

Chapter: Inflation

Macroeconomics Study Guide and Workbook

Purpose of this chapter

This chapter is the study of our third macroeconomic goals, Price Stability. Inflation is one of the most practical macroeconomic topics you will study because it changes what money can buy, how wages feel, how loans are repaid, how businesses plan, and how the Federal Reserve thinks about the economy. This chapter begins with the basic idea of inflation, then moves to the deeper question of why inflation occurs, how it is measured, and how you can adjust dollar amounts, so you do not confuse nominal values with real purchasing power.



Introduction: Why Inflation Matters

You experience inflation whenever the dollars in your pocket, bank account, paycheck, or savings account buy less than they used to buy. A single high price is not inflation by itself. Inflation is a persistent increase in the overall price level across many goods and services. The key idea is purchasing power: when the price level rises, each dollar buys a smaller quantity of real goods and services.¹

As you work through this chapter, keep one central macroeconomic lesson in mind: sustained inflation usually occurs when total spending in the economy grows faster than the economy's ability to produce real output. In the long run, that often means the money supply and credit are expanding more rapidly than production. Put simply, too much money chasing too few goods can push the general price level upward. This does not mean that every price increase begins with money. Oil shocks, supply disruptions, wars, weather events, taxes, regulation, and wage pressures can start price increases in particular sectors. But for inflation to remain broad and persistent, the monetary side of the economy cannot be ignored.^{6,8}

This chapter is organized so that you first understand what inflation is, then why money and production matter, then how economists measure inflation with the Consumer Price Index, and finally how inflation affects real wages, interest rates, borrowers, lenders, savings, business planning, and public policy. By the end, you should be able to move comfortably from a news headline about inflation to the economic reasoning behind the headline.

Learning Objectives

- Define inflation and distinguish it from a one-time relative price change.
- Explain the relationship among money, velocity, prices, and real production.
- Identify monetary inflation, demand-pull inflation, cost-push inflation, built-in inflation, disinflation, deflation, hyperinflation, and stagflation.
- Explain how the Consumer Price Index is constructed and how it is used.
- Calculate a CPI, calculate an inflation rate, and adjust dollar amounts for inflation.
- Evaluate the winners and losers from expected and unexpected inflation.
- Analyze why inflation complicates saving, lending, business planning, wages, and monetary policy.

1. What Inflation Is—and What It Is Not

Inflation is a sustained rise in the average level of prices. You should notice two words in that definition: sustained and average. If the price of oranges rises after a freeze but most other prices stay the same, that is a relative price change. It tells consumers and producers something about scarcity in the orange market. Inflation is broader. It means the average price level is rising, so money is losing purchasing power across the economy.

Think of the price level as the “scale” on which all dollar prices are measured. When the price level rises by 5 percent, not every price rises by exactly 5 percent. Some prices rise more, some rise less, and some may even fall. But the average movement is upward. This is why economists distinguish between individual prices, which communicate information about specific markets, and the overall price level, which measures the value of money in terms of goods and services.

Inflation also differs from a high price level. A city can have high prices but low inflation if prices are expensive but stable. Another economy can have a lower price level but high inflation if prices are rising rapidly. When you read that inflation has declined, do not automatically think prices have fallen. In most

cases, disinflation means prices are still rising, just at a slower rate. Deflation, by contrast, means the average price level is falling.

Concept	Meaning	Example
Relative price change	A change in one price compared with other prices.	Gasoline rises because a refinery shuts down.
Inflation	A sustained rise in the average price level.	Most consumer prices rise over the year.
Disinflation	Inflation continues, but at a slower rate.	Inflation falls from 8% to 3%.
Deflation	The average price level falls.	The CPI falls from 300 to 294.

2. Money, Production, and the Price Level

The most important economic relationship in this chapter is the relationship between money and production. Money is useful because it gives people purchasing power. Production is what gives the economy goods and services to purchase. Inflation pressure builds when purchasing power grows faster than real production. If households, firms, and government have more money to spend, but the economy cannot produce more real goods and services at the same pace, sellers can raise prices because buyers are competing for limited output.

