The Aggregate Expenditures Model

Economics 152

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1 Introduction

In this handout, we will look at the Aggregate Expenditures Model, also called the Keynesian Model.[1] We will use the Aggregate Expenditures model or the Keynesian model to determine the equilibrium level of GDP. Aggregate Expenditures is the sum of expenditures by households, businesses, the government and the foreign sector. This is formally represented by the following equation:

$$Y = C + I_g + G + X_n \tag{1}$$

where,

C = Personal Consumption Expenditures

I_g = Gross Private Domestic Investment

G = Government Purchases of Goods and Services

X_n = Net Exports

Equation (1) represents the complete Keynesian model. We will eventually look at this model, but for now we will start off with a very simple model.

[1] This model is named after the late British Economist John Maynard Keynes. In 1932 Keynes wrote his revolutionary book "*The General Theory Of Employment, Interest and Money.*" Economists often refer to this book as The General Theory and this book had a big impact on macroeconomics.

2 The Simple Keynesian Model

We will look at the Simple Keynesian Model under the following set of assumptions:

- No Government or Public Sector (a Purely Private Economy)
- No Foreign Trade (a Closed Economy)
- No Depreciation
- No Business Savings (all Savings is Personal)
- Substantial Excess Capacity (no Inflation)

Note that some of the assumptions like no government, no foreign trade and no inflation are unrealistic and we will incorporate these assumptions later, but for now let us look at the Simple Keynesian model.

2.1 Determination of Equilibrium GDP

The equilibrium condition in this model is Output = Aggregate Expenditures. Denoting output by Y and aggregate expenditures by AE we have the following *equilibrium condition*:

$$Y = AE \tag{2}$$
$$Y = C + I_g \tag{3}$$

We will look at two cases:

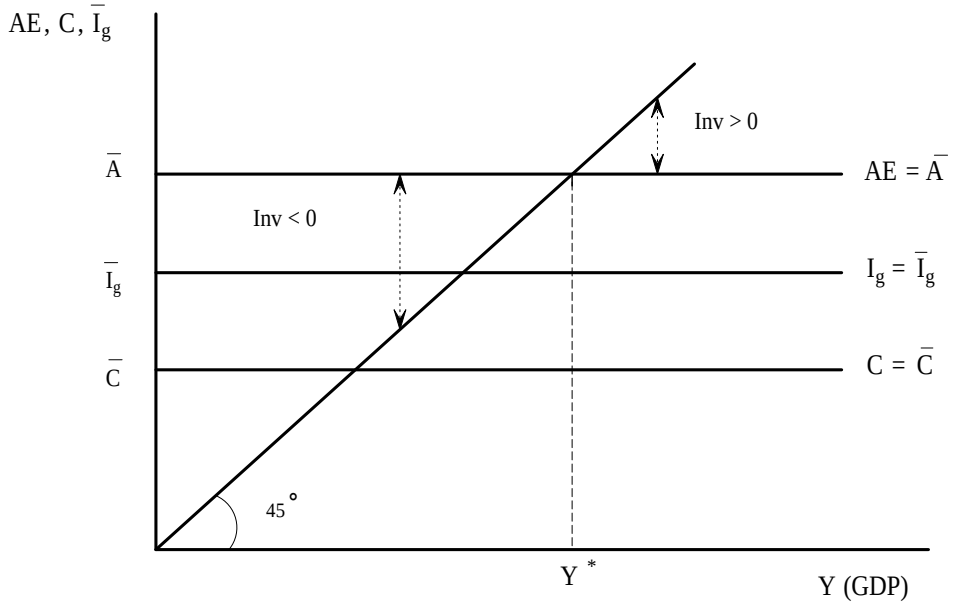
Case 1: Consumption (C) and Investment (I_g) are *autonomous, or exogenous.* Stated alternatively, C and I_g are completely independent of the level of GDP. This assumption is represented as,

$$C = \bar{C} \tag{4}$$
$$I_g = \bar{I}_g \tag{5}$$

Substituting equations (4) and (5) in (3) gives us

$$Y = \bar{C} + \bar{I}_g \tag{6}$$
$$Y^\star = \bar{A} \tag{7}$$

Equation (7) tells us that equilibrium GDP is determined by autonomous or exogenous expenditures by households and firms. Graphically, equilibrium GDP is shown in the diagram below:



