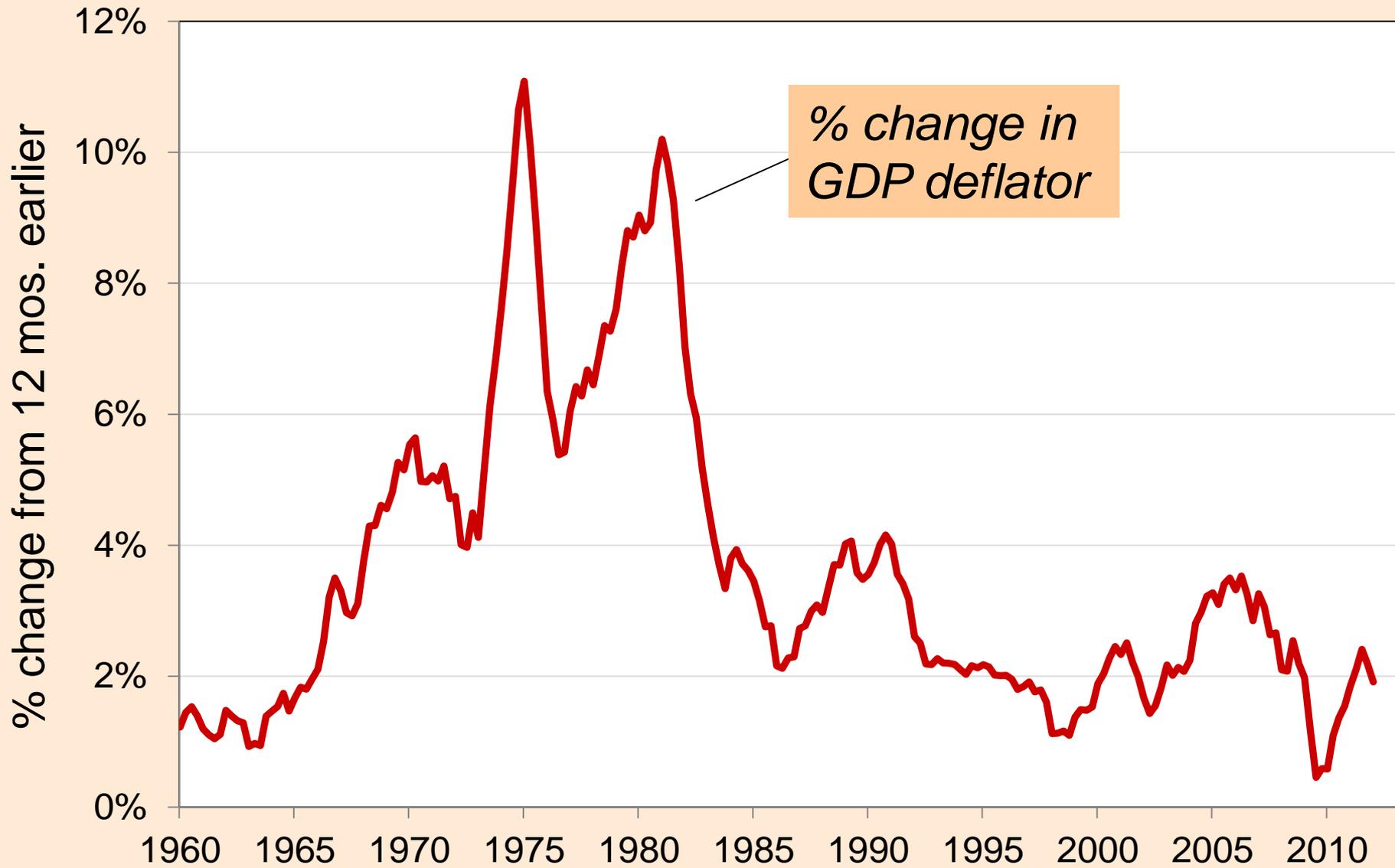


ECON 3010
Intermediate Macroeconomics

Chapter 5
Inflation:
Its Causes, Effects, and Social Costs

U.S. inflation 1960–2012



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 five transactions
 - So, velocity = 5

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,
$$V = \frac{P \times Y}{M}$$

where

P = price of output (GDP deflator)

Y = quantity of output (real GDP)

$P \times Y$ = value of output (nominal GDP)

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.