A simple way to organize this idea is the quantity equation: $M \times V = P \times Y$. In this equation, M is the money supply, V is velocity, P is the price level, and Y is real output. Velocity measures how quickly money turns over through spending. The right side, $P \times Y$, is nominal GDP: the dollar value of total output. The equation says that the amount of money used for spending, adjusted by how often it circulates, must equal the dollar value of what is purchased.^{8,9}

In growth-rate form, the quantity equation gives you a useful classroom rule: inflation is approximately equal to money growth plus velocity growth minus real output growth. If velocity is stable, inflation will tend to reflect money growth minus real output growth. For example, if the money supply grows by 8 percent, real production grows by 3 percent, and velocity does not change, inflation is roughly 5 percent. That does not predict every short-run movement in prices, but it gives you the long-run logic: sustained inflation is difficult to maintain unless nominal spending keeps growing faster than real output.^{6,10}

You should also see the caution in this model. A larger money supply does not automatically create immediate inflation if people hold the new money instead of spending it, if banks do not expand credit, if velocity falls, or if production rises enough to absorb the extra spending. This is why economists study not only money growth but also bank lending, fiscal policy, expectations, supply conditions, and velocity. Still, the core lesson remains powerful: when money and credit growth support spending beyond productive capacity, the economy is likely to experience inflationary pressure.^{16,17}

A practical way to remember it:

If the money side of the economy grows faster than the production side of the economy, the difference often shows up as a higher price level.

3. Types of Inflation

Economists classify inflation by the forces that begin it, spread it, and sustain it. These types can overlap. A supply shock can start inflation, easy monetary conditions can allow it to continue, and expectations can make it more persistent. You should avoid treating the categories as separate boxes. In the real world, inflation often has several causes at once.

Type	Main idea	Why it matters
Monetary inflation	The money supply and credit expand faster than real production.	This is the long-run foundation of persistent inflation.
Demand-pull inflation	Total spending rises faster than the economy can	Often appears when aggregate demand

	produce at current prices.	increases strongly near full employment.
Cost-push inflation	Production costs rise or aggregate supply falls.	Examples include oil shocks, natural disasters, higher input prices, taxes, or regulation costs.
Built-in or inertial inflation	Workers and firms expect inflation and build it into wages and prices.	Expectations can make inflation harder to reduce.
Hyperinflation	The price level rises at an extremely rapid rate.	Usually linked to fiscal crises financed by money creation.
Stagflation	High inflation occurs together with high unemployment or weak output growth.	The 1970s are often used as a major historical example.

Demand-pull inflation is easiest to understand with aggregate demand and aggregate supply. If consumption, investment, government spending, or net exports rise strongly, aggregate demand shifts right. If the economy is near full employment, firms may not be able to increase real output very much. The pressure then appears mainly as higher prices. In this case, spending pulls prices upward.

Cost-push inflation begins on the supply side. If energy prices rise, shipping costs increase, imported inputs become more expensive, or weather damages crops, firms face higher costs. A leftward shift in short-run aggregate supply raises the price level and reduces real output. This type of inflation is painful because the economy can face both rising prices and lower production at the same time.^{16,9}

Monetary inflation emphasizes the deeper question of whether total nominal spending is being supported by money and credit growth. Milton Friedman's famous claim that inflation is a monetary phenomenon is best understood this way: sustained inflation requires the quantity of money to rise faster than the quantity of output over time. Supply shocks can raise specific prices and can even raise the overall price level temporarily, but if money and spending growth are restrained, the shock is less likely to become ongoing inflation.^{6,7}

Built-in inflation appears when people begin to expect inflation. Workers demand higher wages because they expect higher living costs. Firms raise prices because they expect higher labor and input costs. Lenders demand higher nominal interest rates because they expect future dollars to be worth less. Once expectations adjust this way, inflation can become more persistent even after the original shock has faded. Central banks therefore care not only about current inflation but also about whether long-run inflation expectations remain anchored.^{15,13}

