**Macroeconomics ECO202 Dr. Mary Habib**

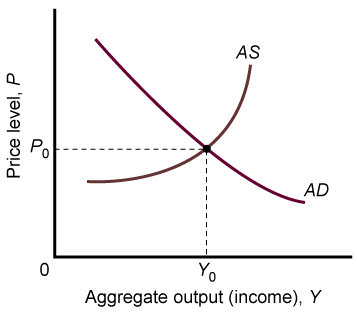
**Ch. 23: Aggregate Expenditure and Equilibrium Output**

**I. Introduction and Historical Background:**

Recall that the three macroeconomic markets are the output or product market (which we shall call the “goods and services market” from now on), and two input markets: the labor market and money market. This chapter and the next are mostly concerned with the first market.

How do we study equilibrium in the goods-and-services market?

We have already mentioned one model that can be used to addresses this issue: the aggregate supply/aggregate demand model, with total quantity on the x-axis and the overall price level (as captured by a price index) on the y-axis.



In this chapter, we will examine another model useful for understanding and analyzing equilibrium in this market. This is a model proposed by Keynes and economists who followed in his footsteps. It is a very influential model that takes a totally different approach to achieving and restoring equilibrium than the standard AS/AD model.

First, let us present a little historical background.

The classical economists (and their modern day descendants, the “neoclassical” economists) believed in perfect price and wage flexibility. In the extreme version of this view, which was the common way of thinking prior to the Great Depression, the aggregate supply (AS) curve can be drawn as a vertical curve at some level of output that corresponds to the potential of the economy (given its current physical, human, and natural resources).

Students: Draw a diagram similar to the one above, but with a vertical AS curve as an exercise.

In such a framework, the position of the aggregate demand (AD) curve (whether it shifts up or down) does not really matter, because in the final analysis the equilibrium quantity produced (of all goods and services) will be determined by the level of potential output. The *only* thing that would happen if demand drops is that prices would drop. Similarly, the *only* thing that would happen if demand increases is that prices will increase. Equilibrium output is mostly *supply-driven*.

Keynes, on the other hand, did not think that prices or wages were flexible. Instead, he argued that they were quite rigid on the short run, and that the “short run” can be a long period of time (depending on the situation and other conditions). Given that, and contrary to the classical analysis, the supply curve may in fact be horizontal at some price level *on the short run*. [Note, again, that by price level, we mean a certain average price level as captured by some price index.] In this case, then, the equilibrium output is really *demand-driven* (at least on the short-run).

Students: Draw the above diagram with a horizontal AS curve to see for yourself how equilibrium would be determined by demand in that case.

Keynesian economics represented the main ideology among policymakers all over the industrialized world in the fifties, sixties, and seventies. In the eighties and nineties it was partially displaced by monetarism (a branch of neoclassical economics which we will discuss later in the course). That was the economic thinking practiced by key policymakers in recent governments such as during the Reagan administrations in the US and the Thatcher government in Britain. However, even when its popularity had dropped, Keynesian thought (captured by the model that will be presented in this chapter) continued to be the most important model on macroeconomic fluctuations taught in introductory college economics courses and textbooks.

As for the AS/AD model, it is also another influential model today. But the way it is now taught is as a “compromise” model, a hybrid between the extreme classical version (vertical AS curve) and the extreme Keynesian version (horizontal AS curve). This is the version depicted in the diagram above, with an AS curve that is slightly upward sloping and a typical AD curve (downward sloping). [The upward sloping AS curve is a short-run curve only. There is another long-run AS curve that is vertical. We will learn more about this model in a latter chapter.]

At the end of the 1990s, the economies of the U.S. and other major countries were doing very well. Some U.S. businesspeople and journalists were speculating that the adoption of new information technologies might make recessions go away forever. Such speculations ended abruptly when a nearly 15 percent drop in investment spending in the IT sector helped bring about a mild recession in mid-2001. The most recent financial crisis (2008-2010) may have started in the real estate sector, but it also led to significant drops in investment in all sectors (including the IT sector). These downturns offered proof that technological progress *does not* protect against recessions.

There is now a rebirth of Keynesian economics. The free-market consensus has been weakened. Several economists in the US and Europe are now advocating stronger government intervention to tackle the current financial crisis (now being referred to by many policymakers and economists as the Great Recession). Keynesian thinking was most evidently reflected in U.S. President Barak Obama’s action plan upon taking office (in January 2009). Among the major decisions made during that initial phase was a plan for extensive government spending (around $825 billion), intended to combat recession. This included bailing out (or even nationalizing) some failing financial institutions. [Obama’s council of economic advisors is mostly made of leading Keynesian economists.] Most of the current US government efforts have been directed towards ending the recession. Similar policies have been announced in several European countries even though they have been less affected by the crisis. [As a side note FYI: In the news recently, a lot of attention has been given to the Greek debt crisis. The current crisis in Greece and a few other highly indebted European countries originated from these governments’ intervention in their respective banking systems. Funds were used to save several banks on the verge of collapse. This increased tremendously the Greek government’s debt, which has now reached unsustainable levels. The Greek government is now being asked (by the European Union) to cut its budget in order to bring its debt back to acceptable levels. These budget cutbacks will mostly come from unemployment compensations, pensions for retirees, and other social welfare programs. This is why the Greek people have been rioting in the streets recently. ]

**II. Introducing the Keynesian Cross Model**

Why did Keynes and his followers develop an alternative model to the AS/AD one?

