployment is to increase output by stimulating demand.

Case 2:   **E > Y**

In this case desired expenditure is actually greater than produced output. Inventories are quickly depleted. Firms begin to increase planned production for the subsequent period. They hire more employees and place orders for intermediate goods. This leads to increase in planned production of other firms. The economy moves in an upward spiral until expenditure is equal to output produced. Throughout this process prices remain stable since Keynesian's assume there is existing (excess) capacity in all sectors. Expansion in the short-run Keynesian analysis is usually from recession to full employment levels.

$$E > Y \longrightarrow Y \uparrow \quad \ldots\ldots\ldots\ldots \quad (3)$$

We can also write equation (2) and (3) as (4) and (5) respectively:

$$E < Y \longrightarrow W > J \dashrightarrow Y \downarrow \quad \ldots\ldots\ldots\ldots \quad (4)$$

$$E > Y \longrightarrow W < J \longrightarrow Y \uparrow \quad \ldots\ldots\ldots\ldots \quad (5)$$

The Formal Keynesian Model

From equation (1), we know that equilibrium requires:

$$\mathbf{Y = E = C + I + G + (X - M)}$$

We now study the various components of aggregate expenditure (E). We will first consider a simple economy with no government and external sector. Therefore, we have:

$$Y \ = \ C + I$$

C or consumption expenditure is the most important component of aggregate expenditure amounting to roughly about 55-56%. Keynes' theory of consumption expenditure is called the **absolute income hypothesis** as considers consumption to be a function of income, i.e.

$$C = f\,(Y)$$

One possible relation between consumption and income could be a linear one, i.e.

$$C = a + bY \qquad \text{where } a = \text{constant and } 0 < b \leq 1$$

"b" is called the **marginal propensity to consume**, which tells us how much of an additional rupee of income is spent on consumption. Also, the marginal propensity to consume (mpc):

$$mpc = b = dC/dY = \text{slope of consumption function}$$

The consumption function has been an area of a huge amount of study and empirical estimation. Consumption may, however, depend on several other factors apart from income, including stock of wealth, availability and cost of credit, expected price level, distribution of income and inequalities, tastes and attitudes, etc. Apart from Keynes' **absolute income hypothesis**, there are other models of consumption including Dusenbury's **relative income hypothesis**, Friedman's **permanent income hypothesis**, and Ando and Modigliani's **life cycle hypothesis**. These alternative theories of consumption do not later Keynes' analysis significantly.

depends on model

Consumption is an **endogenous** variable in our model. It depends on income but income itself depends on expenditure that includes consumption. Variables not dependent on the model or determined outside the model are called **exogenous**.

independent from model

Now let us see how equilibrium output is determined in the simplest possible model with $I = G = X = M = 0$. Then,

$$Y = C = a + bY$$

$$Y^* = a / (1 - b) \quad Y^*=Y \text{ equilibrium}=E=C(Y^*) \text{ (only in this case where I,G,X,M =0)}$$

Figure 1 below illustrates macroeconomic equilibrium. We first draw a 45° line which shows all possible equilibrium points, i.e. where $Y = E$. We then draw the consumption function. "a" is positive, which means that when income = 0, people still consume "a". This is dissaving or what people have to spend from previous savings in order to survive. Suppose $a = 100$ and $b = 0.75$, then $Y^* = 100/0.25 = 400$. What happens if $Y = 500 > Y^* = 400$? If $Y = 500$, then $C = 100 + 0.75(500) = 475$. In this situation savings = 25. Now this savings is a leakage from the system. Since there are no injections (apart from C), output will fall till $Y = Y^* = 400$.

There is another way of looking at the above. Savings (S) which is a leakage from the circular flow of income is given as:

