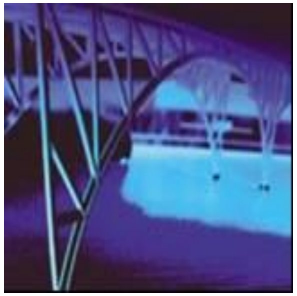
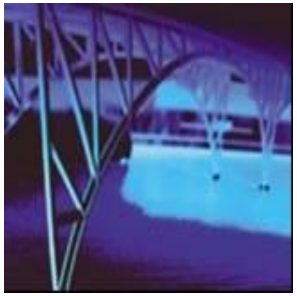


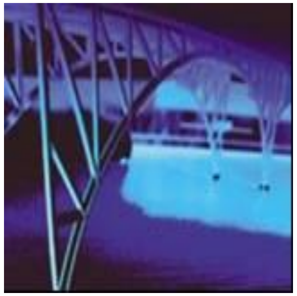
Chapter 4

The Valuation of Long-Term Securities



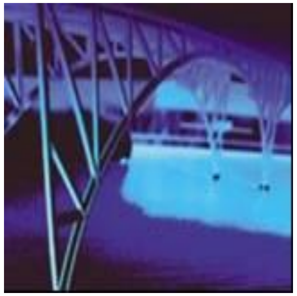
After studying Chapter 4, you should be able to:

1. Distinguish among the various terms used to express value.
2. Value bonds, preferred stocks, and common stocks.
3. Calculate the rates of return (or yields) of different types of long-term securities.
4. List and explain a number of observations regarding the behavior of bond prices.



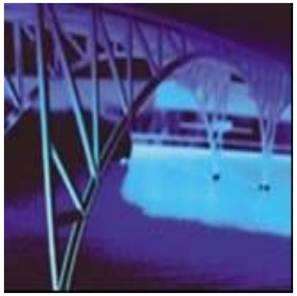
The Valuation of Long-Term Securities

- Distinctions Among Valuation Concepts
- Bond Valuation
- Preferred Stock Valuation
- Common Stock Valuation
- Rates of Return (or Yields)



What is Value?

- Liquidation value represents the amount of money that could be realized if an asset or group of assets is sold separately from its operating organization.
- Going-concern value represents the amount a firm could be sold for as a continuing operating business.

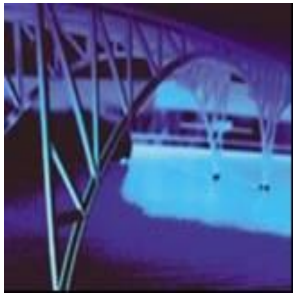


What is Value?

- **Book value** represents either

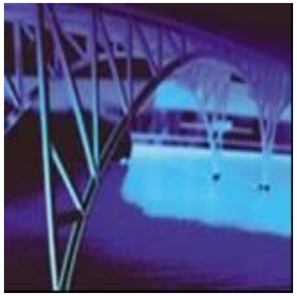
  (1) *an asset*: the accounting value of an asset -- the asset's cost minus its accumulated depreciation;

  (2) *a firm*: total assets minus liabilities and preferred stock as listed on the balance sheet.



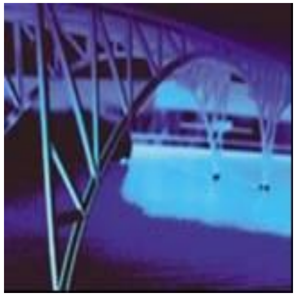
What is Value?

- **Market value** represents the market price at which an asset trades.
- **Intrinsic value** represents the price a security “ought to have” based on all factors bearing on valuation.



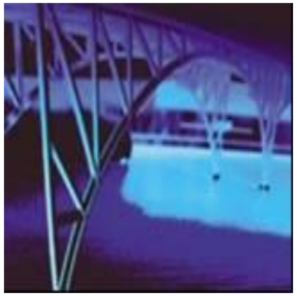
Bond Valuation

- Important Terms
- Types of Bonds
- Valuation of Bonds
- Handling Semiannual Compounding



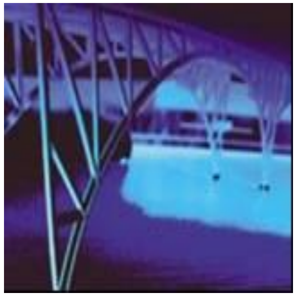
Important Bond Terms

- A <u>bond</u> is a long-term debt instrument issued by a corporation or government.
- The <u>maturity value</u> (MV) [or face value] of a bond is the stated value. In the case of a U.S. bond, the face value is usually $1,000.