The “compromise” AD/AS model mentioned above still leads to the conclusion that, if prices and wages are even *partially* flexible, then any deviations from equilibrium *can* be corrected by the market (the self-correcting mechanism) without external intervention. If there are shortages (such as might happen with increased aggregate demand), prices would increase (up to the equilibrium level) until the shortages are cleared. Similarly, if there are surpluses (such as might happen with a drop in aggregate demand), prices would drop until they are cleared. The equilibrium price level would be restored no matter what.

Students: Using the above diagram, make sure you understand these situations and can draw them. DO IT AS AN EXERCISE!

In the years after the Great Depression, classical economists (later called neoclassical economists) accepted that the market may need more time to do that than originally thought, but, in general, government intervention is still to be avoided (since it is wasteful and inefficient). Keynesians also compromised by accepting the verticality of the AS curve on the long-run, but still argue that the long run may not come around for a “very long period of time”, which suggests a facilitating role for the government.

Keynes (and Keynesian economists) focused much research on how unanticipated changes in investment spending affect a nation’s aggregate spending and real GDP. That is why the standard AS/AD model (in all its versions) does not really help in analyzing the economy. Keynesians argue that what economists need is to decompose the sources of recessions and their implications, and the AD/AS model cannot do that. The model that they developed was designed with that in mind.

**First, before we proceed, remember that**

**Aggregate Expenditure = Aggregate Income = Aggregate Output**

In any given period there is an exact equality between aggregate output, expenditure, and income. All three are equal to GDP. [Recall from chapter six that GDP can be computed via the expenditure, income, or product approaches.]

**Second, here are a few of concepts we will need to understand this model:**

**1) We need to recognize that production and spending are continuous activities.** However, in order to simplify the model we can divide the time horizon into smaller compartments, called “production periods”. You can think of a period as one month, one quarter, one year, or whatever.

In each period, firms engage in production. The total goods and services they produce is aggregate output (= aggregate income = aggregate expenditure).

Simultaneously, in each period, households and firms make *plans* regarding their expenditure behavior. This is “planned” aggregate expenditure.

**2) Always think in real terms.** Output means “real output”. What matters is the quantities of goods and services produced (evaluated at constant dollars), not the dollars currently circulating in the economy. This is in contrast to the AS/AD model which focuses on nominal output measured in current prices.

**3) How do we define equilibrium in the G&S market?** In order for equilibrium to prevail, there must be *equality* between the *planned* aggregate expenditure and the *realized* aggregate expenditure (which, again, equals aggregate output/income).

But…what happens if there is no equilibrium? How can equilibrium be restored?

In the AS/AD model the principal way to restore equilibrium is for prices to adjust. If there are surpluses (AS>AD), then prices will be pressured downward. If there are shortages (AS<AD), then prices will be pressured upwards. [See diagram above.] According to neoclassical economists who believe that markets work well, this price adjustment is guaranteed and relatively fast because prices are flexible. This type of analysis implies that government intervention in the economy is unnecessary. The market is self-correcting.

What do you think restores equilibrium in the Keynesian model that we shall now present?

Since Keynes did *not* think that wages and prices were flexible, then he also did *not* believe that the ­*price*-adjustment mechanism brings the economy back to equilibrium.

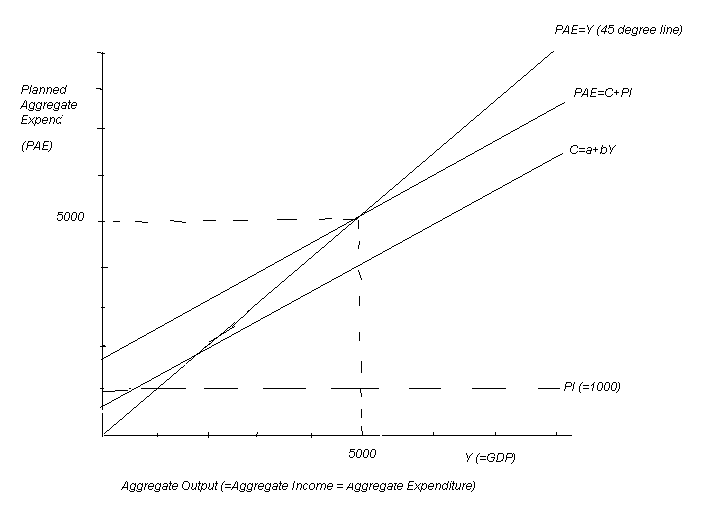
What brings the economy back to equilibrium in this model is *production* adjustment.

In the Keynesian system, if actual production exceeds planned spending (which we can think of as analogous to AS>AD), firms will cut back on investments, lay off workers, and reduce output. If planned spending exceeds actual production (AD>AS), firms will invest more, hire more, and increase output.

That’s what led Keynes to argue in favor of government intervention. The market is *not* self-correcting on its own.

