

Topic 11 – Inflation

Econ 1102 section 28
(part 2)



Agenda

- ✓ Measuring Inflation
 - Measurement Problems
- **Costs of Inflation**
- ✓ Correcting for Inflation (minimum wages)
- **Correcting for Inflation (purchasing power and interest rates)**
- **Money and Inflation**
- **Inflation and Unemployment**



Measuring Inflation

Measurement Problems

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Costs of
Inflation

Correcting for
inflation

Money and
Inflation

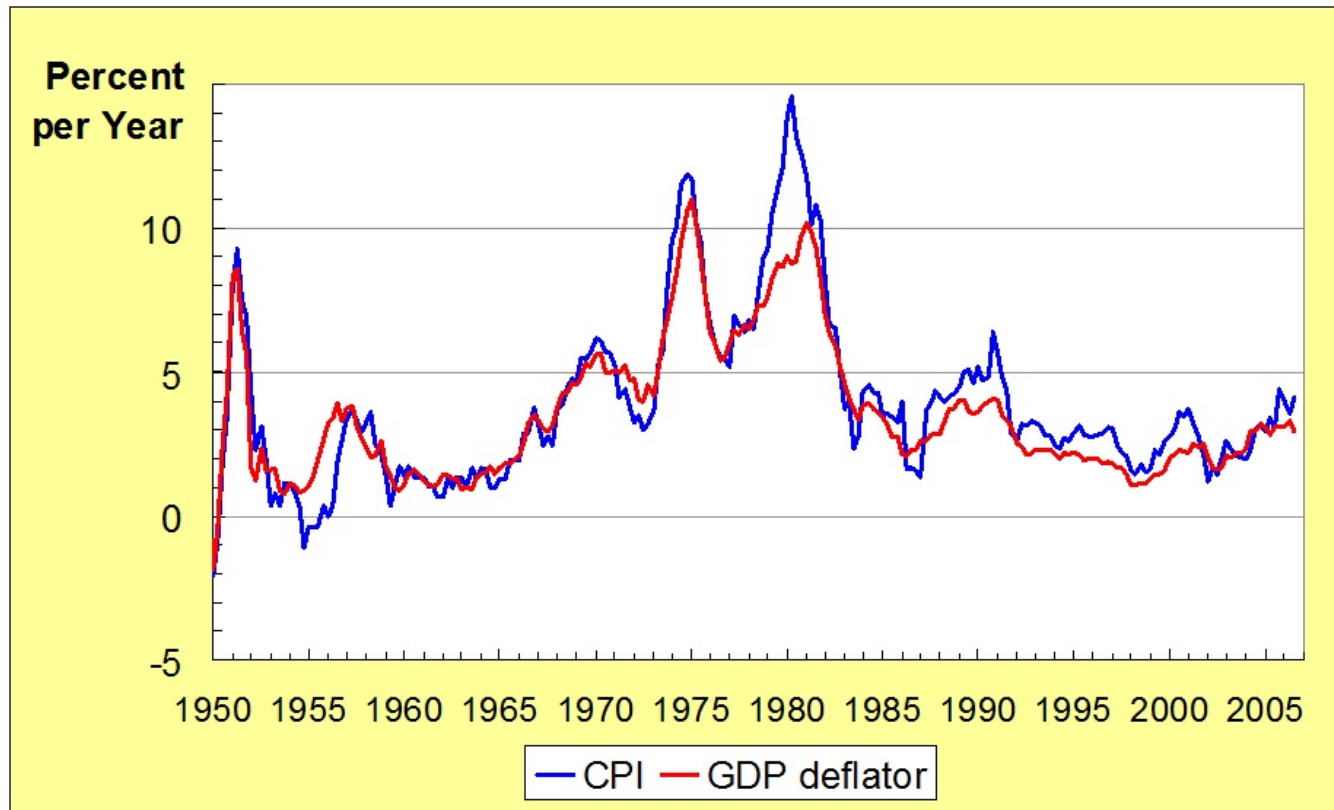
Unemployment
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Are CPI inflation and GDP deflator the same? Not exactly



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They seem close. Why do we care?

- CPI used for
 - Social Security, Poverty Level, Wage Contracts
- Comparing the two:
 - CPI Inflation: The level of inflation consumers experience
 - GDP Deflator: The level of inflation producers experience

If GDP deflator is lower than CPI, are you better or worse off?

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Measurement Problems

- Substitution Bias: Multiple similar goods – ex. iPhone and Samsung Galaxy.
 - If basket is fixed and only contains one item, number misses out substitution effects
- Quality Change: Is today's cellphone the same as a phone from 20 years ago?
- New goods: Kindle – devices didn't exist 10 years ago



How bad are these measurement problems?

- Hard to say. Bils (2009) believes CPI overstates inflation by almost 2% per year (should be quality growth)
- This doesn't seem like much, but inflation is only 3% per year.
 - 2/3 of the price increases normally attributed to inflation may be wrong!



What are the Costs of inflation?

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In which of the following two scenarios will you save?

Scenario 1

- You know prices will increase by 20% next year.
- The bank pays 21% interest on your deposits
- With ***anticipated inflation***, people put their money in a bank to earn interest

Scenario 2

- You don't know what inflation will be next year.
- The bank pays 1% interest on your deposits



Assume we are in scenario 2

- Suppose people are worried about **unanticipated inflation**. What does this do?
 - Decreases your ability to purchase goods (C)
 - Decreases foreigners' ability to purchase US goods (NX)
 - Makes lenders more cautious and/or charge higher interest rates (I)
- All of these are bad for the economy!
 - $Y=C+G+I+NX$



Wait, why are lenders more cautious?

- Suppose you lend \$1000 at 5% interest. That means the borrower has to pay \$1050 back next year.
- Inflation turns out to be 100%. That means \$2000 next year is equivalent to \$1000 today, but next year you only get paid \$1050. In terms of purchasing power, you've taken a loss.



Who does inflation affect?

