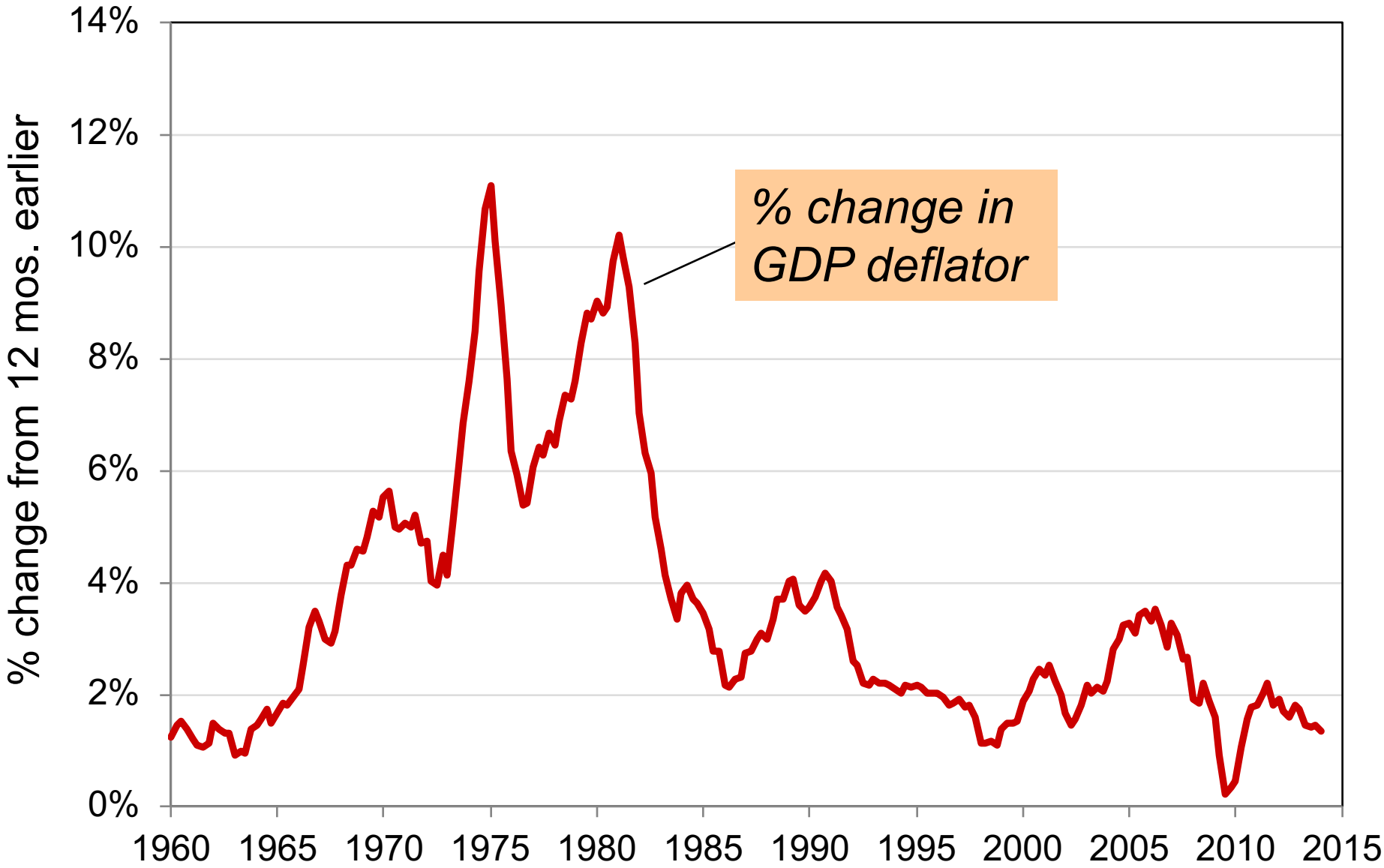
Chapter 5

Inflation: Its Causes, Effects, and Social Costs

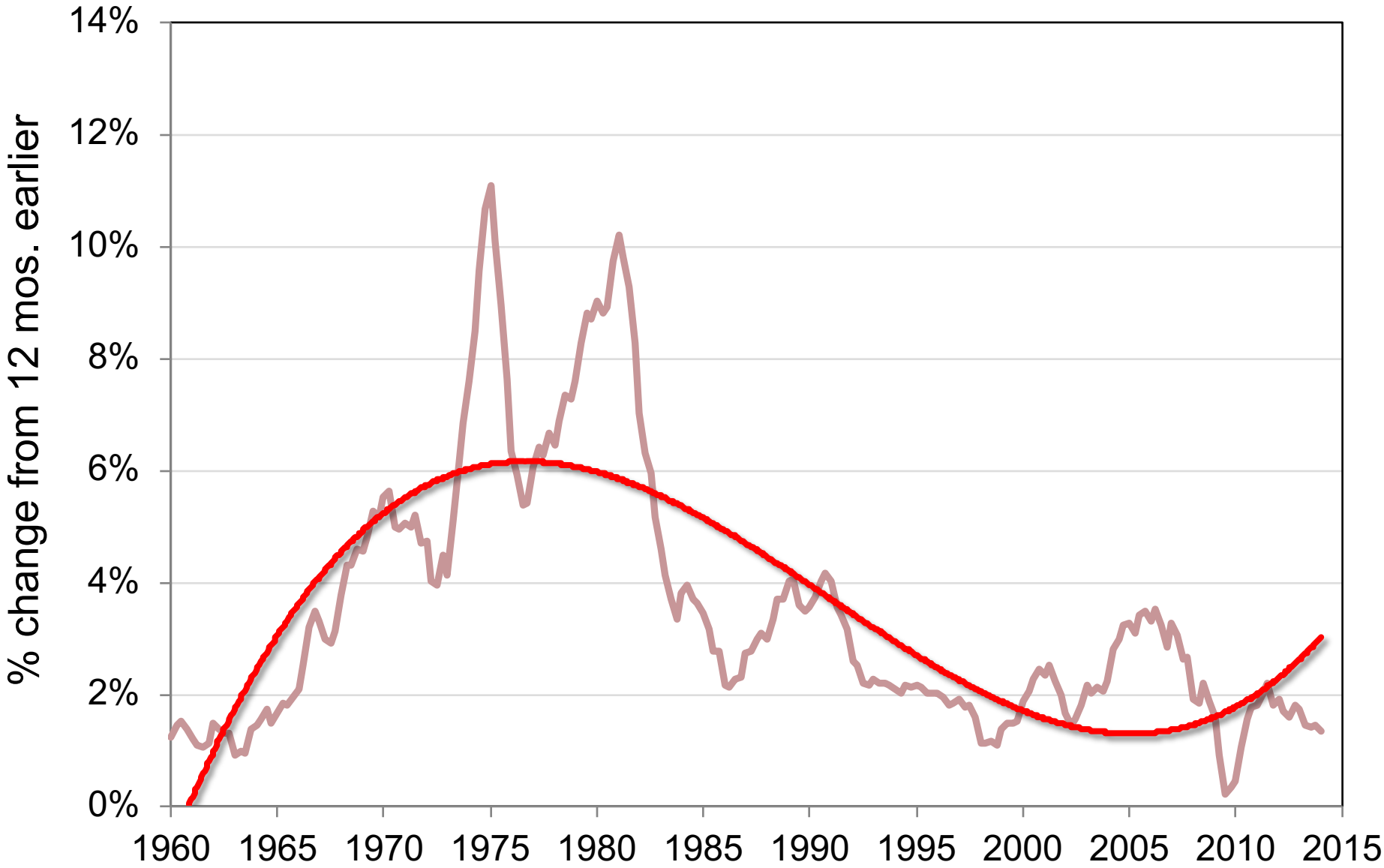
IN THIS CHAPTER, YOU WILL LEARN:

- The classical theory of inflation
  - causes
  - effects
  - social costs
- "Classical" – assumes prices are flexible & markets clear
- Applies to the long run

U.S. inflation and its trend, 1960-2014



U.S. inflation and its trend, 1960-2014



The quantity theory of money

- A simple theory linking the inflation rate to the growth rate of the money supply.
- Begins with the concept of **velocity**…

Velocity

- basic concept:
  the rate at which money circulates
- definition: the number of times the average dollar bill changes hands in a given time period
- example: In 2012,
  - $500 billion in transactions
  - money supply = $100 billion
  - The average dollar is used in ____ transactions in 2012
  - So, velocity = ???

Velocity, cont.

- This suggests the following definition:

$$V = \frac{T}{M}$$

where

V = velocity

T = value of all transactions

M = money supply

Velocity, cont.

- Use nominal GDP as a proxy for total transactions.

  Then,

The quantity equation

- The **quantity equation**

$$M \times V = P \times Y$$

  follows from the preceding definition of velocity.

- It is an *identity:*
  it holds by definition of the variables.

The quantity equation and its relationship with a simple money demand function

- $\boldsymbol{M/P}$ = **real money balances**, the purchasing power of the money supply.

- A simple money demand function:

  $$(\boldsymbol{M/P})^{d} = \boldsymbol{kY}$$

  where

  $\boldsymbol{k}$ = how much money people wish to hold for each dollar of income.

  ($\boldsymbol{k}$ is exogenous)

