Fall Semester '05-'06
Akila Weerapana

Lecture 13: The Keynesian Multiplier

I. OVERVIEW

- We have now completed our discussion of economic growth and will move on to the next portion of our class, which focuses on the short run, in particular on economic fluctuations.
- Rather than trying to motivate the topic myself, let me use the words of Keynes.

  > *In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us that when the storm is long past, the ocean will be flat again* - John Maynard Keynes

- In this section of the course, we will begin to develop a theory that explains how fluctuations in the demand for goods and services in the whole economy) can cause fluctuations in output in the short run.
- Why do these fluctuations in spending occur? What role can fiscal and monetary policy play in preventing such fluctuations from occurring? These are the questions we will try to tackle in this section.

II. WHAT IS THE LONG RUN?

- This is the question that vexes macroeconomists. You will rarely find a macroeconomist who is willing to offer a specific opinion about the length of elapsed time that constitutes the long run. Instead they are very evasive: Keynes himself avoided the question in a most articulate fashion by saying "In the long run we are all dead".
- So rather than offer up a time based definition of the difference between the long run and the short run, I will offer the following alternate definitions of what distinguishes long run economic analysis from short run economic analysis.

  The Long Run

  - Discussions about the Solow Model and the growth path of the economy
  - In the long run, output = potential output. Potential output (full employment output) is the output produced by the economy making full use of the capital, labor and technology available to it.
  - The Solow model describes how K, L, A evolve over time, i.e. describes potential output.
  - Prices are completely flexible: output is determined completely by production - in other words prices adjust to equate demand and supply but demand can't influence output it only affects price.
  - Fiscal and monetary policy can only work if they affect the economy's ability to supply goods and services, i.e. produce output.

The Short Run

- Discussions about fluctuations around the growth path of the economy
- In the short run, output $\neq$ potential output, i.e. we can deviate from the growth path of the economy.
- Prices are sticky (slow to change) as a result demand can determine output because prices do not adjust to equate supply and demand.
- Fiscal policy (the government's decisions about expenditure and taxation) and monetary policy (central banks decisions regarding money supply) influence demand and therefore influence output.

- So the basic distinction is that the economy's ability to produce in the long run is constrained by the capital, labor and technology it has available. In the short run, output does not have to always equal this level of potential output. It can either be higher (booms) or lower (recessions).
- During certain periods of time, there is a lot of spending on goods and services thus leading producers to produce more goods. This temporary boost in production can be accomplished by working machines extra hard, by cutting back on maintenance, by asking workers to work overtime, by hiring part time workers etc.
- During other periods of time, there is a cutback in spending on goods and services thus leading producers to produce fewer goods. This temporary cutback in production can be accomplished by idling machines, reorganizing workplaces, laying off workers etc.
- The goal is to come up with a model that explains what types of changes cause spending to rise or fall suddenly, how those changes are transmitted through the economy and what role monetary and fiscal policy has to play in stabilizing these positive and negative spurts in output.

III. THE KEYNESIAN CROSS MODEL

- In this section, we will begin to develop a theory that explains how fluctuations in aggregate demand (demand for goods and services in the whole economy) can cause fluctuations in output in the short run.
- The intellectual history of the model dates back to the Great Depression, an extremely severe economic downturn that could not be easily explained by fluctuations of aggregate supply (changes in the quantity of goods and services produced in the economy) caused by changes in the factors of production, capital and labor or by changes in technology.
- Keynes argued that a fall in aggregate demand caused the sudden economic downturn that led to the Great Depression and that there was a significant role for the government to play in controlling such downturns in economic activity.
- The basic model, the IS-LM model, is a short run model that explains the determination of national income for a given price level. We can use this model to derive an aggregate demand curve for the economy and determine how prices adjust over time.

- A preliminary step is to derive a simpler model of the demand for goods and services, known as the Keynesian Cross, which we can then generalize to obtain the IS-LM model.
- The Keynesian Cross is the simplest model of the demand for goods and services considered in this class. We can express the expenditure of households, firms, foreigners and the government on domestic goods and services as $E = C + I + G + NX$
- We specify the following consumption function that relates consumption (C) to disposable income (after-tax income:

$$C = \bar{C} + b[Y - \bar{T}]$$

- In the consumption function, b is the marginal propensity of consumption (MPC), the fraction of an additional \$ of disposable income that is used for consumption, and $\bar{C}$ is exogenous consumption, consumption unrelated to current income.
- We assume that investment $\bar{I}$, government purchases $\bar{G}$, lump-sum taxes $\bar{T}$, and net exports $\bar{NX}$ are exogenous.
- In equilibrium, Expenditure = Output, $E = Y$. We can now express the model as

$$\begin{aligned} Y &= C + I + G + NX \\ Y &= \bar{C} + b[Y - \bar{T}] + \bar{I} + \bar{G} + \bar{NX} \end{aligned}$$

