Unemployment and Inflation

Econ 4021, Washington University in St. Louis

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Introduction

- We have studied business cycles and stabilization policy from an abstract perspective
- In practice, most of the public and policy debates are framed in terms of "unemployment versus inflation"
- ...and interest rates

Introduction

THE WALL STREET JOURNAL.

ECONOMY | CAPITAL ACCOUNT

Dashing Fed's Hopes, Low Unemployment Becomes an Inflation Threat

With millions of workers missing from the labor market, vacancies and workers mismatched and demand still strong, the Fed now worries about a wage-price spiral

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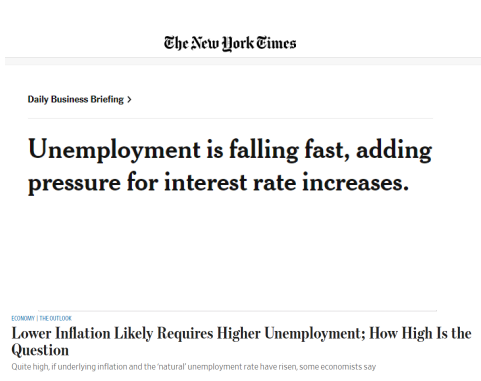
Home › Economy & Politics

Biden lauds sharp decline in unemployment rate, says he's 'confident' Fed can control inflation

Published: Jan. 7, 2022 at 1:05 p.m. ET



The New York Times

Daily Business Briefing ›

Unemployment is falling fast, adding pressure for interest rate increases.

ECONOMY | THE OUTLOOK

Lower Inflation Likely Requires Higher Unemployment; How High Is the Question

Quite high, if underlying inflation and the 'natural' unemployment rate have risen, some economists say

Introduction

This series of lectures:

1. Unemployment and Inflation: is there a trade-off?
2. Macroeconomic Policy and the Phillips Curve
3. The Problem of Unemployment
4. The Problem of Inflation
5. Inflationary Expectations

1. Unemployment and Inflation: is there a trade-off?

The Unemployment-Inflation Trade-off

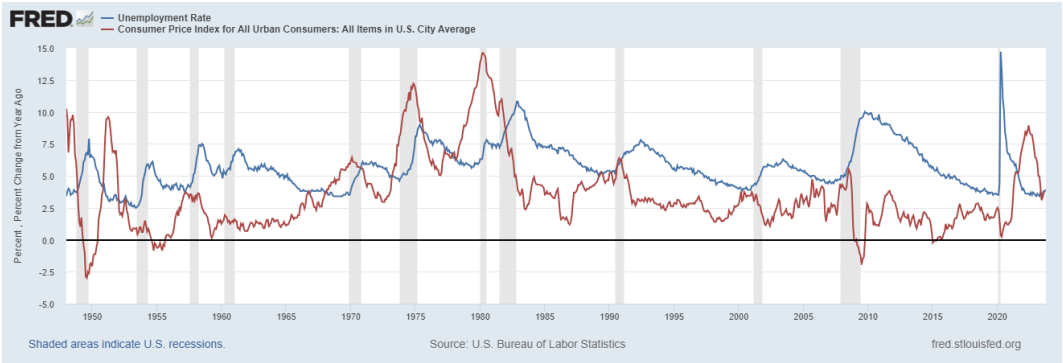
Wall Street Journal, July 31 2022:

ECONOMY | THE OUTLOOK

Lower Inflation Likely Requires Higher Unemployment; How High Is the Question

Quite high, if underlying inflation and the 'natural' unemployment rate have risen, some economists say

The Unemployment-Inflation Trade-off



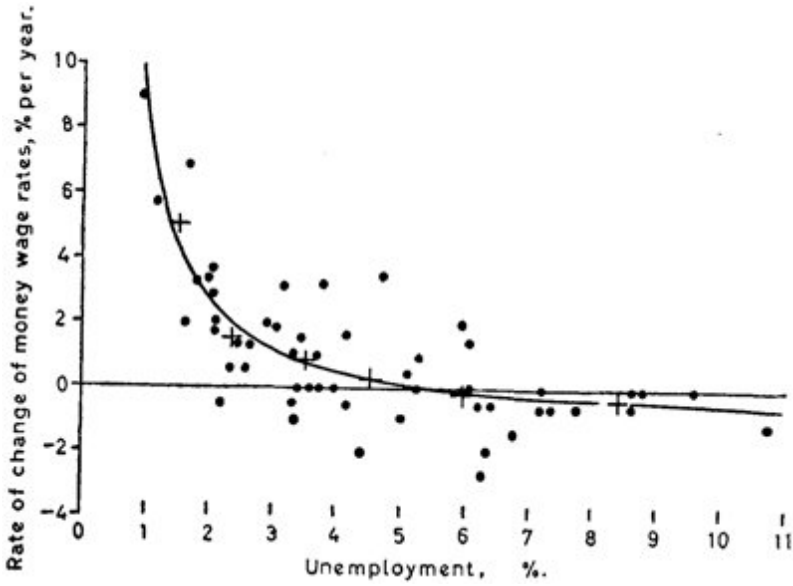
Play with this graph at `https://fred.stlouisfed.org/graph/?g=YPzq`