Case 2: We will now relax the assumption that consumption is independent on income.[2] Consumption (C) is now dependent on income (Y) while I_g is autonomous. This assumption is represented as,

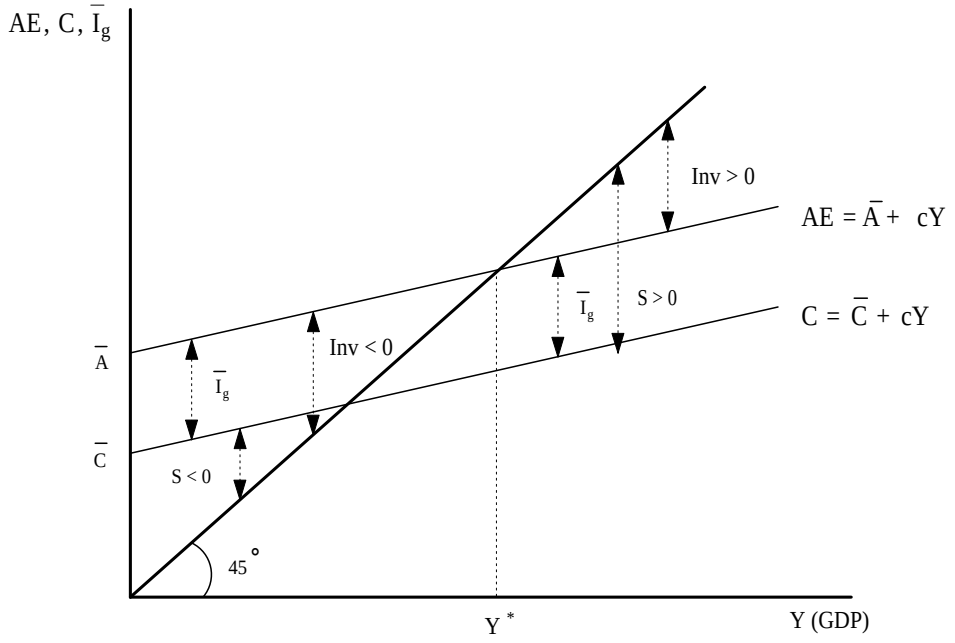
$$C = \bar{C} + cY \tag{8}$$

where $\bar{C}$ is autonomous consumption and c is the marginal propensity to consume(MPC). We will assume that $\bar{C} > 0$ and that $0 < c < 1$. Substituting equations (5) and (8) in equation (3), we have

$$\begin{aligned} Y &= \bar{C} + cY + \bar{I}_g \\ Y &= \bar{C} + \bar{I}_g + cY \\ Y &= \bar{A} + cY \\ Y^\star &= \left(\frac{1}{1-c}\right)\bar{A} \end{aligned} \tag{9}$$

[2]In macroeconomics GDP is synonymously referred to as output, income and employment.

Equation (9) represents the equilibrium level of GDP. This equilibrium level of GDP is shown below graphically using the **Keynesian Cross** diagram.



Keynesian Cross Diagram

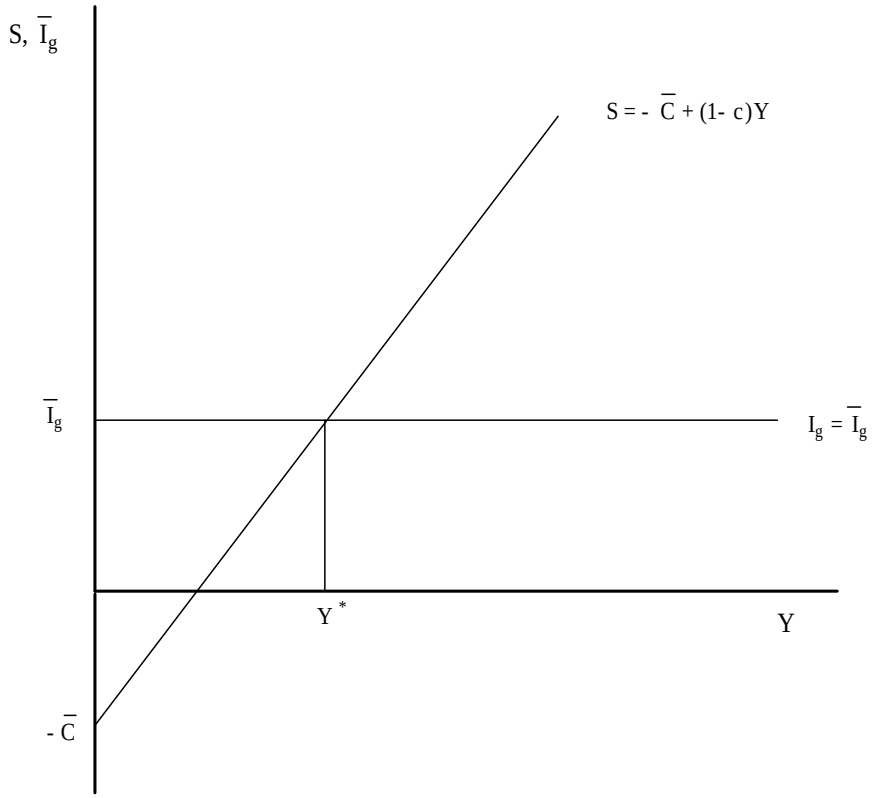
2.2 An Alternative Representation of Equilibrium GDP