$$S = Y - C = Y - (a + bY) = -a + (1-b)Y = -a + mps(Y)$$

where mps = marginal propensity to save = 1 – mpc

The savings function has also been shown in Figure 1. At $Y^* = 400$, $S^* = -100 + 0.25(400) = 0$ implies that there is no leakage or $W = 0 = J$.
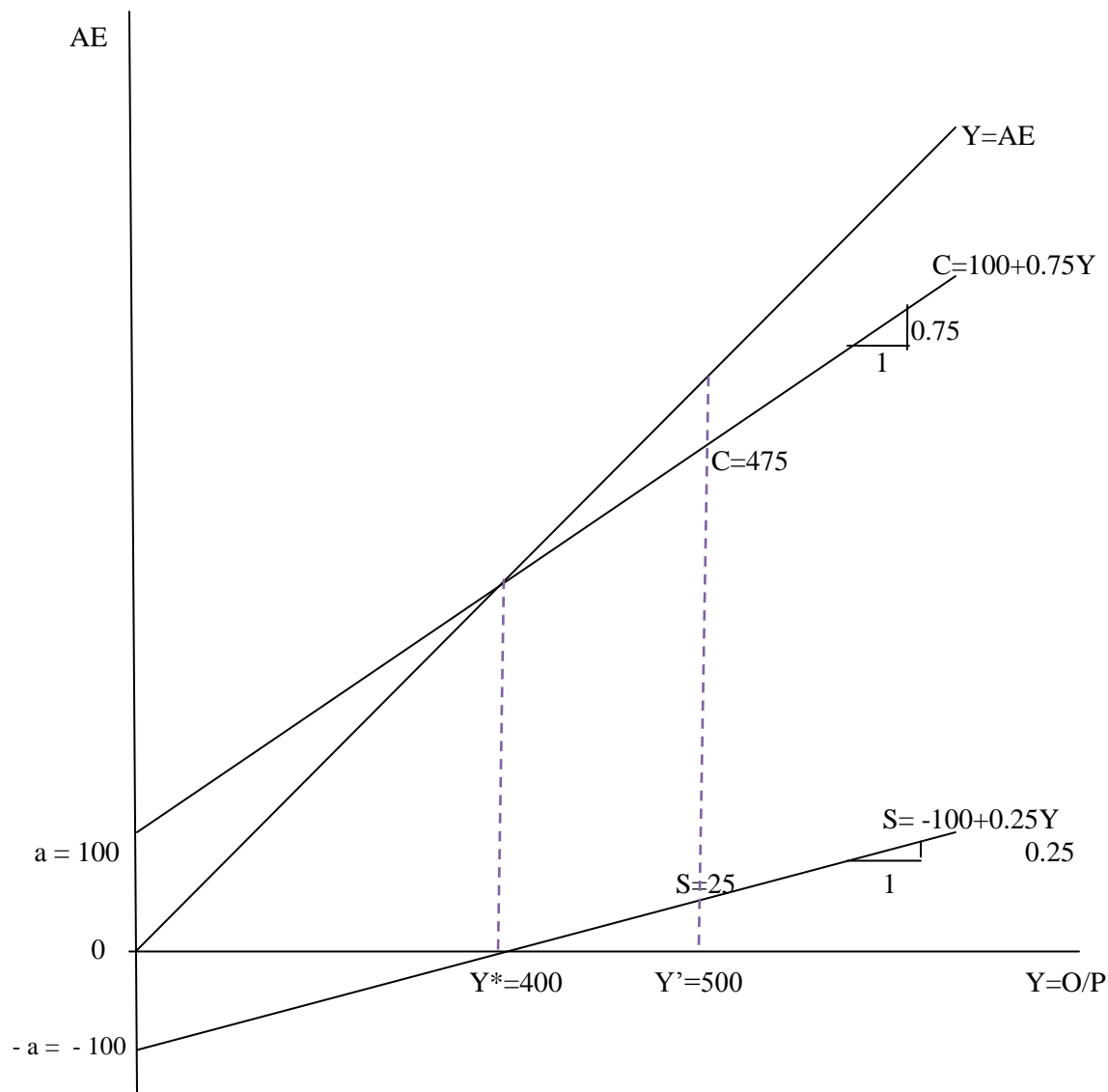
AE