Important Bond Terms

- The bond's coupon rate is the stated rate of interest; the annual interest payment divided by the bond's face value.
- The discount rate (capitalization rate) is dependent on the risk of the bond and is composed of the risk-free rate plus a premium for risk.



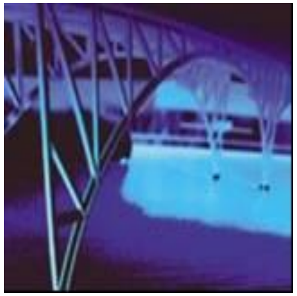
Different Types of Bonds

A perpetual bond is a bond that *never* matures. It has an infinite life.

$$V = \frac{I}{(1 + k_d)^1} + \frac{I}{(1 + k_d)^2} + \dots + \frac{I}{(1 + k_d)^\infty}$$

$$= \sum_{t=1}^{\infty} \frac{I}{(1 + k_d)^t} \quad \text{or} \quad I\,(PVIFA_{kd,\,\infty})$$

$$V = I / k_d$$ *[Reduced Form]*



Perpetual Bond Example

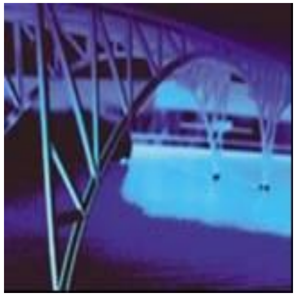
Bond P has a $1,000 face value and provides an 8% annual coupon. The appropriate discount rate is 10%. What is the value of the perpetual bond?

I = $1,000 (8%) = $80.

k_d = 10%.

V = I / k_d [*Reduced Form*]

= $80 / 10% = $800.



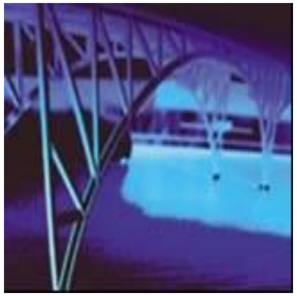
Different Types of Bonds

A <u>non-zero coupon-paying bond</u> is a coupon paying bond with a finite life.

$$V = \frac{I}{(1 + k_d)^1} + \frac{I}{(1 + k_d)^2} + \ldots + \frac{I + MV}{(1 + k_d)^n}$$

$$= \sum_{t=1}^{n} \frac{I}{(1 + k_d)^t} + \frac{MV}{(1 + k_d)^n}$$

$$V = I\,(PVIFA_{kd,\,n}) + MV\,(PVIF_{kd,\,n})$$



Coupon Bond Example

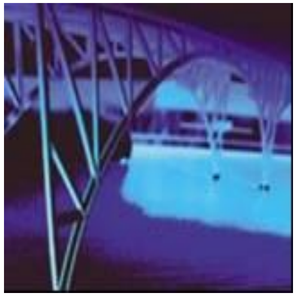
Bond C has a $1,000 face value and provides an 8% annual coupon for 30 years. The appropriate discount rate is 10%. What is the value of the *coupon bond*?

$$V = \$80\,(PVIFA_{10\%,\,30}) + \$1{,}000\,(PVIF_{10\%,\,30}) =$$

$$\$80\,(9.427) + \$1{,}000\,(.057)$$

[*Table IV*] [*Table II*]

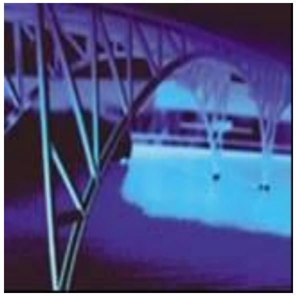
$$= \$754.16 + \$57.00 = \$811.16.$$



Different Types of Bonds

A **zero coupon bond** is a bond that pays no interest but sells at a deep discount from its face value; it provides compensation to investors in the form of price appreciation.

$$V = \frac{MV}{(1 + k_d)^n} = MV\,(PVIF_{kd,\,n})$$

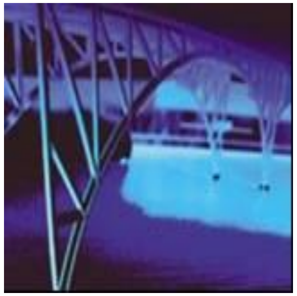


Zero-Coupon Bond Example

Bond Z has a $1,000 face value and a 30 year life. The appropriate discount rate is 10%. What is the value of the *zero-coupon bond*?