An alternative way of determining the equilibrium level of GDP is to use the Savings = Investment equality. We know that in equilibrium $Y = AE$. Thus,

$$\begin{aligned} Y &= C + \bar{I}_g \\ Y - C &= \bar{I}_g \\ S &= \bar{I}_g \end{aligned} \tag{10}$$

Equation (10) is an alternative way to represent the equilibrium level of GDP. It is important to emphasize that this equality holds *only* at the equilibrium level of GDP.

This equilibrium is represented in the figure below:



2.3 The Keynesian Multiplier

The notion of the multiplier is very important in Keynesian macroeconomics. The multiplier measures the increase in output associated with an increase in autonomous spending. For instance, we can compute the investment multiplier. From equation (9), we have

$$\triangle Y^{\star} = \left(\frac{1}{1-c}\right) \triangle \bar{A} \tag{11}$$

$$\triangle Y^{\star} = \left(\frac{1}{1-c}\right) \triangle (\bar{C} + \bar{I}_g) \tag{12}$$

$$\triangle Y^{\star} = \left(\frac{1}{1-c}\right) (\triangle \bar{C} + \triangle \bar{I}_g) \tag{13}$$

Setting $\triangle \bar{C} = 0$ we have the investment multiplier

$$\frac{\triangle Y^{\star}}{\triangle I_g} = \left(\frac{1}{1-c}\right) \tag{14}$$

Given that $0 < c < 1$, the multiplier is greater than unity.

3 The Keynesian Model With Government

So far we have looked at the Keynesian model without the government. We will now introduce the government sector into the model. With the government we now have a mixed economy comprising of two sectors—a private sector and a government (public) sector. Within this mixed economy, we have to account for three things that the government does. They are: (i) government purchases of goods and services, denoted by G, (ii) transfer payments by the government, denoted by TR and (iii) taxes by the government, denoted by TA. We need to incorporate these three things in our model.

3.1 Determination of Equilibrium GDP

The equilibrium condition in this model is again Output = Aggregate Expenditures. Denoting output by Y and aggregate expenditures by AE, we have th following equilibrium condition:

$$Y = AE \tag{15}$$
$$Y = C + I_g + G \tag{16}$$

We will assume that investment (I_g) and government expenditures (G) are *autonomous or exogenous*. This assumption is represented as

$$I_g = \bar{I}_g \tag{17}$$
$$G = \bar{G} \tag{18}$$

However, with the government the consumption function (C) needs to be modified. This is because the government makes transfers and imposes taxes that affect *disposable income*, which in turn affects consumption. Thus the consumption function is of the following form:

$$C = \bar{C} + cY_D \tag{19}$$

where Y_D is disposable income. Disposable income is defined as the income that individuals spend after they receive transfer payments from the government and pay their taxes. Thus disposable income is defined as

$$Y_D = Y + TR - TA \tag{20}$$

We will look at two cases:

