
Flexible Price Long Run Macro

Wednesday; October 12, 2005

Announcements

- Midterm out during section
 - Thursday's Section: Solving the Midterm
 - Q will be handling all sections
 - Outline: Long Run, Flexible Prices
 - Investment and Savings and the determination of Interest Rates
 - Money—an introduction
 - Fisher Effect
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Digression: mastering models

To learn a model well, be sure to know:

1. Which of its variables are endogenous and which are exogenous.
 2. For each curve in the diagram, know
 - a. definition
 - b. intuition for slope
 - c. all the things that can shift the curve
 3. Use the model to analyze the effects of each item.
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Demand for goods & services

Components of aggregate demand:

C = consumer demand for g & s

I = demand for investment goods

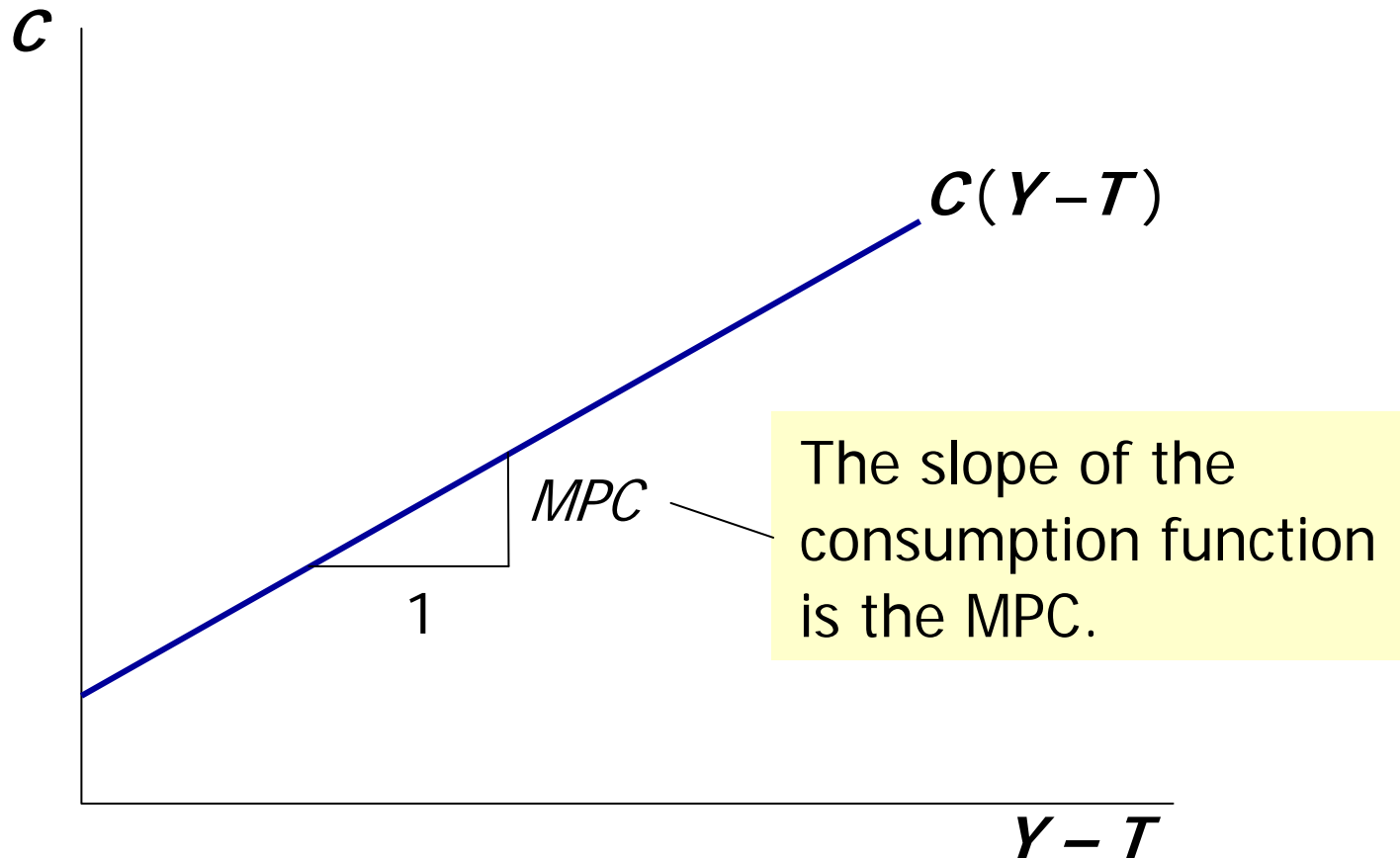
G = government demand for g & s

(if closed economy: no **NX**)

Consumption, C

- def: **disposable income** is total income minus total taxes: $Y - T$
- Consumption function: $C = C(Y - T)$
Shows that $\uparrow(Y - T) \Rightarrow \uparrow C$
- def: The **marginal propensity to consume** is the increase in C caused by a one-unit increase in disposable income.

The consumption function

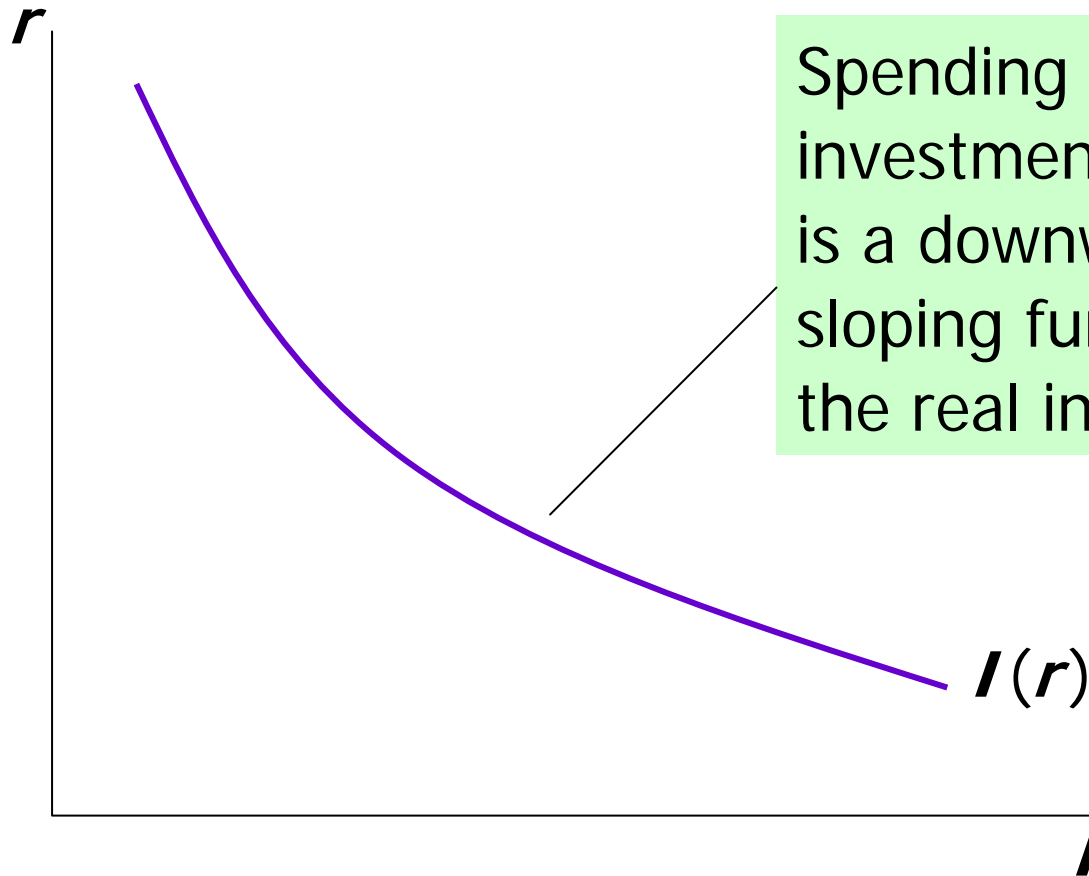


Investment, I

- The investment function is $I = I(r)$, where r denotes the **real interest rate**, the nominal interest rate corrected for inflation.
- The real interest rate is
 - the cost of borrowing
 - the opportunity cost of using one's own fundsto finance investment spending.