The Unemployment-Inflation Trade-off

Is there really a trade-off?

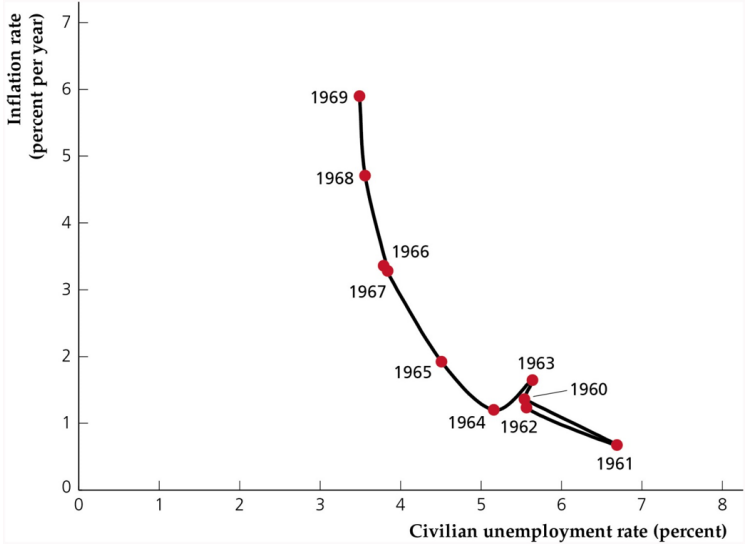
- Does a low-unemployment economy have to experience elevated inflation?
- Does unemployment have to increase to reduce inflation?
- This idea originated in 1958 when A. W. Phillips analyzed historical data for Britain and found a negative relationship between unemployment and wage growth
- In the 1960s, economists looked at similar data for other countries and found the same negative relationship
- This became known as the **Phillips Curve**

The (original) Phillips Curve



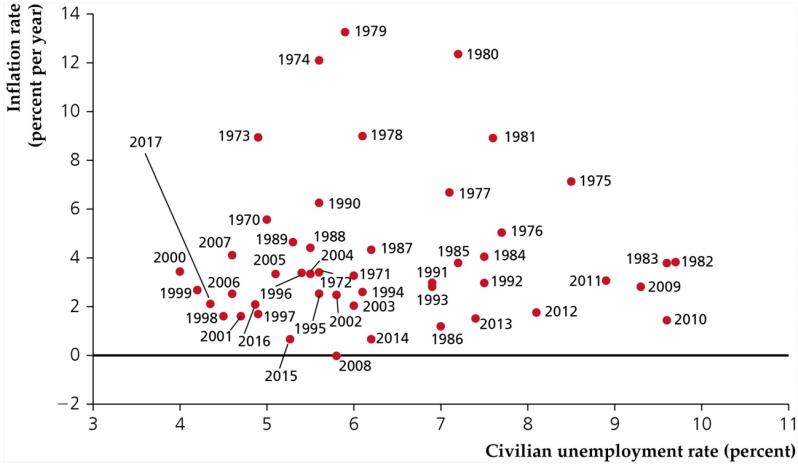
The US Phillips Curve during the 1960s

The experience of the US in the 1960s seemed to confirm the existence of a trade-off...



The US Phillips Curve since then

...but this relationship seems to have failed to hold since



Is there a trade-off?

The historical evidence raises three questions:

1. Why was Phillips' original evidence so systematic across countries prior to the 1970s?

2. Why did it vanish in the 1970s?

3. Does it represent an actual trade-off between unemployment and inflation where a policymaker can "choose" a point (i.e. low unemployment and high inflation)?