$V = \$1,000\ (PVIF_{10\%,\ 30}) =$

$\$1,000\ (.057) = \$57.00$



Semiannual Compounding

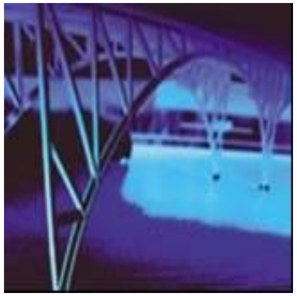
Most bonds *in the U.S.* pay interest twice a year (1/2 of the annual coupon).

<u>Adjustments needed</u>:

(1) Divide k_d by 2

(2) Multiply n by 2

(3) Divide I by 2



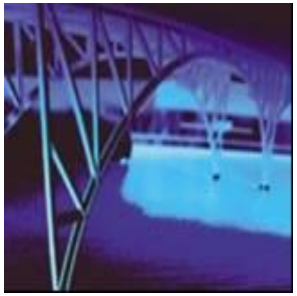
Semiannual Compounding

A non-zero coupon bond adjusted for semiannual compounding.

$$V = \frac{I/2}{(1+k_d/2)^1} + \frac{I/2}{(1+k_d/2)^2} + \dots + \frac{I/2 + MV}{(1+k_d/2)^{2*n}}$$

$$= \sum_{t=1}^{2*n} \frac{I/2}{(1+k_d/2)^t} + \frac{MV}{(1+k_d/2)^{2*n}}$$

$$= I/2\,(PVIFA_{k_d/2,\,2*n}) + MV\,(PVIF_{k_d/2,\,2*n})$$



Semiannual Coupon Bond Example

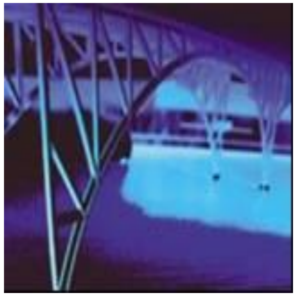
Bond C has a \$1,000 face value and provides an 8% semiannual coupon for 15 years. The appropriate discount rate is 10% (annual rate). What is the value of the *coupon bond*?

$$V = \$40\,(PVIFA_{5\%,\,30}) + \$1{,}000\,(PVIF_{5\%,\,30}) =$$

$$\$40\,(15.373) + \$1{,}000\,(.231)$$

[*Table IV*] [*Table II*]

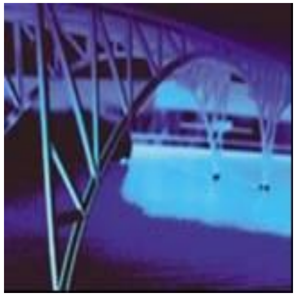
$$= \$614.92 + \$231.00 = \$845.92$$



Semiannual Coupon Bond Example

Let us use another worksheet on your calculator to solve this problem. Assume that Bond C was purchased (settlement date) on 12-31-2004 and will be redeemed on 12-31-2019. This is identical to the 15-year period we discussed for Bond C.

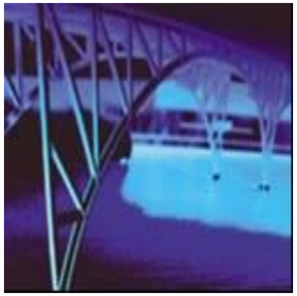
What is its percent of par? What is the value of the bond?



Semiannual Coupon Bond Example

1. What is its percent of par?
   - 84.628% of par (as quoted in financial papers)

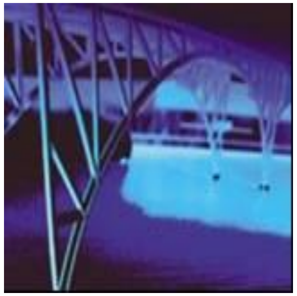
2. What is the value of the bond?
   - 84.628% x \$1,000 face value = ***$846.28***



Preferred Stock Valuation

Preferred Stock is a type of stock that promises a (usually) fixed dividend, but at the discretion of the board of directors.

Preferred Stock has preference over common stock in the payment of dividends and claims on assets.