So, $\uparrow r \Rightarrow \downarrow I$

The investment function



Spending on investment goods is a downward-sloping function of the real interest rate

Government spending, G

- G includes government spending on goods and services.
- G excludes *transfer payments*
- Assume government spending and total taxes are exogenous:

$$G = \bar{G} \quad \text{and} \quad T = \bar{T}$$

The market for goods & services

- Agg. demand: $C(\bar{Y} - \bar{T}) + I(r) + \bar{G}$
- Agg. supply: $\bar{Y} = F(\bar{K}, \bar{L})$
- Equilibrium: $\bar{Y} = C(\bar{Y} - \bar{T}) + I(r) + \bar{G}$

*The real interest rate adjusts
to equate demand with supply.*

Guideline

- So that's the big picture...
- Now, we focus on one of these variables:
INVESTMENT



Supply of funds: Saving

The supply of loanable funds comes from saving:

- Households use their saving to make bank deposits, purchase bonds and other assets. These funds become available to firms to borrow to finance investment spending.
 - The government may also contribute to saving if it does not spend all of the tax revenue it receives.
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Types of saving

■ **private saving** = $(Y - T) - C$

■ **public saving** = $T - G$

■ **national saving, S**

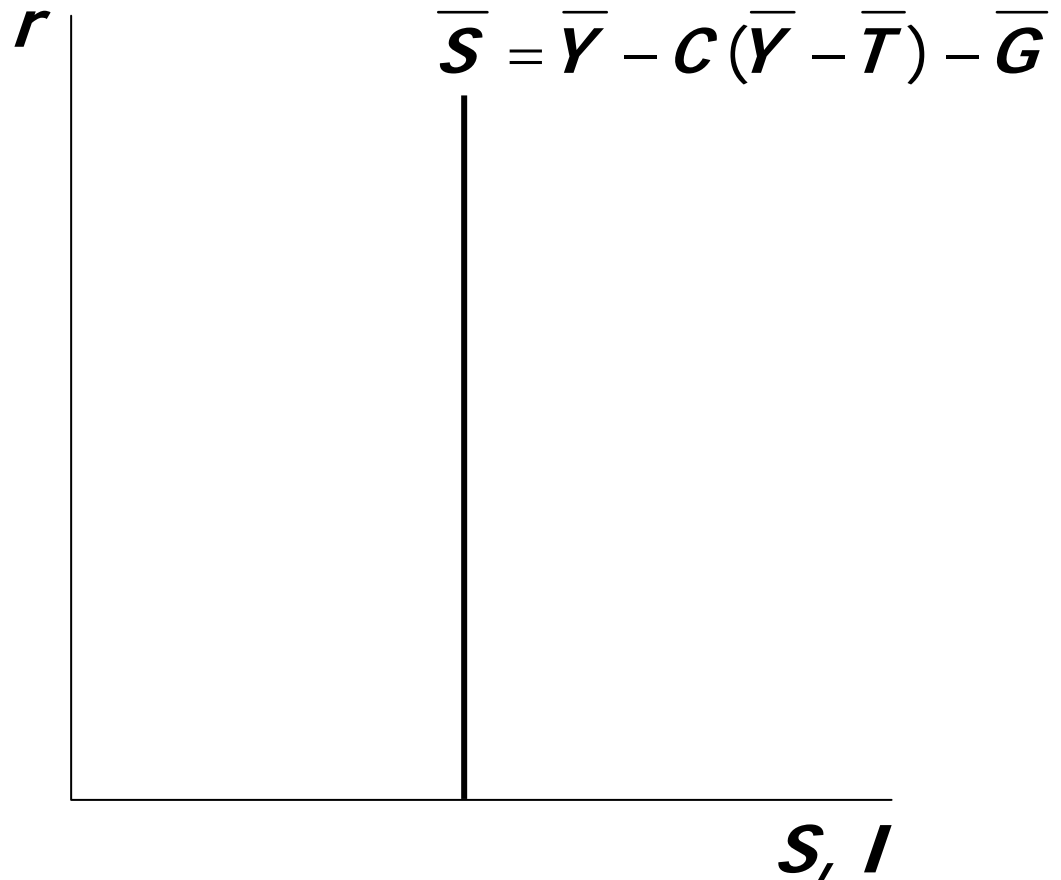
= private saving + public saving

= $(Y - T) - C + T - G$

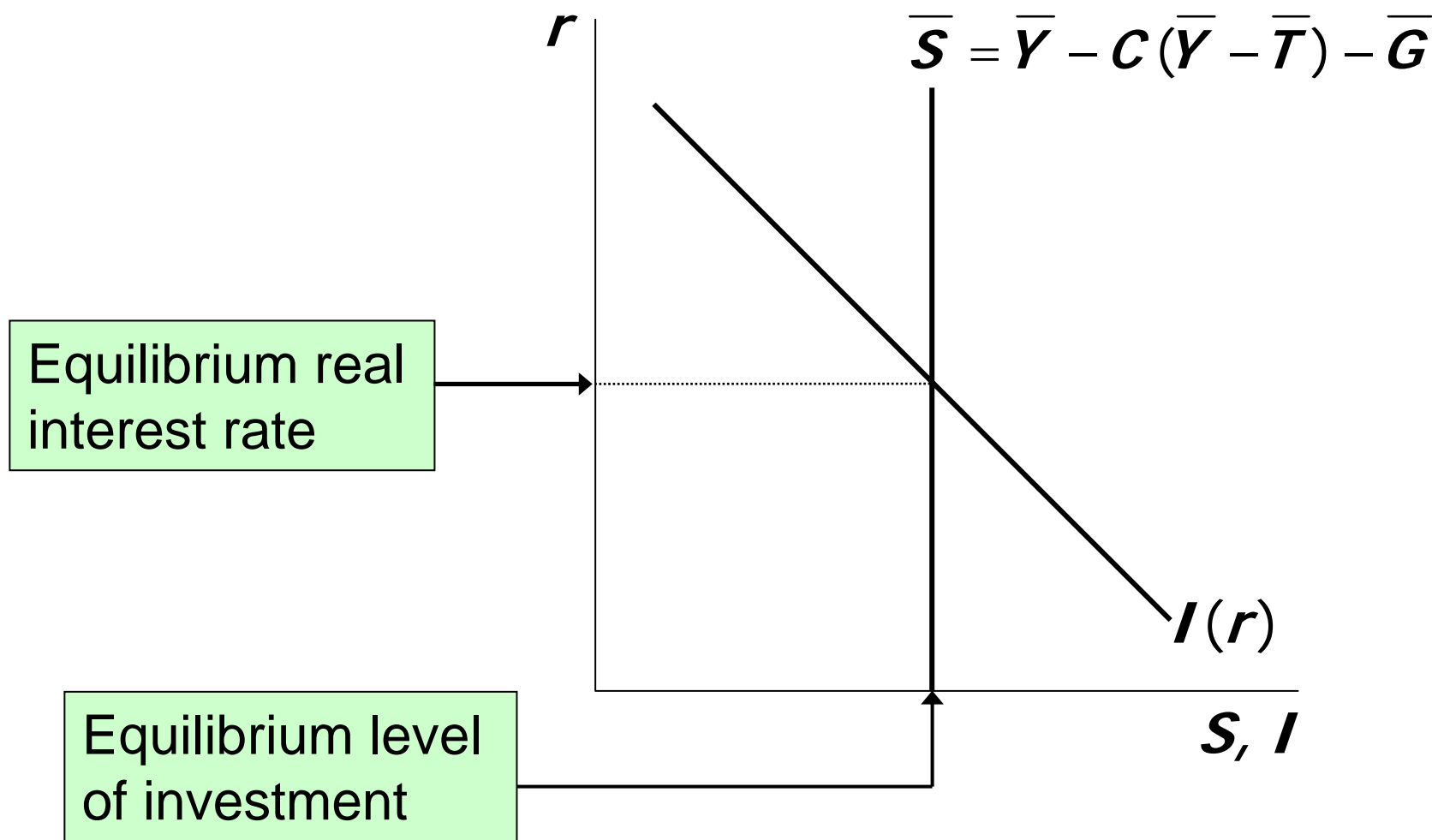
= $Y - C - G$

Loanable funds supply curve

National saving does not depend on r , so the supply curve is vertical.