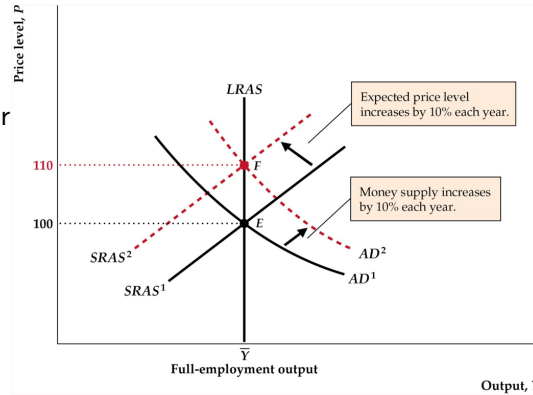
Expectations-Augmented Phillips Curve

- Milton Friedman and Edmund Phelps were early critics of the Phillips Curve
- They argued that there should not exist a stable negative relationship between inflation and unemployment
- They argued instead that there should be a negative relationship between **unexpected inflation** and **cyclical unemployment**
- We can analyze this theory using Classical Misperceptions Theory

Money Supply Growth and the Misperceptions Theory

Assume that money supply grows at a steady 10% per year

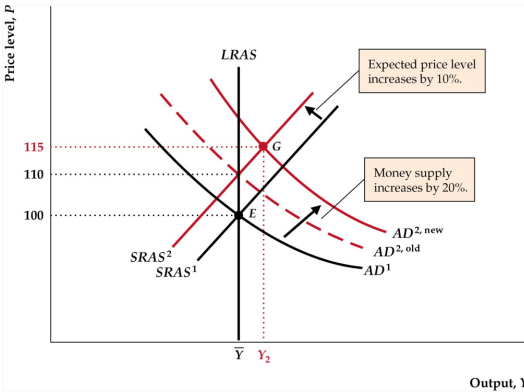
- Every year the *AD* curve shifts up by 10%
- Producers expect this increase, so they adjust their expectations and *SRAS* shifts up 10% every year
- Inflation is 10% every year
- ...but cyclical unemployment remains at zero!
- Economy remains at full employment output $\bar{Y}$



Money Supply Growth and the Misperceptions Theory

Assume that the Fed unexpectedly makes money supply grow by 20% on a given year

- The *AD* curve now shifts by 20%
- But producers only expected 10% inflation, so the *SRAS* shifts up by 10%
- This moves the economy to point *G*
- Note that inflation is higher than 10% in this case
- Thus the economy experiences positive inflation and below zero cyclical unemployment
- Eventually producers adjust their expectations and the economy returns to full employment



Expectations-Augmented Phillips Curve

- When the public correctly predicts aggregate demand growth and inflation, unanticipated inflation is zero and cyclical unemployment is zero
- Only unexpected changes in aggregate demand cause a negative relationship between inflation and cyclical unemployment to arise
- If AD grows faster than expected, inflation is above expected and cyclical unemployment is below zero
- Conversely if AD grows more slowly than expected, inflation is below expected and cyclical unemployment is positive

Expectations-Augmented Phillips Curve

This relationship can be formalized as

$$\pi - \pi^e = -h(u - \bar{u})$$

where

- $\pi - \pi^e$ is unanticipated inflation, the difference between the realized inflation rate and expected inflation
- $u - \bar{u}$ is cyclical unemployment, the difference between the actual unemployment rate and the natural unemployment rate
- $h > 0$ measures the strength of the relationship

This can also be written as

$$\pi = \pi^e - h(u - \bar{u})$$

and is known as the **expectations-augmented Phillips Curve (EAPC)**

The Shifting Phillips Curve

- Note that whenever $\pi = \pi^e$, then cyclical unemployment has to be zero $u = \bar{u}$
- The main insight from Friedman-Phelps is that expected inflation (and the natural rate of unemployment) can change
- If these factors change, the Phillips Curve will shift
- The **short-run Phillips Curve** is the curve relating inflation to unemployment given constant inflation expectations π^e and natural unemployment rate $\bar{u}$

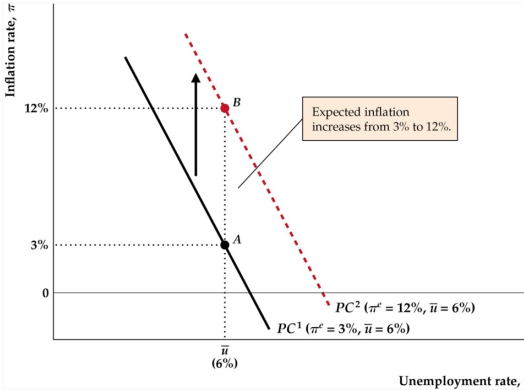
The Shifting Phillips Curve

What happens if inflation expectations increase, $\pi^e \uparrow$?