Y=AE

C=100+0.75Y

0.75

1

C=475

S= -100+0.25Y

0.25

1

a = 100

S=25

0

Y*=400   Y'=500   Y=O/P

- a = - 100

Figure 1

The above analysis highlights what is called the **paradox of thrift**. One would normally think that saving is a virtue; however, the above analysis shows that savings are actually a leakage from the circular flow and unless there is a compensating injection into the system, savings could actually mean lower output and employment levels. The classical theorists assumed that savings (supply of loanable funds) are dependent on interest rates only and free financial markets will ensure that savings will be matched by an equal amount of investment (injection or demand for loanable funds) as in Figure 2 below. To Keynes, the loanable funds theory is not convincing. When individuals save, demand decreases and planned output will be cut and this would also mean lower planned investment. Moreover, as we will see later, according to Keynes during recessions interest rates will not fall to stimulate investment. One individual may succeed in saving more and consuming less, but if all individuals were to do this then income would fall and everyone may actually end up saving less. It's like when you alone stand up to watch the cricket

match in the stadium and then everyone stands up. In the end no one gets a better view and will also have to bear the discomfort of standing up.
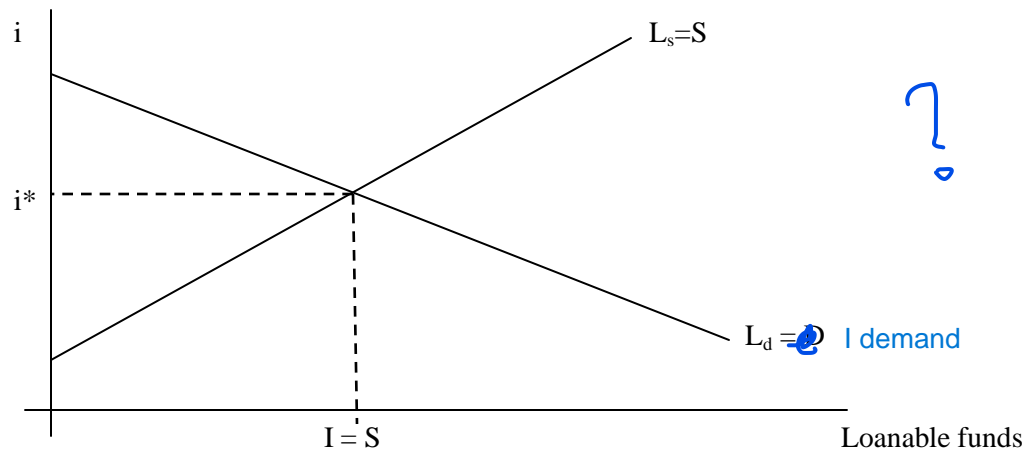

Figure 2

We now introduce **investment** demand (I). Investment consists of firms' desired or planned additions to both, physical capital and inventories. Let us assume that I fixed and is autonomous or exogenous, i.e. $I = I_0$. We now have:

equilibrium $Y = E = C + I_0 = a + bY + I_0$ or $Y^* = a + I_0/(1 - b)$

Alternatively,

$$W = J \qquad \text{or} \qquad S^* = I_0$$

Figure 3 summarizes the above. If $a = 100$, $b = 0.75$ and $I_0 = 25$ then $Y' = 500$.

irrespective of equilibrium or not
E=C+I+G+X-M
C=a+bYd
Y=S+C+T
S=-a+(1-b)Yd

For equilibrium
Y*=E

AE

Y=AE

C + I

C=100+0.75Y

0.75

1

E'