Loanable funds market equilibrium



Mastering the loanable funds model

1. Things that shift the saving curve

- public saving
 - fiscal policy: changes in **G** or **T**
 - private saving
 - preferences
 - tax laws that affect saving
 - Since Savings is just a level, pretty much anything that changes C or G in the closed economy version
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CASE STUDY

The Reagan Deficits

- Reagan policies during early 1980s:
 - ◆ increases in defense spending: $\Delta \mathbf{G} > 0$
 - ◆ big tax cuts: $\Delta \mathbf{T} < 0$
- According to our model, both policies reduce national saving:

$$\bar{\mathbf{S}} = \bar{\mathbf{Y}} - \mathbf{C}(\bar{\mathbf{Y}} - \bar{\mathbf{T}}) - \bar{\mathbf{G}}$$

$$\uparrow \bar{\mathbf{G}} \Rightarrow \downarrow \bar{\mathbf{S}}$$

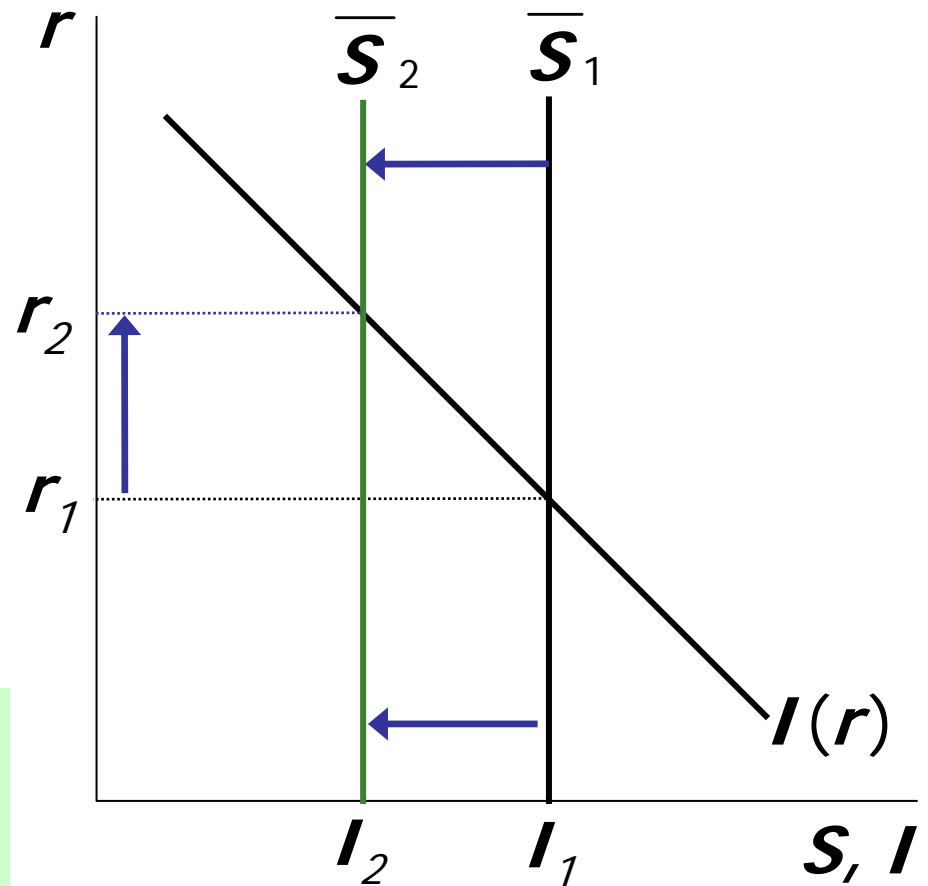
$$\downarrow \bar{\mathbf{T}} \Rightarrow \uparrow \mathbf{C} \Rightarrow \downarrow \bar{\mathbf{S}}$$

1. The Reagan deficits, cont.

1. The increase in the deficit reduces saving...

2. ...which causes the real interest rate to rise...

3. ...which reduces the level of investment.



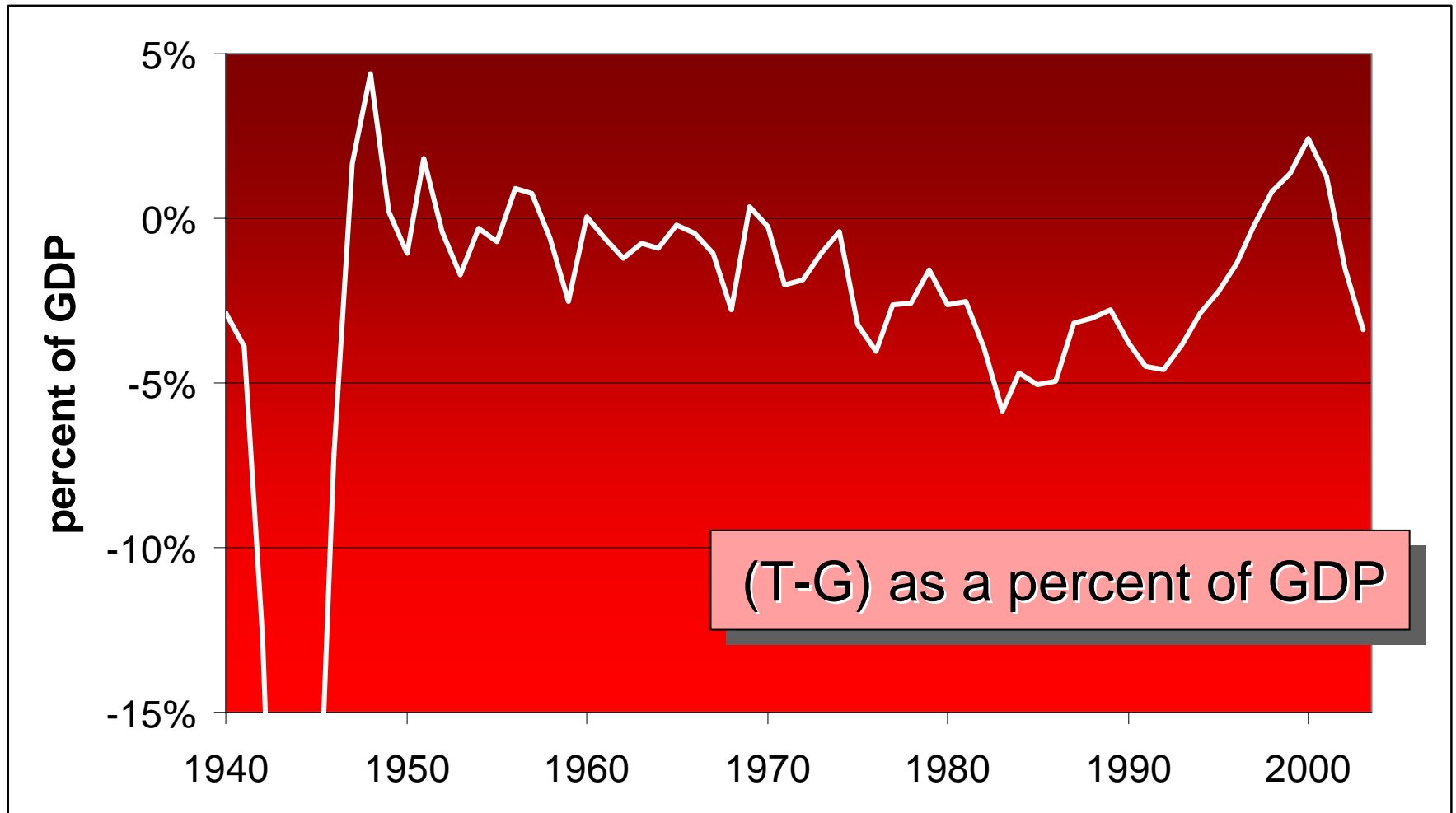
Are the data consistent with these results?

variable	1970s	1980s
<i>T – G</i>	–2.2	–3.9
<i>S</i>	19.6	17.4
<i>r</i>	1.1	6.3
<i>I</i>	19.9	19.4

T–G, S, and I are expressed as a percent of GDP

All figures are averages over the decade shown.

