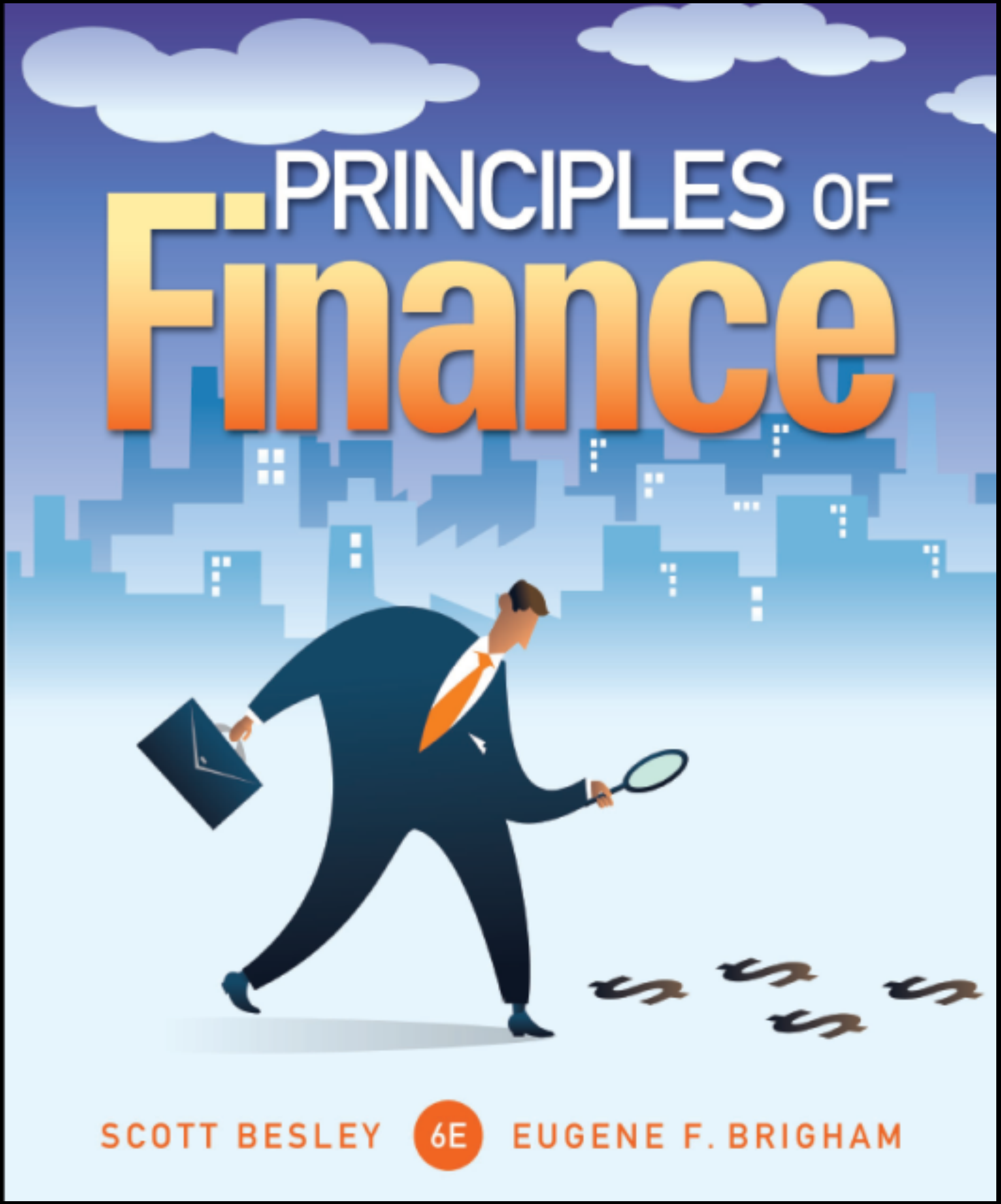


Chapter 10

Valuation Concepts

Besley & Brigham

Chapter 10 – Learning Objectives

- ✓ Explain how (a) bond prices are determined and (b) stock prices (values) are determined under different growth assumptions.
- ✓ Explain how yields (market rates) for both stocks and bonds are determined.
- ✓ Describe the relationship between stock and bond prices and market rates of return.
- ✓ Identify factors that affect the prices of stocks and bonds.

Basic Valuation

- ✓ Using time value of money concepts, we realize that the value of *any* asset is based on the present value of the cash flows the asset is expected to produce in the future

Basic Valuation

$$\text{Asset value} = \frac{\hat{CF}_1}{(1+r)^1} + \frac{\hat{CF}_2}{(1+r)^2} + \cdots + \frac{\hat{CF}_n}{(1+r)^n}$$

$\hat{CF}_t$ = the cash flow expected to be generated by the asset in Period t

r = the return investors consider appropriate for holding such an asset - usually referred to as the required return

Valuation of Financial Assets - Bonds

- Bond is a long term debt instrument
- Value is based on present value of:
  - Stream of interest payments
  - Principal repayment at maturity

Valuation of Financial Assets - Bonds

- r_d = required rate of return on a debt instrument
- N = number of years before the bond matures
- INT = dollars of interest paid each year
- M = par or face, value of the bond to be paid off at maturity

Valuation of Financial Assets - Bonds

Bond value

$$V_d = \left[\frac{INT}{(1+r_d)^1} + \frac{INT}{(1+r_d)^2} + \cdots + \frac{INT}{(1+r_d)^N} \right] + \frac{M}{(1+r_d)^N}$$

$$= INT \left[\frac{1 - \frac{1}{(1+r_d)^N}}{r_d} \right] + \frac{M}{(1+r_d)^N}$$

Bond value = PV of an annuity of interest

+ PV of a lump-sum payment at maturity

Valuation of Financial Assets - Bonds

- Genesco
  10%
  10 years to maturity
  $1,000 bonds
  Valued at 10% required rated of return = r_d

Valuation of Financial Assets - Bonds

✓ Numerical solution

$$V_d = \left[\frac{\$100}{(1.10)^1} + \frac{\$100}{(1.10)^2} + \cdots + \frac{\$100}{(1.10)^{10}}\right] + \frac{\$1{,}000}{(1.10)^{10}}$$

$$= \$100\left[\frac{1 - \frac{1}{(1.10)^{10}}}{0.10}\right] + \$1{,}000\left[\frac{1}{(1.10)^{10}}\right]$$

$$= \$100(6.14457) + \$1{,}000(0.38554)$$

$$= \$614.46 + \$385.54 = \$1{,}000$$

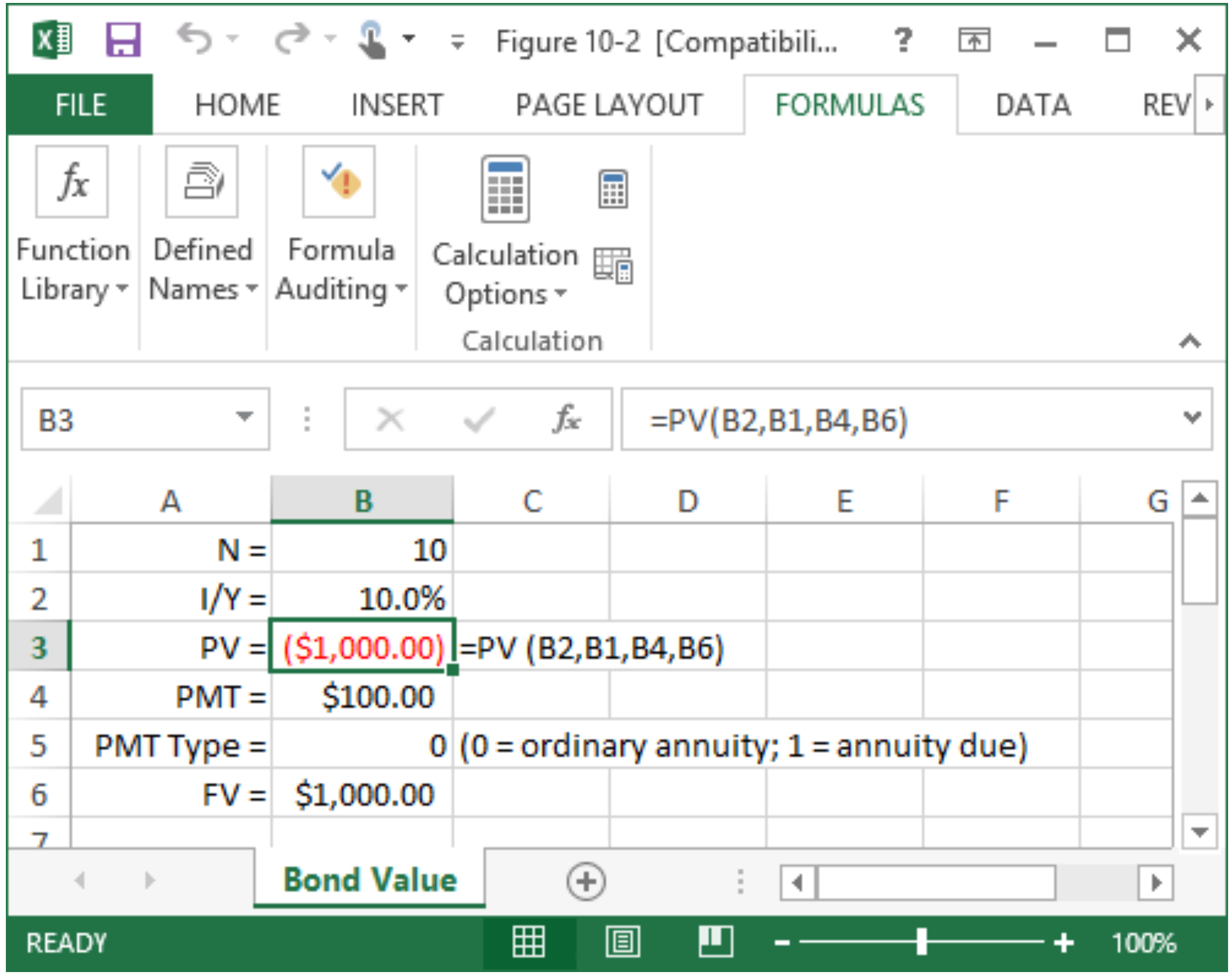
Valuation of Financial Assets - Bonds

Financial Calculator Solution

INPUTS	10	10	?	100	1,000
	N	**I/Y**	**PV**	**PMT**	**FV**
OUTPUT			-1,000		

Valuation of Financial Assets - Bonds

Spreadsheet Solution



Yield to Maturity

- ✓ YTM is the average rate of return earned on a bond if it is held to maturity

$$\text{Approximate yield to maturity (YTM)} = \frac{\text{Annual interest} + \text{Accrued capital gains}}{\text{Average value of bond}}$$

$$= \frac{INT + \left(\frac{M - V_d}{N}\right)}{\left[\frac{2(V_d) + M}{3}\right]}$$

Yield to Maturity—Example

- A bond that pays $70 interest per year currently sells for $821. The bond, which has a $1,000 maturity value, matures in 19 years.

$$\text{Approximate yield to maturity (YTM)} = \frac{\$70 + \left(\frac{\$1{,}000 - \$821}{19}\right)}{\left[\frac{2\,(\$821) + \$1{,}000}{3}\right]} = \frac{\$79.42}{\$880.67} = 0.09 = 9.0\%$$

Yield to Maturity—Example

Financial Calculator Solution

	N	I/Y	PV	PMT	FV
INPUTS	19	?	-821	70	1,000
OUTPUT		9.0			

Yield to Call

- ✓YTC is the average rate of return earned on a callable bond if it is held to the date of its first call

$$\text{Approximate yield to call (YTC)} = \frac{\text{INT} + \left(\dfrac{\text{Call price-}V_d}{\text{Years to first call}}\right)}{\left[\dfrac{2\left(V_d\right) + \text{Call price}}{3}\right]}$$

Yield to Call—Example

- ✓ A bond that pays $70 interest per year currently sells for $821. The bond, which has a $1,000 maturity value, matures in 19 years. The bond can be called in nine years at a call price of $1,070.

$$\text{Approximate yield to call (YTC)} = \frac{\$70 + \left(\dfrac{\$1{,}070\text{-}\$821}{9}\right)}{\left[\dfrac{2\ (\$821)\ +\ \$1{,}070}{3}\right]} = \frac{\$97.67}{\$904} = 0.108 = 10.8\%$$

Yield to Call—Example

Financial Calculator Solution

	N	I/Y	PV	PMT	FV
INPUTS	9	?	-821	70	1,070
OUTPUT		10.7			

Changes in Bond Values over Time

- When the r_d (market rate) equals the coupon rate of interest, the bond will sell at its par value.
- Interest rates in the economy change continuously.
- As interest rates change, so do the market values of bonds such that the rate of return earned by investing in a bond—that is, its yield to maturity (YTM)—is the same as the appropriate interest rate in the financial markets.

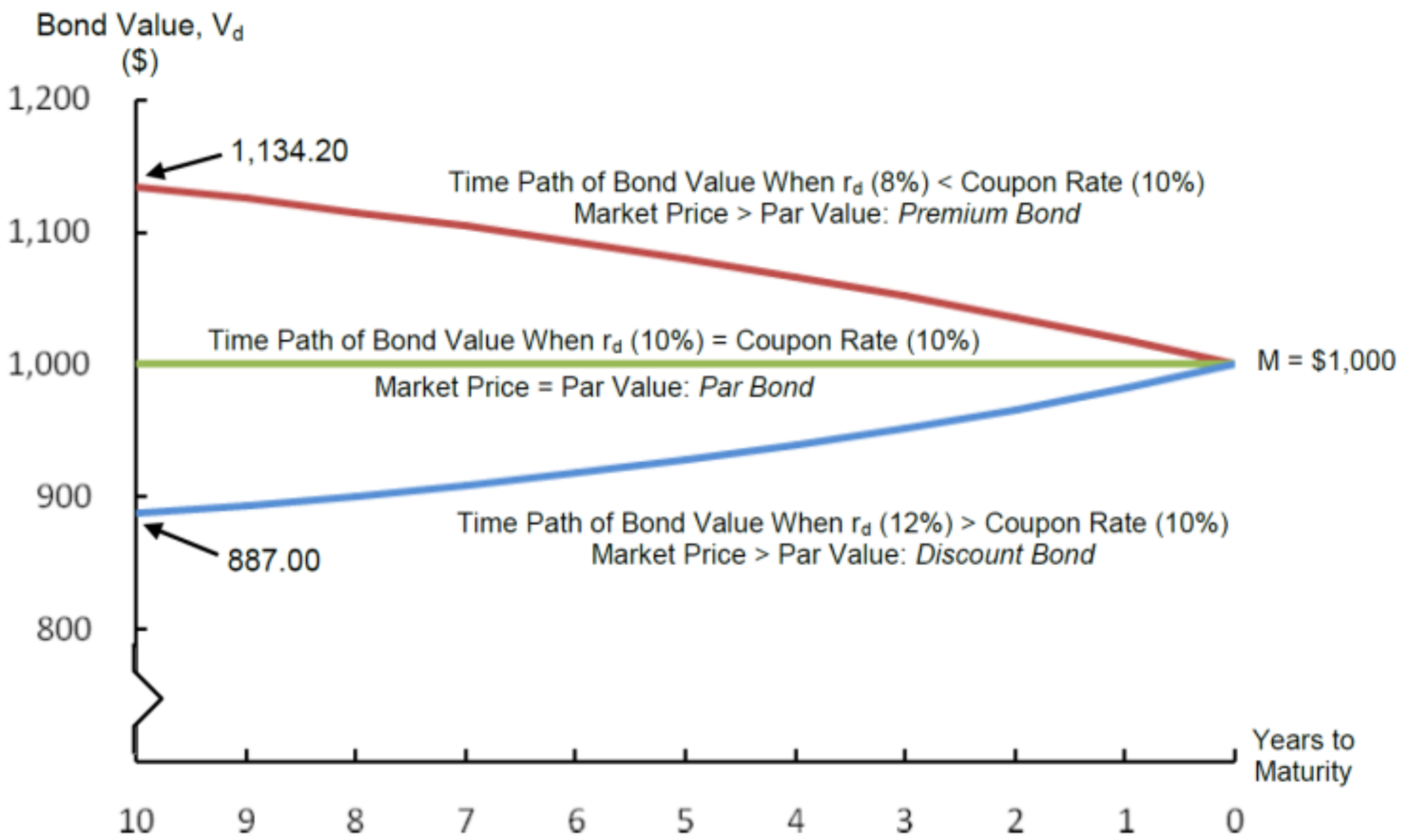
Changes in Bond Values over Time

- ✓ When market rates rise, bond prices decrease, and vice versa
- ✓ When the market rate, r_d, is equal to a bond's coupon rate of interest, the bond's market price equals its maturity (par) value, and the bond is said to be selling at par.
- ✓ When r_d is greater than a bond's coupon rate of interest, the bond's market price is less than its maturity value, and the bond is said to be selling at a discount.
- ✓ When r_d, is less than a bond's coupon rate of interest, the bond's market price is greater than its maturity value, and the bond is said to be selling at a premium.

Changes in Bond Values over Time

- ✓ The market value of a bond will always approach its par value as its maturity date approaches, provided the firm does not go bankrupt

Time path of value of a 10% Coupon, $1000 par value bond when interest rates are 8%, 10%, and 12%



Changes in Bond Values over Time

- ✓ Return (yield) on a bond

$$\text{Bond yield} = \text{Current (interest) yield} + \text{Capital gains yield}$$

$$= \frac{\text{INT}}{V_{d,\text{Begin}}} + \frac{V_{d,\text{End}} - V_{d,\text{Begin}}}{V_{d,\text{Begin}}}$$

INT = interest

$V_{d,\text{Begin}}$ = beginning value of the bond

$V_{d,\text{End}}$ = ending value of the bond

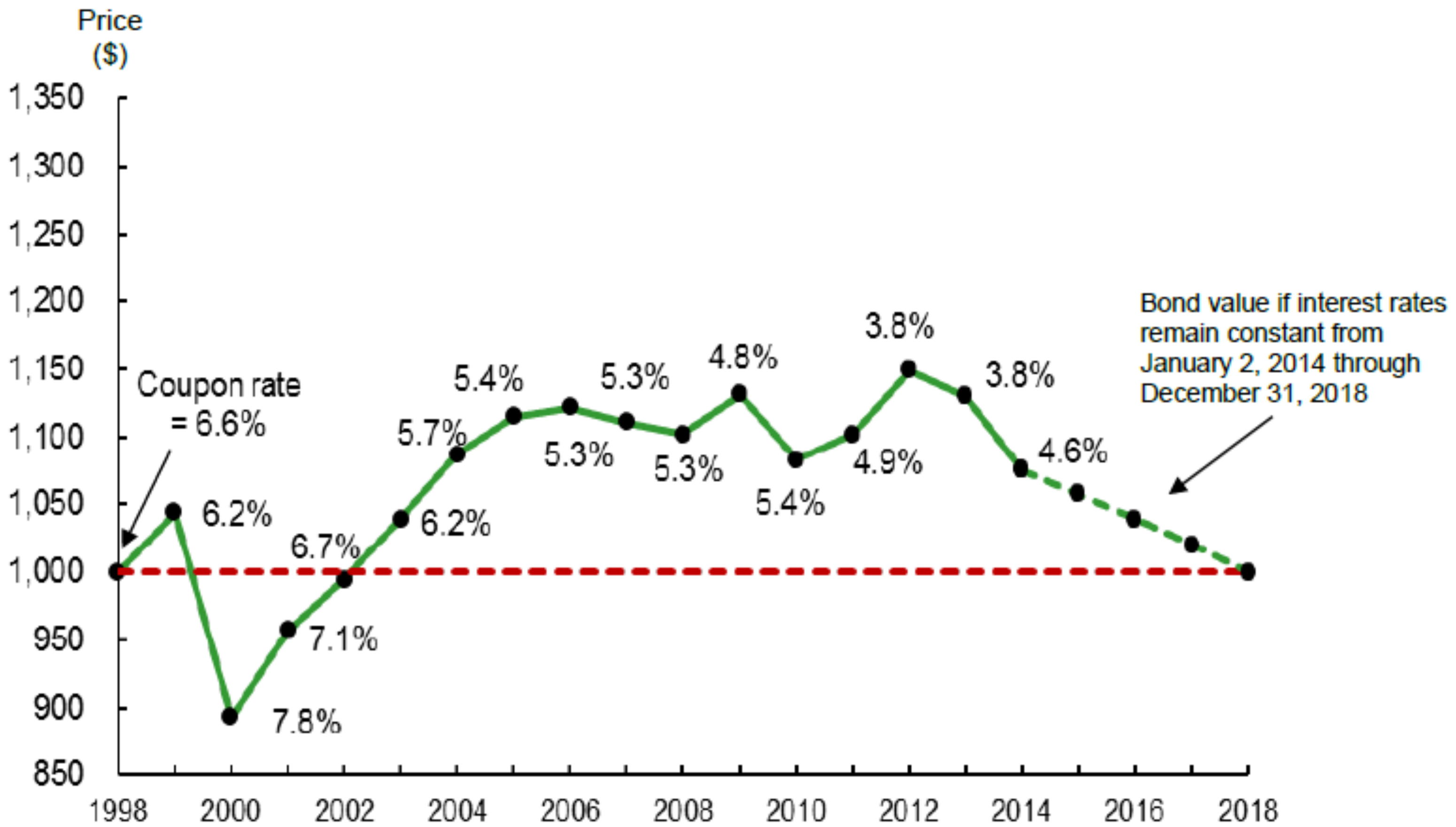
Bond Values with Semiannual Compounding

$$V_d = \sum_{t=1}^{2N} \frac{INT/2}{\left(1+r_d/2\right)^t} + \frac{M}{\left(1+r_d/2\right)^{2N}}$$

Interest Rate Risk on a Bond

- ✓ Interest Rate Price Risk - the risk of changes in bond prices to which investors are exposed due to changing interest rates
- ✓ Interest Rate Reinvestment Risk - the risk that income from a bond portfolio will vary because cash flows have to be reinvested at current market rates

Value of a $1,000 Bond Issued January 2, 1998 that Matures on December 31, 2018



Valuation of Financial Assets - Equity (Stock)

- ✓ Common stock
- ✓ Preferred stock
  - ✓ Hybrid
    - ✓ Similar to bonds with fixed dividend amounts
    - ✓ Similar to common stock as dividends are not required and there is no fixed maturity date

Stock Valuation Models

✓Terms: Expected Dividends

$\hat{D}_t$	The dividend the stockholder expects to receive at the end of Year t
D_0	The most recent dividend already paid
$\hat{D}_1$	The next dividend expected to be paid and it will be paid at the end of the year (Year 1)
$\hat{D}_2$	The dividend expected at the end of two years

Stock Valuation Models

✓ Terms: Market Price

P_0 The price at which a stock sells in the market today

$\hat{P}_0$ The value of an asset that, in the mind of an investor, is justified by the facts. Can be different for different investors.

$\hat{P}_t$ The expected price of the stock at the end of Year t

Stock Valuation Models

✓ Terms: Growth Rate

- **g** The expected rate of change in dividends per share

Stock Valuation Models

- ✓ Terms: Rates of return

r_s Required rate of return = minimum rate of return that stockholders consider acceptable, given the returns available on similar-risk investments

$\hat{r}_s$ The rate of return on a stock that an individual investor expects to receive; can be different for different stockholders

$\ddot{r}_s$ The rate of return on a common stock that an individual investor actually receives, after the fact

Stock Valuation Models

✓Terms: Expected rate of return, $\hat{r}_s$

$$\hat{r}_s = \frac{\hat{D}_1}{P_0} + \frac{\hat{P}_1 - P_0}{P_0}$$

$\frac{\hat{D}_1}{P_0}$ Expected dividend yield

$\frac{\hat{P}_1 - P_0}{P_0}$ Expected capital gains yield = the expected percentage change in price during a given year

Stock Valuation Models

- ✓ Expected Dividends as the Basis for Stock Values
  - ✓ If you hold a stock forever, all you receive is the dividend payments
  - ✓ The value of the stock today is the present value of the dividend payments expected in the future

Stock Valuation Models

- ✓ Expected Dividends as the Basis for Stock Values

$$\text{Stock Value} = \hat{P}_0 = \frac{\hat{D}_1}{(1+r_s)^1} + \frac{\hat{D}_2}{(1+r_s)^2} + \cdots + \frac{\hat{D}_\infty}{(1+r_s)^\infty} = \sum_{t=1}^{\infty} \frac{\hat{D}_t}{(1+r_s)^t}$$

Stock Valuation Models

- Stock Values with Zero Growth
  - A zero growth stock is a common stock whose future dividends are not expected to grow at all, thus g = 0

$$\hat{P}_0 = \frac{D}{(1+r_s)^1} + \frac{D}{(1+r_s)^2} + \dots + \frac{D}{(1+r_s)^\infty}$$

$$= \frac{D}{r_s} = \text{Value of a zero growth stock}$$

Stock Valuation Models

- ✓ Normal, or Constant, Growth
  - ✓ Growth that is expected to continue into the foreseeable future at about the same rate as that of the economy as a whole
  - ✓ g = constant

Stock Valuation Models

- Constant Growth Model
  - (Gordon Model)

$$\hat{P}_0 = \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \cdots + \frac{D_0(1+g)^\infty}{(1+r_s)^\infty}$$

$$= \frac{D_0(1+g)}{r_s - g} = \frac{\hat{D}_1}{r_s - g} = \text{Value of a constant growth stock}$$

Expected Rate of Return on a Constant Growth Stock

$$\hat{r}_s = \frac{\hat{D}_1}{P_0} + g$$

$$= \text{Dividend yield} + \text{Capital gain yield}$$

Nonconstant Growth

- The part of the life cycle of a firm in which its growth is either much faster or much slower than that of the economy as a whole

Valuing a Nonconstant Growth Stock

- To determine the value of a nonconstant growth stock, we generally assume the nonconstant growth ends at some point in the future
- At the point where nonconstant growth ends, we assume constant growth begins
- Follow three steps to compute the current value of a nonconstant growth stock

Valuing a Nonconstant Growth Stock

- ✓ Step 1: Start computing dividends
  - ✓ Compute only the dividends that are expected to be paid during the nonconstant growth period
  - ✓ Using the investors' required rate of return, r_s, compute the present values (PVs) of these nonconstant growth dividends
  - ✓ Sum the PVs

Valuing a Nonconstant Growth Stock

- Step 2: Compute the value of the stock at the end of the nonconstant growth period
  - Compute the first dividend that is affected by the constant growth rate using the following equation

$$\hat{P}_t = \frac{(\text{First constant growth dividend})}{r_s - g_{norm}} = \frac{\hat{D}_t(1+g_{norm})}{r_s - g_{norm}} = \frac{\hat{D}_{t+1}}{r_s - g_{norm}}$$

  - Compute the present value of $\hat{P}_t$

$$\text{PV of } \hat{P}_t = \frac{\hat{P}_t}{(1+r_s)^t} = \text{PV of constant growth dividends beginning in Year t+1}$$

Valuing a Nonconstant Growth Stock

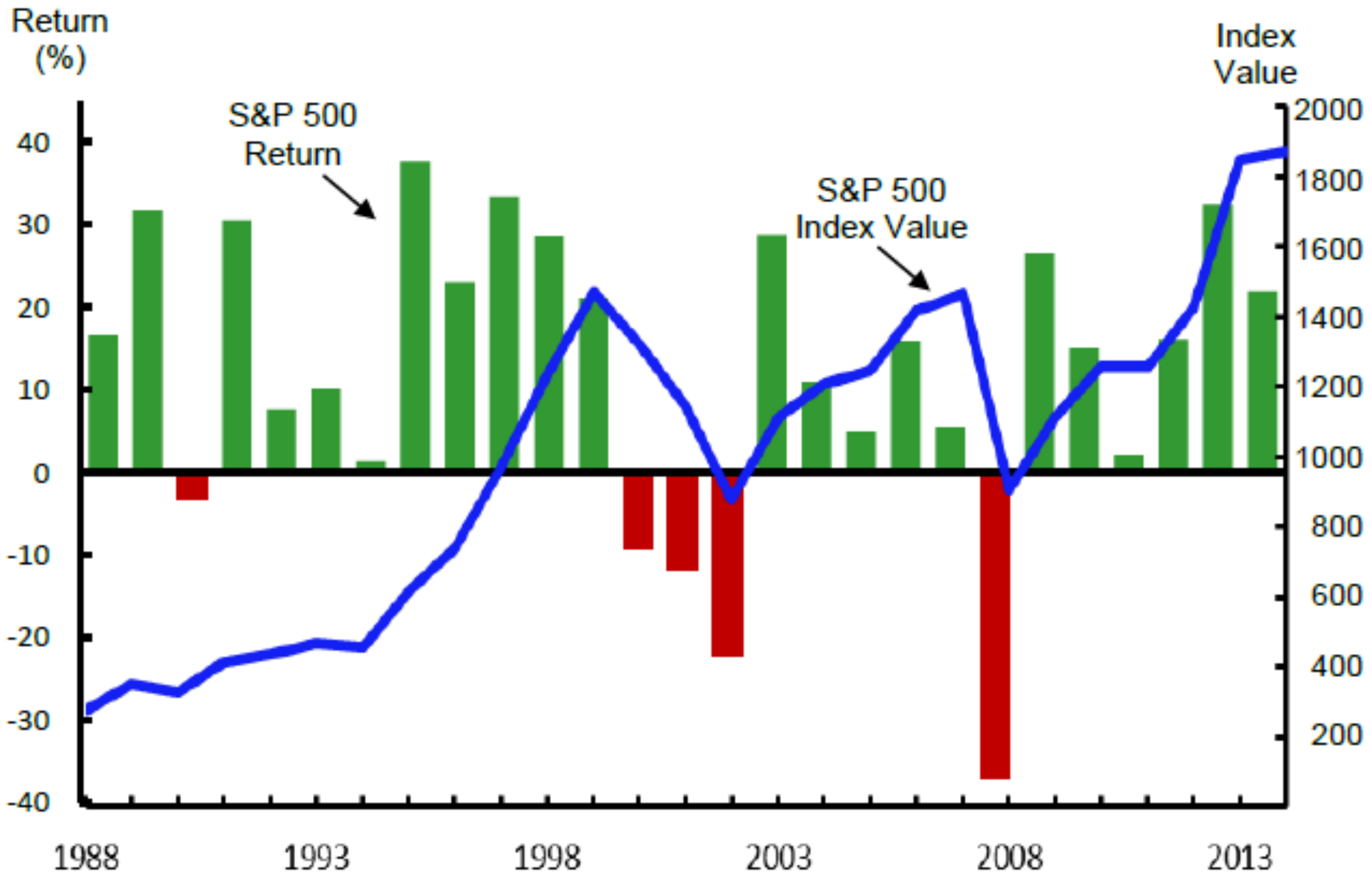
- ✓ Step 3: Sum the PV of the nonconstant growth dividends computed in Step 1 and the PV of $\hat{P}_t$ computed in Step 2 to determine the current value of the stock

$$\hat{P}_0 = (\text{PV of nonconstant growth dividends}) + (\text{PV of } \hat{P}_t)$$