The model below was designed to show that. We start with a simple economy without government or external sector. This helps us demonstrate how reductions in investment or household spending lead to reductions in GDP. In the next chapter, the government sector is added to the model to help understand how government may counter recessions caused by such investment reductions.

Let us take a graphical look at the model before we begin to break it into its component parts. There are two axes as you can see, the horizontal axis tells us what has been produced. The vertical axis tells us what was planned to be spent.

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**III. The X-Axis: Aggregate Output/Expenditure/Income**

We begin our analysis with a very simple economy with no government and no external sector (i.e. a closed economy).

There are two ways to think of GDP.

*1) As Aggregate Income Earned by Producing All G&S:* What can be done with this income that flows to different groups of the economy? It is either spent (domestically) or saved (domestically). Remember again that aggregate income is the same as aggregate output which is the same as aggregate expenditure (all of which are equal to the GDP we studied before). From now on we shall denote this by Y.

So we have: Income ≡ Consumption + Saving

Y ≡ C + S

This is an identity. That means it is always true, no matter what. It is denoted by the three dashes.

*Side Note:* Distinguish between “savings” and “saving”*. “*Savings” is a **stock** variable (all accumulated savings from current and previous periods), while “saving” is a **flow** variable (the act of saving out of current income in the current period).

*2) As Aggregate Expenditure on all G&S Produced:*  We have already learned from the expenditure method for computing GDP that we can write aggregate expenditure as such (assuming no government or ROW):

Y = C + I

So we can think of the X-axis as representing either the aggregate income produced by the economy or the aggregate expenditure made by the different groups of the economy (in this simplified model, households and firms).

**IV. The Y-Axis: The Planned Expenditure Side**

The key to determining the broader economic effects of investment fluctuations, Keynes argued, was to understand the relationship between how much people earn (income) and their willingness to engage in personal consumption spending. A prerequisite to understanding how investment affects a nation’s economy is to understand the determinants of household consumption.

Keynesian analysis (and most macroeconomic thought after Keynes) proposes that economic units make expenditure plans at the beginning of each production period (based on certain factors).

So in our model, *planned* aggregate expenditure is made up of *planned* consumption and *planned* investment.

The model seeks to investigate the following questions: Is there always a correspondence between what the economy planned to do and what it actually ended up doing? Does everything that is produced by the economy correspond to everything the economy planned to spend? (It’s like asking the question of whether aggregate supply equal aggregate demand in a different manner.)

What happens when what is produced *does not* match the expenditure plans made by the different units of the economy? The answer is the economy will not be in equilibrium in this case. How does the economy adjust back to equilibrium?

The discussion below will be divided into two parts, one dealing with planned consumption and the other dealing with planned investment expenditure.

**A. Consumption Expenditure**

According to the identity stated in section III above, we have Y ≡ C + S (total income is either spent or saved),

which means that C ≡ Y - S

Therefore, anything that *increases* Y or *decreases* S will lead to an increase in C. Additionally, wealth and expectations play a role in determining C.

We can summarize the above by the following list of the determinants of household consumption:

1. Household income: as income increases, consumption increases. In other words, when Y↑ C ↑.
2. Household wealth: as wealth increases, consumption increases. [As already mentioned in a previous chapter, wealth is a *stock* variable while income in a *flow* variable. In other words, wealth is total (accumulated) assets, while income is earnings per period of time.]
3. Household expectations about the future (the better their outlook about their future the higher would be the consumption of households)
4. Interest rates: as interest rates increase, consumption declines. Note that interest rates affect the consumption of households through influencing the proportion of their income that they wish to save during any production period. The higher the interest rate, the more attractive saving is and the less a household will consume. Alternatively, you can think of interest rates as the *opportunity cost* of consuming now. If you consume now, you are forfeiting (giving up) the opportunity of earning an interest on the amount you could save instead. The higher the interest, the higher the OC of consumption, and the lower the consumption. [One way of thinking about saving is that it represents the notion of preferring future consumption over present consumption.]

Of the four determinants above, Keynes argued that income is the most important. Income is the aggregate income on the x-axis, so we can use that to plot a function between income (as the independent variable) and consumption (as the dependent variable). The other three variables (expectations, interest rate, wealth) can be considered shift variables (shifting the consumption function up or down).

Keynes suggested that any increase in income would result in an increase in consumption. He considered this to be so evident that he termed it a “fundamental psychological law”. However, the increase in consumption would be less than proportional to the increase in income. In other words, if income increases by a dollar, consumption would increase by *less* than a dollar.

This fraction is called the *marginal propensity to consume*, and we denote it by MPC.

Formally, the MPC is defined as the fraction of an additional dollar of income that is spent on consumption. The rest is saved. For simplicity, macroeconomic models assume that the MPC is constant (does not change with different income levels).

This makes it possible to express such a relation as a linear function with a constant slope:

*C = a + bY*

where *C* is the consumption expenditure, *Y* is income and *a* and *b* are constants. The above is known as a “consumption function”, because it gives us C as a function of Y. Note that *C* and *Y* could be household as well as national measures. In the case of a nation, the MPC would be defined as society’s marginal propensity to consume out of national income.