Money demand and the quantity equation

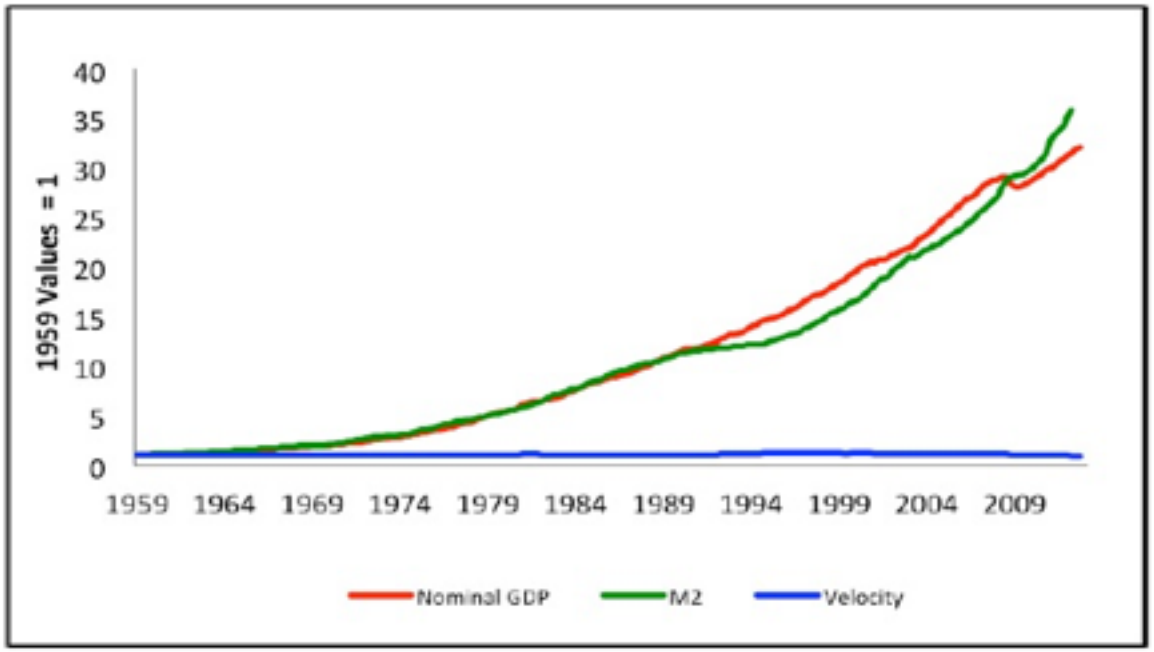
- money demand: $(\boldsymbol{M}/\boldsymbol{P})^{d} = \boldsymbol{kY}$
- quantity equation: $\boldsymbol{M} \times \boldsymbol{V} = \boldsymbol{P} \times \boldsymbol{Y}$
- The connection between them: $\boldsymbol{k}$ = _____
- When people hold lots of money relative to their incomes ($\boldsymbol{k}$ is large), money changes hands infrequently (___ is small).

Back to the quantity theory of money

- starts with quantity equation
- assumes $\boldsymbol{V}$ is constant & exogenous: $\boldsymbol{V} = \overline{\boldsymbol{V}}$

Then, quantity equation becomes:

P*Y, M, and V in the U.S.



The quantity theory of money, *cont.*

$$M \times \overline{V} = P \times Y$$

How the price level is determined:

- With V constant, the money supply determines _____ ($P \times Y$).
- _____ is determined by the economy's supplies of K and L and the production function (Chap. 3).
- The price level is
  P =

The quantity theory of money, *cont.*

- *Recall from Chapter 2:*
  The growth rate of a product equals
  the sum of the growth rates.
- The quantity equation in growth rates:

The quantity theory of money assumes:
V is _____. So _____.

The quantity theory of money, *cont.*

π (Greek letter *pi*)
denotes the inflation rate:

$$\pi = \frac{\Delta \boldsymbol{P}}{\boldsymbol{P}}$$

The result from the preceding slide:

Solve this result for π:

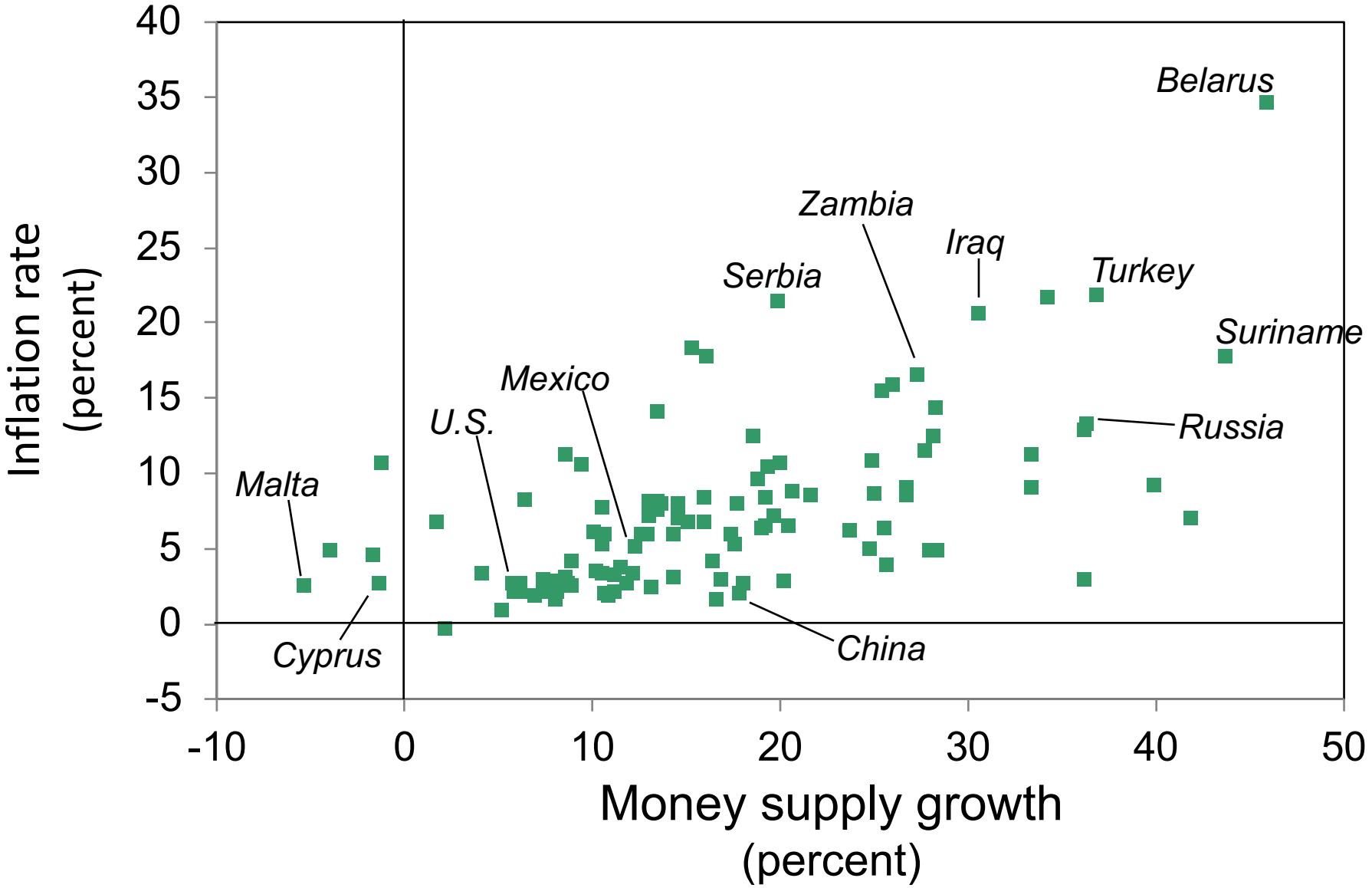
Confronting the quantity theory with data