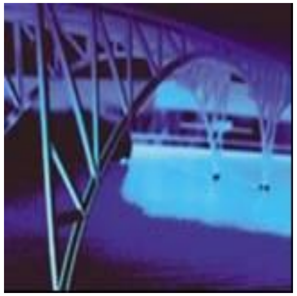
Preferred Stock Valuation

$$V = \frac{Div_P}{(1 + k_P)^1} + \frac{Div_P}{(1 + k_P)^2} + ... + \frac{Div_P}{(1 + k_P)^\infty}$$

$$= \sum_{t=1}^{\infty} \frac{Div_P}{(1 + k_P)^t} \quad \text{or} \quad Div_P(PVIFA_{kP,\,\infty})$$

<u>This reduces to a *perpetuity*!</u>

$$V = Div_P \,/\, k_P$$



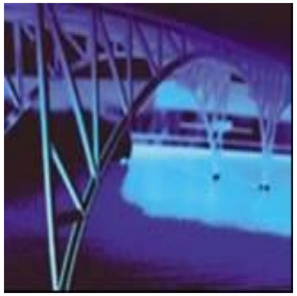
Preferred Stock Example

Stock PS has an 8%, $100 par value issue outstanding. The appropriate discount rate is 10%. What is the value of the preferred stock?

Div_P = \$100 (8%) = \$8.00.

k_P = 10%.

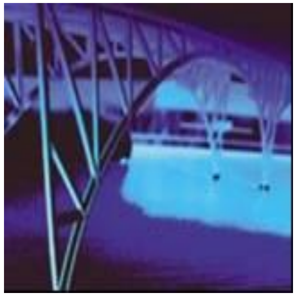
$V = Div_P / k_P$ = \$8.00 / 10% = \$80



Common Stock Valuation

Common stock represents a residual ownership position in the corporation.

- Pro rata share of future earnings after all other obligations of the firm (if any remain).
- Dividends *may* be paid out of the pro rata share of earnings.



Common Stock Valuation

What cash flows will a shareholder receive when owning shares of common stock?

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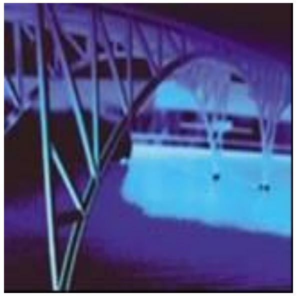
(1) Future dividends

(2) Future sale of the common stock shares



Dividend Valuation Model

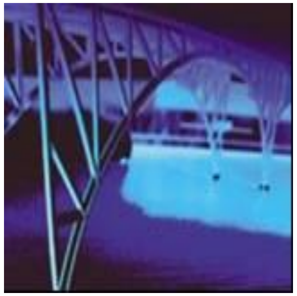
Basic dividend valuation model accounts for the PV of all future dividends.

$$V = \frac{Div_1}{(1 + k_e)^1} + \frac{Div_2}{(1 + k_e)^2} + \dots + \frac{Div_\infty}{(1 + k_e)^\infty}$$

$$= \sum_{t=1}^{\infty} \frac{Div_t}{(1 + k_e)^t}$$

Div_t: Cash Dividend at time t

k_e: Equity investor's required return



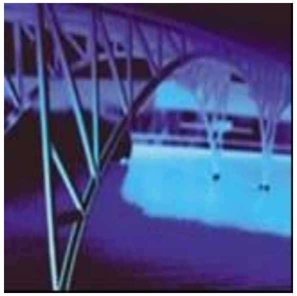
Adjusted Dividend Valuation Model

The basic dividend valuation model adjusted for the future stock sale.

$$V = \frac{Div_1}{(1 + k_e)^1} + \frac{Div_2}{(1 + k_e)^2} + \dots + \frac{Div_n + Price_n}{(1 + k_e)^n}$$

n: The year in which the firm's shares are expected to be sold.

$Price_n$: The expected share price in year n.



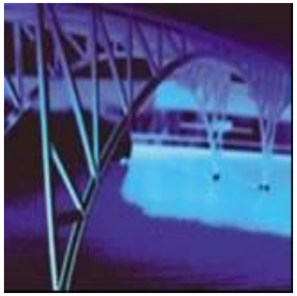
Dividend Growth Pattern Assumptions

The dividend valuation model requires the forecast of *all* future dividends. The following dividend growth rate assumptions simplify the valuation process.

Constant Growth

No Growth

Growth Phases



Constant Growth Model

The constant growth model assumes that dividends will grow forever at the rate g.

