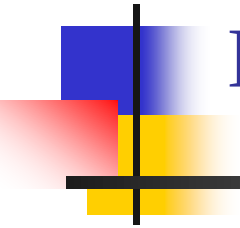


Bonds and Their Valuation

What is a bond?

- A long-term debt instrument in which a borrower agrees to make payments of principal and interest, on specific dates, to the holders of the bond.

Bond Characteristics

- Par Value = Stated face value that is the amount the issuer must repay
- Coupon Interest Rate
- Coupon = Coupon Rate * Par Value
- Maturity Date = when the par value is repaid

- Special Features:
  - Call provisions = right of issuer to repay (buy back) the bond before maturity (call premium)
  - Conversion options = right of bondholders to convert bonds into common stocks of issuing firm
- Different types of Bonds
  - Fixed rate bonds, Floating rate bonds, Callable bonds, Puttable bonds, Convertible Bonds (CBs), Bond with Warrants (BWs), Exchangeable bonds (EBs), Perpetual Bonds (Consols), Zero coupon bonds (STRIPs)

Bond markets

- Primarily traded in the over-the-counter (OTC) market.
- Most bonds are owned by and traded among large financial institutions.
- Full information on bond trades in the OTC market is not published.

Bond Valuation

Time Line,

$$V_B = INT(PVIFA_{k_d,N}) + M(PVIF_{k_d,N})$$

INT = $ coupon interest, kd = required return

N = # of years until maturity

M = Par value of the bond, usually $1,000

Bond Valuation – Example 1

M = \$1,000 par value, INT = \$80 annual coupon, k_d = 10%, N = 12 years

V_B=

Let's play with this example.

What is the new bond value if the required return changes to 8%?

V_B=

What if k_d = 6%?

V_B=

Some Key Relationships from Example 1

The coupon rate was $80/$1000 or 8%

When required rate = coupon rate

Par value (M) Bond value

When required rate > coupon rate

Par value (M) Bond value

When required rate < coupon rate

Par value (M) Bond value

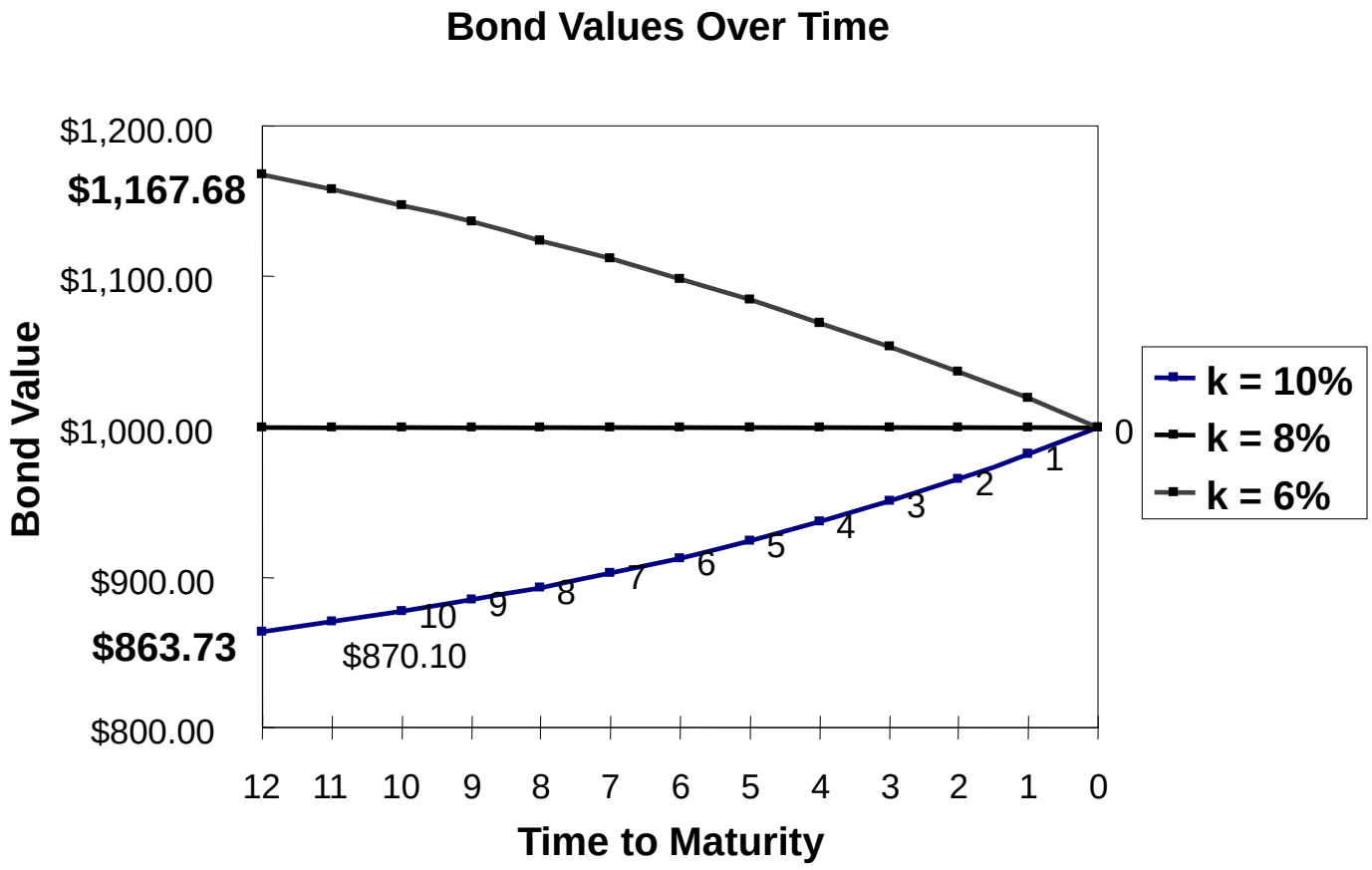
Bond Value Changes over Time

Returning to the original example #1, where k_d = 10%, N = 12, INT(PMT) = $80, M(FV) = $1,000, and V_B = $863.73

What is bond value one year later when N = 11 and k_d is still = 10%?

V_B =

Bond Values Over Time



What is the bond's return over this year?

Total Rate of Return = Current Yield + Capital Gains Yield

Beg. Bond Value (Purchase price) = 863.73
End. Bond Value (Sale price) = 870.10

Current Yield = Annual Coupon (INT)/ Beg. Bond Value (or Purchase Price)

C.Y =
C.G.Y =

Total Return =

Finding a bond's expected rate of return?

In the marketplace, we know a bond's current price (PV), but not its return.

Yield to Maturity (YTM) = the rate of return the bond would earn if purchased at today's price and held until maturity

Yield to Call (YTC) = the rate of return the bond would earn if purchased at today's price and held until could be called

Finding a bond's expected rate of return? – cont'd..

- Yield to Maturity Example:

$1000 face value bond with a 10% coupon rate paid annually with 20 years left to maturity sells for $1091.29

What is this bond's YTM?

YTM =

Bonds with Semiannual Coupons

Double the number of years, and divide required return and annual coupon by 2.

$$V_B = (INT/2)(PVIFA_{k_d/2,2N}) + M(PVIF_{k_d/2,2N})$$

- Semiannual Example:

A $1000 par value bond with an annual coupon rate of 9% pays coupon semiannually with 15 years left to maturity. What is the most you would be willing to pay for this bond if your required return is 8% APR?

V_B=

Risks of Bonds

Let's suppose we have 5 different bonds. Assume that required rates of return on those bonds are all k%, and par values are all $1,000

Bond1: 10-yr, 10% annual coupon

$$V_B = \$100(PVIFA_{k,10}) + \$1000(PVIF_{k,10})$$

Bond2-4: zero coupon bonds, bond2 with N=10, bond 3 with N=5, bond4 with N=30

$$V_B = \$1000(PVIF_{k,N})$$

Bond 5: $100 Perpetuity

$$V_B = PMT/k = \$100/k$$

Risks of Bonds – cont'd…

- Interest Rate Risk

Bond	K = 7%	K = 8%	% Change
10-yr, 10% annual coupon	$1210.71	$1134.20	-6.32%
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Risks of Bonds – cont'd…