Unaffected or benefits

- Flexible Income receivers: income can increase/adjust
- Debtors: real value of borrowing goes down

Hurts

- Fixed Income receivers: purchasing power decreases (income isn't changing)
- Savers: If unexpected, decrease in "real" returns
- Creditors: Lose money in real terms



Other Costs

- You expect inflation to be high, so you want to have as much money as possible in interest-bearing bank accounts or bonds. What do you do?
 - Shoeleather costs: Resources wasted running to/from bank
- You run a restaurant and inflation is 20% a day. What do you do with your menus?
 - Menu Costs: Costs of changing price lists
- Prices of food are going up by 10%, shoes by 15%, and rent by 8%. How do you change your consumption?
 - Relative price variability: Difficulty in properly allocating resources



Other Costs (contd.)

- You don't know what inflation is, but you suspect it will be large
 - Confusion and Inconvenience
- Borrowers win → creditors lose, and vice-versa
 - Redistributions of wealth
- Nominal interest rates increase to make up for inflation, but this gives you higher capital gains, so a higher effective tax rate.
 - Inflation-Induced Tax Distortion: Savings suddenly looks less attractive



How do we correct for inflation?

i.e. How do we use CPI to make sure inflation doesn't affect real values?

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Example: Minimum Wages

- Minimum wage:
 - 1978: \$2.65, 2009: \$7.25
 - In real terms, who is making more?
- Depends on inflation!

$$P_{\downarrow T} = CPI_{\downarrow T} / CPI_{\downarrow B} \quad P_{\downarrow B}$$

- B: Base year, T: Target year



Example: Minimum Wages

- CPI: Base Year is 1978
 - 1978:65.2, 2009:213
- $P_{\downarrow T} = CPI_{\downarrow T} / CPI_{\downarrow B} P_{\downarrow B}$
- Real wages:
 - 1978: $P_{\downarrow 78} = CPI_{\downarrow 78} / CPI_{\downarrow 78} * P_{\downarrow 78} = 65.2 / 65.2 * 2.65 = \2.65
 - 2009: $P_{\downarrow 09} = CPI_{\downarrow 09} / CPI_{\downarrow 78} * P_{\downarrow 78} = 213 / 65.2 * 2.65 = \8.65



Example: Purchasing Power

- Deposit \$1000 in the bank in 2009 at interest rate of 2%. Is it worth more or less in *real* terms after one year?
- Well, this depends on inflation.
- Assume CPI inflation is 1%



Example: Purchasing Power

- Let's say I want to purchase a laptop for \$500. How many can I buy?

Year	Wealth	Price of laptop	# purchase
2009	\$1000	\$500	
2010	\$1020	\$505	



Example: Purchasing Power

- Let's say I want to purchase a laptop for \$500. How many can I buy?

Year	Wealth	Price of laptop	# purchase
2009	\$1000	\$500	2
2010	\$1020	\$505	



Example: Purchasing Power

- Let's say I want to purchase a laptop for \$500. How many can I buy?

Year	Wealth	Price of laptop	# purchase
2009	\$1000	\$500	2
2010	\$1020	\$505	2 + \$10 remaining

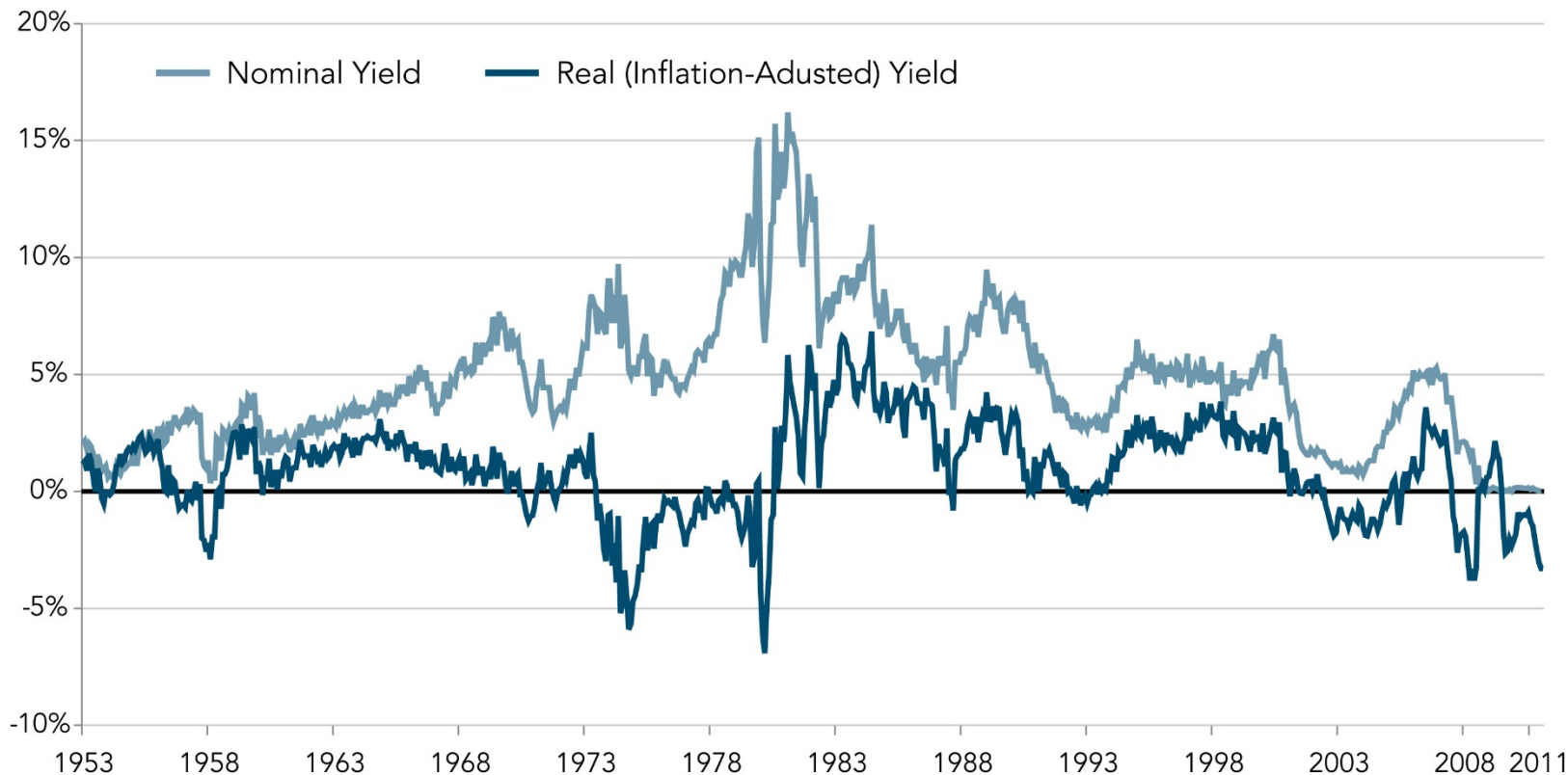
- So inflation affects how much I can purchase