C=475

E

125

S= -100+0.25Y

0.25

a = 100

S=25

1

0

I=25

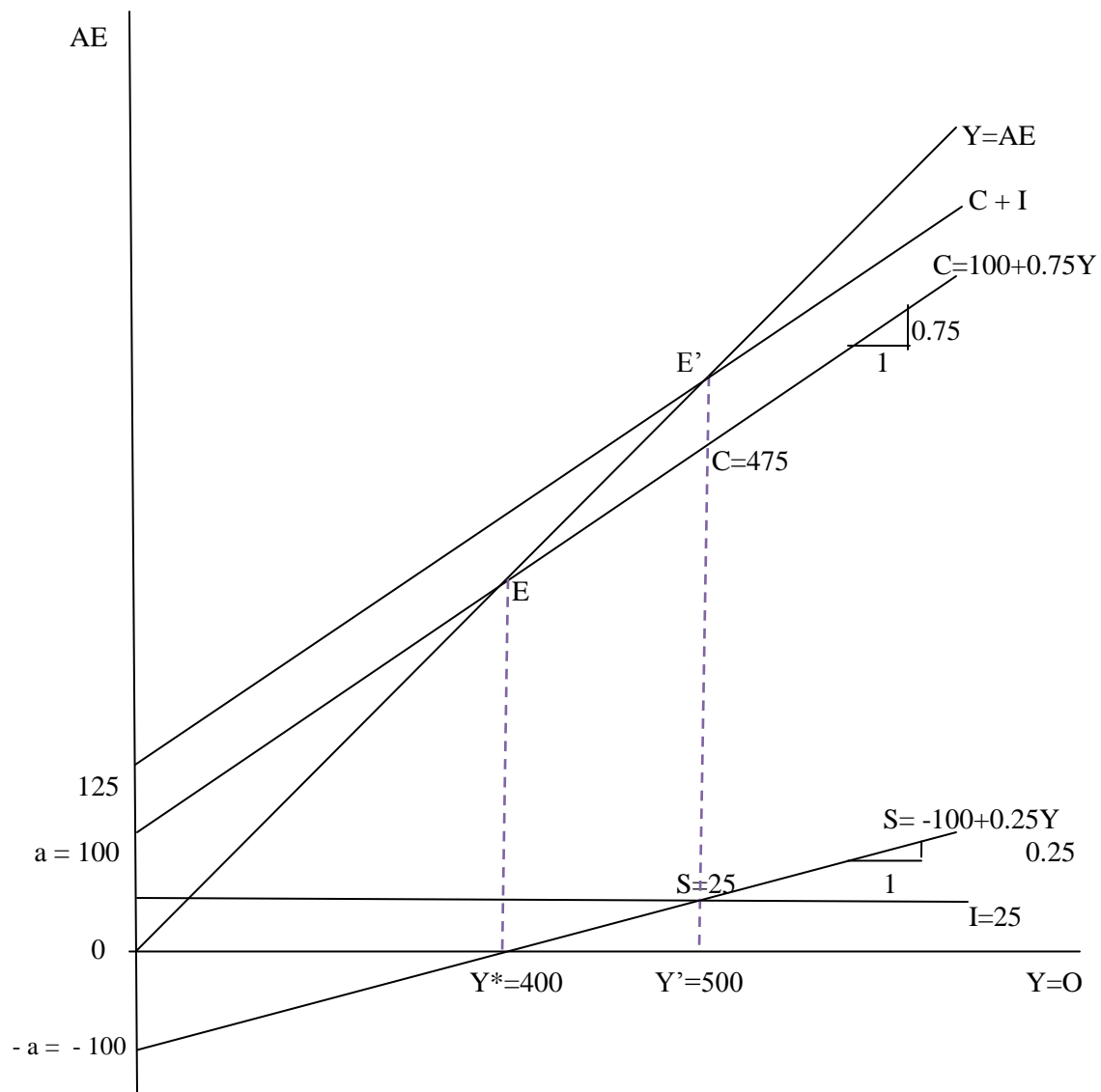Y*=400   Y'=500   Y=O

- a = - 100

Figure 3

The Multiplier Effect

The multiplier effect tells us that any injection of expenditure causes output and income to grow more than the injection itself. This, however, assumes that there is excess capacity available to firms so that the increased demand does not push prices up. The multiplier effect can be seen with respect to the above example.

With $I_0 = 25$, Y' = 500 > 400 = Y* (with I = 0). An investment of 25 leads to an increase in output and income by 100, i.e. 4 times. This is the multiplier effect. Why does it happen? When investment of 25 takes place, say as a purchase of capital equipment, it becomes the income of another individual who would spend 75% (mpc = 0.75) on consumption. This in turn will become the income of another who will then spend 75% … and so on. Therefore