- Solving for Y from the above, the equilibrium level of output in this model can be algebraically expressed as

$$Y = \frac{\bar{C} + \bar{I} + \bar{G} + \bar{NX} - b\bar{T}}{1 - b}$$

The Multiplier

- We can use the Keynesian Cross to examine the impact of a change in any of the exogenous variables $\bar{C}$, $\bar{I}$, $\bar{G}$ or $\bar{NX}$ on the value of Y. From the above expression, we see that a 1 unit increase in any of these variables increases Y by $\frac{1}{1-b}$ units.
- This increase is > 1 because the marginal propensity to consume, b, is < 1. The translation of a 1 unit change in any of the exogenous variables into a more than 1 unit increase in Y is known as the multiplier effect, with $\frac{1}{1-b}$ being called the **spending multiplier**.
- The mechanism by which this happens can be explained fairly easily. Suppose government purchases goes up by 1 unit. Because $Y = C + I + G + NX$ this will bring about a 1 unit increase in income known as a direct effect.
- When income has gone up by 1 unit because of the direct effect, consumption will increase by b units since the consumer spends b of every dollar that he/she receives. This is called a feedback effect.
- This feedback effect does not end here, the increase in consumption causes income to go up by b units which in turn causes consumption to rise by b^2 units and so on ad-infinitum.

- If we denote the change in government purchases by ΔG and the corresponding impact on output by ΔY then we can express the net impact of an increase in G on Y as:

$$\Delta Y = \Delta G[1 + b + b^2 + \cdots] = \Delta G\left(\frac{1}{1-b}\right)$$

- So an increase in government purchases causes a larger increase in output and a fall in government purchases causes a larger fall in output.

- For intuition, think about an example such as the shutdown of a defense base in CA: a reduction in G. Since most military bases employ a large number of people (10,000+ workers), a shut down of a base has huge economic consequences.

- For example, many people in the surrounding area have jobs at the base: cooking, cleaning and clerical work. These people will lose their jobs, their incomes would fall and their spending on food, clothing and education will go down. The owners of services near the base will lose income because the soldiers will no longer be getting hair cuts, drinking beer or buying CDs,

- Finally, farmers and other local suppliers of fresh produce will lose a huge market for their supplies and will cut back on the scale of production of food products. All in all, a $10 million reduction in G will lead to a larger decline in output in the economy.

The Keynesian Cross Model With Income Taxes

- The basic Keynesian cross model dealt with an economy that had lump sum taxes. The resulting multiplier was $\frac{1}{1-b}$ which implies a multiplier of 10 for a reasonable MPC of 0.9. This is an extremely unrealistically large multiplier. It means that a government can increase GDP by $10 merely by spending $1.

- We can reduce the size of the multiplier by considering an economy with income taxes instead of lump-sum taxes. However, to keep the analysis simple we will focus on a flat-tax system rather than a graduated tax system.

- We specify the following consumption function that relates consumption (C) to disposable income (after-tax income):

$$C = \bar{C} + b(1-t)Y$$

- In the above equation, t is the flat tax rate. As before we assume that investment, government purchases and net exports are exogenous.

- We can now express the model as

$$\begin{aligned} Y &= C + I + G + NX \\ Y &= \bar{C} + b(1-t)Y + \bar{I} + \bar{G} + \bar{NX} \end{aligned}$$

- Solving for the equilibrium level of output in this model gives us

$$Y = \frac{\bar{C} + \bar{I} + \bar{G} + \bar{NX}}{1 - b(1-t)}$$

- A 1 unit increase in any of the exogenous variables increases Y by $\frac{1}{1-b(1-t)}$ units. Note that $\frac{1}{1-b(1-t)} < \frac{1}{1-b}$
- The multiplier is smaller under an income tax system than under a lump-sum tax system. Why? Consider a 1 unit increase in G. This will have a direct effect of raising Y by 1 unit. However, C will only increase by $b(1-t)$ units because t units are taxed away by the government. In other words at each stage of the feedback process, the government takes away a fraction in taxes, which reduces the overall impact on the economy.
- If we think of a tax rate of 0.2 (20%), the size of the multiplier will be $\frac{1}{1-0.9(0.8)} = \frac{1}{.28} = 3.57$. This is considerably less than 10 but still high.
- In particular, the government can increase spending or cut taxes and obtain a multiplied positive effect on output. This would seem to imply that government spending has only positive effects, which seems rather unintuitive. We need to build on this model by incorporating the impact of government spending on other variables such as investment through changes in the interest rate and in inflation into our model.