The U.S. Federal Government Budget



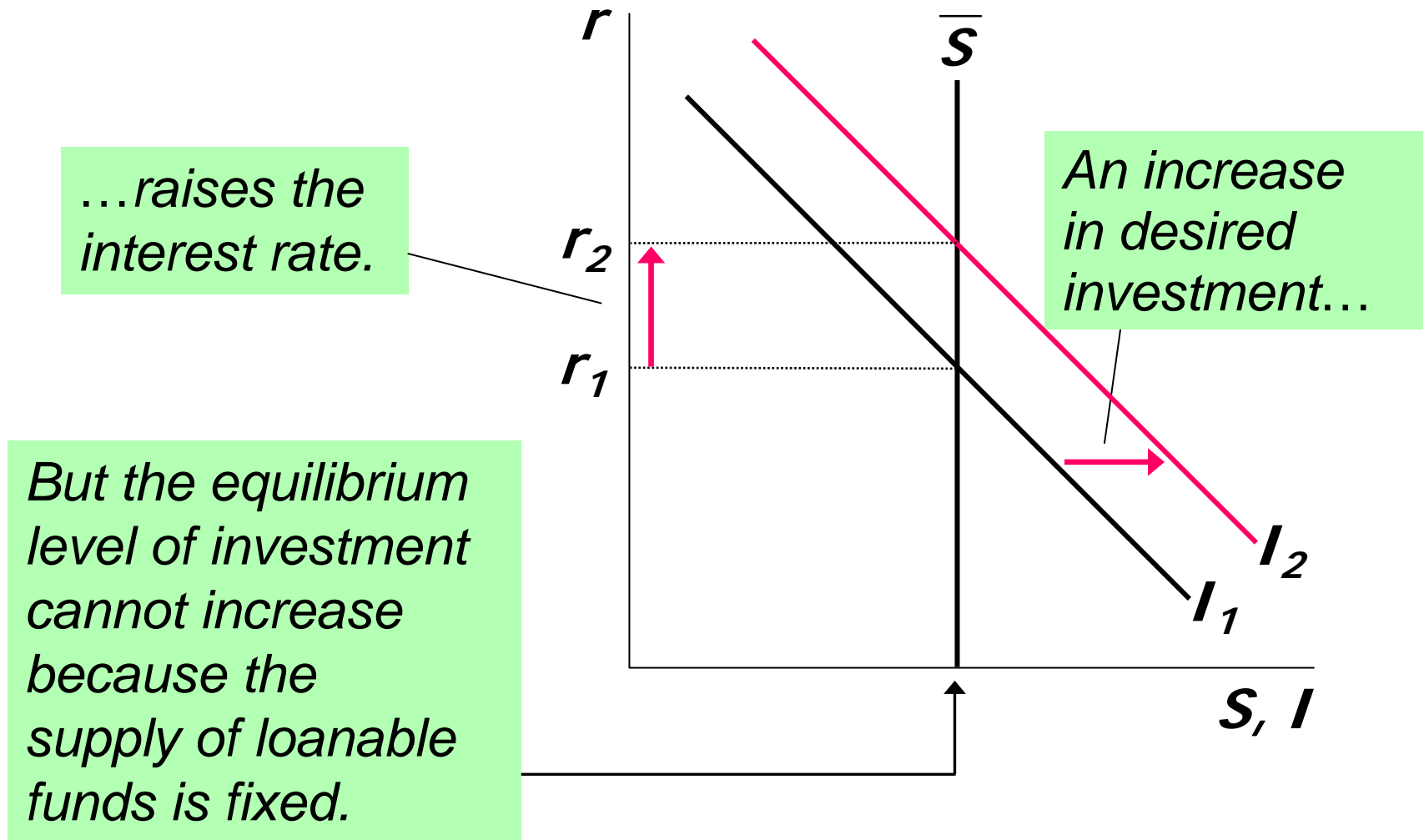
Mastering the loanable funds model

2. Things that shift the investment curve

- certain technological innovations
 - to take advantage of the innovation, firms must buy new investment goods
- tax laws that affect investment
 - investment tax credit



An increase in investment demand

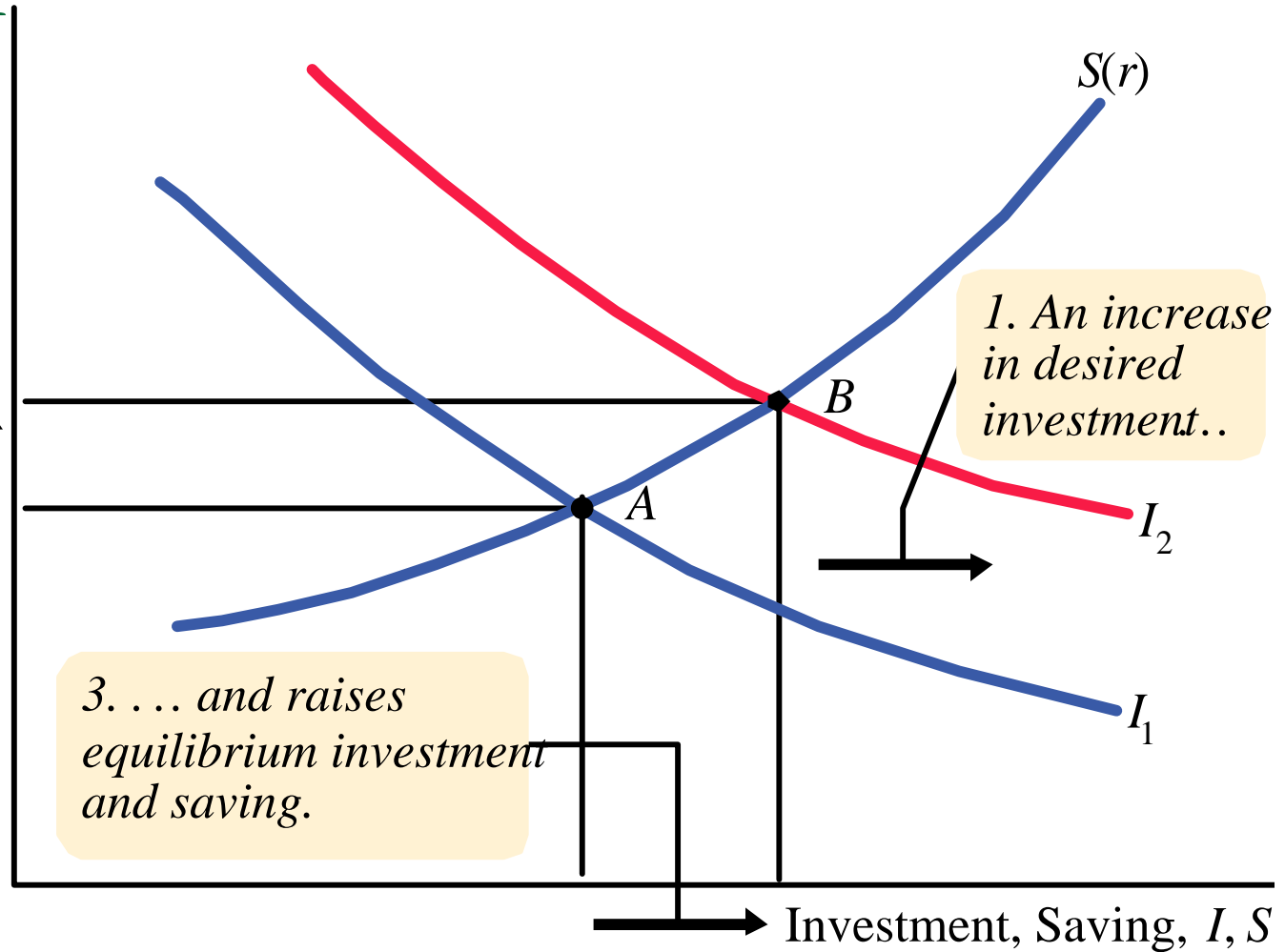


Saving and the interest rate

- Why might saving depend on r ?
 - How would the results of an increase in investment demand be different?
 - Would r rise as much?
 - Would the equilibrium value of I change?
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An increase in investment demand when saving depends on the interest rate

Real interest rate, r



Money...

Most of this should be a review of an introductory principles course

The connection between money and prices

- Inflation rate = the percentage increase in the average level of prices.
 - price = amount of money required to buy a good.
 - Because prices are defined in terms of money, we need to consider the nature of money, the supply of money, and how it is controlled.
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Money: functions

1. **medium of exchange**

we use it to buy stuff (liquidity)

2. **store of value**

transfers purchasing power from the present to the future (inherent value)

3. **unit of account**

the common unit by which everyone measures prices and values (yardstick)

The money supply & monetary policy

- The **money supply** is the quantity of money available in the economy.
 - **Monetary policy** is the control over the money supply.
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The central bank

- Monetary policy is conducted by a country's **central bank**.
- In the U.S., the central bank is called the **Federal Reserve** (“the **Fed**”).