In such a function, the *b* is the Marginal Propensity to Consume (MPC). This is the slope of the consumption function. In other words, it is ∆C/∆Y, or the change in C that results per unit of change in Y.

An example with specific numbers would be

C = 200 + .75Y

where *a* is 200 (billion) dollars and *b* is 0.75. Consumption functions can be estimated by econometric techniques given historical data on consumption and income. Economists employ a technique known as linear regression to estimate the coefficients of the linear equation above (the “a” and “b”).

*Side Note:* Most nations of the world that have national income statistics are able to calculate their MPC based on historical data. Many economists have researched MPC data across countries and time periods, and the studies show that MPCs do not vary much from year to year or from country to country. Statistical evidence has determined that the MPC ranges from 0.65 to 0.8 across countries of the world.

[This does *not* mean that within the nation, each and every individual or household has the exact same propensity to consume out of additional income. There may be wide differences between different households. However, there is an average that also corresponds to the behavior pattern of the typical household. This national average varies across countries, but not by much. It has been calculated to be in the range of 0.65 and 0.8.]

Four things to note:

1) The marginal propensity to consume, *b*, is always less than one.

2) The complement of the marginal propensity to consume is the marginal propensity to save (MPS) defined as 1-MPC. That is if three-quarters of each additional 1000 LL of income goes into consumption, then the remaining quarter (250 LL) must go to saving.

3) The term *bY* is known as “induced consumption”. It captures the fundamental psychological law put forth by Keynes. It is measured by the marginal propensity to consume (MPC) defined above. Consumption expenditures are induced because people are prone to spend a certain proportion of the additional incomes they earn. The greater is the additional income, the greater is the *induced* spending. Similarly, if their incomes decline, their consumption declines as well. Induced consumption plays a critical role in the study of [Keynesian economics](javascript:pop_dsp('pop_gls.pl?k=Keynesian%20economics',500,400)).

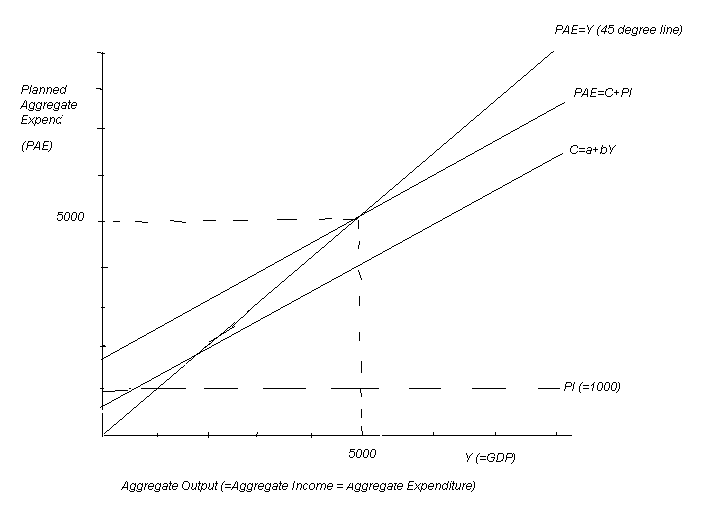
4) The constant *a* (200 in the above linear equation) is called “autonomous consumption”. The implication of "autonomous" is that this component of consumption does NOT depend on income. It is independent of income. It "rules itself". In other words, if income is zero, consumption will be *a* (200 in the above example).

[*Side Note:* If a household has no current income, how will it engage in this autonomous consumption? Answer: Either by borrowing or by resorting to whatever accumulated wealth it has. Same applies to a nation.]

\*\*\*IMPORTANT NOTE:

It is very important to note that C is under the control of households. What is planned is actually realized. Therefore, when we say consumption expenditure, this is the same as saying “planned consumption expenditure”. [We will understand the reason for this terminology later when we look at planned investment.]

Let’s put the graph again to visualize the consumption function.



**B. Planned Investment Expenditure**

Now we should add the investment part of spending.

Let us call this planned investment to emphasize that it is part of planned aggregate expenditure.

First, we must again distinguish between what is meant by investment in financial terminology, and what “investment” means for an economist.

How are they different?

For an economist, investment always refers to the act of buying something (or producing something) that can be utilized to *produce other goods over a long period of time* (exceeding a year). Alternatively, it is the act of buying or producing something *now* in order to create value in the *future*. We can further generalize by saying that investment is the act of buying or producing capital goods, which, in turn, are defined as goods that create future value.

What does investment spending cover?

Recall from our previous discussions that *gross domestic private investment* is composed of three components:

1. residential investment, which is the construction of new homes

2. fixed business investment, which is investment on capital goods by firms (such as plant, buildings, machinery, equipment, etc.)

3. inventory investment (which is investment on inventories by firms).

To simplify the discussion, let us ignore residential investment for now and focus only on investment by firms on fixed capital goods and inventories.

What are inventories?

Inventories are part of the capital stock of a firm. Inventories can be final goods or inputs (raw material). Take the example of a car manufacturer, such as Toyota or Ford. These companies have inventories of production inputs (tires, engines, car seats, etc.) as well as inventories of finished cars waiting to be shipped and sold.