More on the quantity theory of money...

- starts with quantity equation
- assumes V is constant & exogenous:

$$V = \bar{V}$$

Then, quantity equation becomes:

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

The quantity theory of money, *cont.*

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

How the price level is determined:

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

The quantity theory of money, *cont.*

- *Math Fact:* The growth rate of a product equals the sum of the growth rates.
- The quantity equation in growth rates:

$$\frac{\Delta M}{M} + \frac{\Delta V}{V} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y}$$

The quantity theory of money assumes V is constant, so $\frac{\Delta V}{V} = 0$.

The quantity theory of money, *cont.*

π (Greek letter *pi*)

denotes the inflation rate:

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

The result from the preceding slide:

$$\frac{\Delta M}{M} = \frac{\Delta P}{P} + \frac{\Delta Y}{Y}$$

Solve this result for π :

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

The quantity theory of money, *cont.*

$$\pi = \frac{\Delta M}{M} - \frac{\Delta Y}{Y}$$

- Normal economic growth requires a certain amount of money supply growth to facilitate the growth in transactions.
- Money growth in excess of this amount leads to inflation.

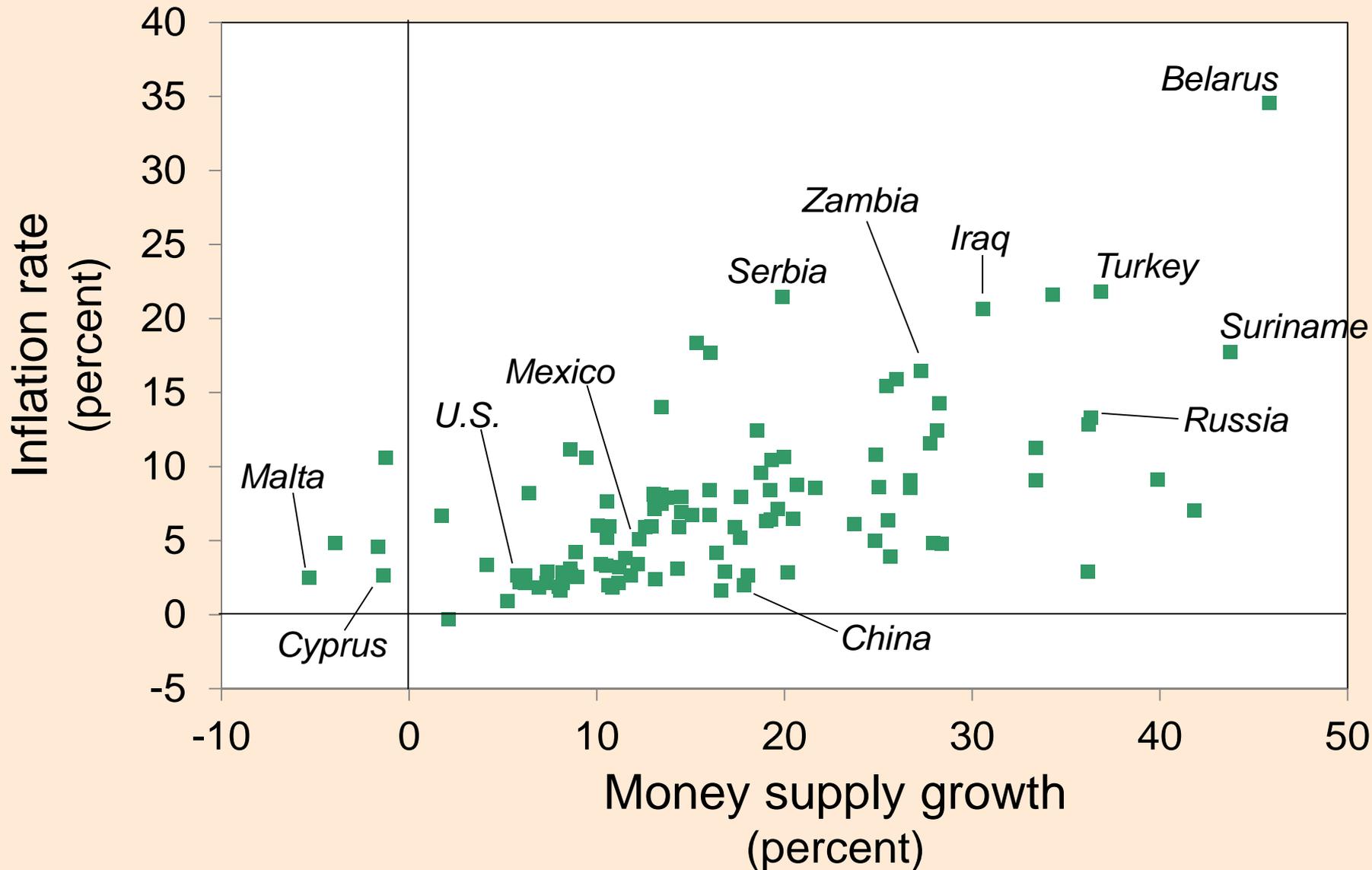
Confronting the quantity theory with data