- The SRPC must cross the point $(\bar{u}, \pi^e)$
- Note that π^e is part of the intercept for the SRPC

$$\pi = \underbrace{(\pi^e + h\bar{u})}_{\text{intercept}} - \underbrace{h}_{\text{slope}} u$$

- If $\pi^e \uparrow$, the SRPC must shift up
- Thus the same unemployment rate is now associated with a higher inflation rate



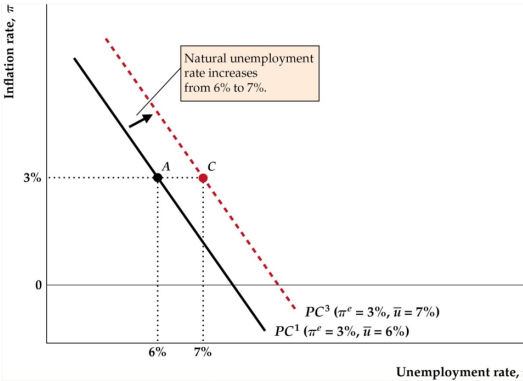
The Shifting Phillips Curve

What happens if the natural rate of unemployment increases, $\bar{u} \uparrow$?

- Expectations have not changed, so the SRPC must cross the new $(\bar{u}, \pi^e)$ point
- SRPC shifts to the right
- Again, $\bar{u}$ is part of the intercept

$$\pi = \underbrace{(\pi^e + h\bar{u})}_{\text{intercept}} - \underbrace{h}_{\text{slope}} u$$

- In general, supply shocks shift $\bar{u}$

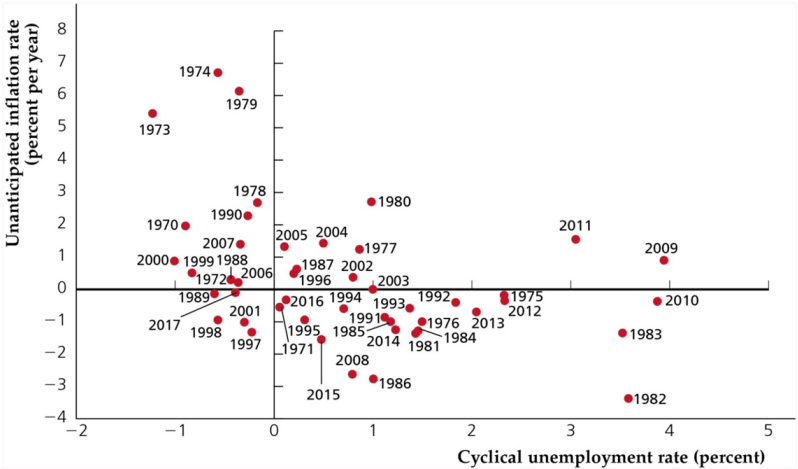


The Shifting Phillips Curve

- Friedman-Phelps: a negative relationship between unemployment and inflation holds only *as long as the natural rate of unemployment and expected inflation are approximately constant*
- There are reasons to believe both of these were true in the 1960s
- What happened in the 1970s?
  - Oil/supply shocks
  - Supply shocks shifted $\bar{u}$ and hence the SRPC
  - Changes in labor force composition and participation
  - Expansionary policy in the 1960s led to rising inflation by the end of the decade
  - More volatile inflation also led to shifts in π^e
  - Lots of uncertainty about the "intercept" of the SRPC

The Shifting Phillips Curve in the Data

If we plot **unexpected inflation** vs **cyclical unemployment**, a Phillips Curve becomes again visible