The reason we consider inventories to be investment is that when firms add to their inventories, they are essentially buying or producing things that will “create value in the future”. So they are *investing* in the economic sense.

Few questions can arise:

1) Who buys these finished goods that go into inventories? Why are they part of the *I* (investment) in the expenditure approach?

The answer is that you can also think of the firm “buying” those cars from itself in order to use them for the purpose of creating future value. The future value will materialize when the goods are sold in a later period. This makes it easier for you to understand why inventories are listed under the “expenditure” approach of computing GDP.

2) Another question that may arise is, why do firms “invest” in inventories of finished goods in the first place? The answer is that firms always produce a little bit more than what they expect to sell during a particular period. This extra production serves as a contingency in the face of any unexpected increases in demand. It is appropriate and wise to do so from a managerial and planning perspective. It is often referred to as “contingency planning”.

3) A third question: Production inputs (such as raw materials) are intermediate goods, and we had previously learned that intermediate goods are NOT counted in GDP. So why are we listing them here as part of inventory investment and, consequently, part of GDP?

Answer: Intermediate goods that are *used up* during the production period under consideration are NOT part of that period’s GDP. Including them will lead to double counting. However, intermediate goods that are kept in the warehouse for future use (not current use) are part of this period’s GDP as inventory investment. In other words, as far as THIS PERIOD is concerned, they are final goods! [Later, when these raw materials are used for production in a future period, they are deducted from inventories in order to avoid double counting for that period.]

Note, however, that inventory investment is mostly investment in final goods ready to go to the market. The part involving raw material is small compared to the part involving finished products.

Therefore, to simplify matters, for the remainder of this chapter, you may disregard raw material inventories and concentrate only on finished product inventories.

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Let us now incorporate investment in the aggregate planned expenditure side of the model.

Denote planned investment by PI. This is the total amount firms plan to invest (all machinery, plant, and inventories they plan to buy or produce).

Note that planned investment is independent of aggregate income/output. It is one fixed level, so we can represent it as a horizontal line (see diagram above). [Planned investment is a function mainly of the interest rate and firms’ expectations about future market potential, and not of current income.]

For a specific example, let planned investment PI = 1000 billion dollars, and assume that the consumption function is

C = 500 + 0.7\*Y

where all figures are measured in billions of dollars.

So now we have

PAE = C + PI

In order to have equilibrium in the goods and services market, it must be the case that PAE = Y. *This is the condition for equilibrium in this market.*

Where,

Y = Aggregate Output (=aggregate expenditure = aggregate income)

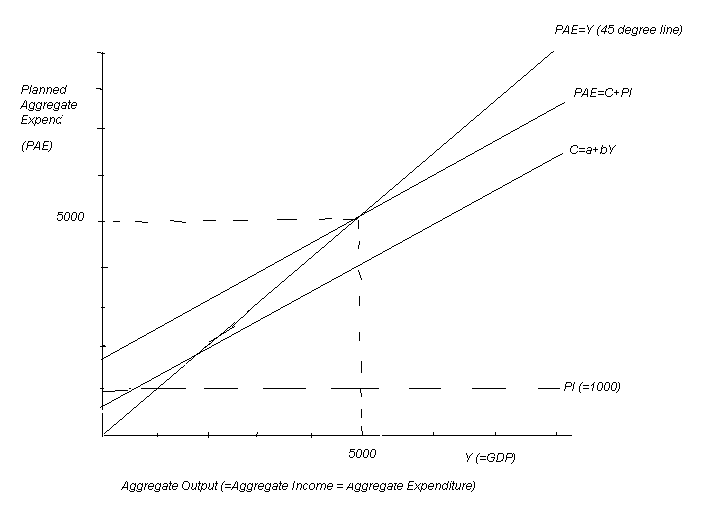
Therefore, the equilibrium condition can be re-written as

Y = C + PI

= 500 + 0.7 Y + 1000

Alternatively, we can think of this equation as telling us that *at equilibrium*, everything produced (by all the firms in the economy), corresponds *fully* to the expenditure plans made by households (consumption) and firms (investment).

Let us present the diagram of the model again.



Again, aggregate output (=income) is measured on the horizontal axis and components of planned expenditure are measured on the vertical axis.

The purpose of the 45 o line is to illustrate the equality condition PAE=Y (equality line). At any point on this line, we have equality between the two sides of the model. [Drawing a 45o line also makes it easier to visually compare output (horizontal axis) with expenditure (vertical axis).]

The consumption function is shown by the first line, labeled C. The equation of this function is C=a+bY (where b is the MPC). Consumption is part of planned expenditure.

Note how the consumption function intersects the *y* axis (i.e. the planned expenditure axis in this model) at *a*=500. This is the level of autonomous consumption that corresponds to a Y of 0.

Planned aggregate expenditure (PAE), which is consumption plus planned investment, is shown by the second line, labeled C+PI.

Economists refer to this diagram as the “Keynesian cross”.

**V. Equilibrium Output/Income:**

Equilibrium in this model is defined as the output (Y) where the economy reaches a point of stability. In other words, it is the situation where the system has no tendency to change.

In the macroeconomic goods-and-services market, equilibrium occurs when planned aggregate expenditure (PAE) is equal to aggregate output (Y).

