1. THE BIG PICTURE

PART 1

THE SHORT RUN

CONCENTRATE ON SHORT FLUCTUATIONS IN THE ECONOMY
LIMIT OURSELVES TO THE DEMAND SIDE OF THE ECONOMY ASSUMING THAT THE SUPPLY SIDE IS TOTALLY FLEXIBLE.

- KEYNESIAN CROSS MODEL;
- GOODS MARKET
- FINANCIAL MARKETS

PART 2

THE MEDIUM RUN

CONCENTRATE ON LARGER FLUCTUATIONS IN THE ECONOMY
INTRODUCE THE SUPPLY SIDE OF THE ECONOMY

- LABOR MARKET;
- AD/AS MODEL: PUTTING TOGETHER THE SUPPLY AND THE DEMAND SIDES;
- PHILLIPS CURVE: PERMITS TO RELATE INFLATION TO THE LEVEL OF ACTIVITY OF ECONOMY AND TO EXPECTATIONS OF PEOPLE;
- TWO MAJOR EXAMPLES: THE GREAT DEPRESSION AND UNEMPLOYMENT IN EUROPE;
- THE CASE AGAINST ACTIVIST POLICY: VARIABLE LAGS, POLICIES AND EXPECTATIONS, TIME INCONSISTENCY.

PART 3
THE LONG RUN

CONCENTRATE ON TREND OF ECONOMIC ACTIVITY: GROWTH
WE IGNORE FLUCTUATIONS AROUND TREND. WHAT DETERMINES
GROWTH: ROLE OF SAVING, POPULATION GROWTH AND TECHNOLOGICAL
GROWTH.

- THE FACTS OF GROWTH
- THE SOLOW GROWTH MODEL

1. THE STEADY-STATE
2. CHANGES IN PARAMETERS
3. THE GOLDEN RULE

2. PART 1: THE SHORT RUN

THE KEYNESIAN-CROSS MODEL

THE COMPOSITION OF DEMAND:

\[ Z = C + I + G \] (by definition)

Consider each component in turn:

Consumption:

\[ C = C(Y_D) \]

with a specific functional form of

\[ C = c_0 + c_1 Y_D \]

(+)

\[ Y_D \text{Disposable Income, } Y_D \equiv Y - T \text{, } Y \text{ is Income, } T \text{ is taxes.} \]

\[ S \equiv Y_D - C \text{ defines private saving.} \]

Investment:

Assumption: \[ I = \bar{I} \]

In this model, Investment is taken as given (Exogenous Variable).
This is due to the inexistence of financial markets in this model.

Government Spending:
Together with Taxes (T), G describes the government’s fiscal policy. These are the two variables that permit the government to influence the behavior of the economy.

T-G defines public saving.

THE DETERMINATION OF EQUILIBRIUM OUTPUT.

Definition of the equilibrium in the goods market: Condition that the supply of goods (production), \( Y \), be equal to the demand for goods, \( Z \).

\[
Y = Z \quad \text{[Equilibrium Condition]}
\]

\[
Y = c_0 + c_1 \cdot (Y-T) + I + G
\]

We can solve for \( Y \) (the unique endogenous variable in the equation), getting:

\[
Y = \frac{1}{1-c_1} \cdot (c_0 + I + G - c_1 \cdot T)
\]

From here, we can get all the multipliers needed. For instance, the G-multiplier is \( \frac{1}{1-c_1} \).

THE DYNAMIC INTERPRETATION

![Graph showing the dynamic effects of an increase in G](image)

The dynamic effects of an increase in G

THE FINANCIAL MARKETS

PEOPLE FACE A CHOICE:
HOW MUCH OF THEIR WEALTH TO HOLD IN MONEY?

THE DEMAND FOR MONEY

\[ M^d = Y \cdot L(i) \]

EQUILIBRIUM CONDITION IN FINANCIAL MARKETS

MONEY SUPPLY = MONEY DEMAND (a)
(We’ll use this one)
or
BONDS SUPPLY = BONDS DEMAND (b)

(a) \iff M = Y \cdot L(i)

THE IS/LM MODEL

THE GOODS MARKET AND THE IS RELATION

EQUILIBRIUM IN GOODS MARKETS GIVEN BY: \[ Y = Z \]
The ‘IS’ curve will be derived from this eq. condition.