Case 1: The government imposes a lump-sum tax. Formally, this means the following:

$$TA = \overline{TA} \tag{21}$$

Substituting equations (17) through (21) in (16) gives us the following

$$\begin{aligned} Y &= \bar{C} + cY_D + \bar{I}_g + \bar{G} \\ Y &= \bar{C} + c\left(Y + \bar{TR} - \bar{TA}\right) + \bar{I}_g + \bar{G} \\ Y &= (\bar{C} + c\bar{TR} - c\bar{TA} + \bar{I}_g + \bar{G}) + cY \\ Y &= \bar{A} + cY \\ Y^\star &= \left(\frac{1}{1-c}\right)\bar{A} \end{aligned} \tag{22}$$

Equation (22) gives us the equilibrium level of GDP. From the above equation, we can compute *the investment multiplier, the government expenditures multiplier, the transfer payments multiplier and the lump-sum taxes multiplier.*

Case 2: The government imposes proportional taxes. Formally this means the following:

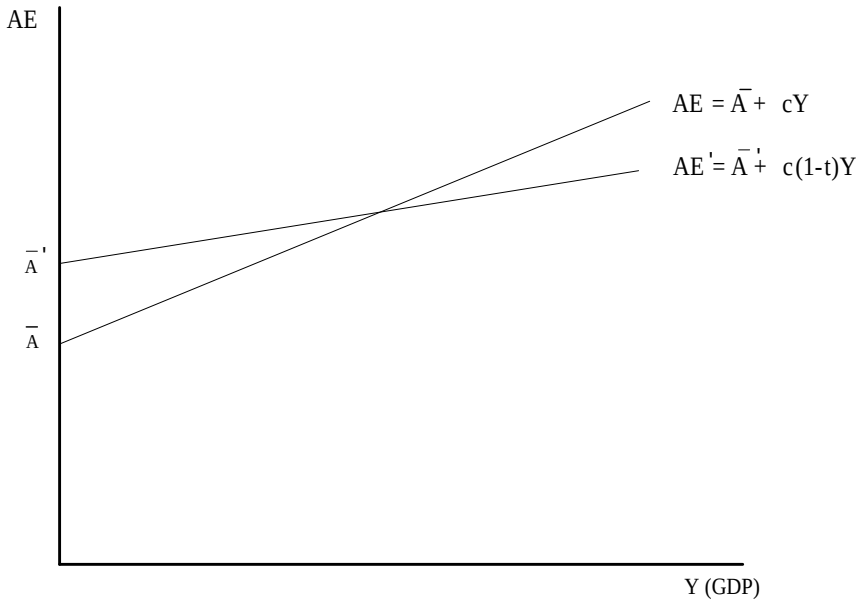
$$TA = t\,Y \quad \text{with } 0 < t < 1 \tag{23}$$

Substituting equations (17) through (20) and (23) in (16) gives us the following

$$\begin{aligned} Y &= \bar{C} + cY_D + \bar{I}_g + \bar{G} \\ Y &= \bar{C} + c(Y + \overline{TR} - t\,Y) + \bar{I}_g + \bar{G} \\ Y &= (\bar{C} + c\overline{TR} + \bar{I}_g + \bar{G}) + c(1-t)Y \\ Y^\star &= \left(\frac{1}{1-c(1-t)}\right)\bar{A} \end{aligned} \tag{24}$$

Equation (24) represents the equilibrium level of GDP. From the above equations we can again compute the *investment multiplier, the government expenditures multiplier, the transfer payments multiplier and the proportional income tax multiplier.*

The aggregate expenditures schedules corresponding to lump-sum taxes and proportional income taxes are shown below:



In the above diagram, $\bar{A} = (\bar{C} + c\bar{T}R - c\bar{T}A + \bar{I}_g + \bar{G})$ and $\bar{A}' = (\bar{C} + c\bar{T}R + \bar{I}_g + \bar{G})$. AE is the aggregate expenditures schedule corresponding to lump-sum taxes while AE' is the aggregate expenditures schedule corresponding to proportional income taxes.

4 The Complete Keynesian Model

We will now introduce the foreign sector. For simplicity, we will assume that net exports are exogenous. This is represented by the following

$$X_n = \bar{X_n} \tag{25}$$

Assuming proportional income taxes this just adds another term in autonomous expenditures. We have the complete Keynesian model as represented by equation (1). The equilibrium level of GDP is still given by equation (24). (Be careful to incorporate equation (25) in the $\bar{A}$ term in equation (24)).

The equilibrium level of GDP is shown in the diagram below: