Macroeconomics

Introduction to Economic Fluctuations

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**Business cycle:** short-run fluctuations in output and employment

**Recession:** a period of falling output and rising unemployment

**Expansion:** a period of increasing output

**Stagnation:** a period of little or no growth in the economy

**Growth in French Real GDP, 1980-2010**
The unemployment rate rises significantly during periods of recession. There is a negative (when one rises, the other falls) relationship between unemployment and GDP.
**Aggregate demand (AD)** is the relationship between the quantity of output demanded and the aggregate price level. Negative relationship between the price level $P$ and quantity of goods and services demanded $Y$.

As the price level decreases, we’d move down **along the AD curve**. Any economic phenomena that causes changes in the value of C, I, G, NX variables changes aggregate demand.
Aggregate supply (AS) is the relationship between the quantity of goods and services supplied and the price level.

The aggregate supply relationship depends on the time horizon.

The long run – vertical AS curve
Prices are flexible
Is called the natural level of output - at which the economy’s resources are fully employed, or more realistically, at which unemployment is at its natural rate.

The short run – horizontal AS curve
Prices are sticky and therefore short-run AS is horizontal
The economy begins in long-run equilibrium at point A. Then, a reduction in aggregate demand, moves the economy from point A to point B, where output is below its natural level. As prices fall, the economy recovers from the recession, moving from point B to point C.
Shocks
Exogenous changes in aggregate supply or aggregate demand.
*supply shock*: a shock that affects aggregate supply.
*demand shock*: a shock that affects aggregate demand.

Stabilization Policy
Policy actions taken to reduce the severity of short-run economic fluctuations. Stabilization policy seeks to dampen the business cycle by keeping output and employment as close to their natural rate as possible.

Shocks to AD
The economy begins in long-run equilibrium at point $A$. An increase in aggregate demand, moves the economy from point $A$ to point $B$, where output is above its natural level. As prices rise, output gradually returns to its natural rate, and the economy moves from point $B$ to point $C$. 
Shocks to AS

There is no way to adjust aggregate demand to maintain full employment and keep the price level sable.

a) to hold AD constant

b) to expand AD to prevent a reduction in output and employment
Aggregate Demand I:
Building the IS-LM Model
The model of aggregate demand \((AD)\) can be split into two parts:

1. **IS** model of the “goods market.” “IS stands for Investment Saving, plots the relationship between the interest rate and the level of income that arises in the market for goods and services.

2. **LM** model of the “money market.” LM stands for Liquidity Money.” plots the relationship between the interest rate and the level of income that arises in the money market.

Because the interest rate influences both investment and money demand, it is the variable that links the two parts of the **IS-LM** model.

The **IS-LM** is the leading interpretation of Keynes’ work. The **IS-LM** model takes the price level as given and shows what causes income to change.

**It shows what causes \(AD\) to shift.**
The Keynesian cross shows how income $Y$ is determined for given levels of planned investment $I$ and fiscal policy $G$ and $T$. We can use this model to show how income changes when one of the exogenous variables change.

**Actual expenditure** is the amount households, firms and the government spend on goods and services (GDP).

**Planned expenditure** is the amount households, firms, and the Government would like to spend on goods and services.

The economy is in equilibrium when:

Actual Expenditure = Planned Expenditure or $Y = E$

Expenditure, $E$

Actual expenditure, $Y=E$

Planned expenditure, $E = C + I + G$

Income, output, $Y$
Changes in government purchases
Higher government purchases result in higher planned expenditure, for any given level of income. The increase in income $Y$ exceeds the increase in government purchases $\Delta G$.
$\rightarrow$ fiscal policy has a multiplied effect on income.

Government-purchases multiplier: $\Delta Y/\Delta G = 1 / (1 - MPC)$

Tax multiplier: $\Delta Y/\Delta T = -MPC / (1 - MPC)$
An increase in the interest rate (in graph a), lowers planned investment, which shifts planned expenditure downward (in graph b) and lowers income (in graph c).

The IS curve shows the combinations of the interest rate and the level of income that are consistent with equilibrium in the market for goods and services. The IS curve is drawn for a given fiscal policy. Changes in fiscal policy that raise the demand for goods and services shift the IS curve to the right. Changes in fiscal policy that reduce the demand for goods and services shift the IS curve to the left.
The money market and the LM curve

Supply of real money balances \( (M/P) \); both of these variables are taken to be exogenously given. This yields a vertical supply curve.

Demand for real money balances, \( L \). The theory of liquidity preference suggests that a higher interest rate lowers the quantity of real balances demanded, because \( r \) is the opportunity cost of holding money \( (M/P)d = L (r,Y) \).