*The Federal Reserve Building
Washington, DC*

Money supply measures, May 2004

Symbol	Assets included	Amount (billions)
C	Currency	\$671.7
M1	C + demand deposits, travelers' checks, other checkable deposits	1319.2
M2	M1 + small time deposits, savings deposits, money market mutual funds, money market deposit accounts	6268.9
M3	M2 + large time deposits, repurchase agreements, institutional money market mutual fund balances	9193.8

The quantity equation!!!

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

It is an *identity*

$$MV=PY$$

- M = Money Supply (amount of money in the economy)
 - V = Velocity of Money (rate at which money changes hands)
 - P = Price Level (flexible)
 - Y = Output (determined by Solow Model)
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The Quantity Theory of Money, *cont.*

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

Usual Assumptions

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

- The growth rate of a product equals the sum of the growth rates. (this was a midterm question)

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

$$\hat{M} + \hat{V} = \hat{P} + \hat{Y}$$

$$\hat{M} + 0 = \pi + \hat{Y}$$

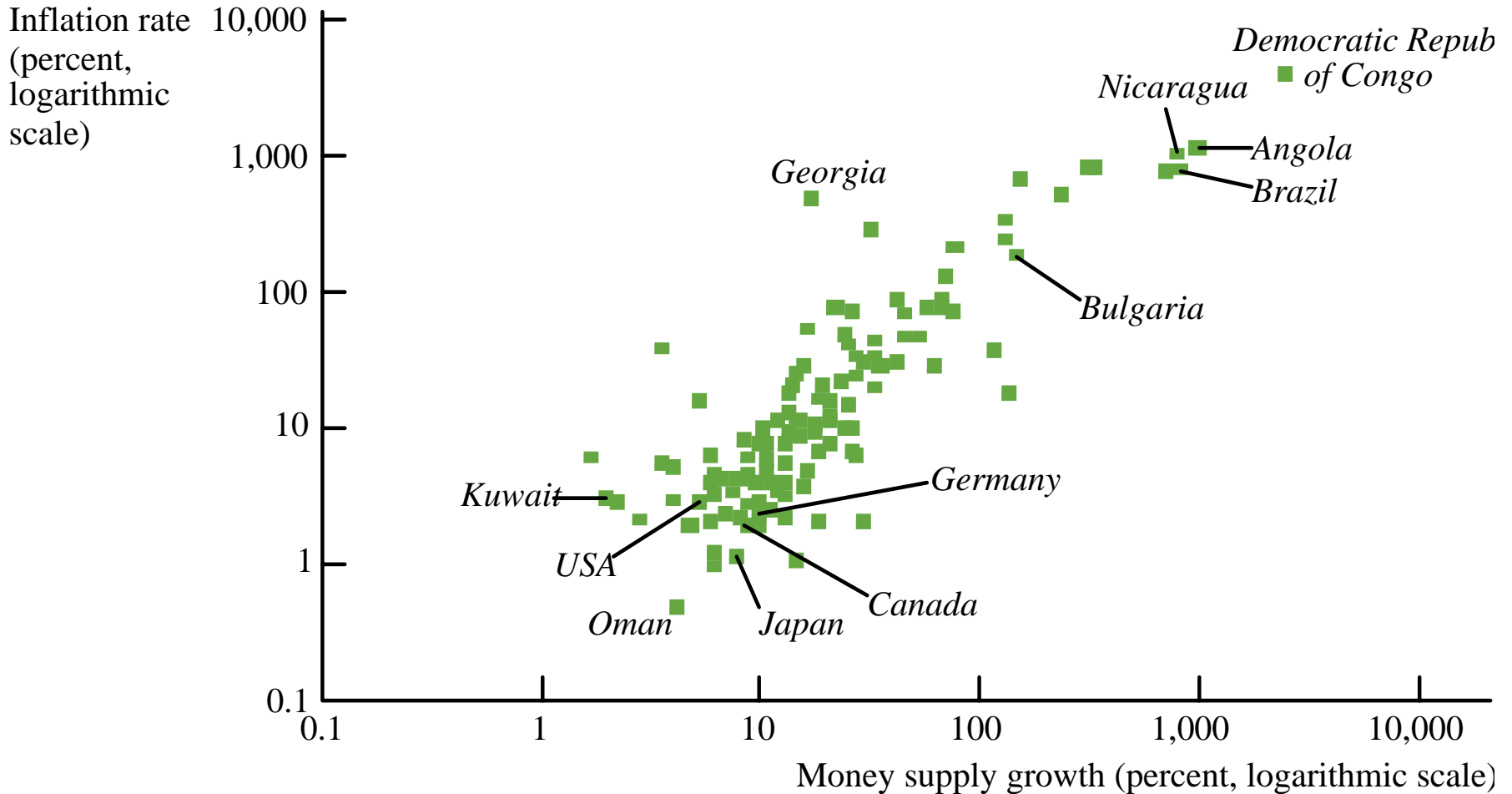
The Quantity Theory of Money, *cont.*

$$\pi = \hat{M} - \hat{Y}$$

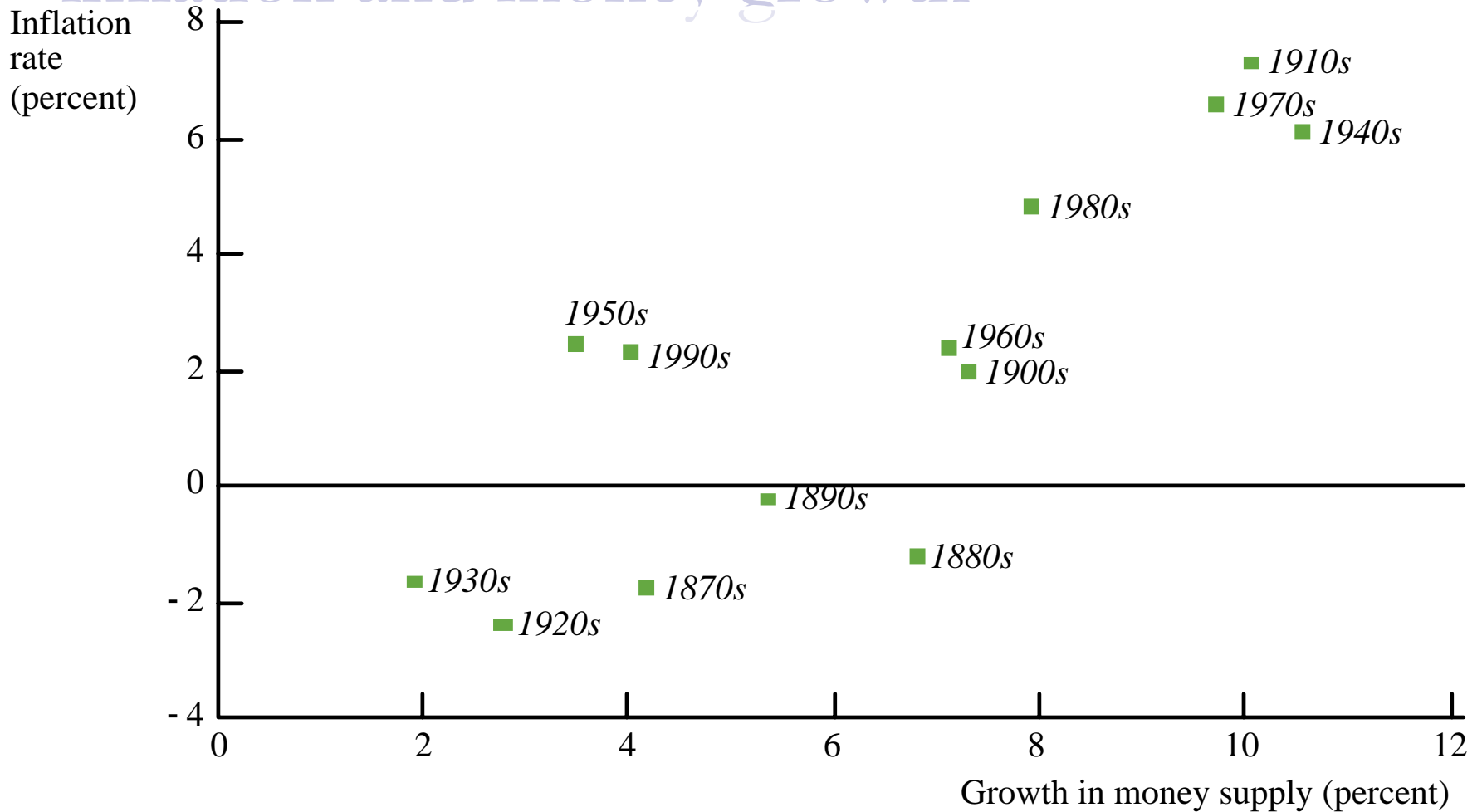
- Normal economic growth requires a certain amount of money supply growth to facilitate the growth in transactions.
- Money growth in excess of this amount leads to inflation.