$$\Delta Y = 25 + (0.75)25 + (0.75)^2 25 + ….$$

$\Delta Y = \quad 1/(1-b). \quad I$

$\Delta Y = \quad 1/(1-b) = 1/(1 - mpc) = 1/mps = 1/0.25 = 4.I$

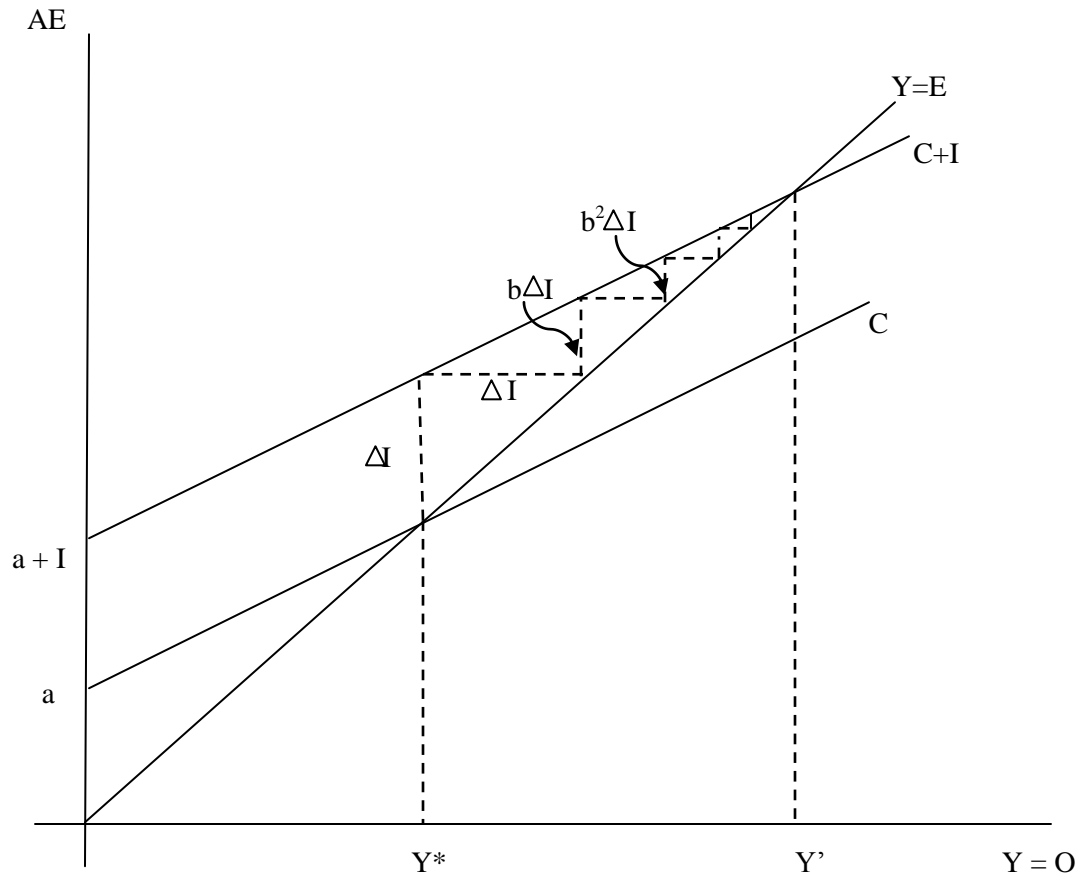The multiplier effect is illustrated in Figure 4 below.

Figure 4

Some points to note about the multiplier effect:

1. The increase in expenditure that triggers off the multiplier effect need not be due to an increase in investment only. It can be due to the constant "a" in the consumption function, investment, government spending and even export demand.
2. The multiplier works exactly in the opposite way for leakages from the circular flow, i.e. a multiple contraction in output and income.
3. The multiplier effect is most likely to be observed during recessions when excess capacity is widely available and the pressures on prices to increase are minimal.