The supply and demand for real money balances determine the interest rate. At the equilibrium interest rate, the quantity of money balances demanded equals the quantity supplied. \( L(r) = M/P \)

Since the price level is fixed, a reduction in the money supply reduces the supply of real balances. The equilibrium interest rate rose.
An increase in income raises money demand, which increases the interest rate. The higher the level of income, the higher the interest rate.

**Monetary policy and the LM curve**

LM curve is drawn for a given supply of real money balances. If real money balances change the LM curve shifts.
The intersection of the IS curve/equation, \( Y = C(Y-T) + I(r) + G \) and the LM curve/equation \( M/P = L(r, Y) \) determines the level of aggregate demand. The intersection of the IS and LM curves represents simultaneous equilibrium in the market for goods and services and in the market for real money balances for given values of government spending, taxes, the money supply, and the price level.
Aggregate Demand II: Applying the IS-LM Model
How Fiscal Policy Shifts the IS Curve and Changes the Short-run Equilibrium

$+\Delta G$ will shift the IS curve to the right by $\Delta G/(1- MPC)$.  
$-\Delta T$ will shift the IS curve to the right by $\Delta T \times MPC/(1- MPC)$.

The increase in $Y$ in response to a fiscal expansion is smaller in the IS-LM model than in the Keynesian cross.
How Monetary Policy Shifts the LM Curve and Changes the Short-run Equilibrium

$+ \Delta M$

The $LM$ curve shifts downward and lowers the interest rate and raises income. The $IS-LM$ model shows that monetary policy influences income by changing the interest rate. The process called the *monetary transmission mechanism*. The $IS-LM$ model shows that an increase in the money supply lowers the interest rate, which stimulates investment and thereby expands the demand for goods and services.
Interaction between monetary and fiscal policy

Suppose the government increases G. Possible central bank’s responses:

• 1. hold M constant
• 2. hold r constant
• 3. hold Y constant

In each case, the effects of the $\Delta G$ are different.
Shocks in the IS-LM model

**IS shocks:** exogenous changes in the demand for goods & services. Examples:
- stock market boom or crash
  - a change in households’ wealth
  - $\Delta C$
- change in business or consumer
  - confidence or expectations
  - $\Delta I$ and/or $\Delta C$

**LM shocks:** exogenous changes in the demand for money. Examples:
- a wave of credit card fraud increases demand for money
- more ATMs or the Internet reduce money demand
From IS-LM to AD

To derive $AD$, start at point $A$ in the top graph. Now increase the price level from $P_1$ to $P_2$. An increase in $P$ lowers the value of real money balances, and $Y$, shifting $LM$ leftward to point $B$. This raises the equilibrium interest rate and lowers the level of income.

AD curve plots this inverse relationship between national income and price level.

Events that shift the IS and the LM curves (for a given price level) cause AD curve to shift:

An increase in $M$, $G$ or a decrease in $T$ raises $Y$ in the IS-LM model – AD shifts to the right.
A decrease in $M$, $G$ or an increase in $T$ lowers $Y$ in the IS-LM model – AD shifts to the left.
The IS-LM model in the short run and long run

We can also use IS-LM to describe the economy in the long run.

K is the short run equilibrium – the economy’s income is less than its natural level. There is insufficient demand for goods and services to keep the economy producing at its potential – $P$ decreases – LM curve shifts to the right - C is the long run equilibrium.

The key difference between Keynesian assumption (K) and classical assumption (C) the time horizon: Classical assumption ($Y=Y$) best describes the long run, Keynesian assumption ($P=P_1$) best describes the short run.
Aggregate Supply and the Short-run Tradeoff Between Inflation and Unemployment
The Short-Run Aggregate Supply Equation

Some market imperfection causes the output of the economy to deviate from its natural level. As a result, the short-run aggregate supply curve is upward sloping, and shifts in the aggregate demand curve cause the level of output to deviate temporarily from its natural level. These temporary deviations represent the booms and busts of the business cycle.

\[ Y = Y + \alpha(P - EP) \text{ where } \alpha > 0 \]

This equation states that output deviates from its natural level when the price level deviates from the expected price level. The parameter \( \alpha \) indicates how much output responds to unexpected changes in the price level, \( 1/\alpha \) is the slope of the aggregate supply curve.
Sticky-Wage Model

1. When the nominal wage is stuck, a rise in the price level lowers the real wage, making labour cheaper.
2. The lower real wage induces firms to hire more labour.
3. The additional labour produces more output.