What we care about is the “real” interest rate

- Definition: The interest rate once we have accounted for inflation.
- $real = nominal - inflation$
 - Nominal inflation is the quoted value (i.e. what you see posted by banks, etc)
- In our previous example, $real = 2\% - 1\% = 1\%$



Real and nominal rates move together (but not exactly)



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How does money affect inflation?

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Consider supply and demand

- If there is more supply than demand, what happens to the value?
 - Let's say I build one million abaci for sale at the university bookstore.
 - How much demand is there?
 - So what value do my abaci have?



Money works the same way

- If there is more supply than demand, what happens to the value?
 - Too much money, and not enough demand, then the value drops.
 - What happens to prices?
 - How many abaci would I have to give you for your computer?
- So prices increase. Inflation!



We can formalize this idea with an equation

- But first, another example
- If there is 100 single dollar bills in the economy, but over the whole year, \$1000 worth of transactions occur, how many times did each dollar bill get used?



Example (contd.)

- So we have something like
$$\textit{TimesUsed} = \textit{GDP} / \textit{MoneySupply}$$
- We call times used, the *velocity of money*
 - Velocity of Money: The rate at which money changes hands
- But which GDP did we use, real or nominal?



Example (contd.)

- If we let
 - Y =quantity of goods
 - P =average price of a “good”
- We can replace the previous equation
Used = GDP / Money Supply



Example (contd.)

- If we let
 - Y=quantity of goods
 - P=average price of a “good”
- We can replace the previous equation
Velocity = GDP / Money Supply



Example (contd.)

- If we let
 - Y=quantity of goods
 - P=average price of a “good”
- We can replace the previous equation

$$Velocity = P * Y / MoneySupply$$



So now we can see the impact of money supply on prices

- Restating the previous equation

$$P = V * MoneySupply / Y$$

- Assume we increase money supply, but has no impact on GDP (Y remains constant)
- V is determined by technology, etc., so is relatively stable
- An increase in MoneySupply will do what to prices?



Quantity Theory of Money

- Given the previous equation, we can see two things:
 1. The quantity of money available determines price levels
 2. Changes in money supply causes changes in prices (inflation)
- Combined, this is the quantity theory of money.



A dancing baby



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What determines how valuable a dollar is?

- Which is more valuable?
 - \$1 – with which I can purchase sandwich
 - €1 – with which I can purchase a new car
 - Why?
- The value of a fiat currency is what you can buy with it



How does inflation affect the value of money?

- Think back to the example of supply and demand.
- Low value meant I had to give up more
- Low value currency means prices go up
- This works the other way. If prices are going up, then value must be going down.



Value of Money = $1/P$

Price of Bread	% of loaf purchased w/ \$1	Value of Money	Money Demand (to buy 2 loaves of bread)
\$2	0.5	$1/2=0.5$	\$4
\$4	0.25	$1/4=0.25$	\$8