2. Macroeconomic Policy and the Phillips Curve

Macroeconomic Policy and the Phillips Curve

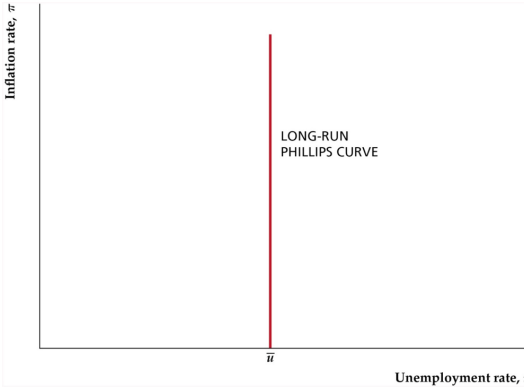
- Can the Phillips Curve be "exploited" by policymakers?
- Can they "pick" a point along the menu of (u, π) possibilities?
- We have seen that a trade-off only exists between cyclical unemployment and **unexpected inflation**
- So whether policy can exploit the Phillips Curve depends on its ability to systematically generate unexpected inflation
- Can policy exploit the Phillips Curve?
  - **Classicals**: No, as the misperceptions theory plus rational expectations imply that people will adjust their expectations of inflation once policymakers start trying to systematically "fool" them
  - **Keynesians**: Yes, in the short-run, due to price stickiness. π^e reflects expectations at the time oldest prevailing prices were set. Since prices are sticky, relevant inflation expectations may also be sticky.

The Lucas Critique

- When the rules of the game change, people's behavior also changes
- Robert E. Lucas, Jr.: when trying to forecast the effects of a change in policy, economists should not extrapolate based on historical relationships between variables
- People react to changes in policy, which affects these relationships between variables
  - Historically stable Phillips Curve was "discovered" in the 1960s
  - This led policymakers to believe they could permanently lower unemployment by increasing inflation
  - ...but when inflation rose, so did inflation expectations, thus breaking the historically stable relationship
- To understand the effects of a change in policy, one must understand how that change affects economic behavior
- This requires the use of models and economic theory: simple empirical analysis is not enough

The Long-Run Phillips Curve

- Classicals and Keynesians disagree about whether the PC can be exploited in the short-run
- But they all agree that it cannot be exploited permanently
- In the long-run, expectations always adjust so that $\pi^e = \pi$
- At this point, unemployment equals the natural rate $u = \bar{u}$
- The **long-run Phillips Curve** is thus vertical at $\bar{u}$
- **Superneutrality** of money in the long-run



3. The Problem of Unemployment

The Costs of Unemployment

- Why do we care about unemployment?
- It has many social and economic costs
- Two important ones:
  1. Loss of output due to idle resources
  2. Personal and psychological costs to workers and their families

The Costs of Unemployment

Loss of output due to idle resources

- Borne primarily by the unemployed themselves, who lose income
- They also stop paying taxes and may receive unemployment insurance, and so government (taxpayer) and society also bear some of the costs
- Okun's Law states that each pp of cyclical unemployment is associated with a loss of 2% of full-employment output

$$\frac{Y - \bar{Y}}{\bar{Y}} = -0.02 \times (u - \bar{u})$$

- US full-employment output in 2021 $\simeq$ \$ 21 trillion, thus 1 pp of cyclical unemployment costs \$ 420 billion / year

The Costs of Unemployment

Personal and psychological costs to workers and their families

- Especially important for those who have been unemployed for a long time
- Over time workers lose skills and self-esteem
- This reduces their productivity, lowers their earnings permanently, and may cause health problems
- Costs of unemployment can be very heterogeneous across demographic groups
  - Tend to be larger for men, Black, Hispanics, and those with low levels of education

The Costs of Unemployment

There are some offsetting effects to unemployment:

1. Unemployment leads to increased job search and may motivate the acquisition of new skills, which may raise future output

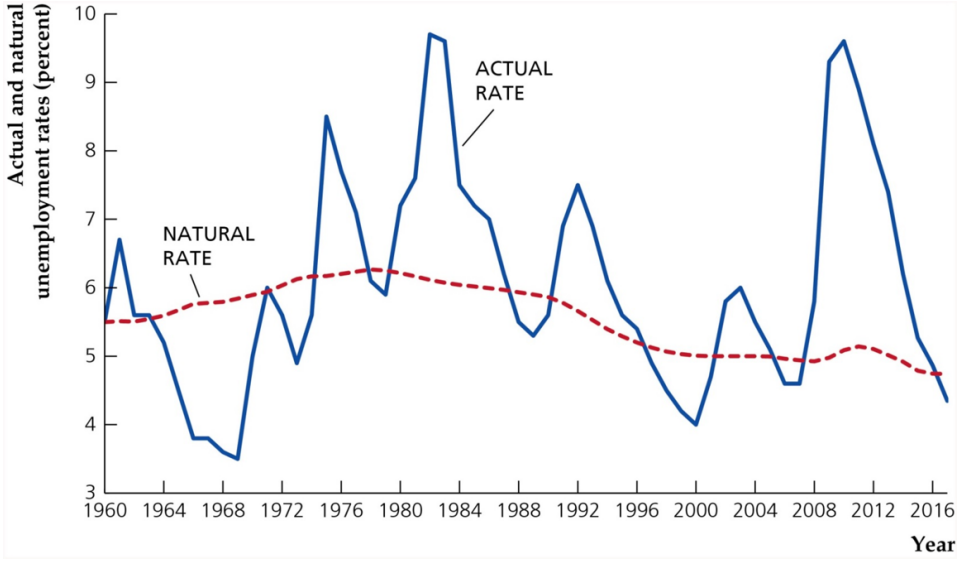
2. Unemployed workers have increased leisure time: extra time to spend with family, friends, etc.