The quantity theory of money implies:

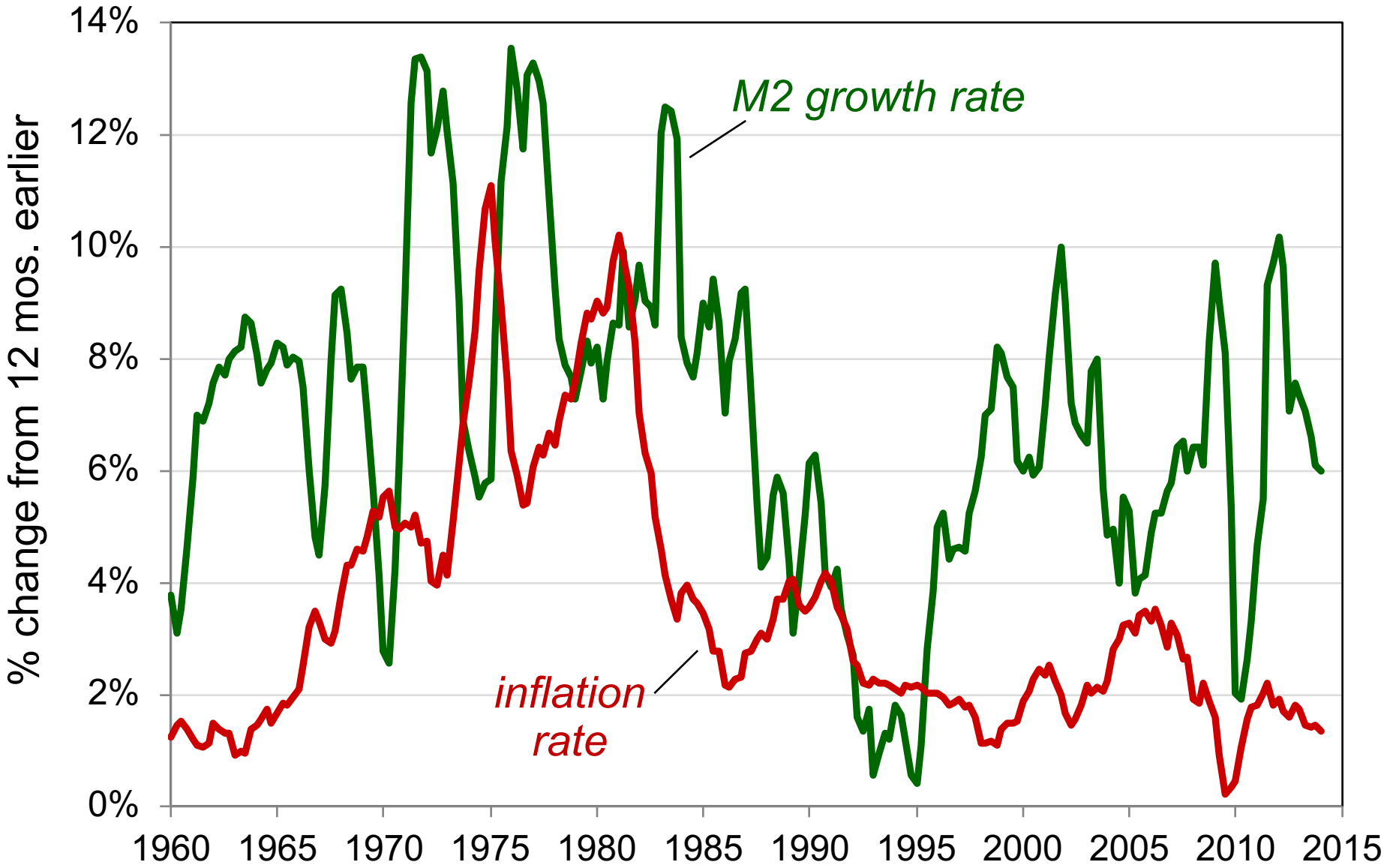
1. Countries with higher money growth rates should have _____ inflation rates.
2. The long-run trend in a country's inflation rate should be similar to the long-run trend in the country's _____ _____rate.