The analysis of aggregate demand introduced above remains unchanged when we introduce G and net exports (X – M). This is shown in Figure 5. The introduction of G and (X-M) shifts the expenditure curve up and increases Y by some multiple of this increase.
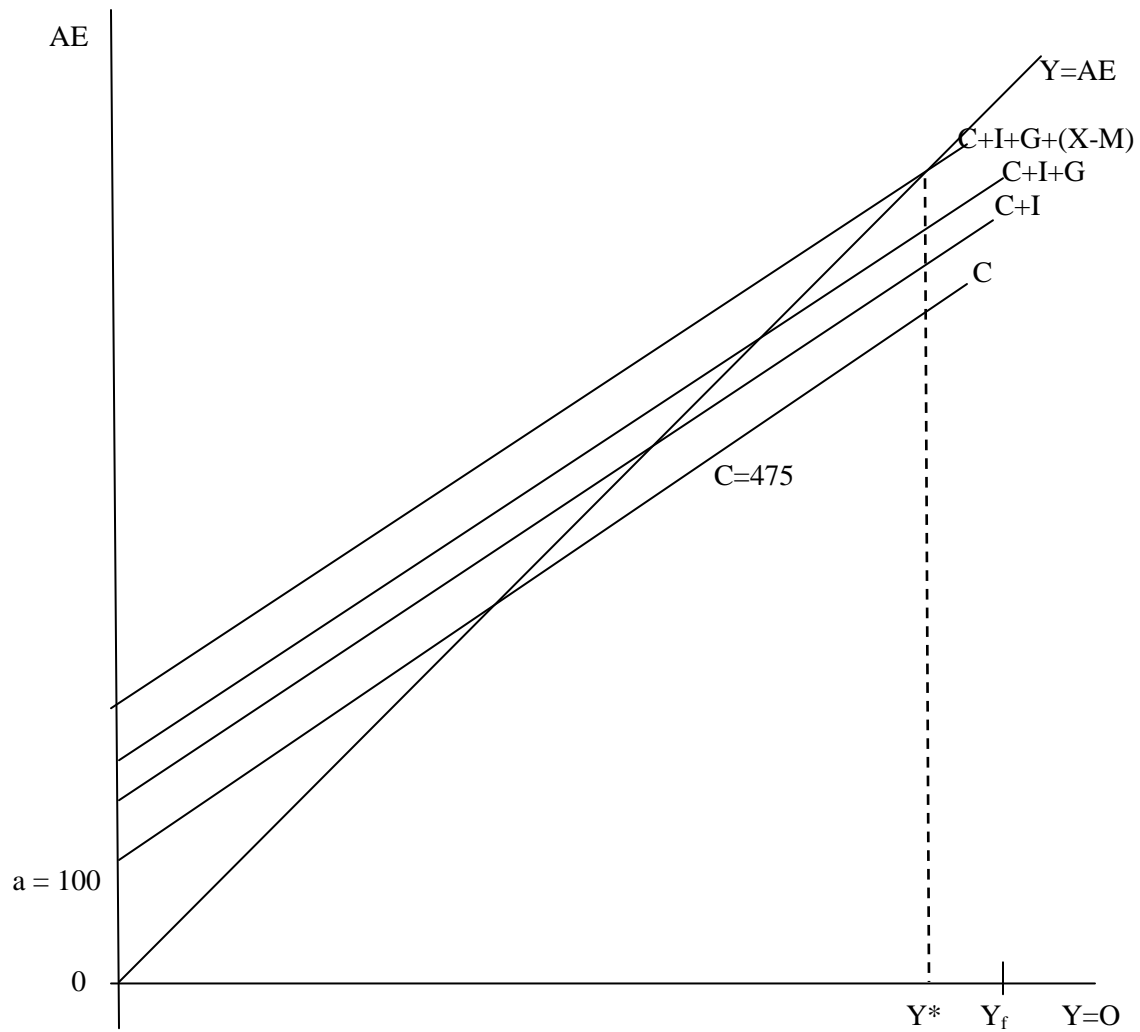
7

AE

Y=AE

C+I+G+(X-M)

C+I+G

C+I

C

C=475

a = 100

0

Y*   Y_f   Y=O

Figure 5

Algebraic Derivation of Expenditure Multipliers

$Y = C + I + G + (X - M)$

$Y = a + bY_d + I + G + (X - M)$ where Y_d = disposable income or income after tax

$Y = a + b(Y - T) + I + G + (X - M)$

dY/dI = dY/dG = dY/dX = 1/(1 – b) = 1/(1 – mpc) = 1/mps

dY/dT = -b/(1 – b) = -mpc/mps

Fiscal Policy during Recession

We are now in a position to understand Keynes' policy prescription to get an economy out of a recession; *increase aggregate expenditure*. But how? Consumers are not likely to spend more as their income levels are low, firms are not likely to invest more because of prevailing negative business sentiments, and exports cannot be easily increased in the short-run. Keynes' answer was that the state should intervene in the market system and *increase G*.

When the government spends more, new demand is created; output and income increases, consumption spending increases, and business expectations change for the better. All in all an autonomous increase in G will mean a multiple increase in Y. But how does the government spend more. Of course it can tax people. This tax, however, is a leakage from the system and may neutralize (though not completely as we will see) the benefits of increasing spending. The other way for the government to increase spending by asking the Central Bank to "print" more money. This may, however, induce inflationary pressures in the economy. If this option is not preferred the other way out is for the government to borrow from the public to finance its spending. Once again there are concerns that increased borrowing would raise interest rates and public investment or spending would "crowd out" private consumption and investment. We will now study in more detail the implications of government spending or fiscal policy.