*Hence, the Quantity Theory of Money predicts a **one-for-one relation** between **changes in the money growth rate** and **changes in the inflation rate**.*

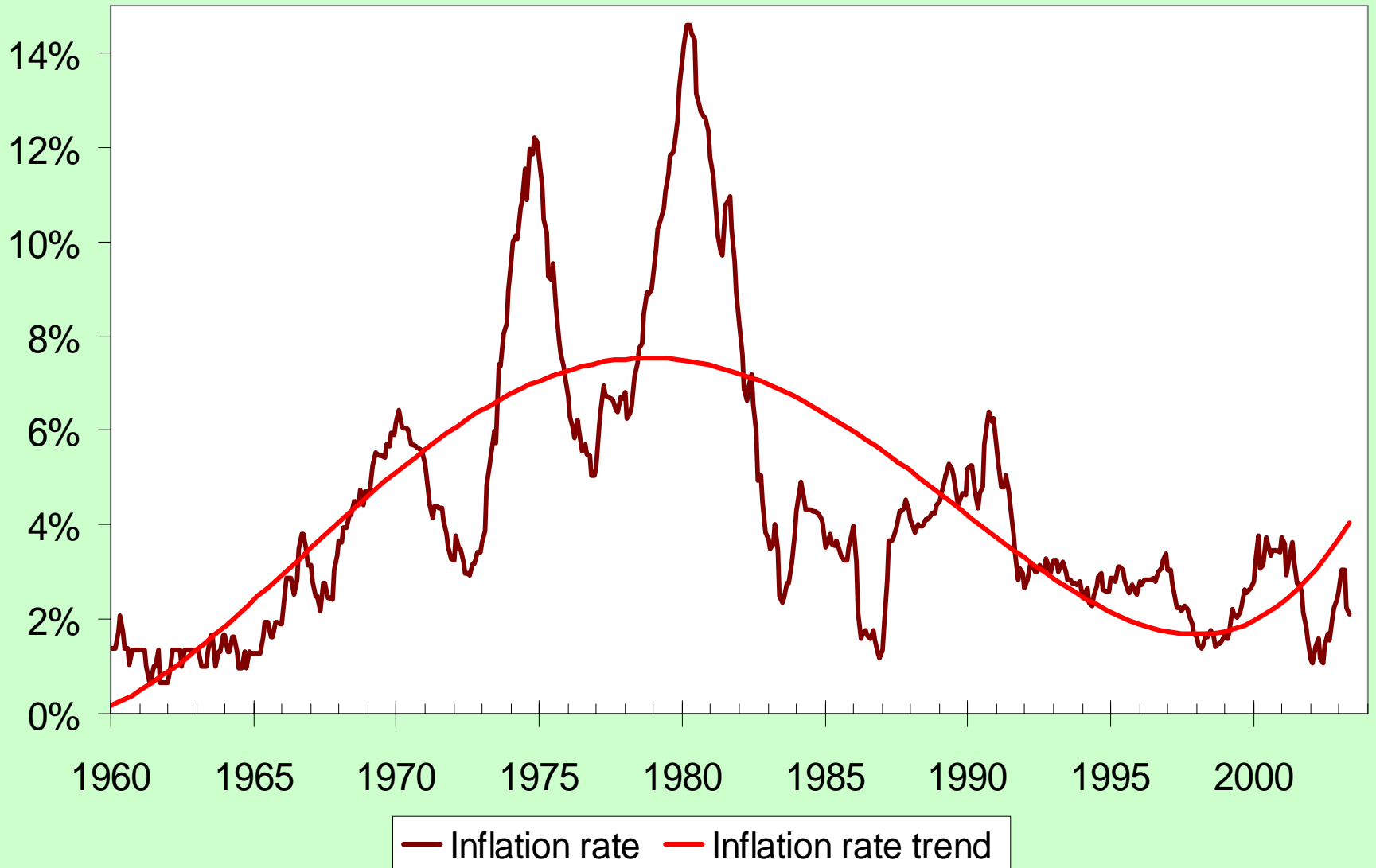
International data on inflation and money growth