Are the data consistent with these implications?

International data on inflation and money growth



U.S. inflation and money growth, 1960-2014



Seigniorage

- To spend more without raising taxes or selling bonds, the govt can _____ _____.
- The "revenue" raised from _____ _____ is called **seigniorage**
  (pronounced SEEN-your-idge).
- The **inflation tax**:
  Printing money to raise revenue causes inflation.
  Inflation is like a ____ on people who hold money.

Inflation and interest rates

- Nominal interest rate, ***i***
  not adjusted for inflation
- Real interest rate, ***r***
  adjusted for inflation:

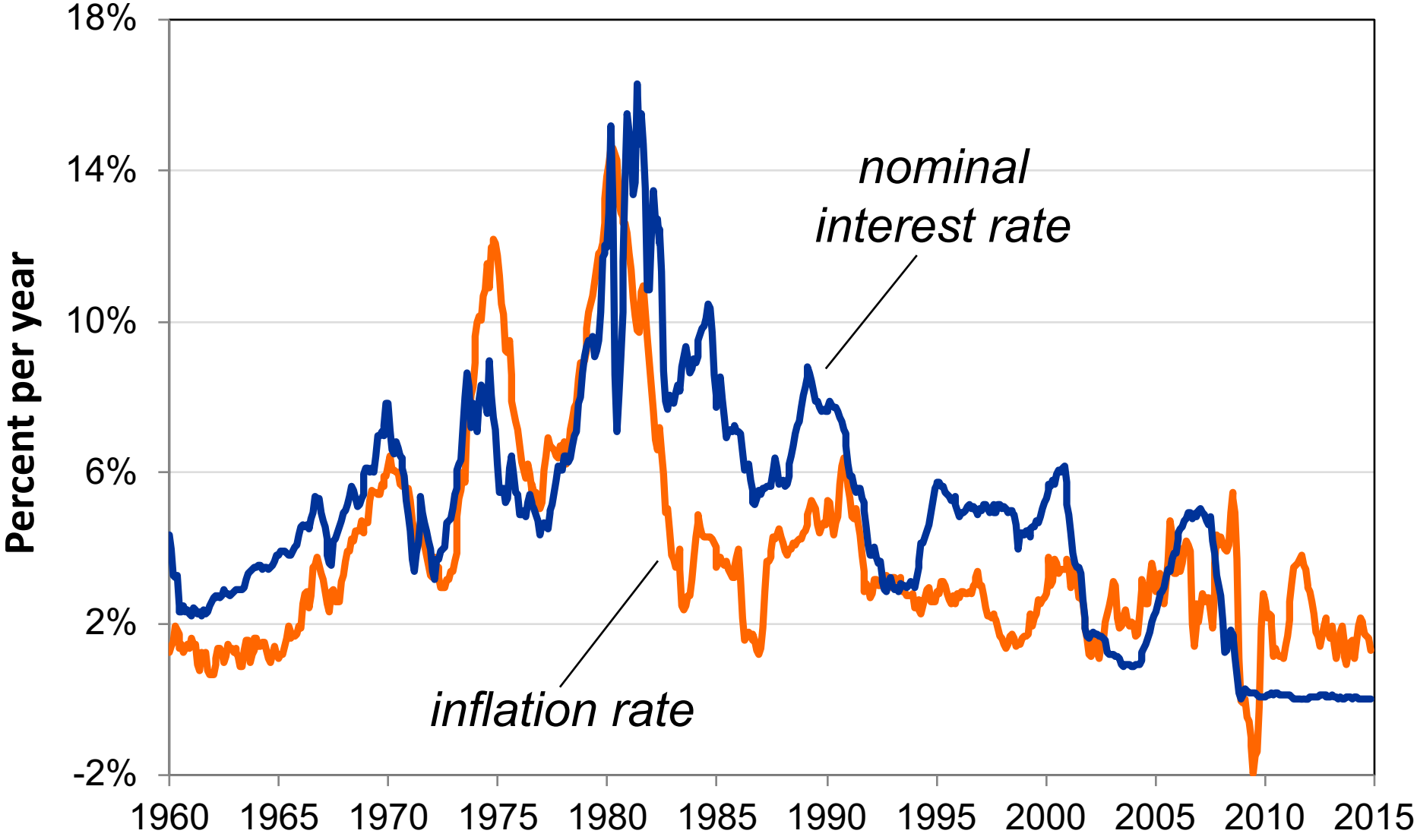
$$r = i - \pi$$

The Fisher effect

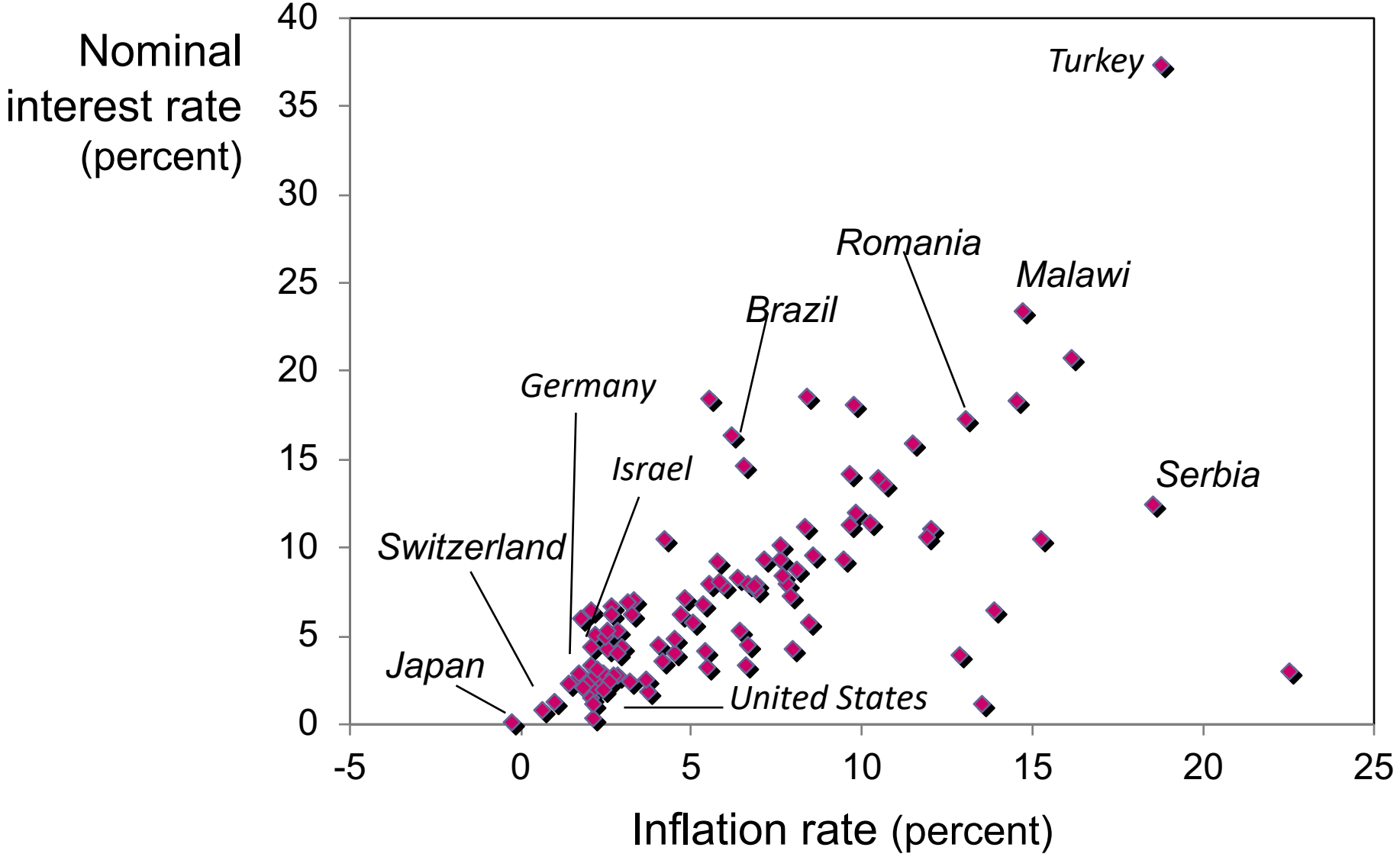
- The Fisher equation: $i = r + \pi$
- Chap. 3: $S = I$ determines r.
- Hence, an increase in π
  causes an equal increase in i.

- This one-for-one relationship is called the **Fisher effect**.

U.S. inflation and nominal interest rates, 1960-2014



Inflation and nominal interest rates in 100 countries



NOW YOU TRY

Applying the theory

Suppose V is constant, M is growing 5% per year, Y is growing 2% per year, and $r = 4$.

a. Solve for i.

b. If the Fed increases the money growth rate by 2 percentage points per year, find Δi.

c. Suppose the growth rate of Y falls to 1% per year.
   - What will happen to π?
   - What must the Fed do if it wishes to keep π constant?

ANSWERS

Applying the theory

Two real interest rates

Notation:

- π = actual inflation rate
  (not known until after it has occurred)
- $E\pi$ = expected inflation rate

Two real interest rates:

- $i - E\pi$ = _____ real interest rate:
  the real interest rate people expect
  at the time they buy a bond or take out a loan
- $i - \pi$ = _____ real interest rate:
  the real interest rate actually realized

Money demand and the nominal interest rate

- In the quantity theory of money, the demand for real money balances depends only on _____.
- Another determinant of money demand: _____
  - the opportunity cost of holding money (instead of bonds or other interest-earning assets).
- The relationship between these variables??.