The quantity theory of money implies:

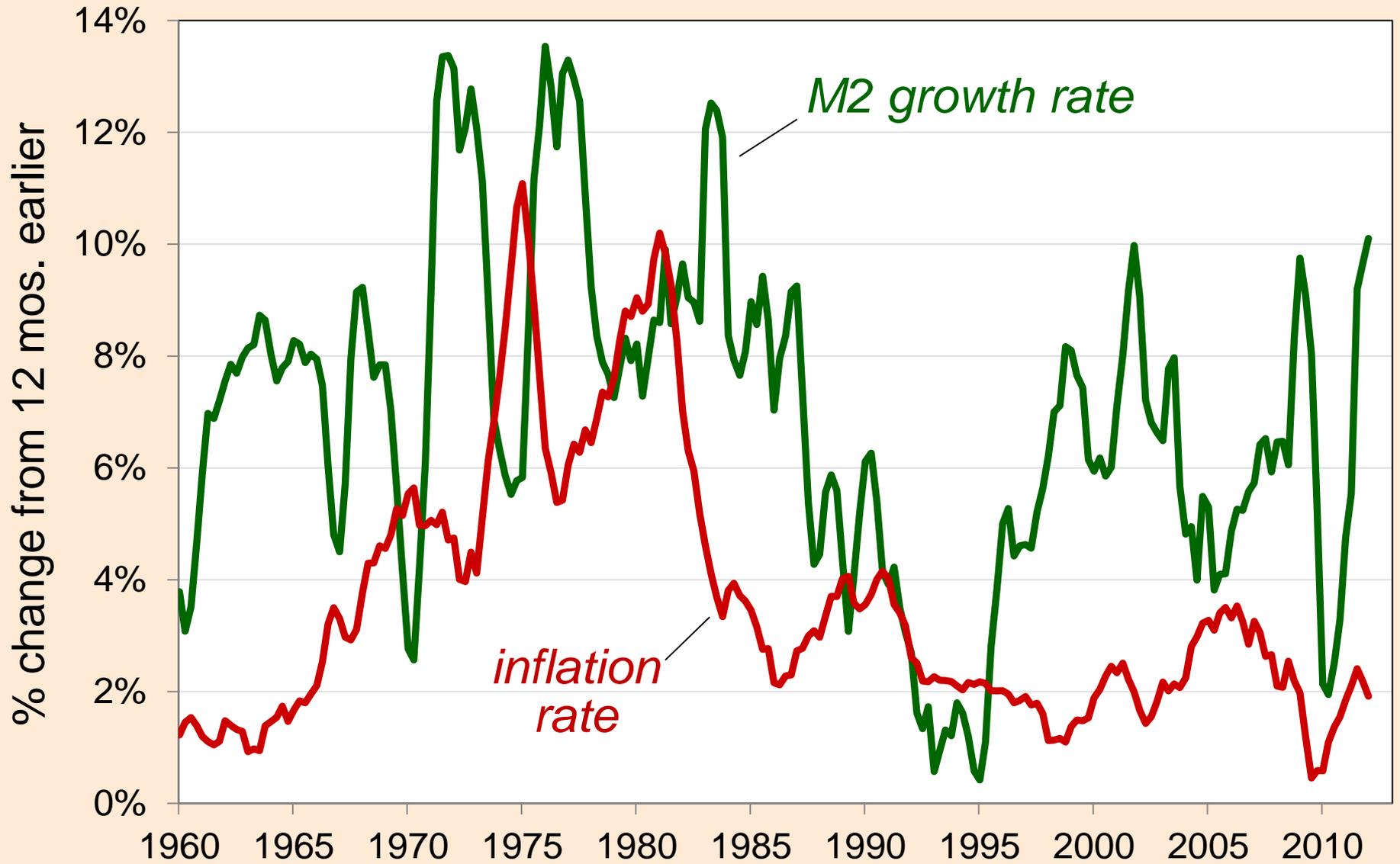
1. Countries with higher money growth rates should have higher inflation rates.
2. The long-run trend in a country's inflation rate should be similar to the long-run trend in the country's money growth rate.