4. Measuring Inflation with the Consumer Price Index

The Consumer Price Index, or CPI, is the inflation measure students encounter most often. The CPI measures the average change over time in the prices paid by urban consumers for a representative market basket of consumer goods and services. The CPI is not the price of one product. It is an index number designed to summarize many prices in one measure.²

The market basket includes categories such as food and beverages, housing, apparel, transportation, medical care, recreation, education, and other goods and services. The Bureau of Labor Statistics uses consumer expenditure data to weight the basket so that categories matter roughly according to how consumers actually spend their budgets. The CPI then tracks how much it costs to purchase that basket over time.³

Current BLS methods are more detailed than the simplified classroom examples you will use in this chapter. The BLS collects a large monthly sample of prices, including prices for commodities, services, rent, and homeowners' equivalent rent. The full index involves geographic areas, item categories, expenditure weights, quality adjustments, and detailed index formulas. You do not need to reproduce the entire BLS method to understand the logic. You need to understand that the CPI is a weighted index of consumer prices.^{3,4}

A Simplified CPI Example

Suppose a simplified economy has only three consumer goods: groceries, rent, and transportation. The base-year basket is fixed so that you can compare the cost of buying the same basket in different years.

Item	Quantity in Basket	Base-Year Price	Base-Year Cost	Current-Year Price	Current-Year Cost
Groceries	10 units	\$5	\$50	\$6	\$60
Rent	1 month	\$900	\$900	\$990	\$990
Transportation	20 rides	\$2	\$40	\$2.50	\$50
Total basket cost			\$990		\$1,100

The CPI formula is:

$$CPI = (\text{Cost of the market basket in the current year} \div \text{Cost of the market basket in the base year}) \times 100$$

Using the example above: $CPI = (\$1,100 \div \$990) \times 100 = 111.1$. A CPI of 111.1 means that the fixed basket costs 11.1 percent more than it did in the base year. The base year always has a CPI of 100 because the basket cost is compared with itself.

Recent CPI Context

The CPI is the basis for many inflation rates reported in the news. For example, the BLS historical CPI table reports the following December-to-December twelve-month changes for the CPI-U all-items index:

Year	December 12-month CPI-U percent change
2020	1.4%
2021	7.0%
2022	6.5%
2023	3.4%

Those numbers help you see why inflation became a major public concern after 2020. The price level did not simply rise once; it continued to rise at a much faster pace than students and consumers had been used to seeing in the preceding low-inflation period.⁵

5. Calculating the Inflation Rate

The inflation rate is the percentage change in a price index from one period to another. The formula is:

$$\text{Inflation rate} = [(CPI \text{ in later year} - CPI \text{ in earlier year}) \div CPI \text{ in earlier year}] \times 100$$

For example, suppose the CPI rises from 120 to 122. The inflation rate is $[(122 - 120) \div 120] \times 100 = 1.7$ percent. This means the average price level rose by 1.7 percent over that period. Notice that you do not divide by the later CPI. You compare the change to the starting point.

Now suppose the CPI rises from 250 to 275. The inflation rate is $[(275 - 250) \div 250] \times 100 = 10$ percent. If your nominal income also rises by 10 percent, your purchasing power is roughly unchanged. If your nominal income rises by only 4 percent, your real income falls because prices rose faster than your income.

6. Adjusting Dollar Amounts for Inflation

Inflation makes comparisons across time tricky. A \$20,000 salary in one year cannot be compared directly with a \$20,000 salary in another year if the price level has changed. You must convert nominal dollars into real dollars. Nominal values are measured in current dollars. Real values are adjusted for inflation.