Consensus among economists that the previously discussed costs greatly outweigh these offsetting effects.

The Natural Rate of Unemployment

- The natural rate of unemployment is the **long-run rate of unemployment** that should prevail when output is at its full-employment level
- The NRU is not zero due to frictional and structural unemployment that exists even if the economy is at full-employment
  - Switches between jobs cause some people to be unemployed for short periods of time
  - Factors like structural change causes some peoples' skills to become obsolete

The US Natural Rate of Unemployment



Measuring the NRU

- The main estimates for the NRU are produced by the Congressional Budget Office
- They change due to factors such as the demographic composition of the labor force and structural change
- Accurate measurement of the NRU is very important for stabilization policy
  - If we know $u - \bar{u}$, then we know whether we are at the *LRAS* curve, to its left or to its right
- While the CBO's estimates are widely used, there is a lot of disagreement on how to measure the NRU
- Given the uncertainty of many of the NRU estimates, policymakers may wish to be less aggressive with policy than they would be if they knew it more precisely

4. The Problem of Inflation

The Costs of Inflation

- Why do we care about inflation?
- Jimmy Carter arguably lost reelection due to his perceived inability to control inflation
- The costs of inflation depend substantially on whether such inflation is anticipated or not

The Costs of Anticipated Inflation

- If inflation is perfectly anticipated, the effects will be small as long as all prices and wages keep up with it
- People's real purchasing power remains constant as long as their nominal incomes grow at the same rate as the price level
- Returns on assets will also rise exactly with inflation (so that their real returns are constant)

The Costs of Anticipated Inflation

- There are still some small costs, as inflation erodes the value of currency

1. Shoe-leather costs: inflation motivates people to hold less currency
   - If they hold less currency, they may have to withdraw it more often to conduct transactions
   - Thus they spend more time going to the ATM or to the bank, time that could be used more productively
   - Estimated to be 0.3% of GDP for a 10% anticipated increase in inflation in the US
2. Menu costs of changing prices

The Costs of Unanticipated Inflation

- The **expected** real return on an investment is the nominal return minus expected inflation

$$r^e = i - \pi^e$$

- The **realized** return on an investment is the nominal return minus realized inflation

$$r = i - \pi$$

The Costs of Unanticipated Inflation

- Unanticipated inflation is much costlier than anticipated inflation
- Suppose that everyone expected prices to rise by 4% and interest rates are 7%, but they actually rise by 8%
  - You agreed on a 7% interest rate on a bank deposit, expecting a real return of $r^e = 7\% - 4\% = 3\%$
  - But your realized real return ends up being $r = 7\% - 8\% = -1\%$
  - You lose, and the bank gains!
- A similar logic applies to wages (and other contracts) that are set in advance
- If inflation is higher than what you expected when negotiating the contract, your real income falls
- In this case, you lose and the employer gains
- Unanticipated inflation leads to **redistribution** between borrowers and savers, employers and employees, etc.

The Costs of Unanticipated Inflation

The Costs of Unanticipated Inflation

- Redistribution from one group to another does not affect the size of the economy as a whole
- But uncertainty about this redistribution constitutes **risk** that people may not want to be exposed to
- In order to avoid this risk, they spend resources trying to insure themselves and trying to forecast inflation
  - Resources that could be more productively used elsewhere
- Another cost is that prices lose their valuable signaling role
  - Hayek: in a market economy, prices are useful signals as they reflect the relative scarcity of each good
  - Unanticipated inflation makes it hard to distinguish between movements in prices that are due to inflation and movements in relative prices due to relative supply and demand
  - People have to spend more resources learning about prices (comparison shopping, etc.)