So looking at the diagram, we are seeking the output/income level that is equal to C+PI. This is the level of output that exactly corresponds to what the economy had planned to spend on consumption and investment. Where is that? It is the point of intersection between the PAE function line and the 45º equality line.

To illustrate why this is a unique point, let's consider a few possibilities with reference to the diagram above:

What if income (output) is 3000?

An income of 3000 leads people to spend 2600 on consumption (from the consumption function C=500+0.7Y). Adding that to the 1000 of planned investment we get a total planned expenditure of 3600. This level of expenditure will not result in equilibrium, because output is 3000 and planned aggregate expenditure is 3600. There is a shortage. The output produced is not enough to satisfy the expenditure plans. Accordingly, 3000 cannot be an equilibrium income.

What if income is 7000?

An income of 7000 leads people to spend 5400 on consumption (again, from the consumption function). Adding that to 1000 of planned investment we get a total planned expenditure of 6400. This is less than income/output, so there is a surplus (a portion of Y has been produced but is not demanded). Which means that 7000 cannot be an equilibrium income.

What if income is 5000?

An income of 5000 leads people to spend 4000 on consumption. Adding that to 1000 of investment we get a total expenditure of 5000! Aggregate output equals planned aggregate expenditure, and we have found the equilibrium income for the example.

So we conclude that we have equilibrium where the total expenditure line intersects the 45º line, that is, where output equals planned expenditure.

There is another way to get this same result -- with a little algebra.

In our example, we have

C = 500 + 0.7Y

and

PI = 1000

We now know that the equilibrium comes where the two lines intersect. In algebraic terms, it means that both equations are solved at the same time -- simultaneously.

The equation for the PAE line is PAE=C+PI = 500 + 0.7 Y + PI.

The equation for the 45º line is PAE=Y

So, solving these simultaneously, we equate:

Y = 500 + 0.7Y +1000

Subtracting 0.7Y from both sides, we get

Y - 0.7Y = 500 +1000

That is

Y (1 - 0.7) = 1500

Therefore,

Y = 1500/(1-0.7)=1500/0.3

Which gives us the equilibrium income of 5000 billion dollars.

Let's look at the method in a still more general way.

In general algebraic terms, the formula for the solution is

Y\* = (a+PI)\* [1/(1-MPC)]

Recall again that MPC=b (the slope of the consumption line). So 1/(1-MPC) is the same as 1/(1-b).

We have already learned that the *a* is autonomous consumption, and the model also assumes that planned investment is autonomous in the sense that it has a fixed level independent of Y. Therefore, the whole term (a + PI) is autonomous expenditure.

The term

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or 1/(1-b) is called the “expenditure multiplier." In our numerical example, the multiplier is

1/0.3 = 3.333...

In a simple Keynesian model, we may obtain the equilibrium income by multiplying the sum of all autonomous spending by "the multiplier."

Why is it called “multiplier”?

Because is the number of times we *multiply* the change in autonomous expenditure to get the ultimate change in equilibrium income/output. What the multiplier tells us is that an increase in autonomous consumption (for example) will lead to a *magnified* increase in equilibrium output.

As a side note, if we differentiate this equation (i.e. take the derivative of Y with respect to autonomous expenditure), the "multiplier" turns out to be the change in equilibrium output that results from a one dollar change in autonomous expenditure. This change may result from a change in “a” and/or a change in PI.

**VI. The Intuition Behind the Model:**

Suppose that planned investment (PI) increases by $100 (thousand, million, billion, or whatever). That is, firms in the economy change their plans and budget $100 more for investment on capital goods (perhaps due to some new scientific discovery that encourages investment in a certain high-tech sector). This is like a shift factor that lifts the planned expenditure function up by $100 to a new Y-intercept. The multiplier theory tells us that (with a marginal propensity to consume of 0.7) the increase in equilibrium income will be $333.33.

How does this happen?

The additional $100 of planned investment is spent on capital goods of some kind. This increases the incomes of the suppliers of these goods by $100. With a marginal propensity to consume of 0.7, these people spend $70 of the $100 on additional consumption.

This will increase the income of the supplier of these consumption goods by $70. Again, only 0.7 of that will now be consumed on additional consumption; the rest will be saved. This translates into 0.7\*70 = 49$ of consumption on some other goods, and so on and so forth.

At each step, somebody's income is increased, and that person increases his or her consumption spending by seven-tenths of the increase in income (following the consumption function).

Here is a table that shows the successive rounds of this earning and spending.