To convert an amount from an earlier year into target-year dollars, use this formula:

$$\text{Amount in target-year dollars} = \text{Amount in original-year dollars} \times (CPI \text{ in target year} \div CPI \text{ in original year})$$

Suppose a salary was \$20,000 in 1984. If the CPI was 104 in 1984 and 219 in 2010, the salary in 2010 dollars would be $\$20,000 \times (219 \div 104) = \$42,115$. This tells you that a 2010 salary of about \$42,115 would have roughly the same purchasing power as \$20,000 in 1984, based on those CPI values. The important step is using the ratio of the two CPI numbers, not simply multiplying by the later CPI divided by 100.

You can also convert nominal income into real income using a base-year price index: $\text{Real value} = (\text{Nominal value} \div \text{Price index}) \times 100$. For example, if nominal income is \$55,000 and the CPI is 125, then real income in base-year dollars is $(\$55,000 \div 125) \times 100 = \$44,000$. That means \$55,000 at a CPI of 125 buys what \$44,000 bought in the base year.

Real Wages and Real Interest Rates

Inflation adjustment is especially important for wages and interest rates. If your nominal wage rises from \$20 per hour to \$21 per hour, your wage increased by 5 percent. But if inflation is 7 percent, your real wage fell by about 2 percent. You are earning more dollars, but those dollars buy less.

The same logic applies to interest rates. The nominal interest rate is the stated rate on a loan or savings account. The real interest rate adjusts for inflation. A useful approximation is: $\text{Real interest rate} \approx \text{Nominal interest rate} - \text{Inflation rate}$. If a bank pays 4 percent interest but inflation is 6 percent, the real return is about -2 percent. The saver has more dollars but less purchasing power.¹¹

7. The Consequences of Inflation

Inflation matters because it changes the meaning of money contracts. A dollar is a nominal unit. Inflation changes how much real value that dollar represents. Some inflation costs are obvious, such as the loss of purchasing power. Others are less obvious but very important: inflation redistributes wealth, distorts decisions, shortens business planning, raises nominal interest rates, and makes economic signals harder to interpret.^{8,9}

Consequence	Explanation
Purchasing power falls	Each dollar buys fewer goods and services. Fixed incomes are especially vulnerable.
Income and wealth are redistributed	Unexpected inflation tends to help borrowers and hurt lenders because debts are repaid with cheaper dollars.
Saving becomes harder	If inflation exceeds the nominal return on savings, real savings decline.
Interest rates rise	Lenders demand compensation for expected inflation, raising nominal rates.
Planning horizons shorten	Businesses become less confident about future costs, prices, wages, and financing.
Price signals become noisy	Firms and consumers may confuse inflation with changes in relative scarcity.
Tax distortions increase	Taxes based on nominal income or nominal capital gains can rise even when real income has not risen.

Expected inflation can be built into contracts. If workers, firms, borrowers, lenders, and landlords all expect 3 percent inflation, they can negotiate wages, interest rates, and rents accordingly. Unexpected inflation is more disruptive. If lenders expected 2 percent inflation but inflation turns out to be 8 percent, borrowers repay loans with dollars worth much less than expected. If workers sign a wage contract and inflation unexpectedly accelerates, real wages may fall before the next contract negotiation.

Inflation also creates uncertainty. Businesses do not simply ask, “Will prices rise?” They ask, “By how much, how long, and in which input markets?” If a firm cannot predict labor costs, energy costs, borrowing costs, and consumer demand, it may delay investment. Students sometimes think inflation only affects consumers at the grocery store. In macroeconomics, inflation also affects investment, employment decisions, financial markets, government budgets, and central-bank policy.

