Inflation is an increase in the overall level of prices.

Inflation: Historical Aspects

- Over the past sixty years, prices have risen on average about 5 percent per year.
- Deflation, meaning decreasing average prices, occurred in the U.S. in the nineteenth century.
- Hyperinflation refers to high rates of inflation such as Germany experienced in the 1920s.
**Inflation: Historical Aspects**
- In the 1970s prices rose by 7 percent per year.
- During the 1990s, prices rose at an average rate of 2 percent per year.

**The Classical Theory of Inflation**
- The quantity theory of money is used to explain the long-run determinants of the price level and the inflation rate.
- Inflation is an economy-wide phenomenon that concerns the value of the economy’s medium of exchange.
- When the overall price level rises, the value of money falls.

**Money Supply, Money Demand, and Monetary Equilibrium**
- The money supply is a policy variable that is controlled by the Fed.
- Through instruments such as open-market operations, the Fed directly controls the quantity of money supplied.
Money demand has several determinants, including interest rates and the average level of prices in the economy.

People hold money because it is the medium of exchange. The amount of money people choose to hold depends on the prices of goods and services.

In the long run, the overall level of prices adjusts to the level at which the demand for money equals the supply.
Money Supply, Money Demand, and the Equilibrium Price Level

The Effects of Monetary Injection

The Quantity Theory of Money

- How the price level is determined and why it might change over time is called the quantity theory of money.
- The primary cause of inflation is the growth in the quantity of money.
The Classical Dichotomy and Monetary Neutrality

- **Nominal variables** are variables measured in monetary units.
- **Real variables** are variables measured in physical units.

According to Hume and others, real economic variables do not change with changes in the money supply. According to the classical dichotomy, different forces influence real and nominal variables. Changes in the money supply affect nominal variables but not real variables.

The irrelevance of monetary changes for real variables is called monetary neutrality.
The velocity of money refers to the speed at which the typical dollar bill travels around the economy from wallet to wallet.

Velocity and the Quantity Equation

\[ V = \frac{P \times Y}{M} \]

Where:
- \( V \) = velocity
- \( P \) = the price level
- \( Y \) = the quantity of output
- \( M \) = the quantity of money

Rewriting the equation gives the quantity equation:

\[ M \times V = P \times Y \]
Velocity and the Quantity Equation

The quantity equation relates the quantity of money (M) to the nominal value of output (P x Y).

The quantity equation shows that an increase in the quantity of money in an economy must be reflected in one of three other variables:

- the price level must rise,
- the quantity of output must rise, or
- the velocity of money must fall.

Nominal GDP, the Quantity of Money, and the Velocity of Money
The Equilibrium Price Level, Inflation Rate, and the Quantity Theory of Money

- The velocity of money is relatively stable over time.
- When the Fed changes the quantity of money, it causes proportionate changes in the nominal value of output \((P \times Y)\).
- Because money is neutral, money does not affect output.

When the Fed alters the money supply and induces parallel changes in the nominal value of output, these changes are also reflected in changes in the price level.

When the Fed increases the money supply rapidly, the result is a high rate of inflation.

Hyperinflation

- Hyperinflation is inflation that exceeds 50 percent per month.
- Hyperinflation occurs in some countries because the government prints too much money to pay for its spending.
Money and Prices During Four Hyperinflations

(a) Austria

Index (Jan. 1921 = 100)

Price level

Money supply

(b) Hungary

Index (Jan. 1921 = 100)

Price level

Money supply

(c) Germany

Money supply

Index (Jan. 1921 = 100)

Price level

(d) Poland

Money supply

Index (Jan. 1921 = 100)

Price level

Hyperinflation and the Inflation Tax

- When the government raises revenue by printing money, it is said to levy an **inflation tax**.
- An inflation tax is like a tax on everyone who holds money.
- The inflation ends when the government institutes fiscal reforms such as cuts in government spending.
The Fisher Effect

- According to the Fisher effect, when the rate of inflation rises, the nominal interest rate rises by the same amount.
- The real interest rate stays the same.

$$\text{Nominal interest rate} = \text{Real interest rate} + \text{Inflation rate}$$

The Nominal Interest Rate and the Inflation Rate

The Costs of Inflation: A Fall in Purchasing Power?