The money demand function

$$(M/P)^d = L(i, Y)$$

$(M/P)^d$ = real money demand, depends

- _____ on i

  i is the opp. cost of holding money

- _____ on Y

  higher $Y \Rightarrow$ _____ spending

  $\Rightarrow$ so, need more money

("L" is used for the money demand function because money is the most liquid asset.)

More or less

The money demand function

$$(M/P)^d = L(i, Y)$$

$$= L(r + E\pi, Y)$$

When people are deciding whether to hold money or bonds, they don't know what inflation will turn out to be.

Hence, the nominal interest rate relevant for money demand is $r + E\pi$.

What determines what

$$\frac{M}{P} = L(r + E\pi, Y)$$

variable	how determined *(in the long run)*
M	
r	
Y	$\bar{Y} = F(\bar{K}, \bar{L})$
P	adjusts to ensure $\frac{M}{P} = L(i, Y)$

How P responds to ΔM

$$\frac{\boldsymbol{M}}{\boldsymbol{P}} = \boldsymbol{L}(\boldsymbol{r} + E\pi, \boldsymbol{Y})$$

- For given values of ***r***, ***Y***, and $E\pi$,
  a change in ***M*** causes ***P*** to change by
  _____—just like in the quantity
  theory of money.

What about expected inflation?

- Over the long run, people don't consistently over- or under-forecast inflation,

  so _____ on average.
- In the short run, $E\pi$ may change when people

  _____ _____ _____.
- EX: Fed announces it will increase ***M*** next year. People will expect next year's ***P*** to be higher, so $E\pi$ rises.
- This affects ***P*** now, even though ***M*** hasn't changed yet….

How P responds to $\Delta E\pi$

$$\frac{\boldsymbol{M}}{\boldsymbol{P}} = \boldsymbol{L}(\boldsymbol{r} + E\pi, \boldsymbol{Y})$$

- For given values of ***r***, ***Y***, and ***M*** ,

NOW YOU TRY

Discussion question

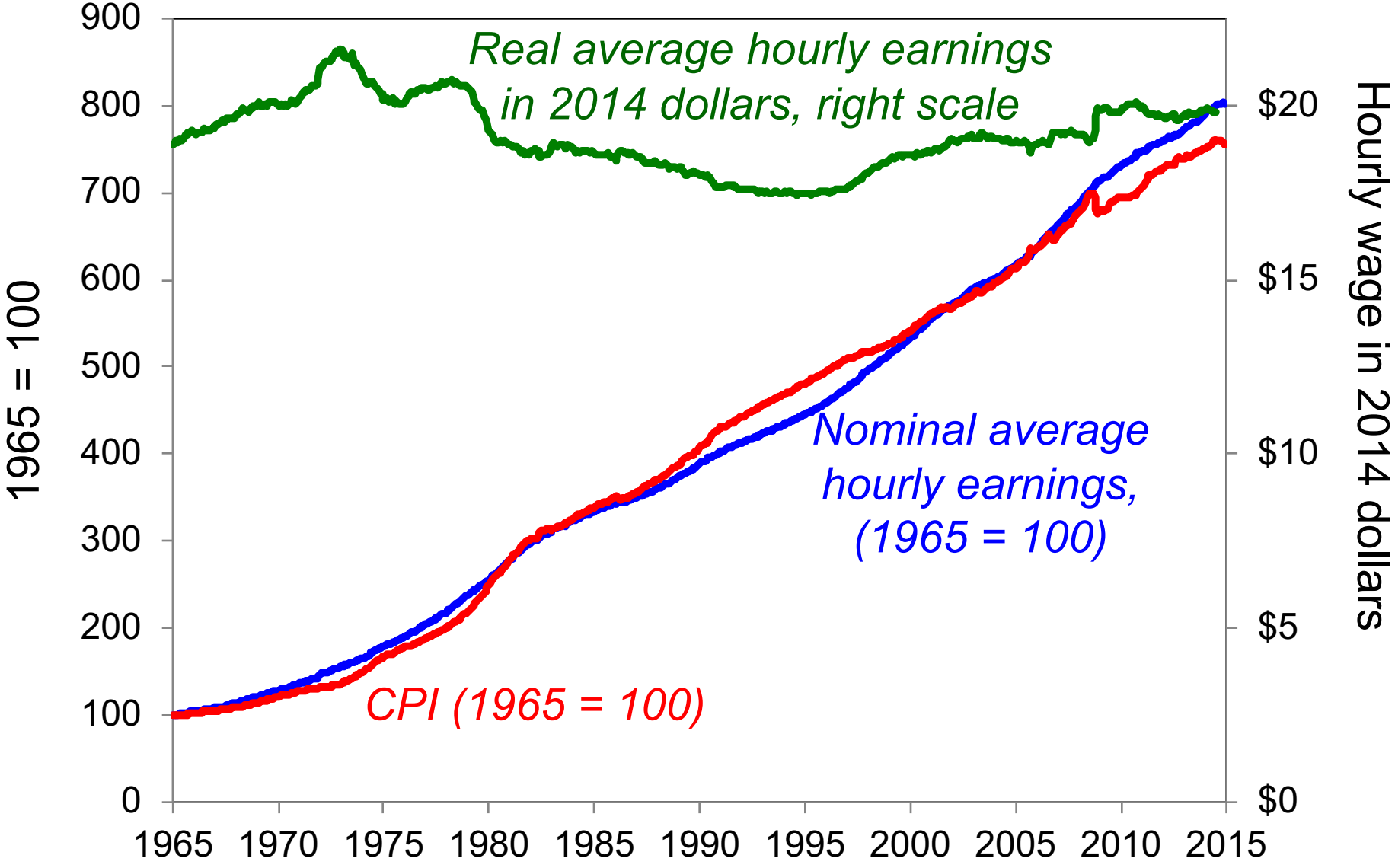
Why is inflation bad?