8. CPI Limitations and Other Inflation Measures

The CPI is extremely useful, but you should not treat it as a perfect measure of every person's cost of living. First, households buy different baskets. A retired household with large medical expenses may experience inflation differently from a college student who spends more on rent, food, and transportation. Second, consumers substitute. If beef becomes expensive and consumers buy more chicken, a fixed basket may overstate the cost of maintaining well-being. Third, quality changes and new products are difficult to measure perfectly. A smartphone today may cost more than an older phone, but it also provides more services.^{4,8}

Another important measure is the Personal Consumption Expenditures price index, or PCE price index, produced by the Bureau of Economic Analysis. The PCE price index also measures prices paid for consumer goods and services, but it has a broader scope and uses a different weighting method than the CPI. The Federal Reserve states its 2 percent longer-run inflation goal in terms of the annual change in the PCE price index, not the CPI. This does not make the CPI unimportant. It means you should know which inflation measure a news report, wage adjustment, tax adjustment, or policy statement is using.^{14,13}

9. Inflation and Policy

The Federal Reserve's monetary policy responsibilities include promoting maximum employment, stable prices, and moderate long-term interest rates. Price stability does not mean every price stays the same. It means the overall price level is stable enough that households and firms can make long-term plans without inflation dominating their decisions.¹²

When inflation is caused mainly by excess aggregate demand, contractionary monetary policy can reduce inflationary pressure by raising interest rates, slowing borrowing, slowing spending, and reducing the growth of aggregate demand. When inflation begins with a negative supply shock, the policy choice is harder. Raising interest rates may reduce inflation, but it can also weaken output and employment. This is why cost-push inflation and stagflation are so difficult: the economy faces inflation and weakness at the same time.

Fiscal policy can also affect inflation. If government spending or transfers increase total demand when the economy is already near full capacity, inflationary pressure can rise. If deficits are financed directly or indirectly by money creation, the monetary link becomes stronger. On the other hand, policies that expand productive capacity—such as improvements in labor productivity, energy production, transportation, competition, and investment—can help ease inflation by increasing real output.

Credibility matters because inflation is partly forward-looking. If people trust the central bank to maintain price stability, wage and price decisions are less likely to build in high future inflation. If people lose that trust, inflation expectations can become unanchored, and inflation can become more costly to reduce. The most important policy lesson is that inflation control is not only about today's interest rate; it is also about expectations, credibility, and the relationship between nominal spending and real production.^{15,9}

10. Summary

Inflation is a sustained increase in the average price level. It reduces the purchasing power of money, changes real wages and real interest rates, redistributes income and wealth, and complicates saving, borrowing, business planning, and monetary policy. You should distinguish inflation from a one-time relative price change, and you should distinguish disinflation from deflation.

The central macroeconomic logic is that inflation pressure emerges when the money side of the economy grows faster than the production side. The quantity equation, $M \times V = P \times Y$, helps you see why. If money and velocity support spending growth beyond real output growth, the price level tends to rise. Demand-pull inflation begins with excessive spending. Cost-push inflation begins with higher production costs or supply disruptions. Built-in inflation develops when expectations shape wages, prices, and interest rates.

You measure inflation most commonly with a price index such as the CPI. To calculate the CPI, compare the cost of a market basket in the current year with the cost of the same basket in the base year. To calculate the inflation rate, measure the percentage change in the CPI. To adjust for inflation, multiply a dollar amount by the ratio of the target-year CPI to the original-year CPI. Mastering these tools helps you understand news reports, wage changes, interest rates, and policy debates with much greater clarity.

Key Terms to Know

inflation; price level; purchasing power; relative price change; CPI; market basket; base year; inflation rate; nominal value; real value; real wage; nominal interest rate; real interest rate; disinflation; deflation; hyperinflation; stagflation; monetary inflation; demand-pull inflation; cost-push inflation; built-in inflation; velocity; quantity equation; inflation expectations; PCE price index.

Worksheet: Critical Thinking Questions and Problems

Answer the following questions in complete sentences where appropriate. For calculation problems, show your formula, substitution, and final answer. The best answers will not only compute numbers but also explain what the numbers mean economically.