Equation now becomes: \[ Y = C(Y-T) + I(Y,i) + G \]

What shifts the IS curve: G, T, Consumer confidence (c₀), Firms’ confidence (\( \bar{I} \)).

Financial Markets and the LM Relation

Equilibrium in financial markets given by:

\[ M^s = M^d \]

Let \( M = M^s \). In real terms, we have:

\[ \frac{M}{P} = Y \cdot L(i) \]

What shifts the LM curve: M, P, L, \( \pi^e \).

The IS/LM Equilibrium:

Can put IS and LM relations together: simultaneous equilibrium in goods market and financial markets (eq. of the economy).

\[ Y = C(Y-T) + I(Y,i) + G \]
\[ \frac{M}{P} = Y \cdot L(i) \]

Dynamics: The adjustment of the interest rate to any change in the demand or the supply of money is so fast that the economy is always on the LM curve.

Relation to Keynesian Cross Model: The KCM is a special case of the IS/LM model. One in which the IS curve is vertical.

3. Part 2: The Medium Run

The labor market

The labor market is at the center of the production adjustment process. That’s the market in which wages are determined. Now, the price level is not fixed anymore.
and adjustments on it will actually be at the origin of the dynamic movement from the short run to the long run.

**Wage determination**

We are going to assume the following:

\[
W = P^e F(u, z)
\]

- \( P^e \): Expected Price Level;
- \( u \): unemployment rate;
- \( z \): catchall variable that stands for all other variables that affect the outcome of wage setting.

**Price Determination**

We look at the determination of prices given wages.

**Assumption:**

\[
Y = N
\]

\( Y = N \) implies the cost of producing an additional unit of output is the cost of employing one more worker, and is thus equal to the wage. Since many markets are not perfectly competitive,

\[
P = (1 + \mu) W
\]

- \( \mu \): markup of price over cost.

**The Natural rate of Unemployment**

Here we assume that \( P^e = P \), expectations are fulfilled.

**The Wage-Setting Relation**

\[
\frac{W}{P} = F(u, z)
\]

**The Price-Setting Relation**

\[
\frac{W}{P} = \frac{1}{1 + \mu}
\]

**Equilibrium Real Wages, Employment, and Unemployment**

In equilibrium:
\[ F(u,z) = \frac{1}{1+\mu} \]

From Unemployment to Output

\[ Y = N = L(1-u) \]

AGGREGATE DEMAND AND AGGREGATE SUPPLY

Now we take into account equilibrium in all markets (goods, financial, labor).

Equilibrium is reduced to 2 equations:

- Aggregate Supply: captures eq. in the labor market.
- Aggregate Demand: characterizes both eq. in the goods and financial markets.

**Aggregate Supply**

Captures the effects of output on the price level. It is derived from the eq. in the labor market.

\[ W = P^e F(u,z) \]
\[ P = (1+\mu)W \]

Combining both,

\[ P = P^e (1+\mu) F\left(1 - \frac{Y}{L}, z\right) \]

This is the Aggregate Supply Relation.

**Aggregate Demand**

\[ Y = Y \left(\frac{M}{P}, G, T, \ldots\right) \]
Movements in Output and Prices

Output tends to return over time to its natural level. Because the expected price level has such a strong effect on the actual price level in the aggregate supply relation, the dynamics of output and prices depend very much on how wage setters form their expectations.

Assumption: \( P_t = P_{t-1} \)

AS: \( P_t = P_{t-1}(1+\mu)F(1- \frac{Y}{L}, z) \)

AD: \( Y_t = Y \left( \frac{M}{P_t}, G, T, \ldots \right) \)

Position of AS depends on last year’s price level.

Adjustment Mechanism:

The mechanism: As long as the economy is operating above its natural level, prices are increasing.

In the SR, output can be above or below its natural level. In the LR, however, output eventually returns to its natural level. The adjustment process works through prices.