The aggregate supply curve slopes upward during the time when the nominal wage cannot adjust.

The Imperfect Information Model

The model assumes that (1) markets clear - that is, all wages and prices are free to adjust to balance supply and demand. The short-run and long-run aggregate supply curves differ because of temporary misperceptions about prices. (2) Each supplier in the economy produces a single good and consumes many goods. Suppliers cannot observe all prices at all times. They monitor the prices of their own goods but not the prices of all goods they consume. Due to imperfect information, they sometimes confuse changes in the overall price level with changes in relative prices.

This confusion influences decisions about how much to supply, and it leads to a positive relationship between the price level and output in the short run.
The Sticky-Price Model

- Firms do not instantly adjust the prices they charge in response to changes in demand. Sometimes prices are set by long-term contracts between firms and consumers.
- When firms expect a high price level, they expect high costs. Those firms that fix prices in advance set their prices high. These high prices cause the other firms to set high prices also. Hence, a high expected price level $E$ leads to a high actual price level $P$.
- When output is high, the demand for goods is high. Firms with flexible prices set their prices high, which leads to a high price level.
- The firm’s desired price ($P$) depends on two macroeconomic variables: the overall level of prices ($P$) and the level of aggregate income ($Y$).
A: the economy is at full employment, the actual price level equals the expected price level.

B: Since $P$ (the actual price level) is now greater than $P^e$ (the expected price level) $Y$ will rise above the natural rate, and we slide along the $SRAS$ ($P^e=P_0$) curve to $C$.

The "long-run" will be defined when the expected price level equals the actual price level. So, as price level expectations adjust, $EP\Rightarrow P_2$, we’ll end up on a new short-run aggregate supply curve, $SRAS$ ($EP=P_2$) at point $C$.

In terms of the SRAS equation, we can see that as $EP$ catches up with $P$, that entire "expectations gap" disappears and we end up on the long run aggregate supply curve at full employment where $Y = Y$.

\[ Y = \bar{Y} + \alpha (P-EP) \]
The Phillips Curve

The *Phillips curve*: represents the trade-off between the inflation and unemployment in the short run.

Inflation rate depends on three forces:
1) Expected inflation
2) The deviation of unemployment from the natural rate, called *cyclical unemployment*
3) Supply shocks

These three forces are expressed in the following equation:

$$\pi = E\pi - \beta(\mu - \mu^n) + \epsilon$$

- **Inflation**
- **Expected inflation**
- **Supply shocks**
- **$b \times$ Cyclical unemployment**
1. Expected inflation: people form their expectations of inflation based on recently observed inflation = *adaptive expectations*. Inflation has inertia, it keeps going until something acts to stop it.

2. The deviation of unemployment from the natural rate, called *cyclical unemployment* = *demand-pull inflation* because high aggregate demand is responsible for this type of inflation.

3. Supply shocks: inflation also rises and falls because of supply shocks. An adverse supply shock implies a positive value of \( n \) and causes inflation to rise = *cost-push inflation*. 


The short-run Trade-off Between Inflation and Unemployment

In the short run, inflation and unemployment are negatively related. At any point in time, a policymaker who controls aggregate demand can **choose a combination of inflation and unemployment** on this short-run Phillips curve.

The **sacrifice ratio** measures the percentage of a year’s real GDP that must be foregone to reduce inflation by 1 percentage point. A typical estimate of the ratio is 5.

**Okun’s law**: the negative relationship between unemployment and real GDP, according to which a decrease in unemployment of 1 percentage point is associated with additional growth in real GDP of approximately 2 per cent.
Rational Expectations and the Possibility of Painless Disinflation

Adaptive expectations: People base their expectations of future inflation on recently observed inflation.

Rational expectations: People base their expectations on all available information, including information about current and prospective future policies. Proponents of rational expectations believe that if policy makers are credibly committed to reducing inflation, rational people will understand the commitment and lower their expectations of inflation. Inflation can then come down without a rise in unemployment and fall in output.

Hysteresis and the Natural-Rate Hypothesis

Our entire discussion has been based on the natural rate hypothesis: Fluctuations in aggregate demand affect output and employment only in the short run. In the long run, the economy returns to the levels of output, employment, and unemployment described by the classical model. Recently, some economists have challenged the natural-rate hypothesis by suggesting that aggregate demand may affect output and employment even in the long run. They have pointed out a number of mechanisms through which recessions might leave permanent scars on the economy by altering the natural rate of unemployment. Hysteresis is the term used to describe the long-lasting influence of history on the natural rate.