Fiscal policy is the name given to government policies aimed at influencing the level of aggregate demand and economic activity by varying the level of government expenditure and tax. Fiscal policy can be implemented through:-

   a. Policies related to the purchase of goods and services by the government. This is **direct** spending by the government.
   b. Policies related to transfer payments such as unemployment benefits, welfare payments, etc. This is **indirect** spending by the government. The government gives money to others who then go out and spend it.
   c. Policies related to taxes, both direct (income, profit tax) and indirect (VAT).

If G > T ---------- budget deficit
If G = T ---------- balanced budget
If G < T ---------- budget surplus

If G > T (budget deficit), then the government has to either: borrow money from the public through open market operations. This can, however, raise interest rates and crowd out private investment. The accumulated stock of debt is called **national debt**. The other option to the government to finance its deficit is to borrow from the Central Bank (in India, the Reserve Bank of India). Earlier, Central Banks had little choice but to convert government deficit into money automatically. However, in recent years, Central Banks the world over have become more autonomous and have got more control over money supply (monetary policy). Usually their objective is to control inflation rather than stabilize the real economy.

Figure 6 below shows counter-cyclical fiscal policy that may be used through government spending and tax policies. There is one crucial issue in such policy; **timing**. When exactly do fiscal policies have their effect on the real economy? Some economists argue that it is almost impossible to say and government intervention usually fails: it's either too much or too little.
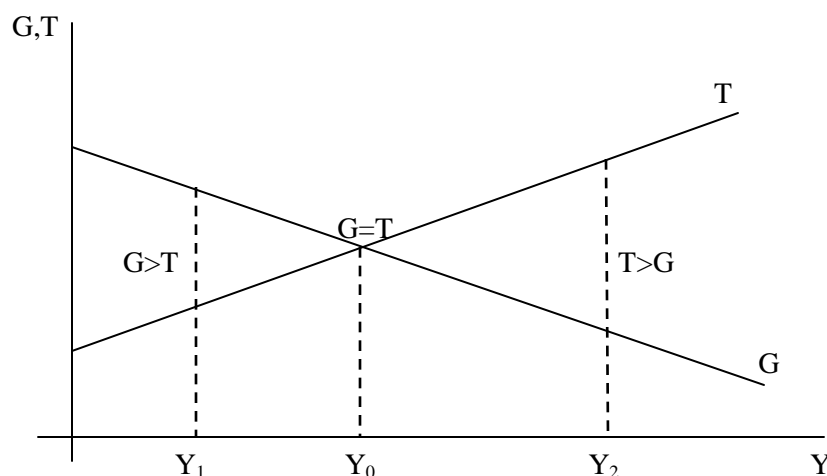
Are the fiscal multipliers during recession big or small?

Ex-1: Because of the financial crisis and the severe damage caused to the system of credit intermediation through banks and securitization, policy multipliers are likely to be disappointingly small compared with historical estimates of their importance. Many of you will remember the idea of the Keynesian multiplier, which is that the impact of traditional macro policies is "multiplied" by boosting private consumption by households and capital investment by firms as they receive income from the initial round of stimulus. It is important to remember why and how policy multipliers actually work. Policy multipliers are greater than 1 to the extent the direct impact of a policy on GDP is multiplied as households and companies increase their spending due to the increased income flow they earn from the debt-financed purchase of goods and services sold to meet the demand generated by the initial round of stimulus. Historically, multipliers on government spending are estimated to be in the range of 1.5 to 2, while multipliers for tax cuts can be much smaller, say 0.5 to 1. But these estimates are from periods when households could – and did – use tax cuts as a down payment on a car or to cover the closing costs on a mortgage refinance. For example, in 2001 the economy was in recession, but households took advantage of zero rate financing promotions – as well as ready access to home equity withdrawals from mortgage refinancing – to lever up their tax cut checks to buy cars and boost overall consumption. **With the credit markets impaired, tax cuts, as well as income earned from government spending on goods and services, will not be leveraged by the financial system to nearly the same extent, resulting in (much) smaller multipliers.**

http://gregmankiw.blogspot.com/2009/03/are-fiscal-multipliers-now-big-or-small.html