The Multiplier Step By Step

|  |  |  |
| --- | --- | --- |
| Round | Increase  in Spending | Resulting Total  Increase  in Income |
| 1 | 100 (=∆PI) | 100 (=∆Y=∆PI) |
| 2 | 70 (=∆C=b∆Y) | 170 (=∆Y=∆C) |
| 3 | 49 (=…) | 219 (=…) |
| 4 | 34.30 … | 253.30 …. |
| 5 | 24.01 …. | 277.31….. |
| 6 | 16.81….. | 294.12….. |
| 7 | 11.76…….. | 305.88……. |
| 8 | 8.24….. | 314.12….. |
| 9 | 5.76 | 319.88 |
| 10 | 4.04 | 323.92 |
| 11 | 2.82 | 326.74 |
| ….. |  |  |
| Ultimate total |  | 333.33 |

Note on Table Above: First there is an increase in planned investment *PI*. Let us assume for simplicity that this increase in planned investment *actually* takes place as an increase in *investment, I*. This leads to an initial equal increase in Y (=C+I, as we learned in the GDP chapter). Let us now move from round 1 to round 2. The additional increased income of $100 (round 1) leads to a $70 increase in consumption (round 2). This is due to the consumption function: C = a + bY, which means that ΔC = bΔY = 0.7 x 100 = 70. This extra $70 in consumption adds exactly $70 to Y (since Y = C+I).

Then to move from round 2 to round 3, we do the same thing: ΔC = bΔY = 0.7 x 70 = 49, which adds exactly $49 to Y, which leads to round 4 with ΔC = bΔY = 0.7 x 49 = 34.30, and so on….It is the circularity built in the model that leads to this multiplication. *Y* is both an independent variable (*C=a+bY*) and a dependent variable (*Y=C+I.*), so when Y increases, C increases, which leads to further increase in Y, which leads to further increase in C (circularity).

The successive rounds come to an end when all that extra $100 in investment has been translated into extra incomes for other people and has been totally spent out. The final increase in income turns out to be 333.33 which is exactly the initial increase in investment (100) times the multiplier (3.33). Since things stop changing at that point (unless there is another shock to the system), then we consider that to be the new equilibrium income (Y\*), which is $333.33 higher than the initial Y\*.

**VII. Adjustment Toward Equilibrium**

This is the most important part of the analysis, and it is the whole purpose of the model. Keynes basically wanted to study and explain fluctuations and what causes fluctuations.

We want to know what happens if the economy deviates from the equilibrium level defined above. So in what follows, we shall focus on a particular level of Y (the equilibrium level), in order to see how that changes.

Why might the economy deviate from equilibrium?

Suppose PAE decreases due to a decline in planned investment (which may occur if firms have worries about uncertainty or political unrest or whatever). [Recall that that any change in autonomous expenditure (*a* or PI) will change PAE.] Such a scenario can be used to understand the implications of the current Great Recession (or to understand the fluctuations that occur in Lebanon when we move from stable periods (with higher PI) to unstable periods (with lower PI).

Now we no longer have equilibrium. PAE has changed so it’s no longer equal to Y\* (the equilibrium Y). Y\* will have to be adjusted in order to bring the system back into equilibrium.

So now the question is, how does Y\* change in response to that change in planned investment? Does it change by the same amount or by a greater amount?

In the table above, we saw how a change in investment leads to an initial change in Y, which fuels a series of changes in Y (due to the feedback mechanism built into the equation Y=a+bY+I, where Y is simultaneously a dependent variable AND an independent variable).

Since we are interested in equilibrium, let us now replace Y by Y\*, and the equation above by Y\*= a+bY+PI (which is the equilibrium condition). We will see that Y\* will change by MORE than the change in PI. By how much more? By a multiple of the change in PI. The multiple is equal to 1/(1-MPC).

What is the channel leading to this change in equilibrium output?

The answer is “inventories”.

Recall again that inventories are a kind of capital good. That means that an increase in inventories is an investment. Likewise, a *decrease* in inventories is a *negative* investment.

Investment in inventories has a special significance.

At the beginning of a period, businessmen can decide how much they think it will be profitable to invest in capital goods of all sorts: machinery and equipment, plants and structures, and inventories.

As the period goes on, the investments in plant and equipment and structures will be under control as per the plan. But the investment in inventories will not be under control, because the change in inventories depends on how much firms sell, and this in turn depends on how much households demand.

If firms do not sell as much as they had expected, they will find themselves with more inventories than they had *planned* to have. These increases in inventories are investments, but they are not investments the firms had intended to make. They are “unplanned investment.”

If firms sell more than they had expected, they will find themselves with less inventories than they had *planned* to have. These decreases in inventories are also investments. They are “unplanned *negative* investment.”

So now we can say that investment is of two types: *planned investment* and *actual investment*. Unplanned investment is the difference between them.

[As a side note: It is now also clear why we say “planned investment” but we do not say “planned consumption”. Planned investment differs from actual investment, because one part of investment, inventories, is not under the complete control of firms. Consumption remains under the control of households throughout so we need not distinguish between planned and actual consumption.]

**Total Actual Investment = Planned Investment + Unplanned Investment**

The unplanned investment comes from unplanned changes (increases *or decreases*) in inventories.

And that is the key to the equilibrium in the simple Keynesian model we have been studying.

Likewise, we can make the following statement:

**Aggregate Expenditure = Planned Aggregate Expenditure + Unplanned Expenditure**

So now we can see why the statement

“Aggregate Income = Aggregate Output = Aggregate Expenditure”

is ALWAYS true (and all three lead to the same thing: Y),

But the statement

“Aggregate Income/Output/Expenditure = *Planned* Aggregate Expenditure”

is ONLY true under equilibrium.

When planned spending is less than output then some of the goods that are produced will not be sold. *Goods that are produced but not sold are added to inventories.* They are the unplanned inventory investment.