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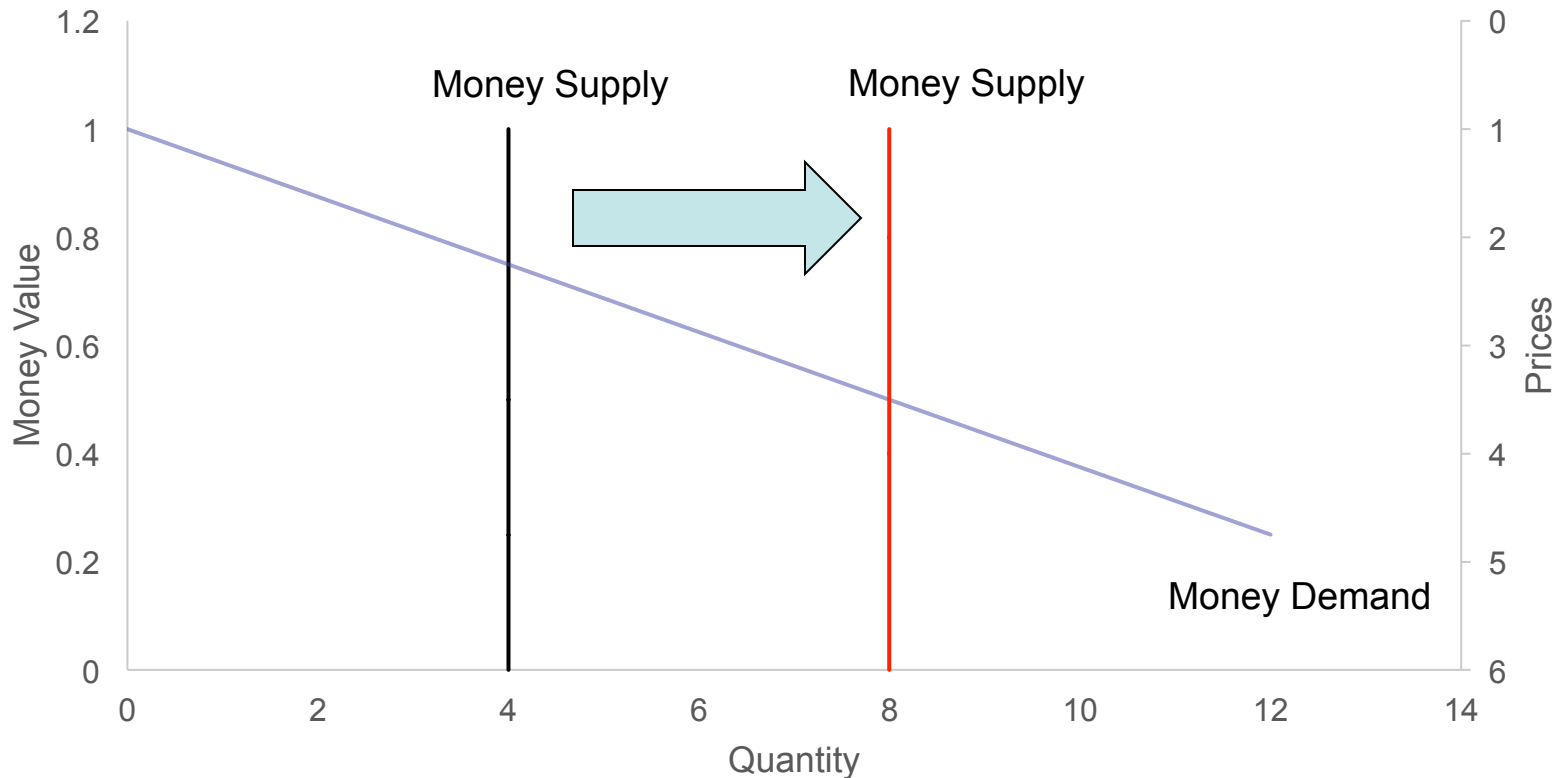
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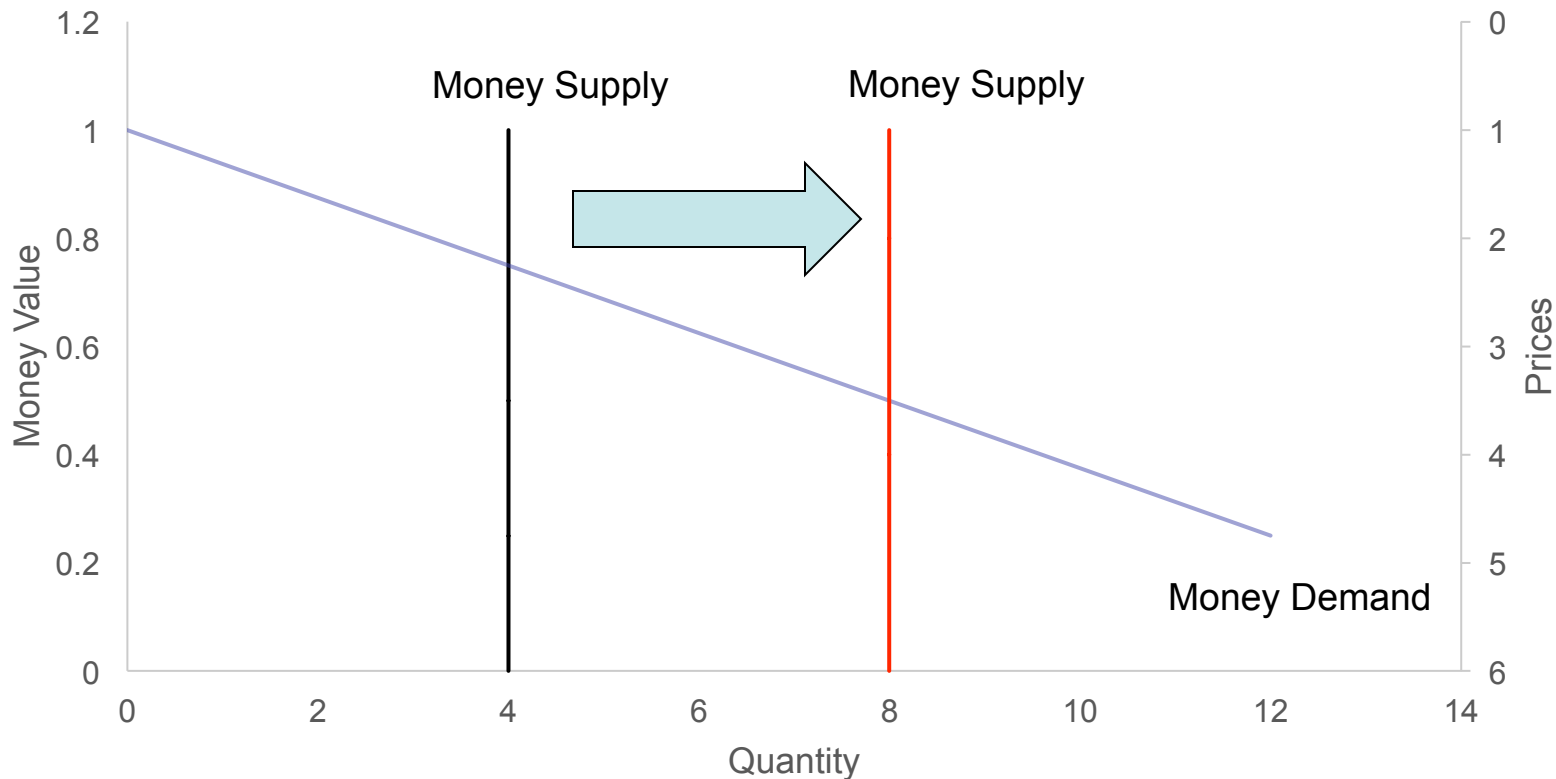
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Let's see this in a supply/ demand diagram



We assume output has not changed



How does money affect “real” prices

- If prices double, and your wage remains the same, is there any change in your “real” purchasing power?
- Recall the flow diagram. If prices have doubled, what must eventually happen to wages?
- Now, is there a change to your “real” purchasing power?