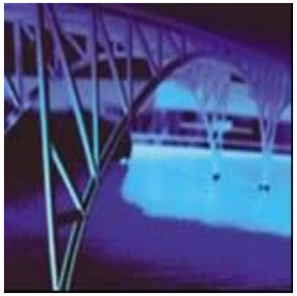
$$V = \frac{D_0(1+g)}{(1+k_e)^1} + \frac{D_0(1+g)^2}{(1+k_e)^2} + \cdots + \frac{D_0(1+g)^\infty}{(1+k_e)^\infty}$$

$$= \frac{D_1}{(k_e - g)}$$

D_1: Dividend paid at time 1.

g : The constant growth rate.

k_e: Investor's required return.

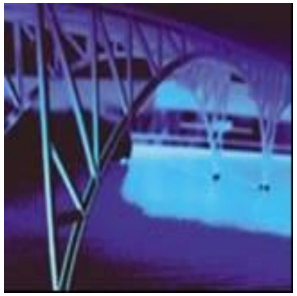


Constant Growth Model Example

Stock CG has an expected dividend growth rate of 8%. Each share of stock just received an annual \$3.24 dividend. The appropriate discount rate is 15%. What is the value of the common stock?

D_1 = \$3.24 (1 + .08) = \$3.50

V_{CG} = D_1 / (k_e - g) = \$3.50 / (.15 - .08) = \$50



Zero Growth Model

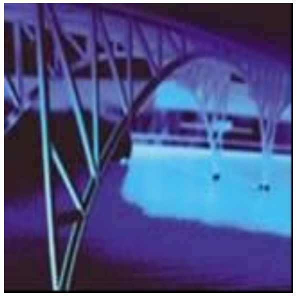
The zero growth model assumes that dividends will grow forever at the rate g = 0.

$$V_{ZG} = \frac{D_1}{(1 + k_e)^1} + \frac{D_2}{(1 + k_e)^2} + \ldots + \frac{D_\infty}{(1 + k_e)^\infty}$$

$$= \frac{D_1}{k_e}$$

D_1: Dividend paid at time 1.

k_e: Investor's required return.

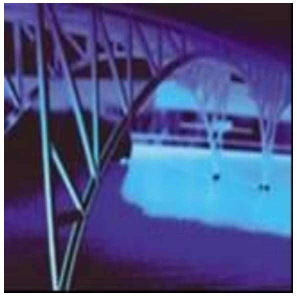


Zero Growth Model Example

Stock ZG has an expected growth rate of 0%. Each share of stock just received an annual $3.24 dividend per share. The appropriate discount rate is 15%. What is the value of the common stock?

$D_1 = \$3.24 (1 + 0) = \$3.24$

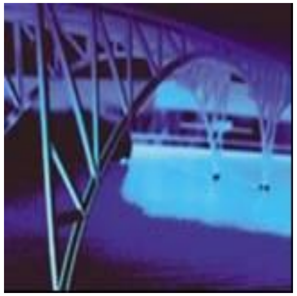
$V_{ZG} = D_1 / (k_e - 0) = \$3.24 / (.15 - 0)$
$= \$21.60$



Growth Phases Model

The growth phases model assumes that dividends for each share will grow at two or more *different* growth rates.

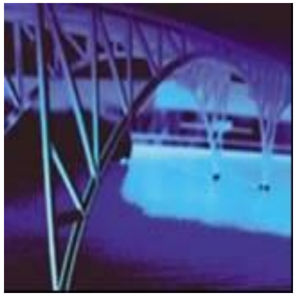
$$V = \sum_{t=1}^{n} \frac{D_0(1+g_1)^t}{(1+k_e)^t} + \sum_{t=n+1}^{\infty} \frac{D_n(1+g_2)^t}{(1+k_e)^t}$$



Growth Phases Model

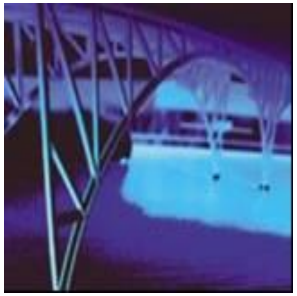
Note that the second phase of the growth phases model assumes that dividends will grow at a constant rate g_2. We can rewrite the formula as:

$$V = \sum_{t=1}^{n} \frac{D_0(1+g_1)^t}{(1+k_e)^t} + \left[\frac{1}{(1+k_e)^n}\right]\left[\frac{D_{n+1}}{(k_e - g_2)}\right]$$

