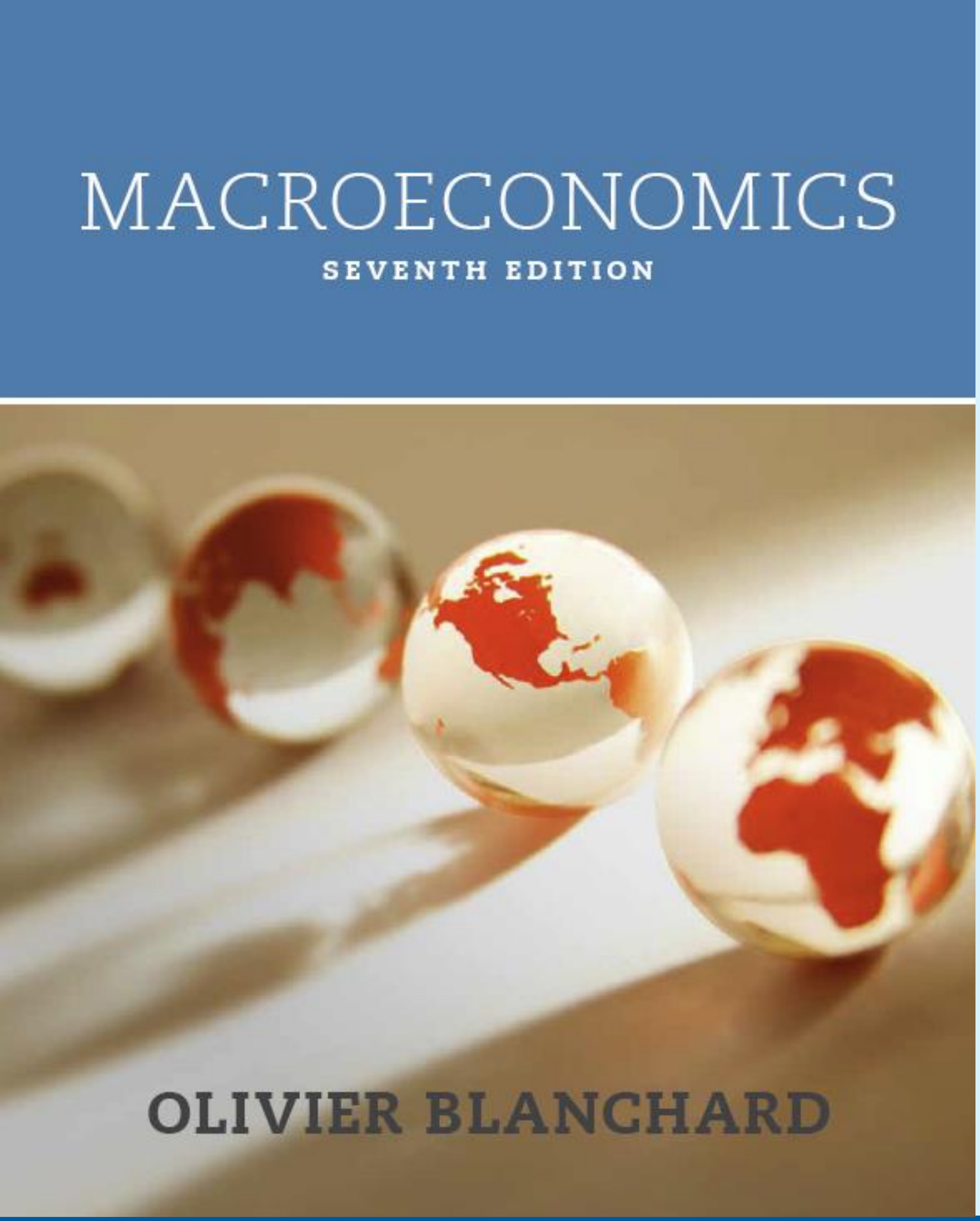
Financial Markets and Expectations

GRADUATE MACRO – LAB SESSION 10

ETTORE GALLO

Class Outline

14-1	Expected Present Discounted Values
14-2	Bond Prices and Bond Yields
14-3	The Stock Market and Movements in Stock Prices
14-4	Risk, Bubbles, Fads, and Asset Prices



Financial Markets and Expectations

Chapter 14

Financial Markets and Expectations

- Our focus throughout this chapter will be on the role expectations play in the determination of asset prices, from bonds, to stocks, to houses.
- We discussed the role of expectations informally at various points in the core.
- It is not time to do it more formally.

14-1 Expected Present Discounted Values

- The **expected present discounted value** of a sequence of future payments is the value today of this expected sequence of payments.
- Expected presented discounted values are not directly observable, but must be constructed from information on the sequence of expected payments and expected interest rates.

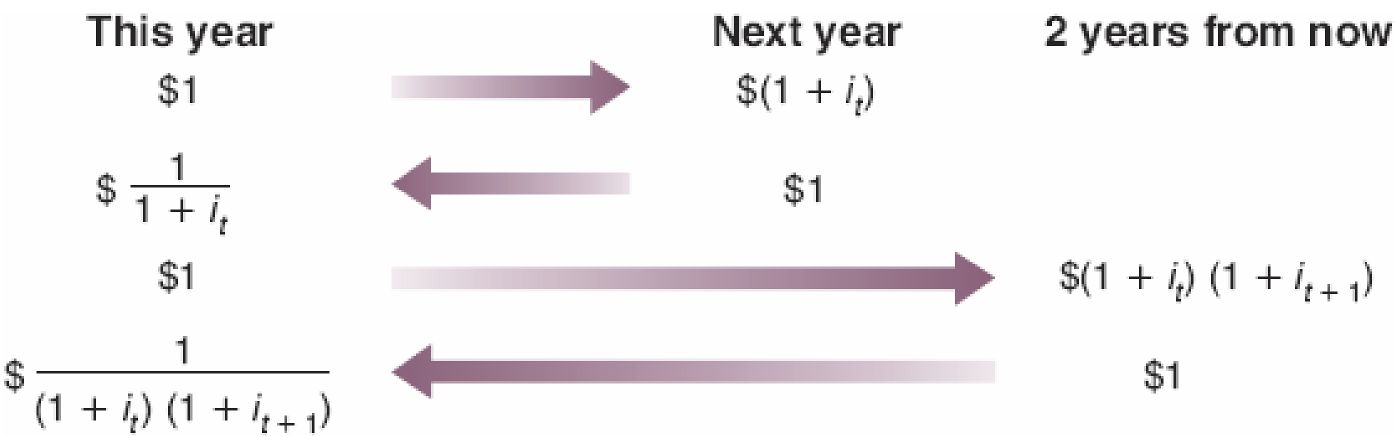
14-1 Expected Present Discounted Values

- $1/(1 + i_t)$ is the **discount factor** with the **discount rate** i_t, which is used to compute the *present discounted value* of one dollar next year.
- The higher the nominal interest rate, the lower the value today if a dollar received next year.

14-1 Expected Present Discounted Values

- Example: The value today of a dollar received two years from now.

Figure 14-1 Computing Present Discounted Values



14-1 Expected Present Discounted Values

- The **expected present discounted value** or **present value** of a payment $\$z$ and its expected payment $\$z^e$ in the future:

$$\$V_t = \$z_t + \frac{1}{(1+i_t)}\$z^e_{t+1} + \frac{1}{(1+i_t)(1+i^e_{t+1})}\$z^e_{t+2} + \cdots \qquad (14.1)$$

- For constant interest rates i:

$$\$V_t = \$z_t + \frac{1}{(1+i)}\$z^e_{t+1} + \frac{1}{(1+i)^2}\$z^e_{t+2} + \cdots \qquad (14.2)$$

- For constant interest rates and constant payments $\$z$:

$$\$V_t = \$z\left[1 + \frac{1}{(1+i)} + \cdots + \frac{1}{(1+i)^{n-1}}\right]$$

14-1 Expected Present Discounted Values

- For constant interest rates and payment forever :

$$\$V_t = \frac{\$z}{i}$$

- If $i = 0$, then the present discounted value of a sequence of expected payments is just the sum of those expected payments.
- The present value of a sequence of real payments (discounted by real interest rates r_t):

$$V_t = z_t + \frac{1}{(1 + r_t)} z^e_{t+1} + \frac{1}{(1 + r_t)(1 + r^e_{t+1})} z^e_{t+2} + \cdots \qquad (14.3)$$

14-1 Expected Present Discounted Values

- Two ways to compute the present value of payments:
  1. The present value of the sequence of payments expressed in dollars, discounted using nominal interest rates, and then divided by the price level today.
  2. The present value of the sequence of payments expressed in real terms, discounted using real interest rates.

Exercise 1, Ch. 14

1. Using the information in this chapter, label each of the following statements true, false, or uncertain. Explain briefly.

a. As long as inflation remains roughly constant, the movements in the real interest rate are roughly equal to the movements in the nominal interest rate.

b. If inflation turns out to be higher than expected, the realized real cost of borrowing turns out to be lower than the real interest rate.

c. Looking across countries, the real interest rate is likely to vary much less than the nominal interest rate.

d. The real interest rate is equal to the nominal interest rate divided by the price level.

e. In the medium run, the real interest rate is not affected by money growth.

f. The Fisher effect states that in the medium run, the nominal interest rate is not affected by money growth.

g. The experience of Latin American countries in the early 1990s supports the Fisher hypothesis.

h. The value today of a nominal payment in the future cannot be greater than the nominal payment itself.

i. The real value today of a real payment in the future cannot be greater than the real payment itself.

Solution

1.
    a. True.
    b. True.
    c. True.
    d. False.
    e. True.
    f. False.
    g. True.
    h. True. The nominal interest rate is always positive.
    i. False. The real interest rate can be negative.

14-2 Bond Prices and Bond Yields

- Bonds differ in two basic dimensions:
  - **Maturity**: The length of time over which the bond promises to make payments to the holder of the bond.
  - *Risk*: (1) Default risk as the risk that the issuer of the bond will not pay back the full amount promised by the bond; or (2) price risk as the uncertainty about the price you can sell the bond for if you want to sell it in the future before maturity.

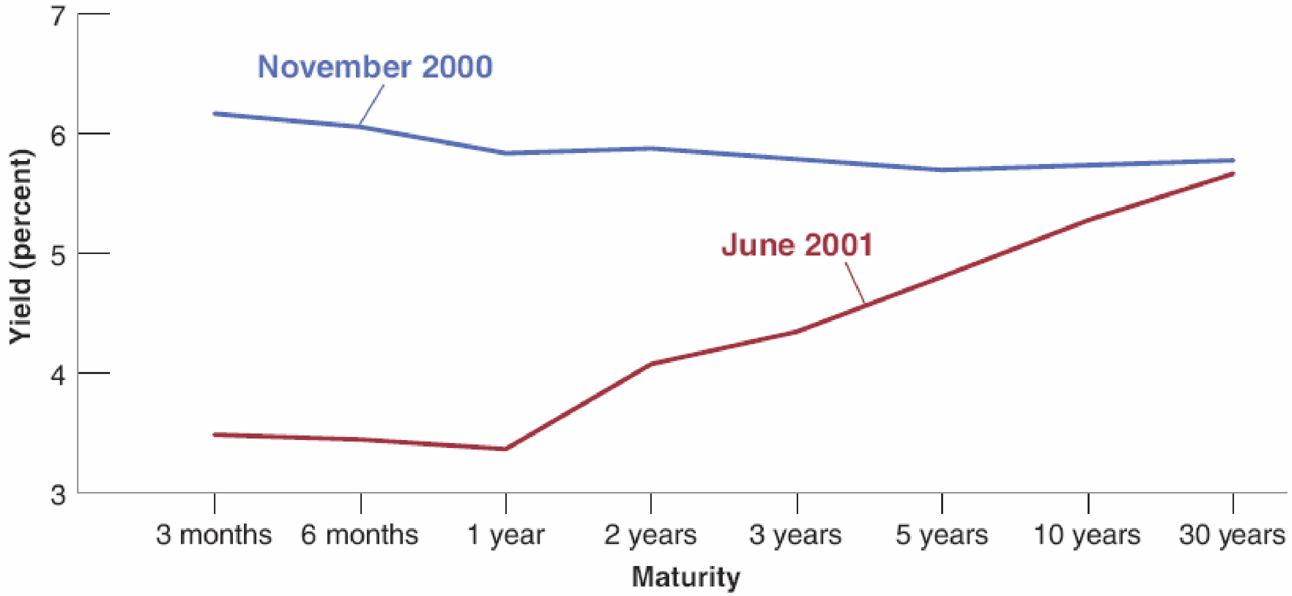
14-2 Bond Prices and Bond Yields

- **Yield to maturity** or **yield**: The interest rates associated with bonds of different maturities
- **Short-term interest rates**: Yields on bonds with a short maturity, typically a year or less
- **Long-term interest rates**: Yields on bonds with a longer maturity than a year
- **Term structure of interest rates or yield curve**: The relation between maturity and yield

14-2 Bond Prices and Bond Yields

Figure 14-2 U.S. Yield Curves: November 1, 2000 and June 1, 2001

The yield curve, which was slightly downward sloping in November 2000, was sharply upward sloping seven months later.



Source: Series DGS1MO, DGS3MO, DGS6MO, DGS1, DGS2, DGS3, DGS5, DGS7, DGS10, DGS20, DGS30. Federal Reserve Economic Data (FRED) http://research.stlouis-fed.org/fred2/.

14-2 Bond Prices and Bond Yields

Why was the yield curve downward sloping in November 2000 but upward sloping in June 2001?

Why were **long-term** interest rates slightly lower than **short-term interest rates** in November 2000, but substantially higher than short-term interest rates in June 2001?

To answer these questions, and more generally to think about the determination of the yield curve and the relation between short-term interest rates and long-term interest rates, we proceed in two steps:

1. First, we **derive bond prices** for bonds of different maturities.
2. Second, we go **from bond prices to bond yields** and examine the **determinants of the yield curve** and the relation between short- and long-term interest rates.

FOCUS: The Vocabulary of Bond Markets

- **Government bonds**: Bonds issued by the governments
- **Corporate bonds**: Bonds issued by firms
- **Bond ratings**: ratings for default risk
- **Risk premium**: The difference between the interest rate paid on a given bond and the interest rate on the bond with the best rating
- **Junk bonds**: Bonds with high default risk
- **Discount bonds**: Bonds that promise a single payment at maturity called the **face value**

FOCUS: The Vocabulary of Bond Markets (continued)

- **Coupon bonds**: Bonds that promise multiple payments before maturity and one payment at maturity
- **Coupon payments**: The payments before maturity
- **Coupon rate**: The ratio of the coupon payments to the face value
- **Current yield**: The ratio of the coupon payment to the price of the bond
- **Life**: The amount of time left until the bond matures
- **Treasury bills (T-bills)**: U.S. government bonds with a maturity up to a year

FOCUS: The Vocabulary of Bond Markets (continued)

- **Treasury notes**: U.S. government bonds with a maturity of 1 to 10 years
- **Treasury bonds**: U.S. government bonds with a maturity of 10 or more years
- **Term premium**: The premium associated with longer maturities
- **Indexed bonds**: Bonds that promise payments adjusted for inflation
- **Treasury Inflation Protected Securities (TIPS)**: Indexed bonds introduced in the United States in 1997

14-2 Bond Prices and Bond Yields

- The price of a one-year bond that promises to pay \$100 next year:

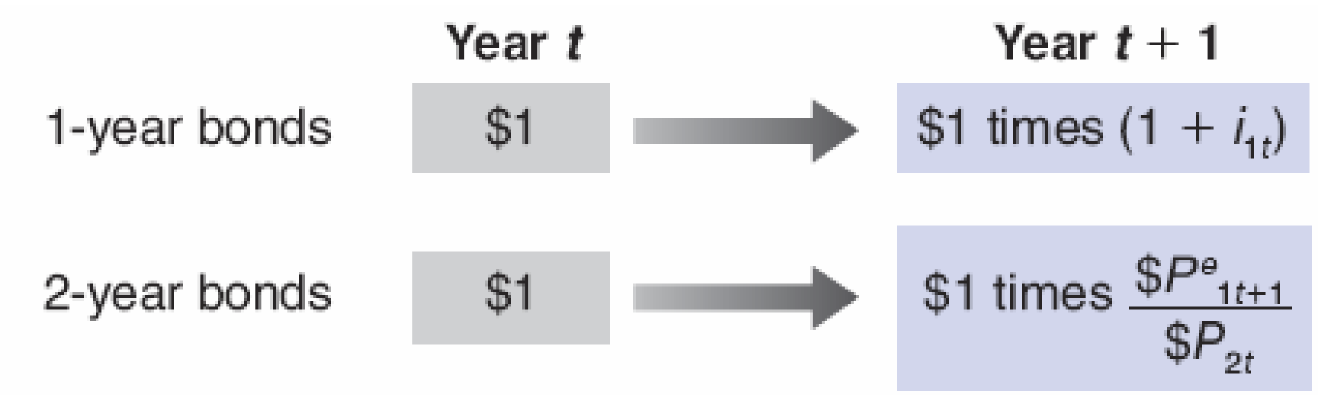
$$\$P_{1t} = \frac{\$100}{1 + i_{1t}} \qquad (14.4)$$

- The price of a two-year bond that promises to pay \$100 in two years:

$$\$P_{2t} = \frac{\$100}{(1 + i_{1t})(1 + i^{e}_{1t+1})} \qquad (14.5)$$

14-2 Bond Prices and Bond Yields

Figure 14-3 Returns from Holding One-Year and Two-Year Bonds for One Year



14-2 Bond Prices and Bond Yields

- **Arbitrage**: The expected returns on two assets must be equal.
- **Expectations hypothesis**: Investors care only about the expected returns and do not care about risk.
- Two bonds in Figure 14-3 must offer the same expected one-year return:

$$1 + i_{1t} = \frac{\$P^e_{1t+1}}{\$P_{2t}} \tag{14.6}$$

$$\$P_{2t} = \frac{\$P^e_{1t+1}}{1 + i_{1t}} \tag{14.7}$$

which means that the price of a two-year bond today is the present value of the expected price of the bond next year.

14-2 Bond Prices and Bond Yields

- The expected price of one-year bonds next year with a payment of $100:

$$\$P^e_{1t+1} = \frac{\$100}{(1 + i^e_{1t+1})} \tag{14.8}$$

so that

$$\$P_{2t} = \frac{\$100}{(1 + i_{1t})(1 + i^e_{1t+1})} \tag{14.9}$$

which is the same as equation (14.5)

14-2 Bond Prices and Bond Yields

- The *yield to maturity* on an *n*-year bond (***n*-year interest rate**) is the constant annual interest rate that makes the bond price today equal to the present value of future payments on the bond.
- The yield to maturity on a two-year bond that satisfies:

$$\$P_{2t} = \frac{\$100}{(1 + i_{2t})^2} \qquad (14.10)$$

is:

$$i_{2t} \approx \frac{1}{2}(i_{1t} + i^e_{1t+1}) \qquad (14.11)$$

which means that *the two-year interest rate is (approximately) the average of the current one-year interest rate and next year's expected one-year interest rate*.

14-2 Bond Prices and Bond Yields

- Equation (14.8) with a risk premium x on the two-year bond:

$$\$P_{2t} = \frac{\$100}{(1 + i_{1t})(1 + i^e_{1t+1} + x)} \tag{14.12}$$

so that the two-year yield is:

$$i_{2t} \approx \frac{1}{2}(i_{1t} + i^e_{1t+1} + x) \tag{14.13}$$

which is the average of the current and expected one-year rate plus a risk premium.

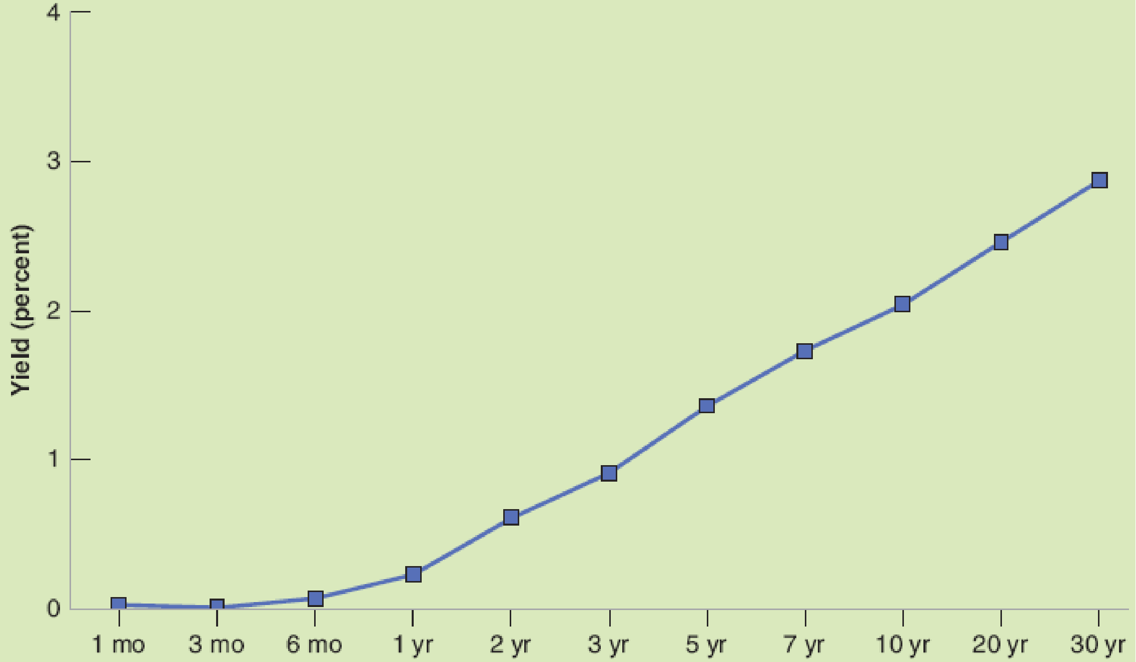
Back to the 2000 yield curve

- When investors expect interest rates to be constant over time, the yield curve should be slightly upward sloping, reflecting the fact that the risk premium increases with maturity.
- The fact that the yield curve was downward sloping, something relatively rare, tells us that investors expected interest rates to go down slightly over time, with the expected decrease in rates more than compensating for a rising term premium.
- **Macroeconomic situation**: At the end of November 2000, the U.S. economy was slowing down.
  - Investors expected that Fed would slowly decrease the policy rate, and these expectations were what laid behind the downward sloping yield curve.
  - By June 2001, however, growth had declined much more than was expected in November 2000, and by then, the Fed had decreased the interest rate much more than investors had expected previously.

FOCUS: The Yield Curve, the Zero Lower Bound, and Liftoff

- In October 2015, the yield curve was upward sloping, suggesting that investors expect the Fed to increase the policy rate or "liftoff".
- However, the yield curve was flat up to maturities of six months, meaning that investors did not expect the Fed to increase the policy rate before April 2016.

Figure 1 The Yield Curve as of October 15, 2015



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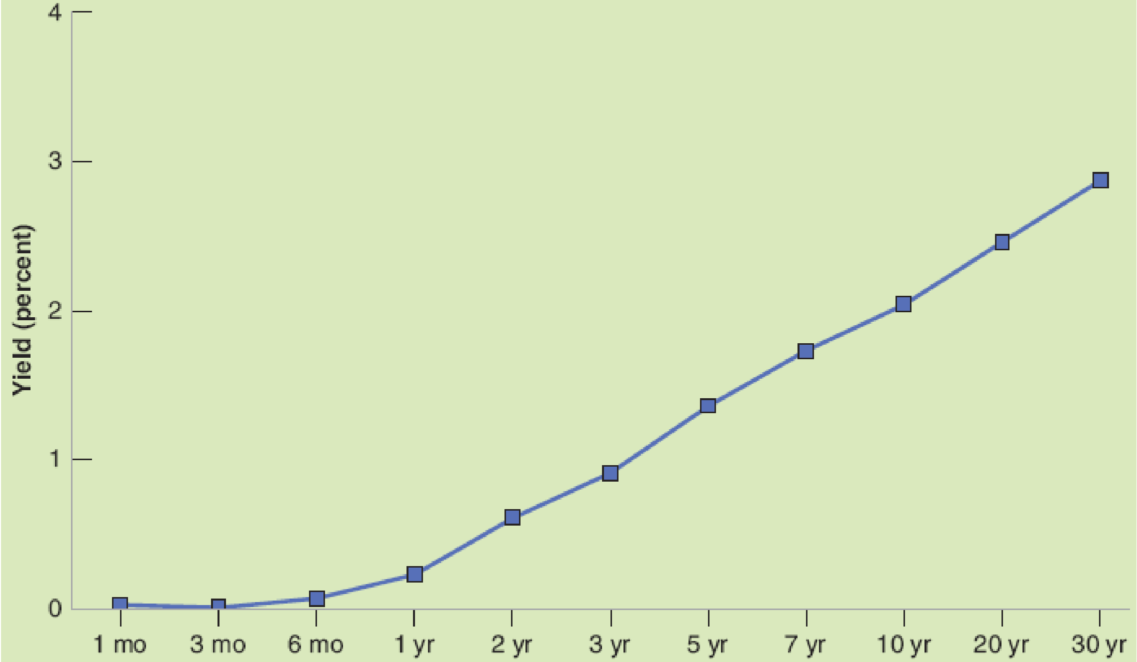