Two definitions

- Classical Dichotomy: The theoretical separation of nominal and real variables
- Monetary Neutrality: The proposition that changes in the money supply do not affect real variables
 - Wait, what? Didn't we say in the previous slide that it can affect real purchasing power?



The difference between short run and long run

- Why do we have upward sloping SR aggregate supply curves?
 - Sticky prices
- In LR, how does aggregate supply change?
- The same with money.
 - SR: sticky prices cause real value to drop (inflation)
 - LR: relative prices adjust to their normal value



Inflation as a Tax

- Which of these would you consider a tax? The government:
 - takes 10% of your income
 - Forces you to deliver mail one day a month
 - Takes one gallon of gas from your car each week
 - Sells one million mint condition Wayne Gretzky rookie hockey cards

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A tax reduces the value of wealth/goods you hold

- Recall $P = V * MoneySupply / Y$
- If money supply goes up by more than quantity, what happens to prices?
- What happens to value of money?
- By printing money (and causing inflation), government is taxing your holding of money!



Sometimes this can be positive

- Do drug dealers report income to the government?
- Do they accept credit cards?
- Inflation provides a way to tax “black market” or illegal transactions that use cash



Fisher Effect

- Monetary Neutrality says changing money supply does not affect real variables (in the long run)
- This includes the real interest rate! The Fed's actions shouldn't affect it, in the long run



Fisher Effect (continued)

- Recall:
$$\text{Nominal int rate} = \text{Real int rate} + \text{Inflation}$$
- If Real int rate stays the same...
- **Fisher Effect:** The one-for-one adjustment of the nominal interest rate to the inflation rate.



Fisher Effect (example)

- **Suppose nominal = 4%; inflation = 3%.**
 - Real int rate = $4 - 3 = 1\%$
- Gov't starts printing extra money, and inflation permanently increases to 4%.
 - Short run real int rate = $4 - 4 = 0\%$
 - Long run real int rate = 1% (what it was originally) so it must be that...
 - Nominal int rate = Real int rate + Inflation
 $= 4 + 1 = 5\%$



Inflation and Unemployment

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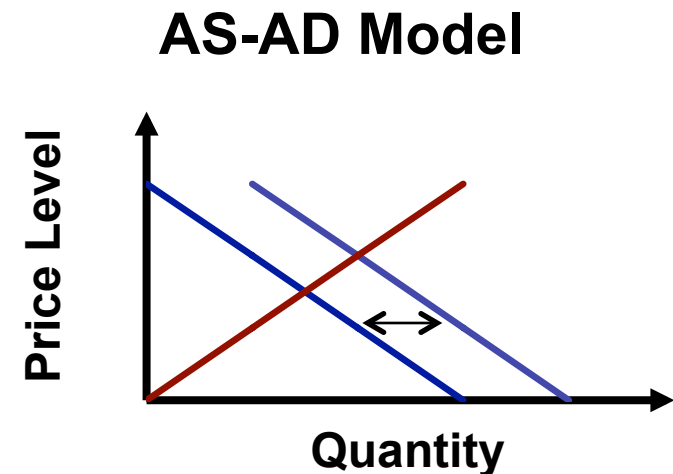


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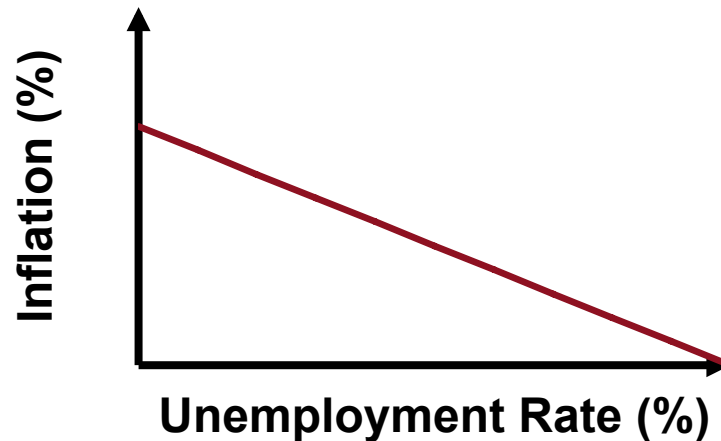
AS-AD shows a trade-off

- Recall:
 - fiscal/monetary policy affect AD.
 - higher output means lower unemployment rate (UR)
- Short-run AD shift right:
lower UR, higher inflation
- Short-run AD shift left:
lower inflation, higher UR
- So policy faces this trade-off



Definition

- **Phillips Curve:** The curve that shows the short-run tradeoff between inflation and unemployment.
- Will look something like this:



A short history of the Phillips Curve

- AS-AD model was just a theory in 1950
- Late 1950s, Phillips uses UK data to show negative relationship



A short history of the Phillips Curve

1960s:

Samuelson and

Solow show it
using US data.

They apply it to
policy: trade higher
inflation for lower
unemployment

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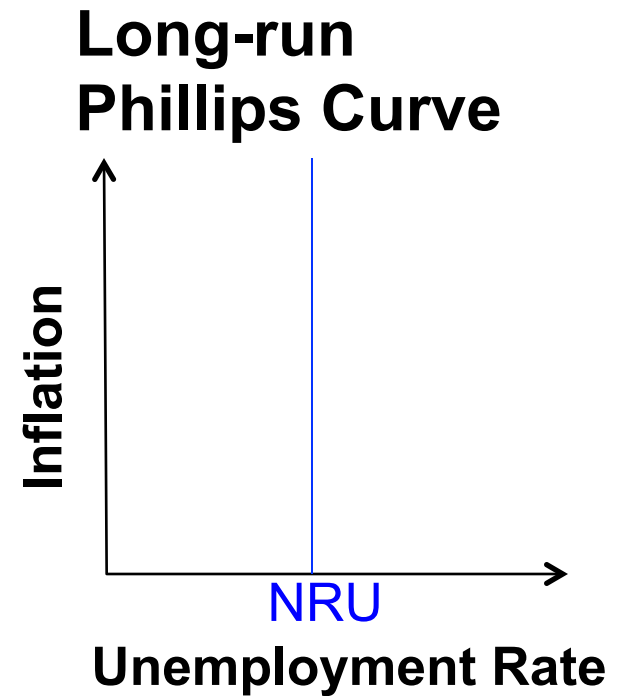


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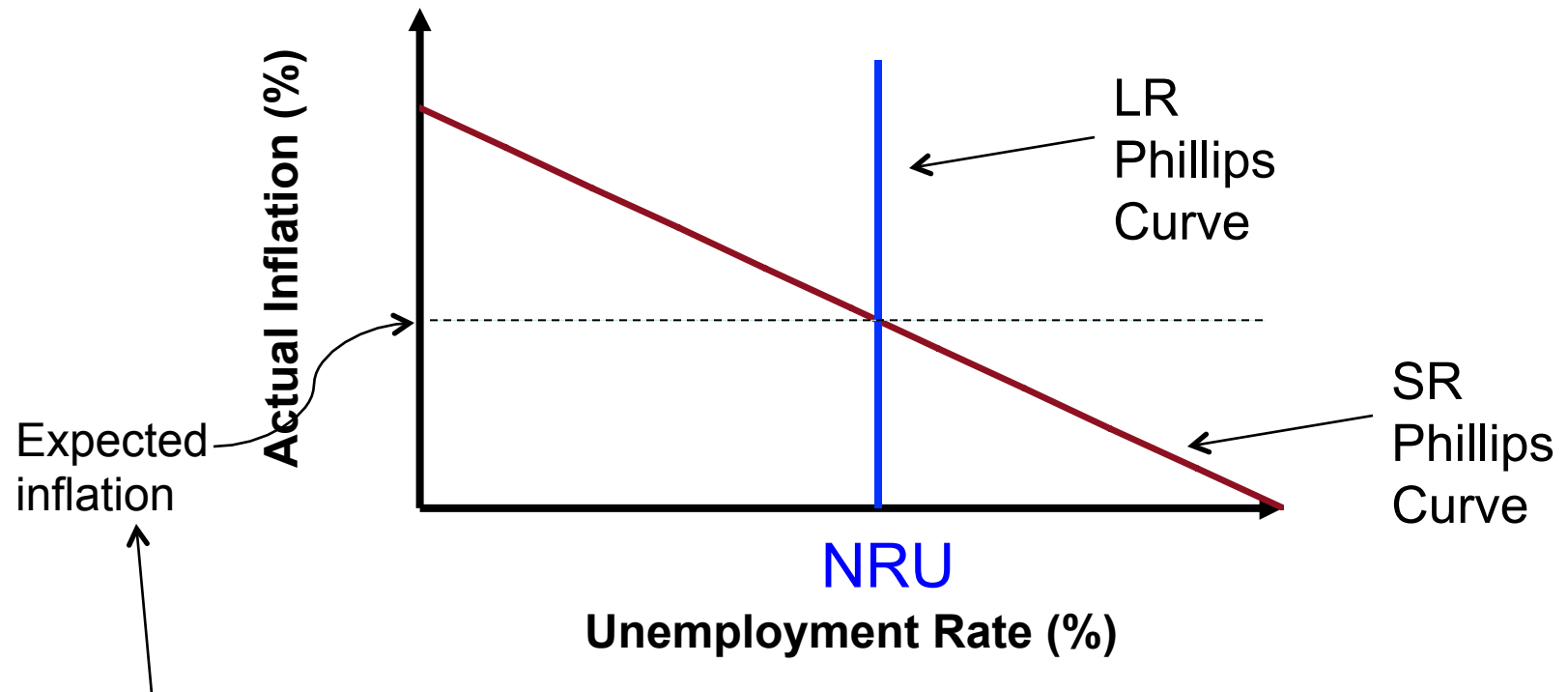
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But wait! If firms *expect* inflation they will adjust production

- 1970s: Friedman and Phelps
 - No! Phillips Curve is a short-run relationship (think sticky wages)
 - Unemployment will adjust to natural rate, inflation will stay high.