The Costs of Hyperinflation

- **Hyperinflation** is a situation of very high, sustained inflation (i.e. 50% per month)
- There are many famous historical examples
  1. Weimar Republic (Germany) in 1921-23
  2. Hungary in August 1945, 19,800% per month for 12 months
  3. Zimbabwe had 1017% in 2006, rising to 55.6 billion percent in 2008
- Shoe-leather costs are enormous
  - People avoid using currency to the point that the economy could revert to barter
  - Workers demand to be paid daily and spend their wages almost immediately
  - or convert their wages to some more stable foreign currency (i.e. Argentina)
- People stop/delay paying taxes: the longer they delay, the lower the real value of those tax payments
- Prices become worthless as signals

Worthless Currency in Weimar Germany, 1921-23

Can inflation be too low?

- Negative inflation is called **deflation**
- Very low inflation can also be a problem
  - Low unexpected inflation generates the same kind of redistribution risk as high unexpected inflation
- Deflation was a significant problem during the Great Depression
  - People's nominal incomes started falling, but nominal debt contracts were fixed
  - Deflation caused the real value of debt to increase leading many people and firms to bankruptcy
  - This is Irving Fisher's Debt-Deflation Theory of Great Depressions
- Deflation can lead to increases in real wages that exacerbate unemployment problems

The Zero Lower Bound

- A significant problem with deflation is the **zero lower bound** on nominal interest rates
- Nominal interest rates generally cannot fall below zero
  - If they did, people would simply sell all their interest-bearing assets (i.e. withdraw their money from the banks) and hold zero-interest currency instead
  - This is not exactly true in modern economies, but there is still some lower bound
- Interest rates are an important policy tool for central banks
  - Recall monetary policy in the $IS - LM$ model: central bank expands M^s, expanding LM curve and lowering the real interest rate
  - If the nominal interest rate cannot go below zero, then the minimum real interest rate the central bank can implement is

$$i = 0 \Leftrightarrow r + \pi = 0 \Leftrightarrow r = -\pi$$

  - If $\pi < 0$, the minimum real rate the central bank can implement cannot be very low

What is the optimal inflation rate?

- Some disagreement on this issue
- Most central banks around the world target a low and stable inflation rate, usually 2% (Fed, ECB, etc.)
- The goal is to keep inflation low, but at the same time:
  1. Reduce the risk of deflation
  2. Allow prices to gradually change so as to maintain their function of signals of relative scarcity

5. Inflationary Expectations

What causes inflation?

- We have seen that factors that expand *AD* beyond *LRAS*, or that contract *SRAS*/*LRAS* cause inflation
  - Positive aggregate demand shocks
  - Negative supply shocks
- In particular, we have seen that the only factor that causes sustained inflation is **rapid money growth**
- Why do central banks allow the money supply to grow rapidly?
  - Developing or war-torn countries may not be able to raise taxes or borrow in international financial markets, and so they print money to finance government spending
  - This is the usual cause of hyperinflations
  - Industrialized countries typically use expansionary monetary policy during recessions, but balance these with tighter policy during booms and recoveries

Disinflation

- The process of lowering the inflation rate is called **disinflation**
- The recipe for disinflation seems simple: reduce money growth
- Recall the EAPC

$$\pi = \pi^e - h(u - \bar{u})$$

- Lowering inflation $\pi \downarrow$ implies raising unemployment above the NRU, $u > \bar{u}$
- The only way to avoid causing a recession is by reducing inflation expectations $\pi^e \downarrow$

Rapid vs. Gradual Disinflation

Classical economists advocate **cold turkey**:

- Quick and painful reduction in money supply
- This causes a recession, but proponents argue that the recession can be minimized if the policy is announced well in advance
- If the policy is **credible enough**, it lowers π^e and minimizes the costs of adjustment

Keynesian economists advocate **gradualism**:

- Reducing money supply growth gradually over many years
- Due to price stickiness, rapid adjustments are not possible
- The effectiveness of cold turkey policies is predicated on policymakers' credibility
  - If unemployment were to reach politically intolerable levels, policymakers could renege on their commitment to decrease money growth
  - The public may anticipate this and consequently inflation expectations do not fall