Inflation does not in itself reduce people's real purchasing power.
The Costs of Inflation

- Shoeleather costs
- Menu costs
- Relative price variability
- Tax distortions
- Confusion and inconvenience
- Arbitrary redistribution of wealth

Shoeleather Costs

- **Shoeleather costs** are the resources wasted when inflation encourages people to reduce their money holdings.
- **Inflation reduces the real value of money, so people have an incentive to minimize their cash holdings.**

- Less cash requires more frequent trips to the bank to withdraw money from interest-bearing accounts.
- The actual cost of reducing your money holdings is the time and convenience you must sacrifice to keep less money on hand.
- Also, extra trips to the bank take time away from productive activities.
Menu Costs

- **Menu costs** are the costs of adjusting prices.
- During inflationary times, it is necessary to update price lists and other posted prices.
- This is a resource-consuming process that takes away from other productive activities.

Relative-Price Variability

- Inflation distorts relative prices.
- Consumer decisions are distorted, and markets are less able to allocate resources to their best use.

Inflation-Induced Tax Distortion

- Inflation exaggerates the size of capital gains and increases the tax burden on this type of income.
- With progressive taxation, capital gains are taxed more heavily.
Inflation-Induced Tax Distortion

- The income tax treats the nominal interest earned on savings as income, even though part of the nominal interest rate merely compensates for inflation.
- The after-tax real interest rate falls, making saving less attractive.

How Inflation Raises the Tax Burden On Saving

<table>
<thead>
<tr>
<th>Real interest rate</th>
<th>Economy 1</th>
<th>Economy 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflation rate</td>
<td>4%</td>
<td>4%</td>
</tr>
<tr>
<td>Nominal interest rate</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Reduced interest due to 25 percent tax</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>After-tax nominal interest rate</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>After-tax interest rate (after-tax nominal interest rate - inflation rate)</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Confusion and Inconvenience

- When the Fed increases the money supply and creates inflation, it erodes the real value of the unit of account.
- Inflation causes dollars at different times to have different real values.
- Therefore, with rising prices, it is more difficult to compare real revenues, costs, and profits over time.
Arbitrary Redistribution of Wealth

- Unexpected inflation redistributes wealth among the population in a way that has nothing to do with either merit or need.
- These redistributions occur because many loans in the economy are specified in terms of the unit of account – money.

Summary

- The overall level of prices in an economy adjusts to bring money supply and money demand into balance.
- When the central bank increases the supply of money, it causes the price level to rise.
- Persistent growth in the quantity of money supplied leads to continuing inflation.

Summary

- The principle of money neutrality asserts that changes in the quantity of money influence nominal variables but not real variables.
- A government can pay for its spending simply by printing more money.
- This can result in an “inflation tax” and hyperinflation.
Summary

- According to the Fisher effect, when the inflation rate rises, the nominal interest rate rises by the same amount, and the real interest rate stays the same.
- Many people think that inflation makes them poorer because it raises the cost of what they buy.
- This view is a fallacy because inflation also raises nominal incomes.

Summary

- Economists have identified six costs of inflation:
  - Shoeleather costs
  - Menu costs
  - Increased variability of relative prices
  - Unintended tax liability changes
  - Confusion and inconvenience
  - Arbitrary redistributions of wealth

Graphical Review
Money Supply, Money Demand, and the Equilibrium Price Level

- Quantity fixed by the Fed
- Quantity of Money
- Value of Money (1/P)
- Price Level (P)

A

Money supply

0
1 (Low)
1 (High)

1/2
1/4
3/4
1
1.33
2
4

Equilibrium price level

Money demand

1/2
1/4
3/4
1
1.33
2
4

The Effects of Monetary Injection

1. An increase in the money supply...
2. ...decreases the value of money ...
3. …and increases the price level...

Nominal GDP, the Quantity of Money, and the Velocity of Money

- Nominal GDP
- Quantity of Money
- Velocity

Indexes

(1960 = 100)

1,500
1,000
500
0


M2

Velocity
Money and Prices During Four Hyperinflations

(a) Austria

(b) Hungary

Money supply

Price level

Index (Jan. 1921 = 100)

1921 1922 1923 1924 1925

Price level

Money supply

Money supply

Index (Jan. 1921 = 100)

1921 1922 1923 1924 1925

Money and Prices During Four Hyperinflations

c) Germany

d) Poland

Money supply

Price level

Index (Jan. 1921 = 100)

1921 1922 1923 1924 1925

Money supply

Price level

Index (Jan. 1921 = 100)

1921 1922 1923 1924 1925

The Nominal Interest Rate and the Inflation Rate

Percent (per year)

Nominal interest rate

Inflation