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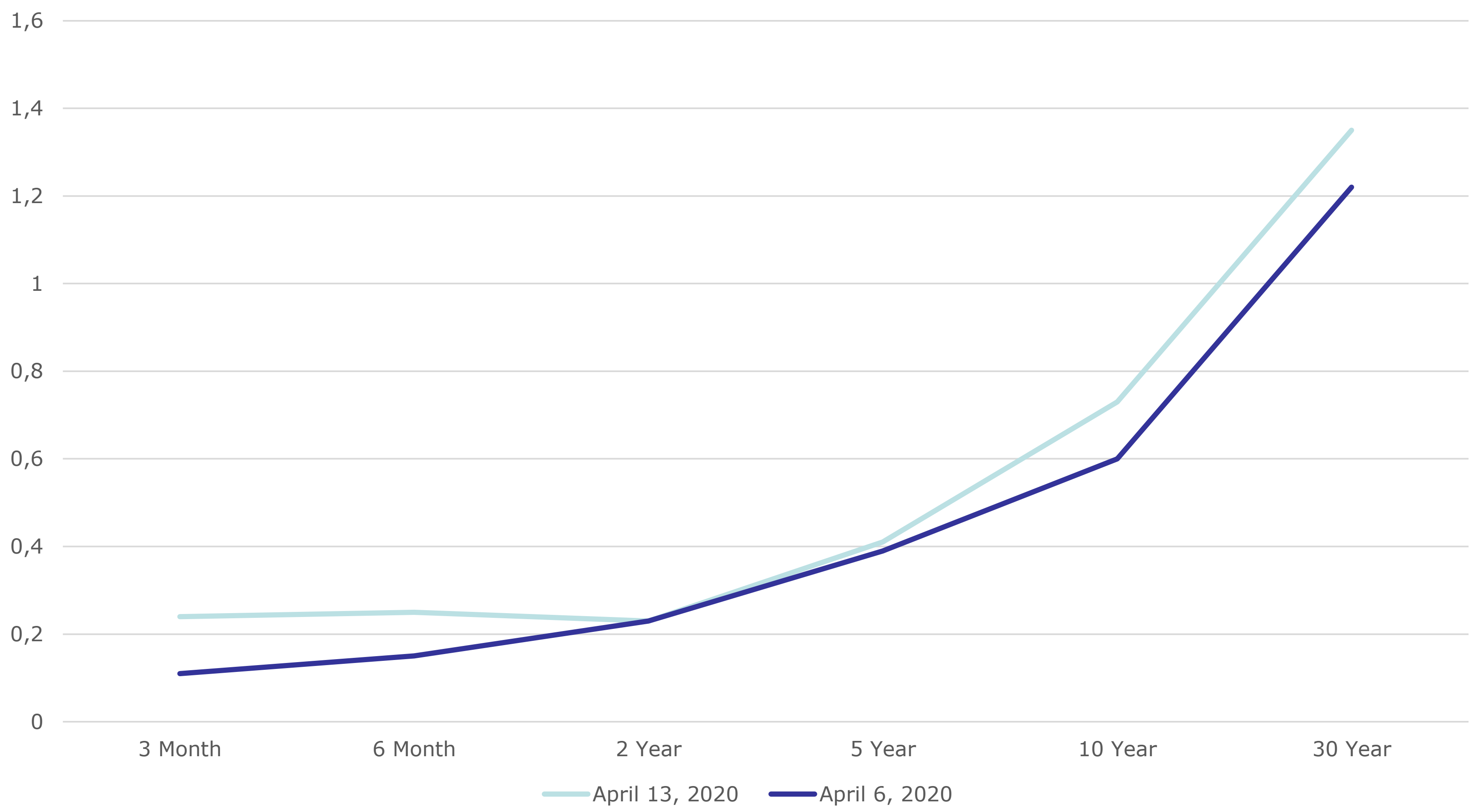
The yield curve today

YieldCurve.com	Yield Curve figures updated weekly since October 2003 For historical animated yield curve data use drop-down menu					
UK Gilt	6 Month	1 Year	2 Year	5 Year	10 Year	30 Year
April 13, 2020	0.27	0.08	0.04	0.13	0.31	0.66
April 6, 2020	0.18	0.11	0.09	0.16	0.32	0.79
US Treasury	3 Month	6 Month	2 Year	5 Year	10 Year	30 Year
April 13, 2020	0.24	0.25	0.23	0.41	0.73	1.35
April 6, 2020	0.11	0.15	0.23	0.39	0.6	1.22

The yield curve today

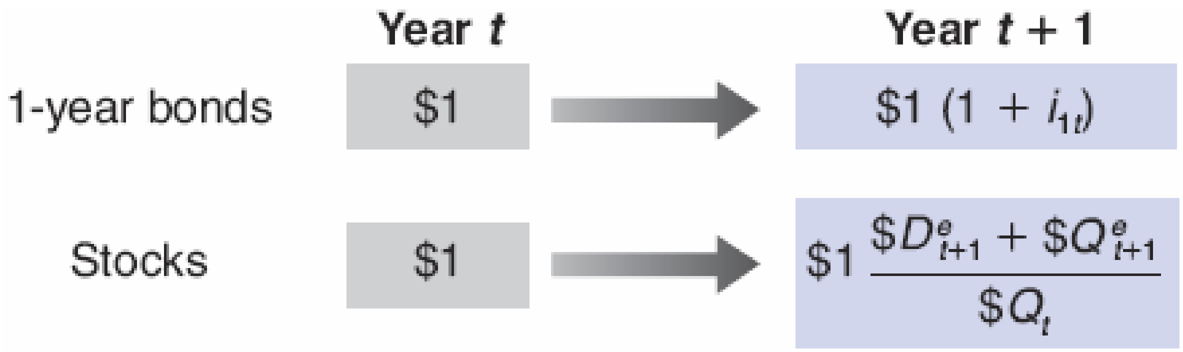


14-3 The Stock Market and Movements in Stock Prices

- Firms finance themselves through:
  - **Internal finance**: Using their own earnings
  - **External finance**: Bank loans
  - **Debt finance**: Bonds and loans
  - **Equity finance**: Issuing **stocks** or **shares** that pay **dividends**

14-3 The Stock Market and Movements in Stock Prices

Figure 14-5 Returns from Holding One-Year Bonds or Stocks for One Year



- $\$Q$ is the price of the stock
- $\$D^e$ is the expected dividend
- **Ex-dividend price**: The stock price after the dividend has been paid this year

14-3 The Stock Market and Movements in Stock Prices

- Equilibrium requires that the expected rate of return from holding stocks for one year (left side) be the same as the rate of return on one-year bonds plus the equity premium x (right side):

$$\frac{\$D^e_{t+1} + \$Q^e_{t+1}}{\$Q_t} = 1 + i_{1t} + x$$

or

$$\$Q_t = \frac{\$D^e_{t+1}}{(1 + i_{1t} + x)} + \frac{\$Q^e_{t+1}}{(1 + i_{1t} + x)} \qquad (14.14)$$

14-3 The Stock Market and Movements in Stock Prices

- If the expected prices in *n* years equal the present values of the expected prices and dividends:

$$\$Q_t = \frac{\$D^e_{t+1}}{(1 + i_{1t} + x)} + \frac{\$D^e_{t+2}}{(1 + i_{1t} + x)(1 + i^e_{1t+1} + x)} + \cdots + \frac{\$D^e_{t+n}}{(1 + i_{1t} + x)\cdots(1 + i^e_{1t+n-1} + x)} + \frac{\$Q^e_{t+n}}{(1 + i_{1t} + x)\cdots(1 + i^e_{1t+n-1} + x)} \quad (14.15)$$

- If the interest rate is positive, then it reduces to:

$$\$Q_t = \frac{\$D^e_{t+1}}{(1 + i_{1t} + x)} + \frac{\$D^e_{t+2}}{(1 + i_{1t} + x)(1 + i^e_{1t+1} + x)} + \cdots + \frac{\$D^e_{t+n}}{(1 + i_{1t} + x)\cdots(1 + i^e_{1t+n-1} + x)} \quad (14.16)$$

14-3 The Stock Market and Movements in Stock Prices

- Replacing the *nominal* interest rates with the *real* interest rates, then the real stock price is:

$$Q_t = \frac{D^e_{t+1}}{(1 + r_{1t} + x)} + \frac{D^e_{t+2}}{(1 + r_{1t} + x)(1 + r^e_{1t+1} + x)} + \cdots \qquad (14.17)$$

- Implications:
  - Higher expected future real dividends lead to a higher real stock price.
  - Higher current and expected future one-year real interest rates lead to a lower real stock price.
  - A higher equity premium leads to a lower stock price.

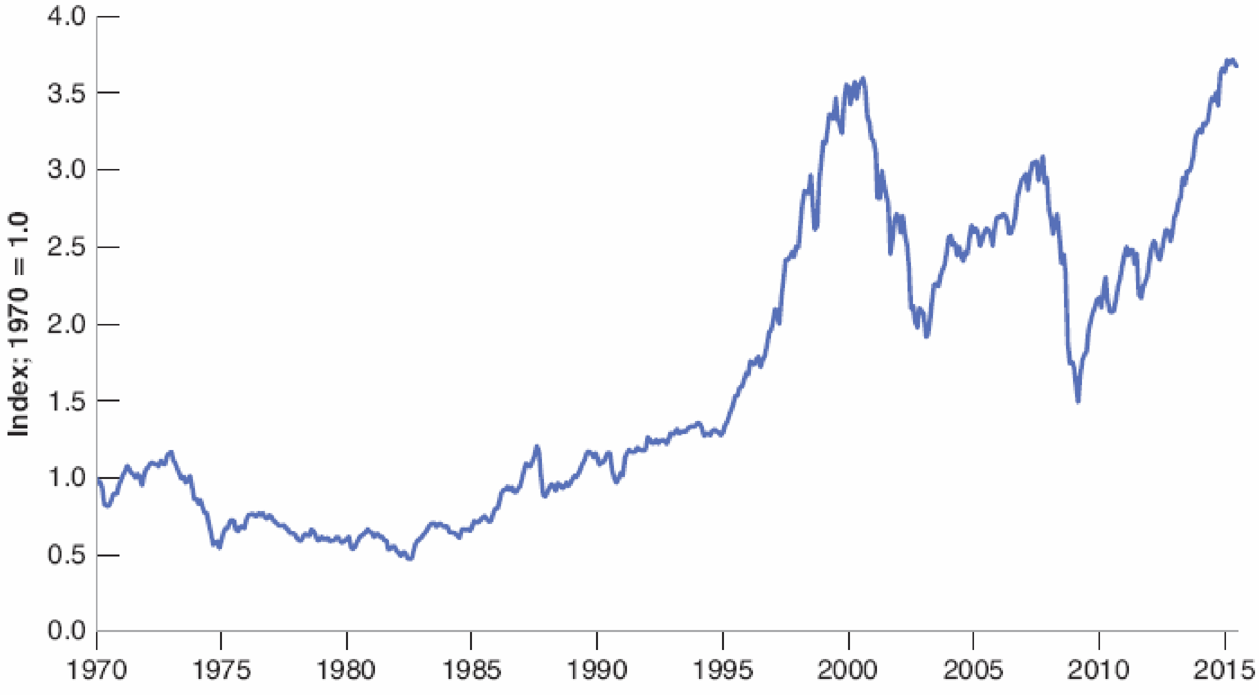
14-3 The Stock Market and Movements in Stock Prices

- For the most part, major movements in stock prices are unpredictable.

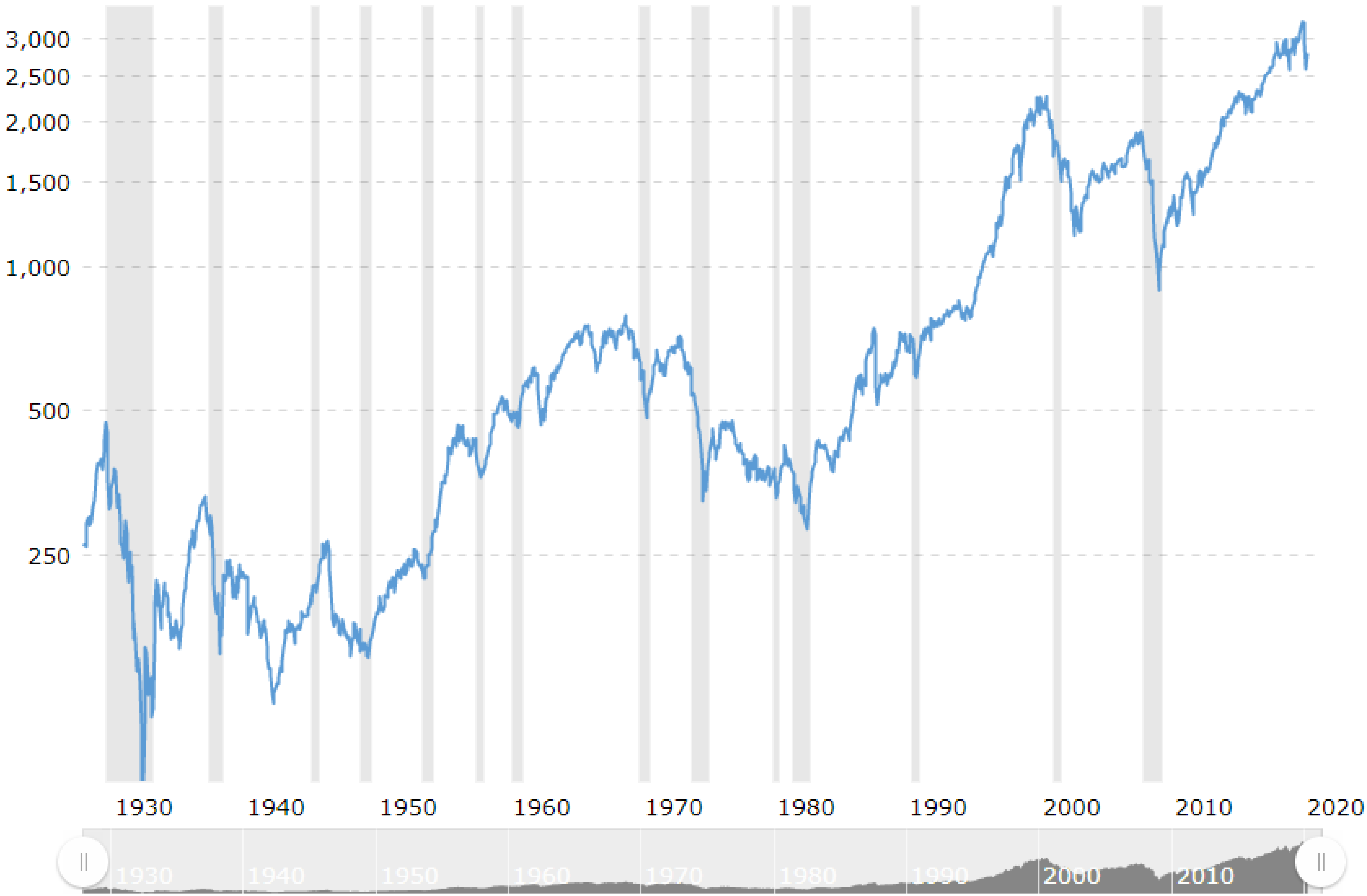
Figure 14-4 Standard and Poor's Stock Price Index in Real Terms since 1970