Are the data consistent with these implications?

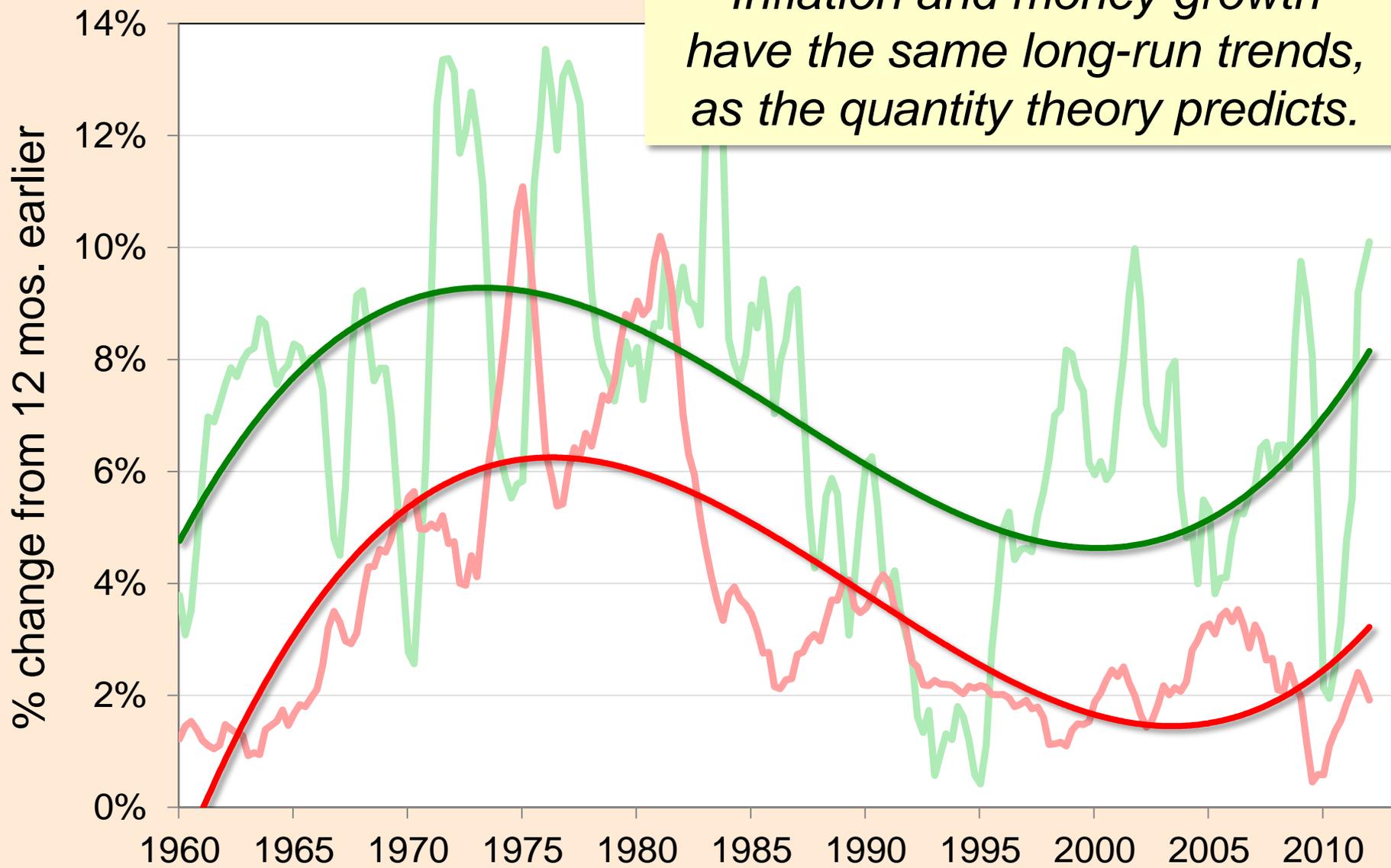
International data on inflation and money growth