Changes in Stock Prices

- ✓ Investors change the rates of return required to invest in stocks
- ✓ Expectations about the cash flows associated with stocks change

S&P Index: Value and Total Returns 1988 - 2014



Chapter Principles
Key Valuation Concepts

- ✓ How are bond prices determined?
  - ✓ Computed as the present value of the cash flows the bond is expected to pay during its life
  - ✓ The value of a bond is based on the interest payments and the repayment of the bond's principal value
- ✓ How are stock prices determined?
  - ✓ The value of a stock is based on the dividend payments that the stock is expected to generate during its life.
  - ✓ Dividend Discount Model (DDM) - all future dividends are discounted to the present period to determine the stock's current value

Chapter Principles
Key Valuation Concepts

- How are stock and bond yields determined?
  - The current market values of both stocks and bonds are based on (1) the cash flows the investments are expected to generate during their lives and (2) the rate of return (yield) that investors require to purchase the investments.
  - The yield on any investment is comprised of two components: (1) the yield that is produced by the income that investors receive from the investment and (2) the capital gains yield, which is defined as the change in the investment's market value from the beginning of the year to the end of the year.

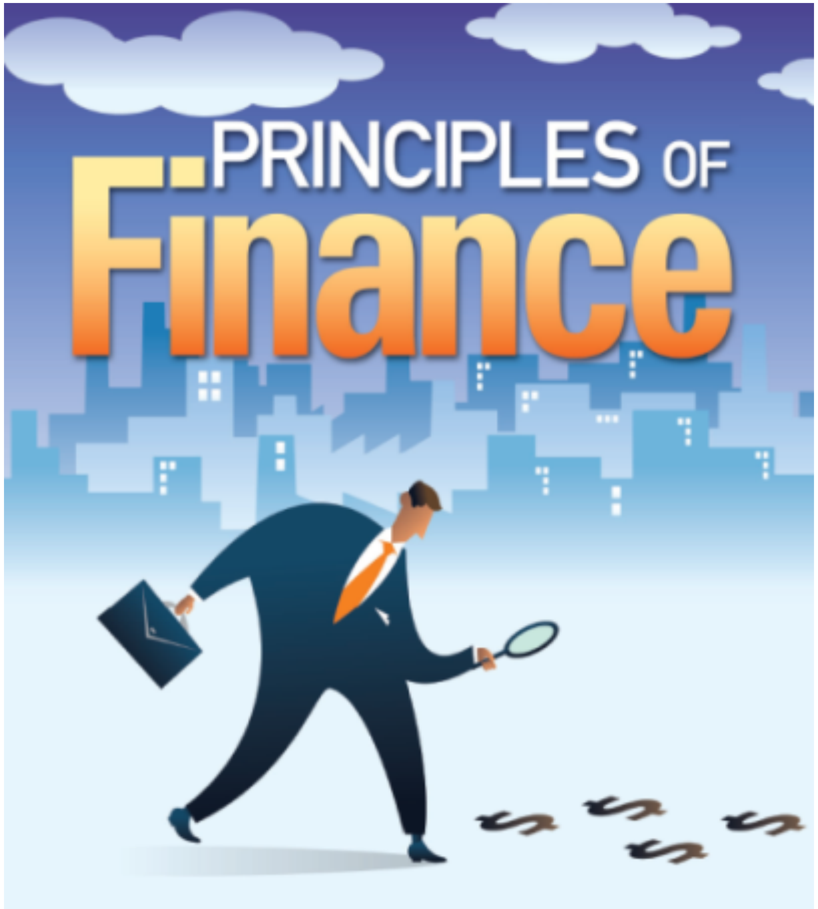
Chapter Principles
Key Valuation Concepts

- What is the relationship between stock and bond prices and market rates of return?
  - When market rates increase, the prices of both stocks and bonds decrease
  - To earn higher rates of return, investors lower the prices they are willing to pay for their investments (stocks).

Chapter Principles
Key Valuation Concepts

- What factors affect the prices of stocks and bonds?
  - The price (value) of a financial asset, such as a stock or a bond, is determined by two primary factors:
    1. The cash flows the asset is expected to generate in the future
    2. The rate of return that investors require to invest in the asset.
  - Everything else equal, if the expected cash flows increase, the asset's value increases
  - The asset's value also increases if investors lower the rate of return that they require to purchase it.

End of Chapter 10



Valuation Concepts