- What costs does inflation impose on society? List all the ones you can think of.

A common misperception

- Common misperception:
  inflation reduces real wages
- This is true only in the _____ _____, when nominal wages are fixed by contracts.
- (Chap. 3) In the long run, the real wage is determined by _____ _____ and _____ _____;not the price level or inflation rate.
- Consider the data…

The CPI and average hourly earnings, 1965–2015



The classical view of inflation

- *The classical view:*
  A change in the price level is merely a change in the units of measurement.

Then, why is inflation a social problem?

The social costs of inflation

…fall into two categories:

1. costs when inflation is expected
2. costs when inflation is different than people had expected

The costs of expected inflation:

1. Shoeleather cost

- The inflation does erode the value of money that each person holds in his or her wallet.
- Thus, when inflation rises, people make **greater efforts to reduce the amounts of money that they hold**, for example, by going to the bank or the **ATM more often**, but **withdrawing smaller amounts each time**.
- **The costs that are associated with these efforts are called shoe-leather costs**, based on the imagery of someone wearing out his or her shoes walking to the bank more often.

The costs of expected inflation:
2. Menu costs

- def: The costs of changing prices.
- Examples:
  - cost of printing new menus
  - cost of printing & mailing new catalogs
- The higher is inflation, the more _____ firms must change their prices and incur these costs.

The costs of expected inflation:
3. Relative price distortions

- Firms facing menu costs change prices infrequently.
- Example:
  A specific firm issues new catalog each January only.
  As the general price level rises throughout the year, the firm's relative price will _____.
- Different firms change their prices at different times, leading to relative _____ distortions…

  …causing microeconomic inefficiencies
  in the allocation of resources.

Rise or fall?

price

The costs of expected inflation:

4. Unfair tax treatment

- Consider two economies, one in which the inflation rate is zero and the other in which the inflation rate is 8 percent.
- In both economies, the real interest rate is 4 percent.
- **The differences in interest rates lead, through the Fisher effect, to differences in nominal interest rates**. With zero inflation, the nominal interest rate is 4 percent, but with 8 percent inflation, the nominal interest rate is 12 percent.
- Suppose that interest income is taxed at rate of 25 percent.
- This means with a 4 percent before tax interest rate, the saver pays 1 percent in taxes.
- But with a 12 percent before tax interest rate, the saver pays 3 percent in taxes.
- With zero inflation, the after tax real return to saving is 3 percent.
- But with 8 percent inflation, the after tax return is just 1 percent.

The costs of expected inflation:
5. General inconvenience

- Inflation makes it harder to compare nominal values from different time periods.
- This complicates long-range financial planning.

Additional cost of high inflation: Increased uncertainty

- When inflation is high, it's more variable and unpredictable:
  π turns out different from $E\pi$ more often, and the differences tend to be larger
  (though not systematically positive or negative)
- This creates higher _____.

Hyperinflation

The World's Worst Hyperinflations

Country	Month with Highest Inflation Rate	Highest Monthly Inflation Rate	Time Required for Prices to Double
Hungary	July 1946	$4.16 \times 10^{16}\%$	15.0 hours
Zimbabwe	November 2008	79,600,000,000%	24.7 hours
Yugoslavia	January 1994	313,000,000%	1.4 days
Germany	October 1923	29,500%	3.7 days
Greece	October 1944	13,800%	4.3 days
China	May 1949	2,178%	6.7 days

From: Steve H. Hanke and Alex K.F. Kwok. "On the Measurement of Zimbabwe's Hyperinflation." *Cato Journal* vol.29 (Spring/Summer 2009): pp.353-364.

Hyperinflation

The World's Worst Hyperinflations

Germany Hyperinflation in 1923

A few examples of hyperinflation

country	***period***	***CPI Inflation*** *% per year*	***M2 Growth*** *% per year*
Israel	1983-85	338%	305%
Brazil	1987-94	1,256	1,451
Bolivia	1983-86	1,818	1,727
Ukraine	1992-94	2,089	1,029
Argentina	1988-90	2,671	1,583
Dem. Republic of Congo / Zaire	1990-96	3,039	2,373
Angola	1995-96	4,145	4,106
Peru	1988-90	5,050	3,517
_____	2005-07	5,316	9,914