U.S. inflation and money growth, 1960–2012



U.S. inflation and money growth, 1960–2012



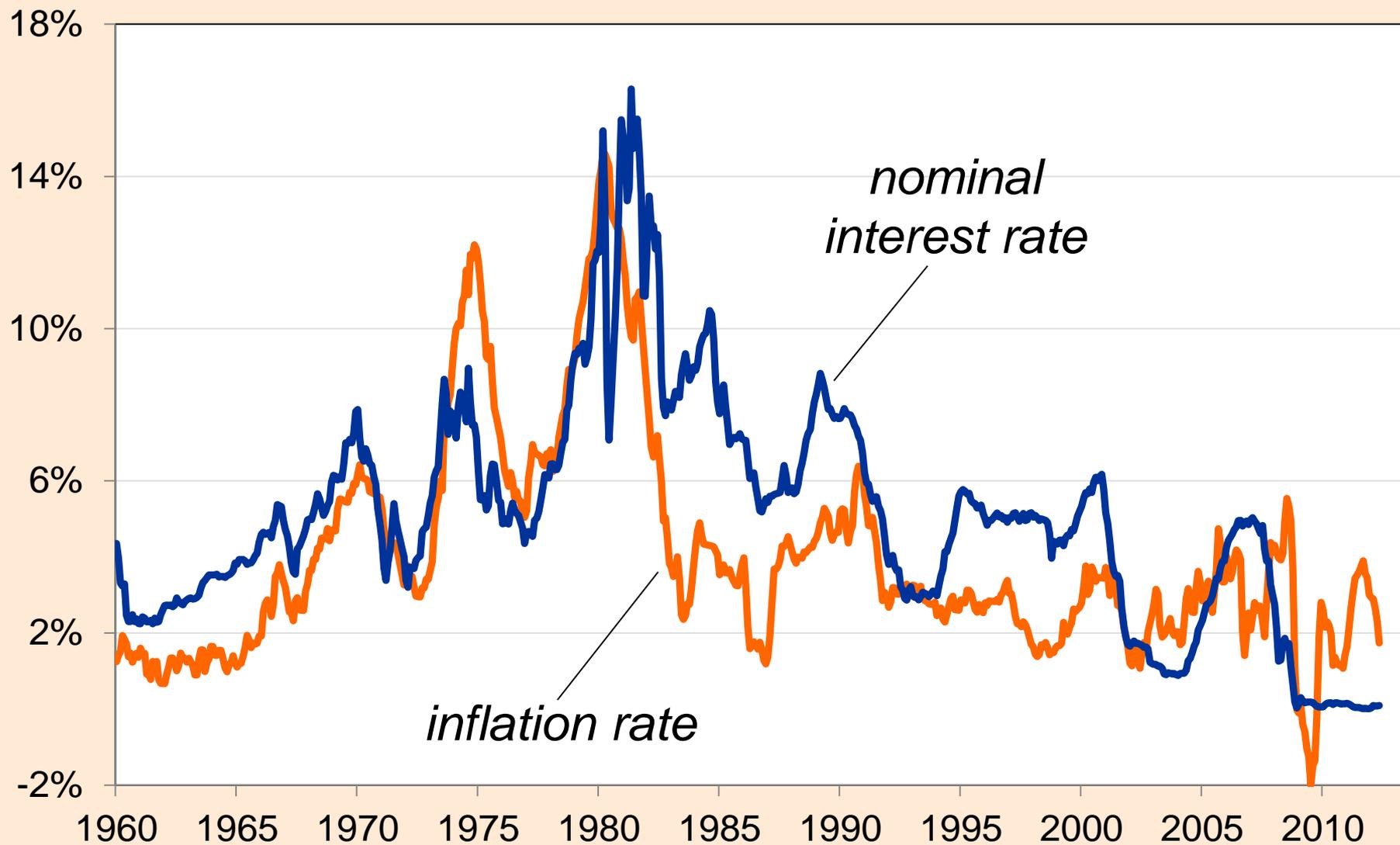
Inflation and interest rates

- Nominal interest rate, i
not adjusted for inflation
- Real interest rate, r
adjusted for inflation: $r = i - \pi$