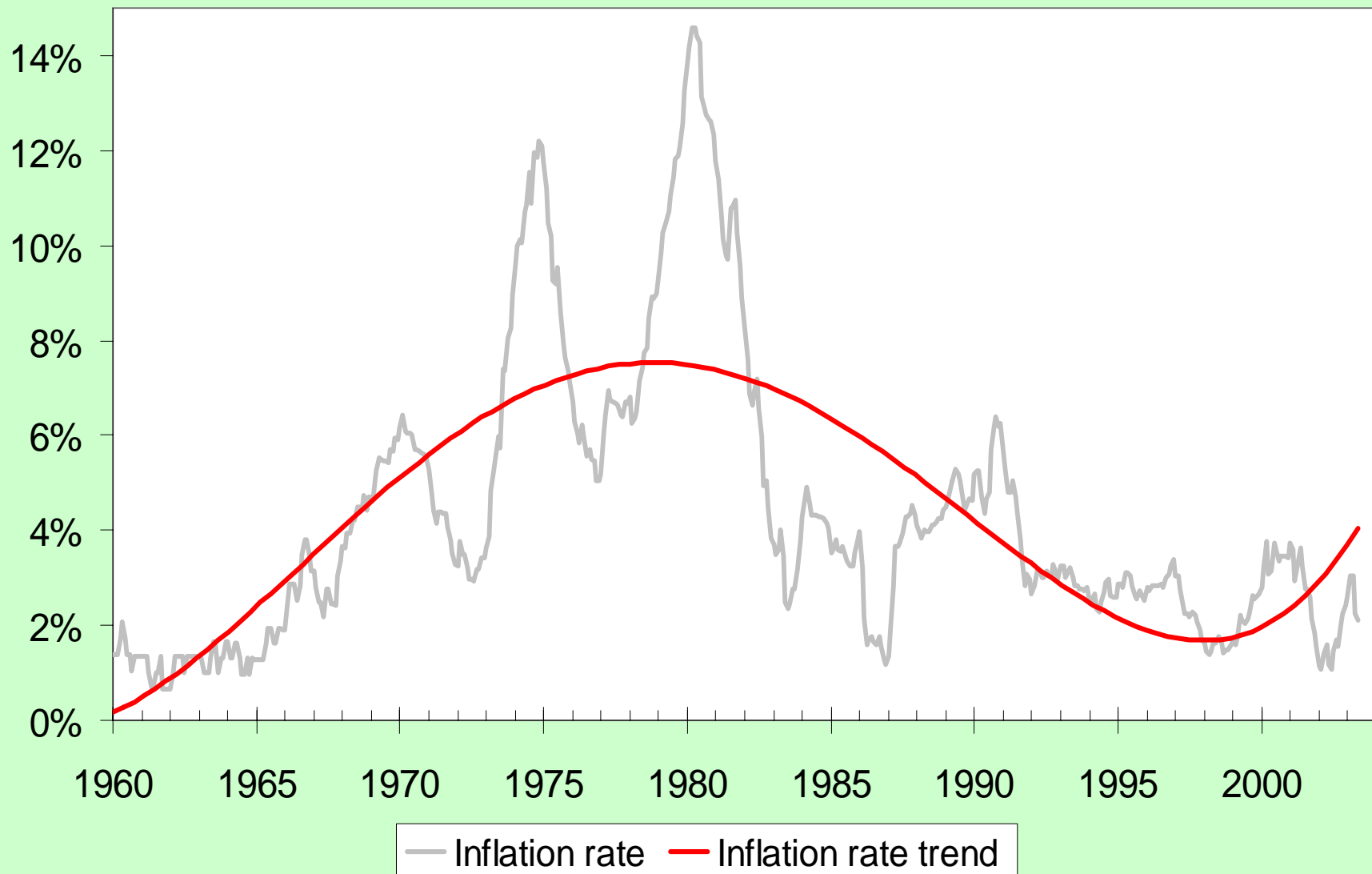
U.S. data on inflation and money growth



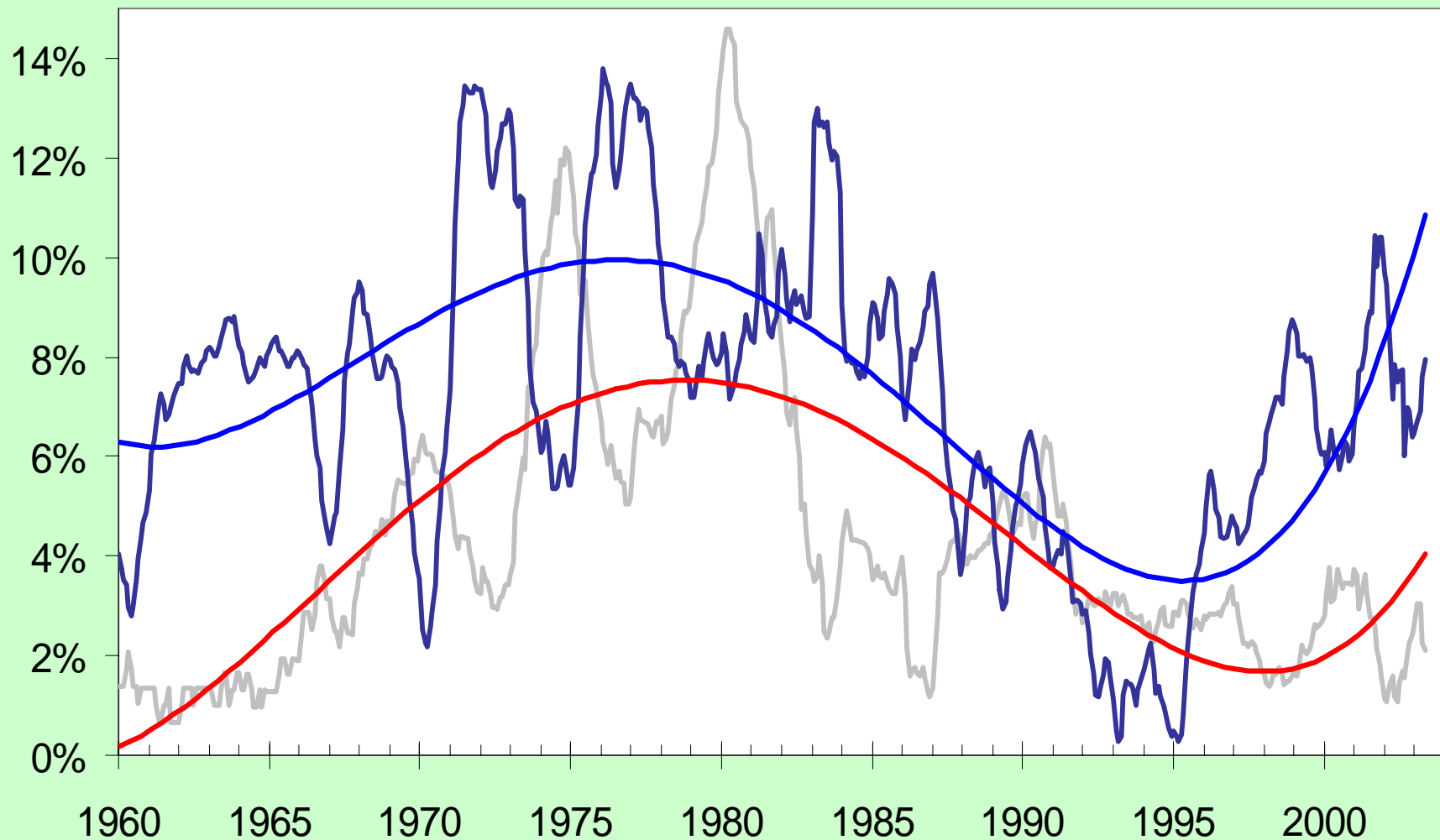
U.S. Inflation & Money Growth, 1960-2003