Sacrifice Ratios

- To disinflate, monetary and fiscal policies must slow down aggregate demand, which causes output and employment to fall below their natural levels
- Economists have estimated the amount of output lost when the inflation rate falls by 1 percentage point
- Laurence Ball estimates the sacrifice ratio for the US during the 1980s disinflation was equal to

$$\text{sacrifice ratio} = \frac{\text{loss in output as \% of potential}}{\text{pp fall in the inflation rate}} = \frac{16.18}{8.83} = 1.832$$

- Each pp reduction in inflation costs 1.832% of a year's potential GDP
- These ratios varied widely for other advanced economies, from less than 1 to almost 3
- Ball found that labor market flexibility was an important determinant
- Cold turkey disinflation also seemed to yield lower sacrifice ratios than gradualism

Wage and Price Controls

- Some policymakers advocate a more direct way of causing disinflation: via legal limits on the ability of firms to raise prices and/or wages
- The objective is to reduce inflation directly *and* adjust inflation expectations, which could help reduce the costs of disinflation
- In practice, the evidence on the effectiveness of wage and price controls is not great
  - They cause inefficient shortages of goods and services
  - Once they are removed, inflation returns. Knowing that they are temporary, people do not adjust their inflation expectations

Price Controls in the US

- In the early 1970s, inflation began rising in the US
- Nixon imposed price controls from August 1971 to April 1974
- This caused massive shortages of goods and materials such as steel and lumber
- Inflation resumed after price controls were lifted

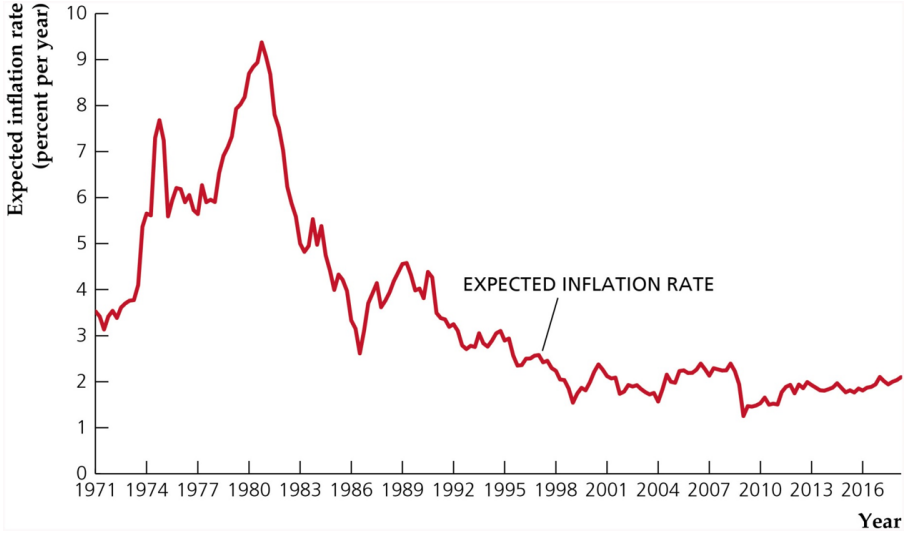
Credibility and Central Bank Independence

- Keynesians and Classical agree that credibility is the single most important factor in lowering inflation expectations
- Credibility is people's trust that policymakers will go through with their announced disinflationary policy
- Governments should strive to build reputation of carrying through their promises in order to accumulate credibility
- Economists and political scientists argue that an important factor in building credibility is **central bank independence**
  - An independent central bank does not take orders from the executive branch of government
  - Elected officials could be tempted to ask the central bank to slow down recessionary disinflation measures in order to be reelected or to gain popularity
  - This would make the central bank less likely to carry through its promised policy and undermine its credibility

The US Disinflation of the 1980s and 1990s

- How did the inflation of the 1970s come to an end?
- In 1979, Fed Chair Paul Volcker sought to eliminate inflation
- This was done "cold turkey", with the Fed raising interest rates and causing a recession in the US economy
- This policy was very successful from a macroeconomic perspective and inaugurated a period of decades of low and stable inflation

The US Disinflation of the 1980s and 1990s



Post-Pandemic Inflation and the Soft Landing

- Inflation in 2021-23 reached its highest levels since the 1980s
  - positive AD shocks (monetary and fiscal policy)
  - negative AS shocks (supply-chain disruptions, invasion of Ukraine)
- The Fed raised interest rates in the hope of achieving a **soft landing**
- A soft landing is a disinflation where unemployment does not exceed $\bar{u}$
- This can only be done by a credible central bank that is able to steer inflation expectations π^e

Post-Pandemic Inflation and the Soft Landing