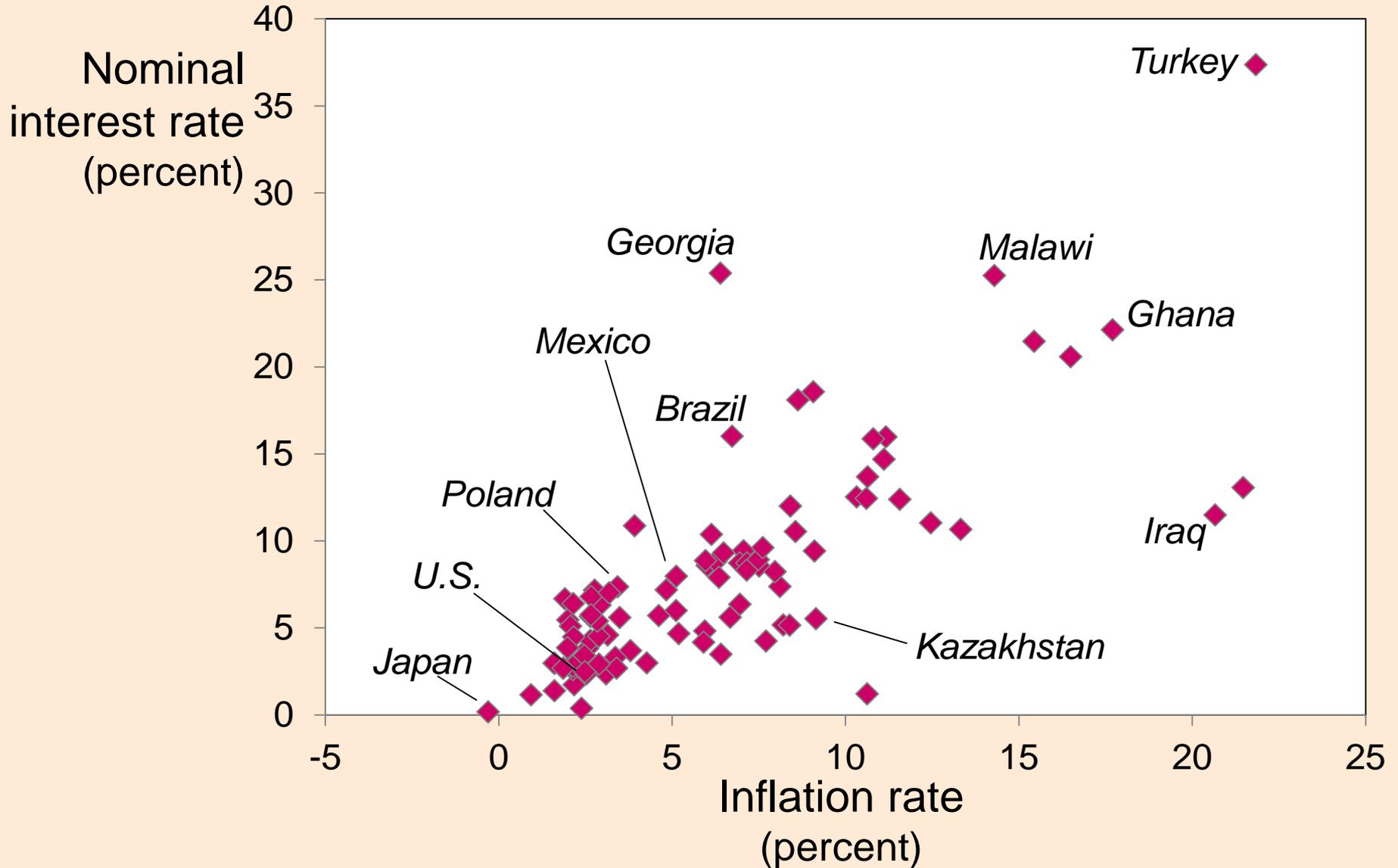
The Fisher effect

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

U.S. inflation and nominal interest rates, 1960–2012



Inflation and nominal interest rates in 96 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?

Applying the theory

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

a. First, find $\pi = 5 - 2 = 3$.