Note the sharp fluctuations in stock prices since the mid-1990s.

Source: Calculated from Haver Analytics using series SP500@USECON.



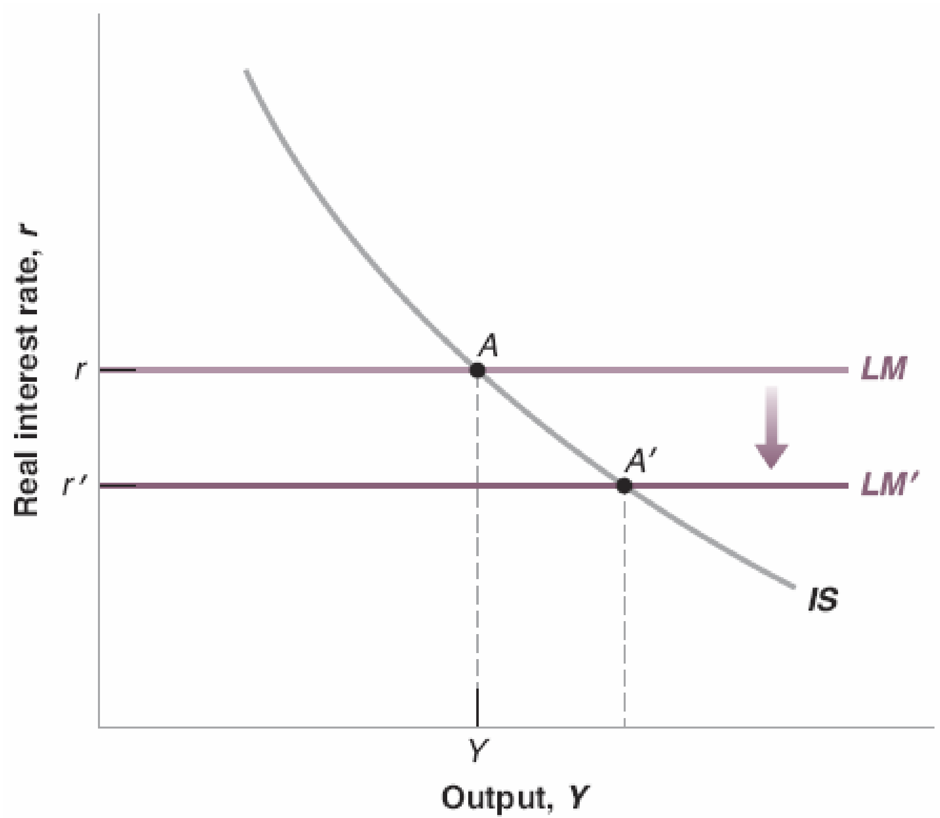
14-3 The Stock Market and Movements in Stock Prices - TODAY



14-3 The Stock Market and Movements in Stock Prices

Figure 14-6 An Expansionary Policy and the Stock Market

A monetary expansion decreases the interest rate and increases output. What it does to the stock market depends on whether or not financial markets anticipated the monetary expansion.



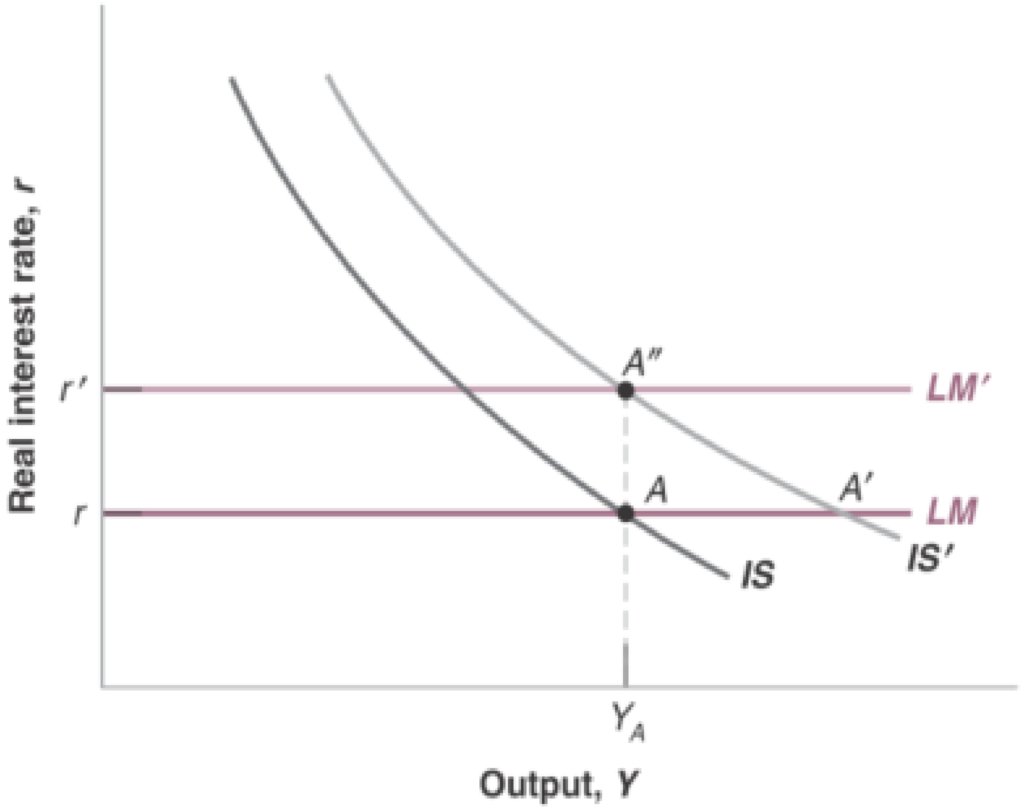
14-3 The Stock Market and Movements in Stock Prices