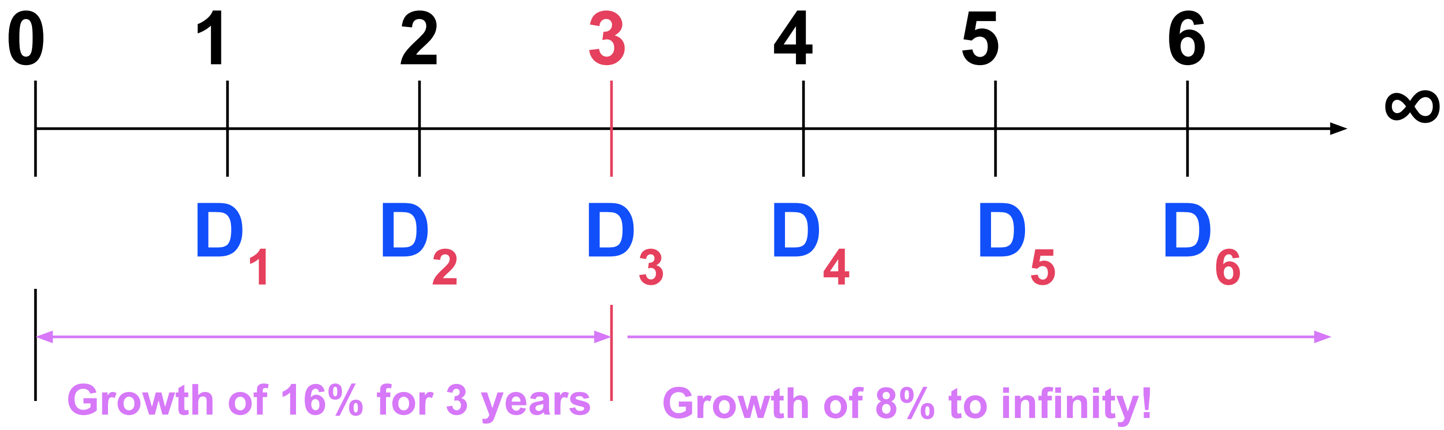


Growth Phases Model Example

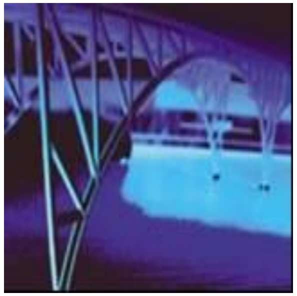
Stock GP has an expected growth rate of 16% for the first 3 years and 8% thereafter. Each share of stock just received an annual $3.24 dividend per share. The appropriate discount rate is 15%. What is the value of the common stock under this scenario?



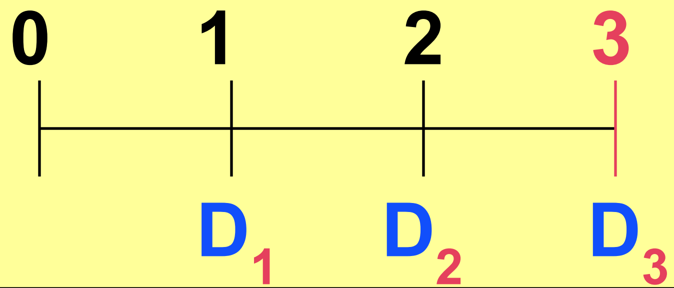
Growth Phases Model Example



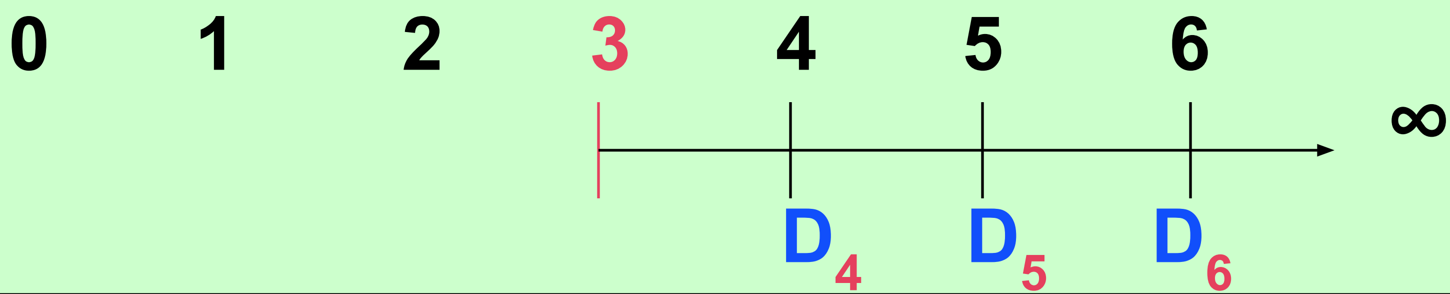
Stock GP has two phases of growth. The first, 16%, starts at time t=0 for 3 years and is followed by 8% thereafter starting at time t=3. We should view the time line as two separate time lines in the valuation.