U.S. Inflation & Money Growth, 1960-2003

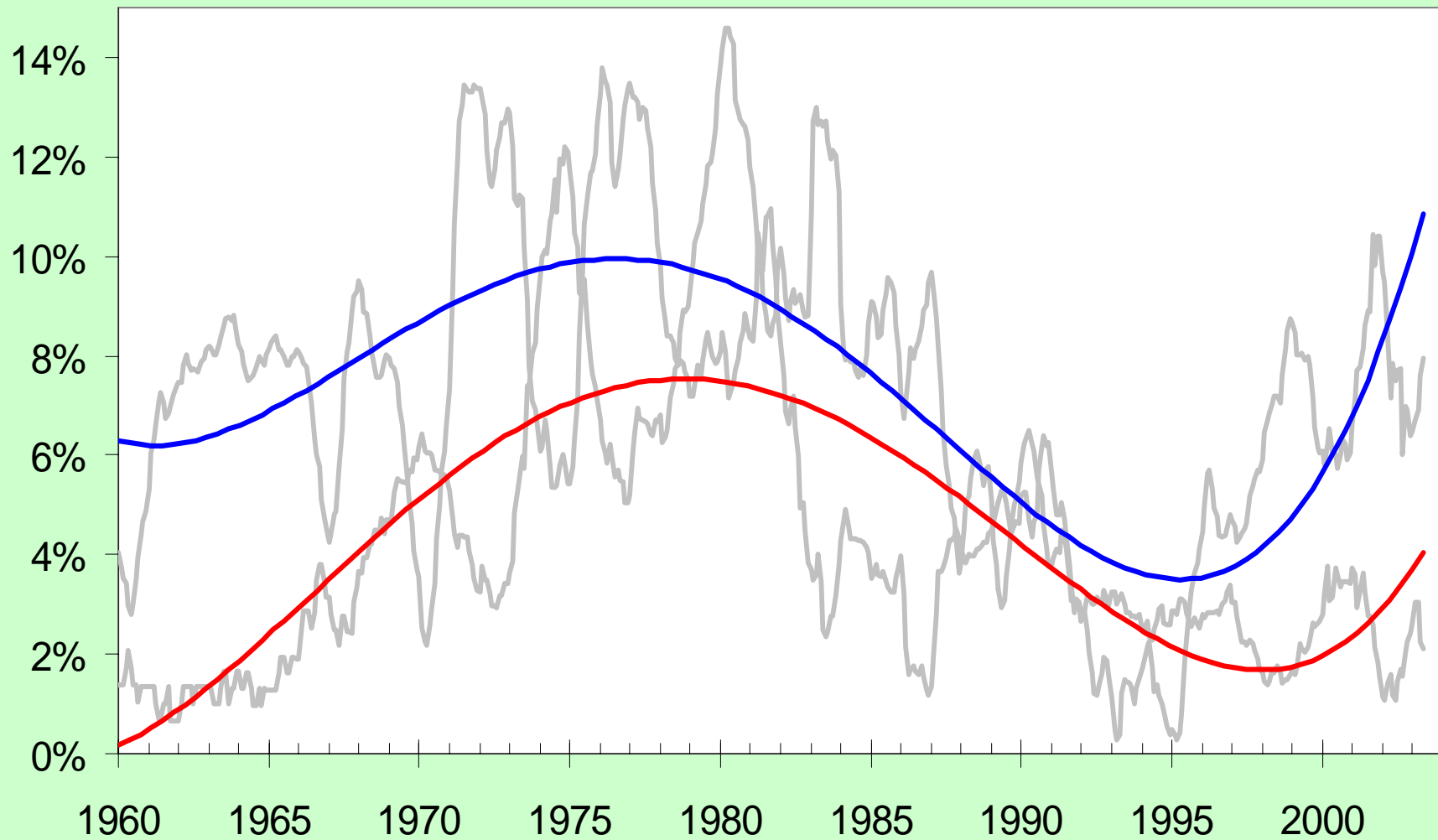


U.S. Inflation & Money Growth, 1960-2003



— Inflation rate — M2 growth rate — Inflation rate trend — M2 growth rate trend

U.S. Inflation & Money Growth, 1960-2003



— Inflation rate — M2 growth rate — Inflation rate trend — M2 growth rate trend

Inflation and interest rates

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

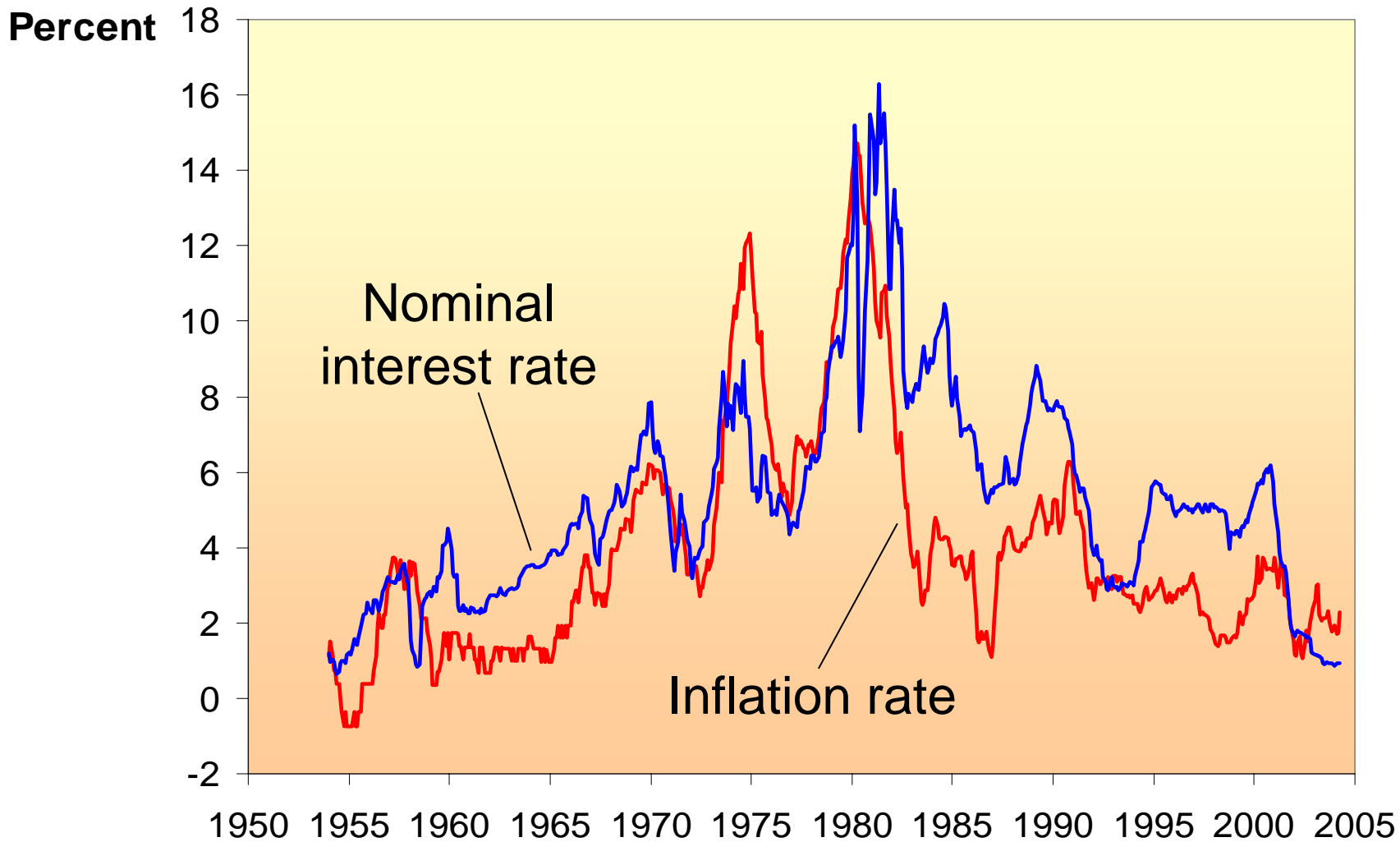
$$r = i - \pi$$



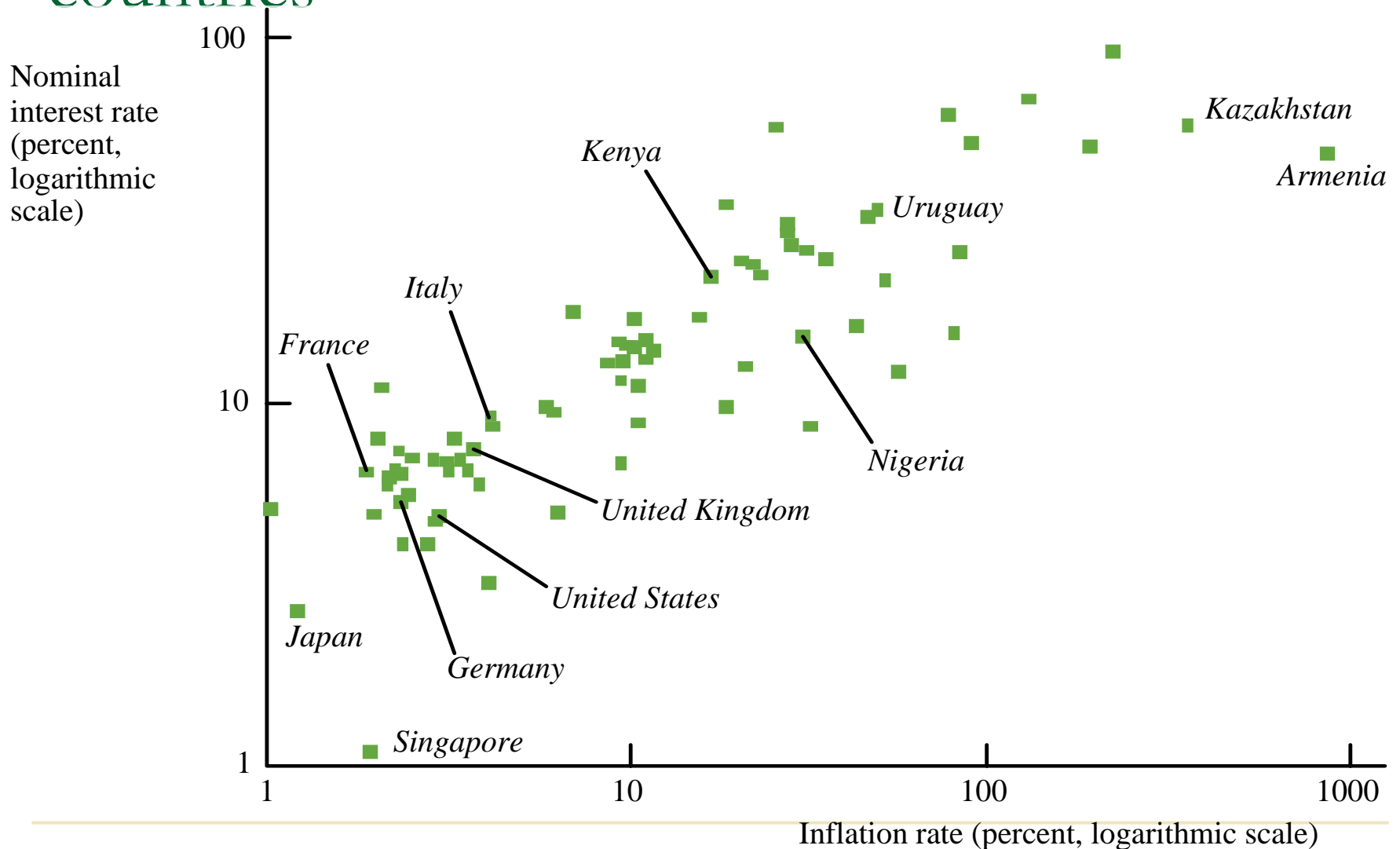
The Fisher Effect

- 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**.
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U.S. inflation and nominal interest rates, since 1954



Inflation and nominal interest rates across countries



Summary (1 of 4)

1. The economy's output is used for
 - consumption
(which depends on disposable income)
 - investment
(depends on the real interest rate)
 - government spending
(exogenous)
 2. The real interest rate adjusts to equate the demand for and supply of
 - goods and services
 - loanable funds
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Summary (2 of 4)

3. A decrease in national saving causes the interest rate to rise and investment to fall.
 4. An increase in investment demand causes the interest rate to rise, but does not affect the equilibrium level of investment if the supply of loanable funds is fixed.
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Summary (3 of 4)

5. Money

- the stock of assets used for transactions
- serves as a medium of exchange, store of value, and unit of account.
- Commodity money has intrinsic value, fiat money does not.
- Central bank controls money supply.

6. Quantity theory of money

- assumption: velocity is stable
 - conclusion: the money growth rate determines the inflation rate.
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Summary (4 of 4)

7. Nominal interest rate

- equals real interest rate + inflation rate.
 - Fisher effect: nominal interest rate moves one-for-one w/ expected inflation.
 - is the opp. cost of holding money
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