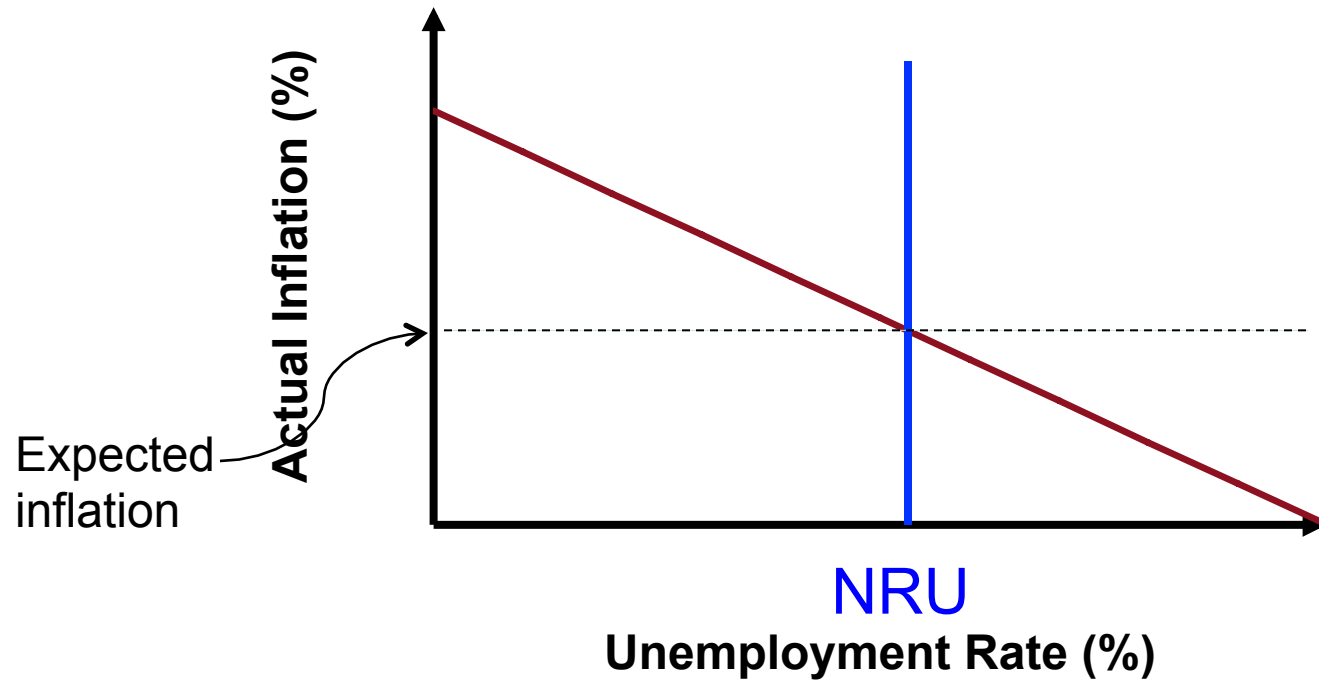


It must be *unexpected* inflation that matters!



Only leave long-run equilibrium (i.e. NRU) when actual prices are not expected prices (think sticky wages)

The Complete Phillips Curve



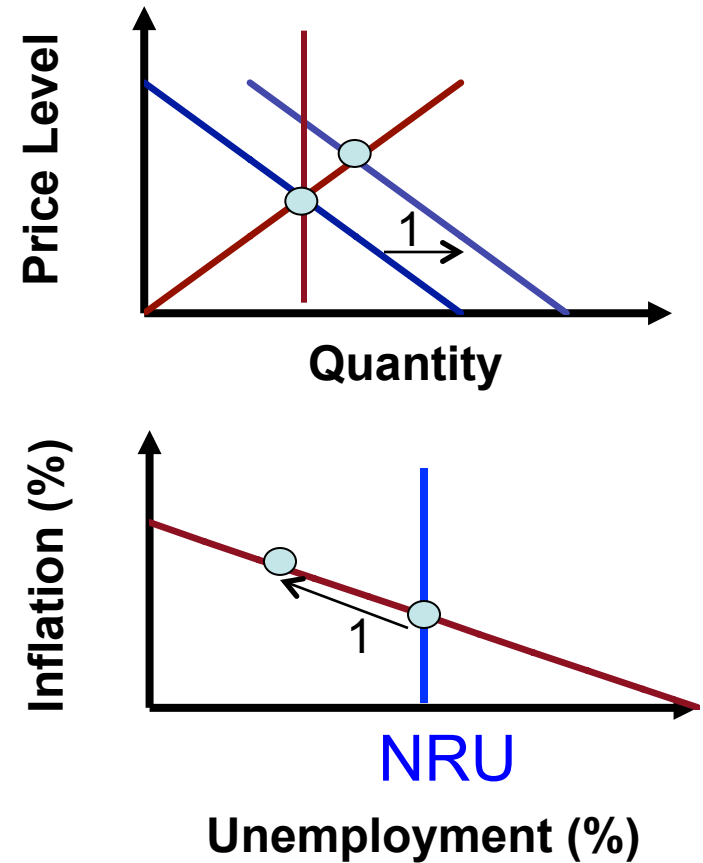
(Equation for this line)

$$UR = NRU - a(\text{Actual Inflation} - \text{Expected Inflation})$$

Example, part 1 (short-run)

1. Fed increases money supply, shifting AD right.

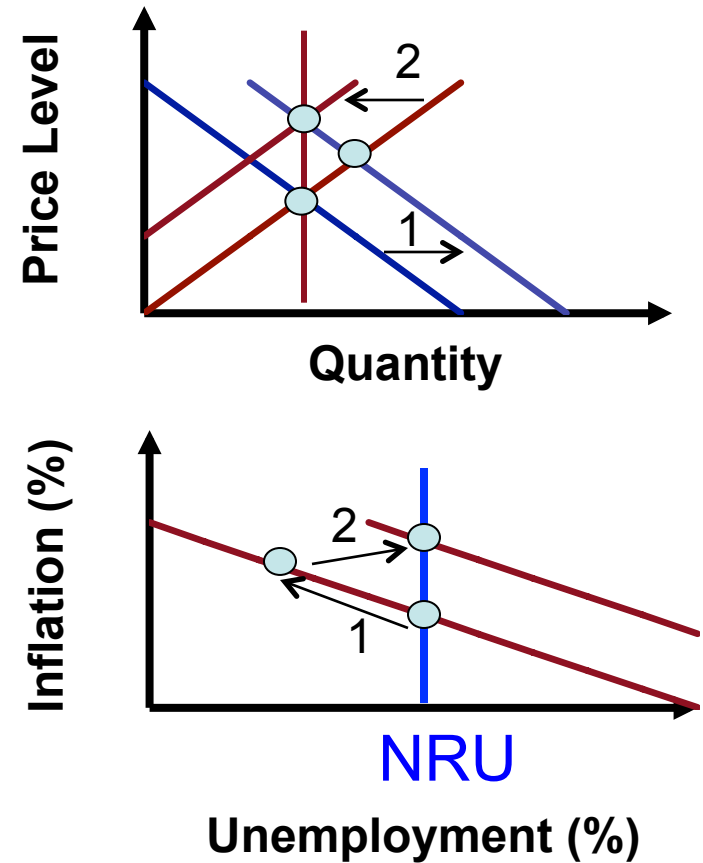
Due to sticky wages, we move along the SR-AS to a point with lower UR and higher inflation (firms are hiring more because labor is relatively cheap)



Example, part 2 (long-run)

2. People's expectations of inflation begin to align with actual inflation (people start asking for a raise)

Employment returns to NRU.