1. Inflation versus relative prices. Suppose rent rises by 12 percent, gasoline falls by 8 percent, groceries rise by 5 percent, and the price of most services is unchanged. Explain why this information alone does not prove that the economy has high inflation. What additional information would you need?
2. Money and production. Use the quantity equation $M \times V = P \times Y$ to explain why a growing money supply may be inflationary when real output does not grow at the same pace. Then explain why a growing money supply might not immediately cause inflation if velocity falls.
3. Classifying inflation. For each situation, identify the most likely type of inflation pressure: monetary, demand-pull, cost-push, built-in, or a combination. Briefly defend each answer. (a) A central bank keeps interest rates very low while credit expands rapidly. (b) A hurricane damages oil refineries and raises energy prices. (c) Workers and firms expect 6 percent inflation next year and build it into wage contracts and prices. (d) Government spending rises sharply when the economy is already near full employment.
4. CPI construction problem. A simplified market basket contains 4 pounds of chicken, 3 gallons of milk, and 2 bus passes. In the base year, chicken is \$4 per pound, milk is \$3 per gallon, and a bus pass is \$20. In the current year, chicken is \$5 per pound, milk is \$4 per gallon, and a bus pass is \$22. Calculate the base-year basket cost, the current-year basket cost, and the current-year CPI.
5. Inflation-rate problem. Suppose the CPI rises from 240 to 258. Calculate the inflation rate. Then explain what your answer means for purchasing power.
6. Real wage problem. A worker's hourly wage rises from \$18.00 to \$19.08. During the same year, inflation is 8 percent. Did the worker's real wage rise or fall? Explain using percentage changes.
7. Adjusting for inflation. A textbook cost \$75 when the CPI was 180. What would the equivalent price be when the CPI is 300? Explain why you use a ratio of CPI values rather than simply adding the inflation rate once.
8. Borrowers and lenders. A bank makes a 30-year fixed-rate loan at 5 percent interest expecting inflation to average 2 percent. Inflation unexpectedly averages 7 percent for several years. Who is helped and who is hurt by the unexpected inflation? Explain in real terms.
9. Disinflation versus deflation. A news story says, "Inflation fell from 9 percent to 4 percent, so prices are coming down." Rewrite the statement so that it is economically accurate. Under what condition would prices actually be coming down?
10. Policy analysis. An economy is experiencing 7 percent inflation and unemployment is below the natural rate. Use aggregate demand and aggregate supply reasoning to explain why contractionary monetary policy might reduce inflation. What short-run cost might occur?
11. Supply-shock analysis. An economy is hit by a sudden increase in oil prices. Inflation rises while real GDP falls. Explain why this is not a simple demand-pull problem. What makes the policy response more difficult?
12. CPI limitations. Explain two reasons the CPI may not measure every person's cost of living perfectly. Then explain why the CPI is still useful despite these limitations.
13. Critical thinking essay. Evaluate the statement: "Inflation is caused only by greedy businesses raising prices." Your answer should consider costs, demand, money, production, competition, and expectations. The strongest answer will distinguish between price-setting behavior in individual markets and sustained inflation in the overall price level.
14. Quantity-equation calculation. Suppose money growth is 10 percent, velocity growth is -2 percent, and real output growth is 3 percent. Using the growth-rate form of the quantity equation, estimate inflation. Then explain why this estimate is a simplification rather than a perfect forecast.

15. Data interpretation. If the CPI is 100 in the base year, 130 ten years later, and 156 fifteen years later, calculate total inflation from the base year to year 10, total inflation from year 10 to year 15, and total inflation from the base year to year 15. Why should you not simply average the index numbers?

Problem-Solving Reminders

- $\text{CPI} = (\text{current-year basket cost} \div \text{base-year basket cost}) \times 100.$
- $\text{Inflation rate} = [(\text{later CPI} - \text{earlier CPI}) \div \text{earlier CPI}] \times 100.$
- $\text{Target-year dollars} = \text{original dollars} \times (\text{target-year CPI} \div \text{original-year CPI}).$
- $\text{Real interest rate} \approx \text{nominal interest rate} - \text{inflation rate}.$
- $\text{Inflation} \approx \text{money growth} + \text{velocity growth} - \text{real output growth}.$

Endnotes

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