Figure 14-7 An Increase in Consumer Spending and the Stock Market

The increase in consumption leads to higher level of output. What happens to the stock market depends on what investors expect the Fed will do.

If investors expect that the Fed will not respond and will keep the policy rate unchanged, output will increase, as the economy moves to *A′*. With an unchanged policy rate and higher output, stock prices will go up.

If instead investors expect that the Fed will respond by raising the policy rate, output may remain unchanged as the economy moves to *A″*. With unchanged output, and a higher policy rate, stock prices will go down.



14-4 Risk, Bubbles, Fads, and Asset Prices

- **Fundamental value**: The present value of expected dividends given in equation (14.17) and that stocks are sometimes underpriced or overpriced.
- **Rational speculative bubbles**: Stock prices increase just because investors expect them to.
- **Fads:** Stocks become high priced for no reason other than its price has increased in the past.

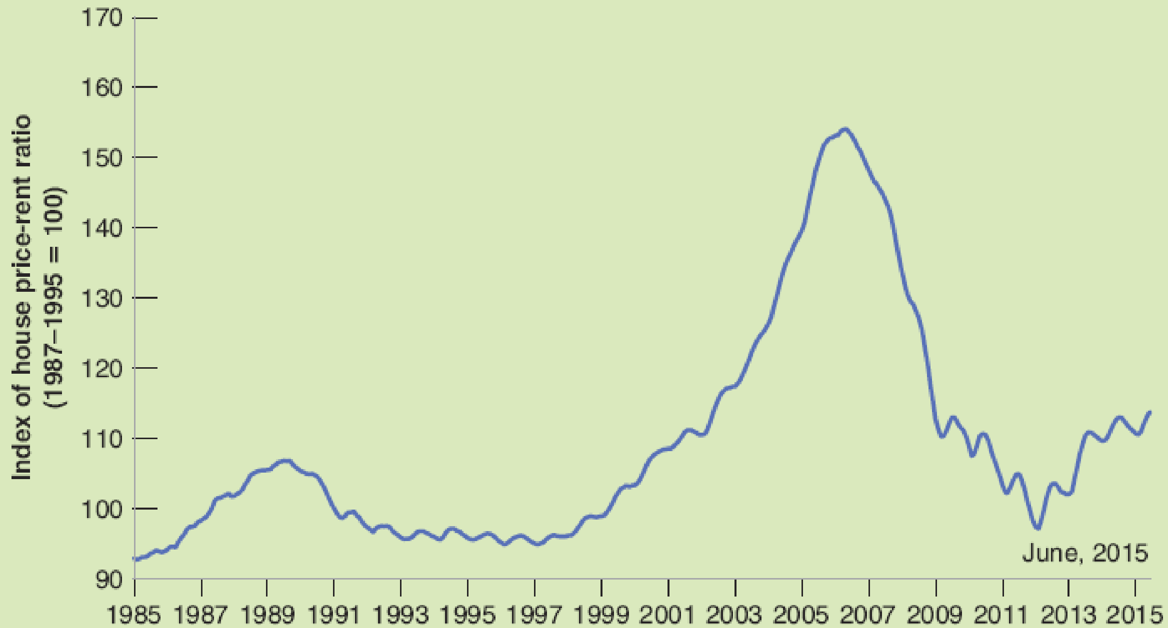
FOCUS: Famous Bubbles: From Tulipmania in 17th-Century Holland to Russia in 1994

- In 1634, a “tulip bubble” began to take place as the price of rare bulbs started increasing, and speculators bought tulip bulbs in anticipation of even higher prices later.
- The price of a bulb called “Admiral Van de Eyck” jumped from 1,500 guineas in 1634 to 7,500 guineas in 1637.
- In 1994, a Russian “financier” created a company called MMM and promised shareholders a rate of return of at least 3,000% a year.
- Even though MMM was not involved in any type of production and held no assets, its share prices increased from 1,600 rubles in February to 105,000 in July.

FOCUS: The Increase in U.S. Housing Prices: Fundamentals or Bubble?

- In real time, there was little agreement whether the large increase in housing prices in the 2000s was a bubble.
- Pessimists argued that the increase in house prices was not matched by a parallel increase in rents.
- Optimists argued that the increasing price-to-rent ratio reflects the decreasing real interest rate and changing mortgage market.

Figure 1 The U.S. Housing Price-to-Rent Ratio since 1985



Source: Calculated using Case-Shiller Home Price Indices: http://us.spindices.com/index-family/real-estate/sp-case-shiller. Rental component of the Consumer Price Index: CUSR0000SEHA, Rent of Primary Residence, Bureau of Labor Statistics.

APPENDIX: Deriving the Expected Present Discounted Value Using Real or Nominal Interest Rates

- Equations (14.1) and (14.3) are equivalent in their ways of expressing present discounted values.
- Divide both sides of equation (14.1) by the current price (P_t):

$$\frac{\$V_t}{P_t} = \frac{\$z_t}{P_t} + \frac{1}{1+i_t}\frac{\$z^e_{t+1}}{P_t} + \frac{1}{(1+i_t)(1+i^e_{t+1})}\frac{\$z^e_{t+2}}{P_t} + \cdots \tag{14.A1}$$

- Recall equation (14.3):

$$V_t = z_t + \frac{1}{1+r_t} z^e_{t+1} + \frac{1}{(1+r_t)(1+r^e_{t+1})} z^e_{t+2} + \cdots \tag{14.3}$$

- Each term on the right side of equation (14.3) is equal to the corresponding term in equation (14.A1).