Employment always returns to the NRU eventually!

- **Natural-Rate Hypothesis:** The claim that unemployment eventually returns to its normal, or natural, rate, regardless of the rate of inflation.

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Remember the theory of money neutrality

- The government can create inflation by increasing money
- Can this affect real variables (like natural rate of unemployment)?
- So in the long run monetary policy _____ affect unemployment!

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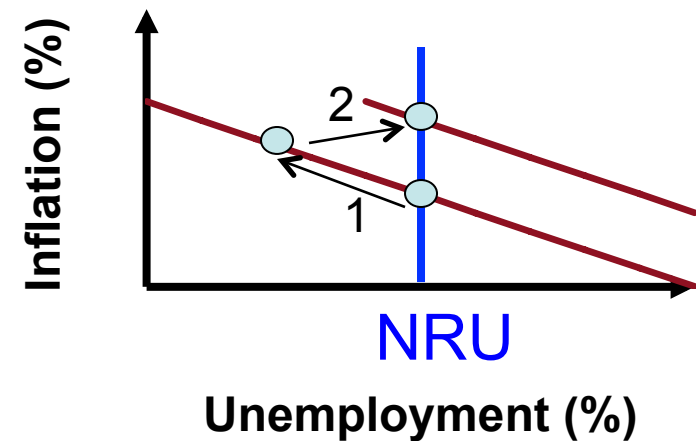


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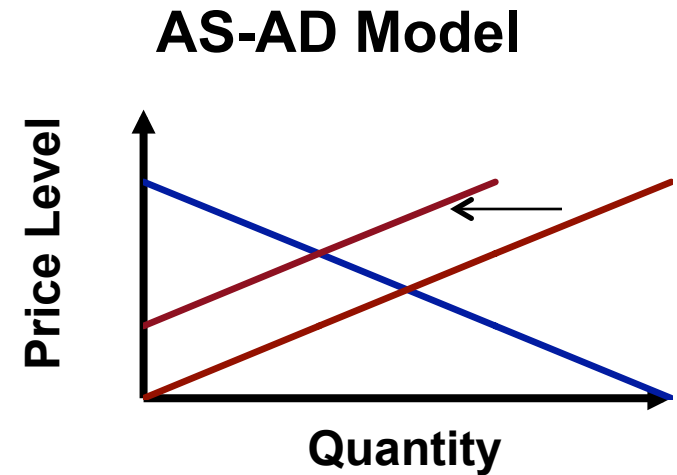
SR Phillips Curve is not stable

- Let's return to the previous example.
- When people update beliefs and expect higher inflation, you have to increase inflation even further to affect unemployment. You have to keep “surprising” people.



Example: Supply Side Shocks

- 1970's oil shocks
- By 1980: Unemployment = 7%, Inflation = 9%.
What to do?
- Fed Chairman Paul Volcker used contractionary monetary policy to control inflation. But what would that do to unemployment?



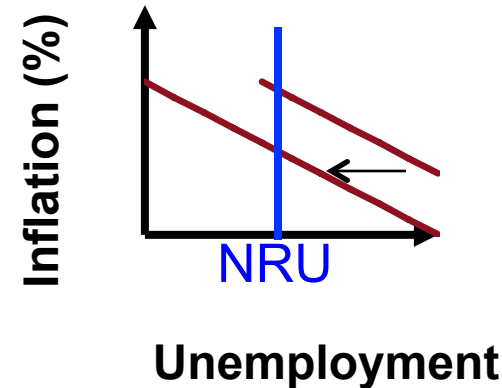
Sacrifice Ratio

- How much must unemployment increase for a reduction in inflation?
- **Sacrifice Ratio:** # of percentage points of annual output lost while reducing inflation by 1 percentage point.
- Typical estimate of sacrifice ratio= 5.
- So for inflation \downarrow 6%, unemployment \uparrow 30%!



Rational Expectations

- Then a new group of economists say:
- **Rational Expectations:** People optimally use all the info they have, including information about government policies, when forecasting the future (forming expectations).
- If people thought Fed were serious about lowering inflation, expected inflation would decrease, so unemployment would decrease.



Back to Paul Volcker

- Rational Expectations economists said Volcker just had to seem serious to get costless disinflation.
- If people thought Fed were serious about lowering inflation, expected inflation would decrease, so unemployment would decrease.

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Back to Paul Volcker

- Inflation was about 10% in 1980 and 1981, 6% in 1982, 3-4% in 1983 -87
- Unemployment reached 10%
- Big recession!

- Were the RE economists right? Sort of. Cost was much less than the theoretical sacrifice cost of 5



Should the Fed Aim for Zero Inflation?

- Probably not
 - Not easy to measure costs of 3% inflation, but probably not that high
 - Zero inflation makes monetary policy ineffective
 - Why? If zero inflation, is nominal interest greater than, less than, or equal to real interest?
 - Recall: can't cut nominal interest rate below zero
 - What does this imply about real interest rates?
 - Inflation makes wage cuts “Easier” (your nominal wages can rise even while your real wages fall)



Key Ideas and Things To Think About

Note: This is NOT a study guide – i.e. do not limit yourself to these items when studying



Key Ideas

- In the long run, inflation doesn't affect real variables (like real interest rate or unemployment)
- High inflation (like 9%) has high costs, but reducing it requires raising unemployment in the short run



Things To Think About

- Does it make sense to buy a thousand Forever Stamps, since they are “worth more” each year? How would you figure this out?



Things To Think About

- Suppose the expected CPI (base year = 2005) for 2013 is 132 and the sacrifice ratio is 4. Draw the SR Phillips curve
 - Assume you sacrifice 4 percentage points unemployment to reduce inflation by 1 percentage point.