So, we can write (as already done so above):

Income(Output) = Planned Expenditure + Unplanned Expenditure

Which is also like saying:

Y = C + Planned Investment + Unplanned Investment

OR

Unplanned Investment = Y – (C+PI)

Which is the same as saying:

Change in Inventories = Production – Sales

Here “change in inventories” is the unplanned investment. “Production” is Y, and “sales” is C+PI.

What happens when firms have more inventories than had planned?

The only way they can get rid of unwanted inventories is by selling some of it in the next period. So, with sales down, they have to cut back on next-period’s production.

TO SUMMARIZE:

1) aggregate output > planned aggregate expenditure

→ actual inventory investment is greater than planned inventory investment

→ actual total investment is greater than planned total investment

→ Firms have *positive* unplanned inventory investments (i.e. additional inventories pile up in warehouse)

→ Firms cut back on production the next period in order to get rid of inventories (movement down the X-axis).

2) planned aggregate expenditure > aggregate output

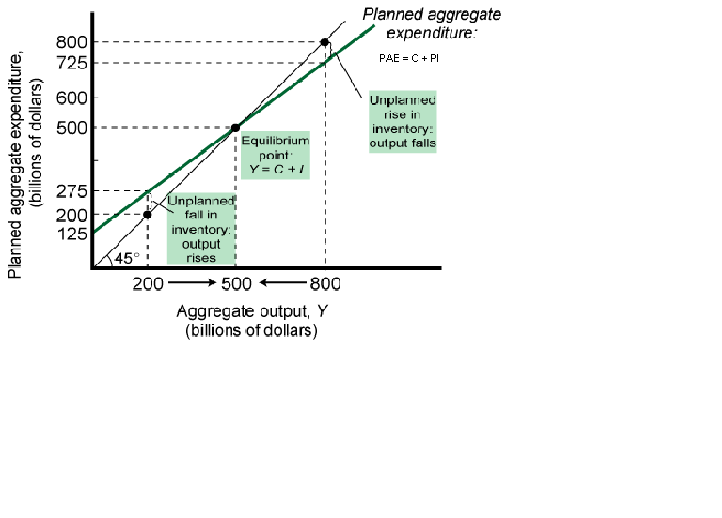
→ planned inventory investment is greater than actual inventory investment

→ planned total investment is greater than actual total investment

→ Firms have *negative* unplanned inventory investments (i.e. inventories decline in the warehouse

→ Firms increase production in the next period in order to replenish inventories (movement up the X-axis).

These facts can also be illustrated with a diagram as follows:



The above diagram shows that when Y = 800 > PAE = 725, we have an unplanned rise in inventory investments (firms pile up additional inventories). This means more was produced by the economy than demanded. Output will have to be adjusted downward. So in the next production period firms produce less as they already have a lot of inventories. This should bring things back to equilibrium again. Alternatively, when Y = 200 < PAE = 275, we have an unplanned fall in inventory investments (firms draw down their inventory supplies). This means the economy produced less than was demanded. Output will have to be adjusted upward. So in the next production period firms produce more in order to replenish their inventory supplies.

**VIII. Another Approach to Equilibrium: Saving/Planned Investment Equality**

In addition to the above approach to equilibrium (i.e. planned vs. actual investment) there is another approach: the saving/planned investment approach.

Because aggregate income must either be spent or saved, by definition we have: Y≡ C+S. The equilibrium condition is Y= C + PI. This means that for equilibrium we must have C+S=C+PI which means that S=PI.

Only when planned investment equals saving will there be equilibrium.

Saving is a **leakage** out of the spending stream whereas investment is an **injection** back into the spending stream. This approach is therefore also sometimes called the leakages/injections approach to equilibrium.

What leaks out of the spending stream must find its way back as an injection. If saving can always be channeled back into the economy thru financial markets (banks and other financial institutions) where it can be converted into productive investment, then saving is a good thing.

However, in the event that the whole society saves more and those savings are not channeled back into investments due to imperfections in the financial system (for instance), inventories will pile up and GDP will adjust downward.

For example, if a country experiences a banking crisis, it is very possible that people will not save their money in banks (or will choose to save them in foreign banks). This will lead to a situation where some leakage (saving) does not get injected back into spending (as planned investment). In this case, S>PI. [There are more savings out there but not all of them return to the spending stream.] Disequilibrium occurs, inventories pile up, GDP adjusts downwards, and unemployment results.

**IX. Concluding Remarks**

So what kind of equilibrium did this chapter explore? The answer is that it is a plan-fulfillment equilibrium. Equilibrium is at the level of output that is in accordance with people’s plans. That's the good news. But now we have to go on to the bad news.

The bad news has to do with employment.

In this sort of equilibrium, equilibrium production is what it is, regardless of whether it is enough production to employ all the people who are looking for jobs. The number of workers employed will correspond to the equilibrium production. If this number is less than the labor force, there will be unemployment.

Unlike the neoclassical model, unemployed is not eliminated with wage or price adjustments. To increase employment firms must increase their planned investments or households must increase their autonomous consumption, OR the government must interfere, as we will see in the next chapter.