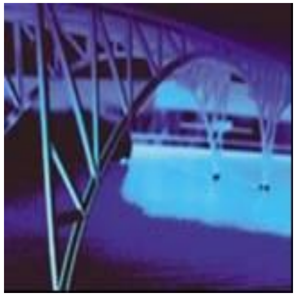
Growth Phases Model Example



Growth Phase #1 plus the infinitely long Phase #2



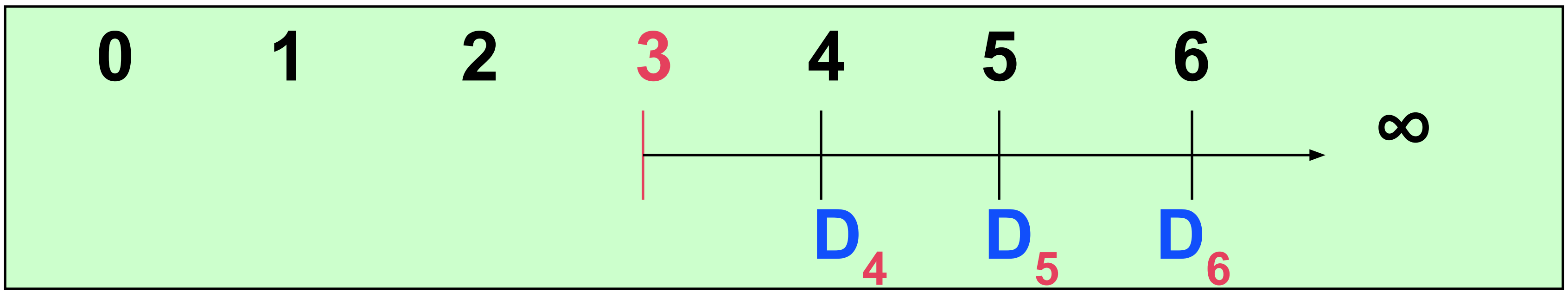
Note that we can value Phase #2 using the *Constant Growth Model*



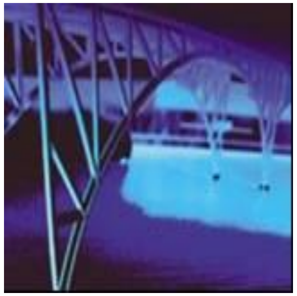
Growth Phases Model Example

$$V_3 = \frac{D_4}{k-g}$$

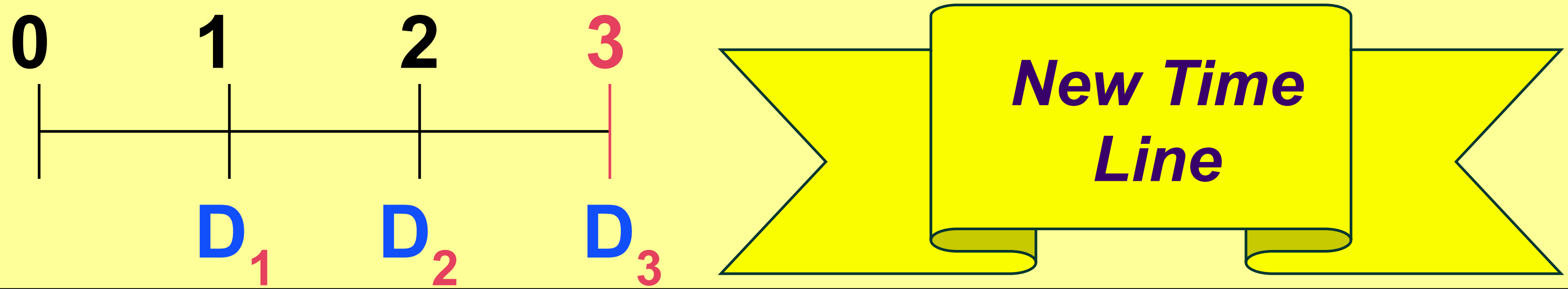
We can use this model because dividends grow at a constant 8% rate beginning at the end of Year 3.