THE PHILLIPS CURVE

Permits to relate inflation to the level of activity of the economy and to the expectations of people.

\[ \pi_t = \pi^e_t + (\mu + z) - \alpha u_t \]

\( \alpha \) - reflects the effect of unemployment on inflation.

or, \[ \pi_t = \pi^e_t - \alpha (u_t - u) \]
If \( \pi_t^e = \pi_{t-1} \) then \( \pi_t = \theta \cdot \pi_{t-1} + (\mu + z) - \alpha u_t \)

\( \theta = 0 \) -- original Phillips curve.
\( \theta = 1 \) -- modified Phillips curve or expectations-augmented Phillips curve.

\[
\begin{align*}
\pi &\to \pi^e \\
\pi^e &\downarrow u_n \\
\end{align*}
\]

Natural rate of Unemployment

Defined for \( \pi_t = \pi_t^e \implies u_n = \frac{\mu + z}{\alpha} \)

THE GREAT DEPRESSION

How can the Great Depression be explained with our framework?

Impulses: Probably \( \bar{I} \)

Propagation: Bank Panics, Bankruptcies
(Money Multiplier \( \downarrow \));
Challenge to NAIRU? (to our adjustment mechanism):

Yes, because we were supposed to return to the natural rates and we did not for a long time.

UNEMPLOYMENT IN EUROPE

The Facts:

The first explanation:

The dominant view in Europe today is that high European unemployment is the result of labor market rigidities. These put too many restrictions on firms, prevent them from adjusting to changes in the economic environment.

Problem with this explanation:

The labor market rigidities were already in place in the 1960s, when European unemployment was very low.

The alternative explanation:

Hysteresis - the dependence of a variable in its whole history.

Idea: The natural unemployment rate is not, as we’ve assumed so far, independent of actual unemployment. Instead, the natural rate depends on the history of actual unemployment. In particular, a long period of high unemployment leads to an increase in the natural rate.
Consequence: Persistent shocks in G, T, M (shifting out AD curve) can have effects on $u_n$, according to this theory.

CASE AGAINST ACTIVIST POLICY

So far, we’ve been saying that macroeconomic policy has an important role to play. However, some argue that policy makers should be restrained. We are going to see why this can be the case.

• Not Enough Information (Uncertainty and Policy)

How much do actually macroeconomists know, before they decide which policy to implement?

Some examples of problems:

• Long and variable Lags

What is the risk that the effects will come too late, when the economy has already recovered?

![Diagram]

• How do the policies affect Expectations?

We have to predict how people will respond.

Example 1: Lucas Critique, example of desinflation of 80s. Lucas, in his critique, emphasized that the economic impact of a government policy action depended a lot on people’s expectations. If the government contemplates shifting to a tighter monetary policy, then our Phillips curve analysis indicates we’ll go through a period of recession before expected inflation shifts down and we get back to the natural rate of unemployment and a lower
inflation rate. The length of that recession depends on how long it
takes for people’s inflation expectations to come down.

Example 2: Tax cut of 1968.

• Time consistency problems (Interaction between Expectations and Policy)

Time inconsistency idea: Optimal for you to make something today but something else can become optimal a few periods later.

Example 1: Plane Hijackings

Example 2: Monetary Policy

\[ \pi = \pi^e - \alpha (u - u_n) \]

Stage 1: Fed announces that it will follow a monetary policy consistent w/ zero inflation. Wage setters believe the announcement => \( \pi^e = 0 \).
If Fed follows announced policy => \( \pi = 0 \) and \( u = u_n \)

Stage 2: But once there, it would seem like Fed can do better. Now that wages are set (and fixed for a period of time) with \( \pi^e=0 \).
If Fed (assume \( \alpha=1 \)) keeps only \( \pi=1\% \), \( u \) will be 1% below natural rate.
Once the Fed decides to do this they incurring in a time-inconsistency of optimal policy.

Stage 3: Fed loses credibility and next time people will not be fooled. They will expect higher inflation than the one announced and this will prevent the Fed from achieving its objectives.

Ways to regain credibility: Make central bank independent of the government, specify by law the policies they can adopt.
• An example of The Expectation Trap: The high inflation of the 1970s

The bad supply disruptions of the 70s (oil shock) drove up prices and \( u_n \) (\( u \) goes up). In addition, high money growth during the period, possibly reflecting that policy makers got pushed by private expectations of higher inflation (“expectation traps”), raised inflation too.