Then, find $i = r + \pi = 4 + 3 = 7$.

b. $\Delta i = 2$, same as the increase in the money growth rate.

c. If the Fed does nothing, $\Delta\pi = 1$.

To prevent inflation from rising,

Fed must reduce the money growth rate by

1 percentage point per year.

Two real interest rates

Notation:

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

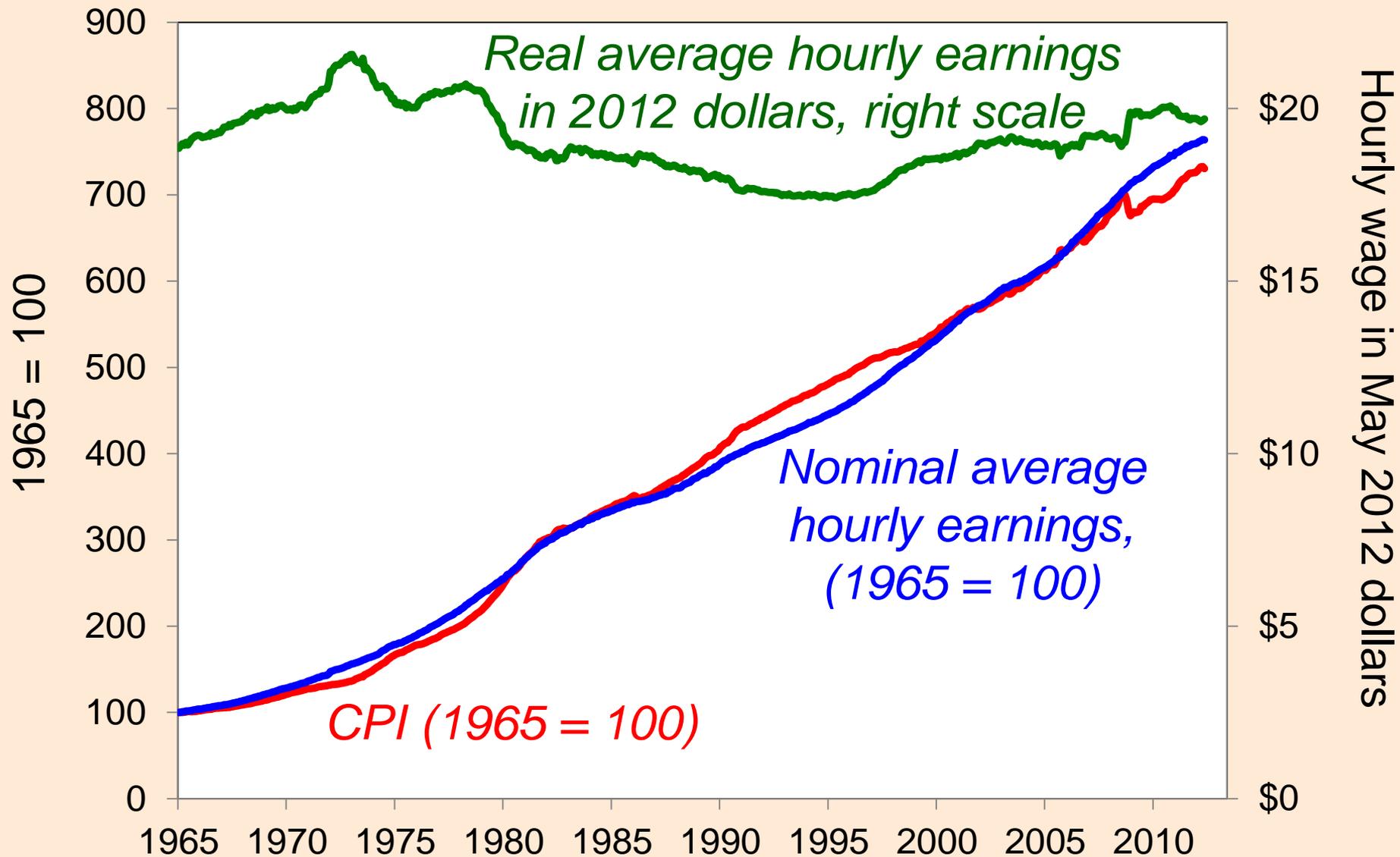
Two real interest rates:

