Class 28: A Model of Macroeconomic Equilibrium

1. What is a Macroeconomic Model?
   a. A model is a simplified description that captures essential elements of a phenomenon such as the business cycle that allows us to analyze the phenomenon in a logical and disciplined way.
   b. A macroeconomics model is a model of the forces that determine national output, inflation, unemployment and the real rate of interest.
   c. A macroeconomic model is sometimes a system of equations
      i. Solving the model is equivalent to solving the equations simultaneously
      ii. The model can be used to predict the effect on the economy of changes in monetary and fiscal policy and of shocks (surprising changes) in the collective behavior of households and firms.
   d. Important terminology
      i. Endogenous variables are variables determined by the model; exogenous variables are variables determined outside the model.
      ii. Structural relationships are those that are unchanged no matter what kind of shocks hit the economy. The predictions of a model are more likely to be valid when they are derived from structural relationships.

2. A Two Equation Macro Model
   a. Aggregate Demand Schedule
      i. Aggregate demand is measured in constant dollars
      ii. Aggregate demand equals $C + I + G + NX$
         
         $C = \text{Consumption}$
         $I = \text{Investment}$
         $G = \text{Government Spending}$
         $NX = \text{Net Exports}$
      iii. Aggregate demand is inversely related to the real rate of interest ($r$).
         Consumption falls when $r$ rises because a higher real rate of interest implies a higher cost for financing consumer durables purchases and a higher reward to saving.
         Investment spending falls when $r$ rises because the real rate of interest is an economic cost of investment.
         Net exports fall when $r$ rises because an increase in the real rate typically causes an appreciation of the dollar which makes exports more expensive and imports cheaper.
b. Potential Output Schedule
   i. Potential output is the output level associated with full employment of labor and capital.
   
   ii. Potential output does not vary (or varies little) with the real rate of interest.
   
   iii. Potential output increases over time as the quantity and quality of inputs to the productive process increase. The path of potential output is approximately the same as the exponential trend that we estimated using data for real GDP.
   
   c. The intersection of the AD and PO schedules define the real rate of interest that will support full employment of resources.
d. Accounting for inflation in the macro model

i. Inflation tends to increase when the economy operates above potential output because resources are scarce and their prices rise as a result. Higher prices of productive resources translate into higher product prices generally and inflation results.

ii. Inflation tends to remain unchanged when the economy is below but not too far below potential output.

iii. Inflation tends to fall (even to negative levels) when the economy operates far below potential output. When many resources are unemployed, their prices tend to fall. Price decreases for productive resources translate into lower prices of products generally.

e. The model accounts for unemployment because there is a close relationship in the US between growth in output and the level of unemployment.
3. Describing Monetary Policy with the Two-equation Macro Model

a. US law specifies a dual mandate for monetary policy
   i. The primary objective is to keep the inflation rate low and stable
   ii. The secondary objective is to keep the economy operating near full employment

b. Example: How monetary policy can be used to offset the effects of recessionary forces

![Graph showing the effects of recessionary forces on aggregate demand.]

Choosing the right value for the real rate of interest involves some risk

i. Shocks are constantly hitting aggregate demand. Some push demand higher. Some push demand lower. The Fed never knows the position of the AD schedule for sure.

ii. Setting the interest rate at r₁ entails risks—that rate could be too high (continued recession) or too low (inflation) depending on what shocks hit the AD schedule.

![Graph showing the effects of monetary policy on aggregate demand.]

iii. Shocks are constantly hitting the production sector as well. For example, a shock to the price of oil may lower potential output. The Fed never knows the position of the PO schedule for sure.

![Shocks Shift Potential Output](image)

### d. Summary

i. From the point of view of our simple macro model, optimal monetary policy requires the Fed to set the nominal interest rate at a level so that aggregate demand equals the potential level of output. By doing so, the Fed simultaneously meets the objective of low and constant inflation and the objective of full employment of resources.

ii. Shocks are constantly hitting the economy. Future values of consumption, investment and net exports cannot be perfectly predicted which implies that the position of the AD schedule should be viewed as uncertain. Future input costs and exogenous factors effecting production such as weather cannot be perfectly predicted which implies that the position of the YP schedule should also be viewed as uncertain.

iii. The Fed faces a tradeoff. If it cares more about keeping the inflation rate from increasing, it will err on the side of keeping the interest rate higher and will thereby risk an economy that operates below its potential. If it cares more about full employment of resources, it will err on the side of keeping the interest rate lower and will thereby risk an increase in the inflation rate.

### e. Rules versus Discretion

i. Some economists, such as John Taylor, believe that the Fed should follow a rule for setting the federal funds rate. By doing so, the Fed becomes more transparent and private decision makers can more easily predict what the Fed will do in the future.

Taylor’s rule can be summarized by the following equation

\[
ffr(t) = 1.5(\pi(t) - \pi^*) + 0.5(Y gap(t)) + (r^* + \pi^*)
\]

where ffr is the federal funds rate, \(\pi\) and \(\pi^*\) are the inflation rate and its target, \(Y gap\) is the output gap, and \(r^* + \pi^*\) is the long run interest rate.

ii. Other economists believe that it is not possible to create a policy rule that will cover all important contingencies and that the Fed should use discretion and treat every policy challenge as unique.
4. **Using the Model to Explain the Great Recession (aka the Great Contraction)**

a. Kenneth Rogoff argues that a recession and a financial crisis interact in ways that make the negative outcomes greater than the sum of negative outcomes from a typical recession and a financial crisis that occurs during an expansion. He calls the combination of a recession and a financial crisis a “Contraction” and compares it with the Great Depression of the 1930’s.

b. The following diagram shows how our model would depict the Great Contraction

![Diagram showing the fall in aggregate demand and the nominal interest rate during the Great Contraction.](image)

The fall in aggregate demand that occurred during the Great Contraction was so great that a nominal interest rate of zero would not provide sufficient stimulus to return the economy to full employment.

c. The following diagram shows that the Taylor rule prescribed negative values for the federal funds rate during the Great Contraction.

![Comparison of Federal Funds Rate with Taylor Rule Prescription](image)