4. PART THREE: THE LONG RUN: GROWTH

THE FACTS OF GROWTH:

• LARGE INCREASE IN THE STANDARD OF LIVING SINCE 1950
• SLOWDOWN IN GROWTH SINCE THE MID-1970s
• CONVERGENCE AMONG RICH COUNTRIES

THE SOLOW GROWTH MODEL (THE COMPLETE ONE)

Production Function (The supply side):

\[
Y = F(K, LE)
\]

\( Y \)- Aggregate Output, \( K \)- capital, \( L \)- labor, \( F \)-Aggregate Production Function, \( E \)- state of technology, \( LE \)- effective labor.

Assumptions:

• Constant returns to scale (CRS)
  Multiply by \( \lambda \) all the inputs and check that production is exactly multiplied by \( \lambda \).

• Diminishing Marginal Products
MPK (MPLE) decreases as K (LE) increases: first derivatives of MPK and MPLE are negative.

**Transformation of Production Function:** Write in per effective worker

Using CRS, we can reach the following production function:

$$ F(\frac{LE}{LE}, \frac{F}{LE}) $$

Let

$$ y = \frac{Y}{LE} $$ (output per effective worker) and

$$ k = \frac{K}{LE} $$ (capital per effective worker)

We then have:

$$ y = f(k) $$

$$ \frac{dy}{dk} = f'(k) $$, Marginal product of capital per effective worker: how output (diminishing marginal products).

**Demand Side:**

$$ y = c + i $$

where,  
- consumption per effective worker, 
- i

You either consume or save. In our economy, since private savings = total savings (no government) and since we have a closed economy, then saving is equal to investment.

s be the saving rate

$$ i = s y = s f(k) $$

$$ c = (1-s)y = (1-s) f(k) $$
Evolution of Capital Stock:

\[
k = i - (\delta_E)k
\]
\[
k = sf(k) - (\delta_E)k
\]

This rule describes how investment is growing/shrinking over time.

Steady State Capital Stock:

\( k_{ss} \) at which capital stock is not changing: \( k=0 \)

\[k\] is obtained by assuming \( \Delta s f(k_{ss}) \delta + n + g \) \( k_{ss} \)

The steady state capital stock per effective worker is the capital stock per worker towards which the economy will tend over time. Once in steady state, without

Graphical Depiction:

In the LR, \( k \) and \( y \) reach a constant level. Their growth rate is zero.

In steady-state, in this economy, what is constant is not output but rather output per
Result: In SS, the growth rate of output and the growth rate of capital (and also the growth rate of consumption) is equal $n+g_E$. The growth rate is independent of the saving rate.

\[
\text{Growth rate (X,Y)} = \text{Growth rate (X)} + \text{Growth rate (Y)}
\]

Since $Y = y \cdot L \cdot E$, growth rate (Y) = growth rate (y) + growth rate (L) + growth rate (E) = $0+n + g_E$

Same thing for $K = k \cdot L \cdot E$.

The standard of living is measured by $Y/L$.

Since $Y/L = yE$, then the growth rate of the standard of living is $g_E$.

The importance of the saving rate and the technological growth rate: How do changes in $s$ and $g_E$ impact on the SS?

Example 1: The effects of the saving rate (increase in $s$)

Example 2: The effects of $g_E$ (an increase in $g_E$)
Golden Rule capital stock:

Capital stock which maximizes steady state consumption:

$$\text{Max } \frac{c_{ss}}{k} = f(k) - (\delta + n + g_E) k \quad \Rightarrow \quad k_{GR}$$

Solution: taking derivative and setting equal to zero yields

$$f'(k_{GR}) = \delta + n + g_E$$

The golden rule saving rate can be obtained by:

$$s_{GR} f(k_{GR}) = (\delta + n + g_E) k_{GR}$$

The graphical interpretation:
Are we above or below the golden rule?

Compare $MP_k = f'(k)$ to $(\delta + n + g_E)$

THE END

I WISH GOOD LUCK ON YOUR FINAL EXAM.
THANK YOU FOR MAKING THIS TA EXPERIENCE A VERY REWARDING ONE TO ME.

HAVE A NICE VACATION