- $i - E\pi = \text{ex ante}$ real interest rate:
the real interest rate people expect
at the time they buy a bond or take out a loan
- $i - \pi = \text{ex post}$ real interest rate:
the real interest rate actually realized

Why is inflation bad?

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

The CPI and Average Hourly Earnings, 1965–2012



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:

Shoeleather cost

- def: the costs and inconveniences of reducing money balances to avoid the inflation tax.
- $\uparrow \pi \Rightarrow \uparrow i$
 $\Rightarrow \downarrow$ real money balances
- So, same monthly spending but lower average money holdings means more frequent trips to the bank to withdraw smaller amounts of cash.

The costs of expected inflation:

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 frequently firms must change their prices and incur these costs.

The costs of expected inflation:

Relative price distortions

- Firms facing menu costs change prices infrequently.
- Different firms change their prices at different times, leading to relative price distortions...
...causing microeconomic inefficiencies in the allocation of resources.

The costs of expected inflation:

Unfair tax treatment

Some taxes are not adjusted to account for inflation, such as the capital gains tax.

Example:

- Jan 1: you buy \$10,000 worth of IBM stock
- Dec 31: you sell the stock for \$11,000, so your nominal capital gain is \$1,000 (10%).
- Suppose $\pi = 10\%$ during the year. Your real capital gain is \$0.
- But the govt requires you to pay taxes on your \$1,000 nominal gain!!

The costs of expected inflation:

General inconvenience

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

Additional cost of *unexpected* inflation: Arbitrary redistribution of purchasing power

- Many long-term contracts not indexed, but based on $E\pi$.
- If π turns out different from $E\pi$, then some gain at others' expense.
- Example: borrowers & lenders
 - If $\pi > E\pi$, then purchasing power is transferred from lenders to borrowers.
 - If $\pi < E\pi$, then purchasing power is transferred from borrowers to lenders.

Additional cost of high inflation: Increased uncertainty

- When inflation is high, it's more variable and unpredictable: π is different from $E\pi$ more often, and the differences tend to be larger
- So, arbitrary redistributions of wealth more likely.
- This creates higher uncertainty, making risk-averse people worse off.

One *benefit* of inflation

- Nominal wages are rarely reduced. This hinders labor market clearing.
- Inflation allows the real wages to reach equilibrium levels without nominal wage cuts.
- Therefore, moderate inflation improves the functioning of labor markets.

The Classical Dichotomy

- ***Classical dichotomy:*** the separation of real and nominal variables in the classical model, which implies nominal variables do not affect real variables.
- ***Neutrality of money:*** Changes in the money supply do not affect real variables. In the real world, money is approximately neutral in the long run.