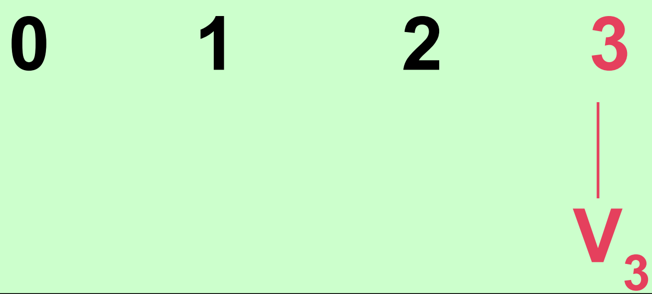


Note that we can now replace <u>all</u> dividends from year 4 to infinity with the *value* at time t=3, V_3! Simpler!!



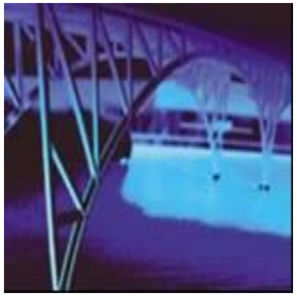
Growth Phases Model Example





Where $V_3 = \frac{D_4}{k-g}$

Now we only need to find the first four dividends to calculate the necessary cash flows.



Growth Phases Model Example

Determine the annual dividends.

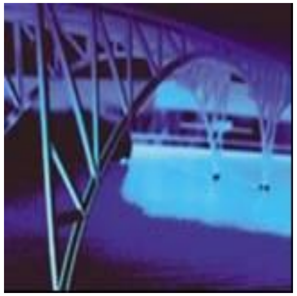
D_0 = $3.24 (this has been paid already)

$$D_1 = D_0(1+g_1)^1 = \$3.24(1.16)^1 = \$3.76$$

$$D_2 = D_0(1+g_1)^2 = \$3.24(1.16)^2 = \$4.36$$

$$D_3 = D_0(1+g_1)^3 = \$3.24(1.16)^3 = \$5.06$$

$$D_4 = D_3(1+g_2)^1 = \$5.06(1.08)^1 = \$5.46$$



Growth Phases Model Example

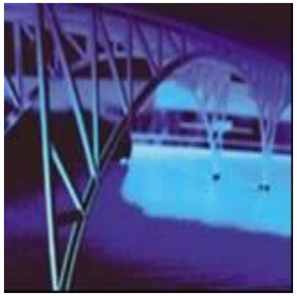
0	1	2	3
	3.76	4.36	5.06

Actual Values

0	1	2	3
			78

Where $\$78 = \frac{5.46}{.15 - .08}$

Now we need to find the present value of the cash flows.



Growth Phases Model Example

We determine the PV of cash flows.

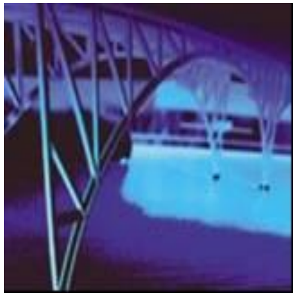
$PV(D_1) = D_1(PVIF_{15\%, 1}) = \$3.76\ (.870) = \$\underline{3.27}$

$PV(D_2) = D_2(PVIF_{15\%, 2}) = \$4.36\ (.756) = \$\underline{3.30}$

$PV(D_3) = D_3(PVIF_{15\%, 3}) = \$5.06\ (.658) = \$\underline{3.33}$

$P_3 = \$5.46\ / (.15 - .08) = \$78$ [CG Model]

$PV(P_3) = P_3(PVIF_{15\%, 3}) = \$78\ (.658) = \$\underline{51.32}$



Growth Phases Model Example

Finally, we calculate the *intrinsic value* by summing all of cash flow present values.

$$V = \$3.27 + \$3.30 + \$3.33 + \$51.32$$

$$V = \$61.22$$

$$V = \sum_{t=1}^{3} \frac{D_0(1+.16)^t}{(1+.15)^t} + \left[\frac{1}{(1+.15)^n}\right]\left[\frac{D_4}{(.15-.08)}\right]$$