Comparing Bonds 1 and 5 shows longer term bonds have greater bond price changes = More interest rate risk

Comparing Bonds 2, 3, and 4 also confirms that

Comparing the two 10-yr (1 & 2), the zero had the greater price change = More interest rate risk for lower coupon bonds

Risks of Bonds – cont'd…

– Reinvestment Rate Risk

Greater for short-term bonds = risk that income from bonds will fall

– Default Risk

Measured by bond ratings = ability of issuer to fulfill debt obligations (see table 8-1 in the text)

Ex) AAA, best rating, lowest default risk

Evaluating default risk: Bond ratings

	Investment Grade				Junk Bonds			
Moody's	Aaa	Aa	A	Baa	Ba	B	Caa	C
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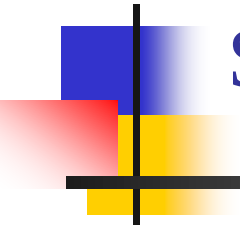
- Bond ratings are designed to reflect the probability of a bond issue going into default.



Stocks and Their Valuation

Facts about Common Stock

- Claim on income after interest and dividend payments to the creditors and preferred stock holders
- Represents ownership and Ownership implies control
- Shareholders get cash flow rights and control rights
- Limited liability

Advantages of Financing with Stock

- No required fixed payments
- No maturity
- No default, no repayment to investors

Disadvantages of Financing with Stock

- Controlling shareholders may lose some control (Dilution of ownership)
- Future earnings shared with new stockholders.
  =>Possible EPS Dilution
- Higher flotation costs vs. debt
- Higher component cost of capital
- Too little debt may encourage a takeover bid

Intrinsic Value and Stock Price

- Outside investors, corporate insiders, and analysts use a variety of approaches to estimate a stock's intrinsic value (P_0).
- In equilibrium we assume that a stock price equals its intrinsic value.
  - Outsiders estimate intrinsic value to help determine which stocks are attractive to buy and/or sell.
  - Stocks with a price below (above) its intrinsic value are *undervalued* (*overvalued*) by the market.

Different approaches for estimating the intrinsic value of a common stock

- Dividend growth model
- Corporate value model
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Stock Valuation

Stock value = PV of Dividends

$$\hat{P}_0 = \frac{D_1}{(1+k_s)^1} + \frac{D_2}{(1+k_s)^2} + \frac{D_3}{(1+k_s)^3} + \ldots\ldots + \frac{D_\infty}{(1+k_s)^\infty}$$

For Valuation: we will assume stocks fall into one of the following dividend growth patterns.

- Constant growth rate in dividends
- Zero growth rate in dividends
- “Supernormal” (non-constant) growth rate in dividends

Constant Growth Stock Valuation Model

$$D_1 = D_0(1+g)^1$$
$$D_2 = D_0(1+g)^2$$
$$D_t = D_0(1+g)^t$$

If g is constant, then

$$\hat{P}_0 = \frac{D_0(1+g)}{k_s - g} = \frac{D_1}{k_s - g}$$

,where

D_0 = today's (or current) dividend

D_1 = expected dividend at the end of this year (year1)

K_s = stocks' required rate of return

g = the constant growth rate in dividends

Example

ABC Inc. currently pays a dividend of $3 per share, and this dividend is expected to grow at a constant annual rate of 8% forever. ABC's stock has a beta of 1.6, the risk-free rate is 5%, and the market risk premium is 9%. What is the most a well-diversified investor would be willing to pay for a share of ABC Inc.?

Example – cont'd…

- Solution

$D_0 = \$3$, $g = 8\%$ or 0.08, $D_1 = \$3(1.08) = \$3.24$, need k_s

Can find required return from

$\hat{P}_0 =$

Expected Return of Constant Growth Stocks

Expected rate of return = Expected dividend yield + Expected Capital Gains Yield

D_1/P_0 = Expected Dividend Yield

g = Expected Capital Gains Yield

From our example, D_1 = \$3.24, P_0 = \$28.42, g = 8%

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Expected Return of Constant Growth Stocks -cont'd..

What happens if $g > k_s$?

We can't use model unless (1) $k_s > g$ and (2) g is expected to be constant forever.

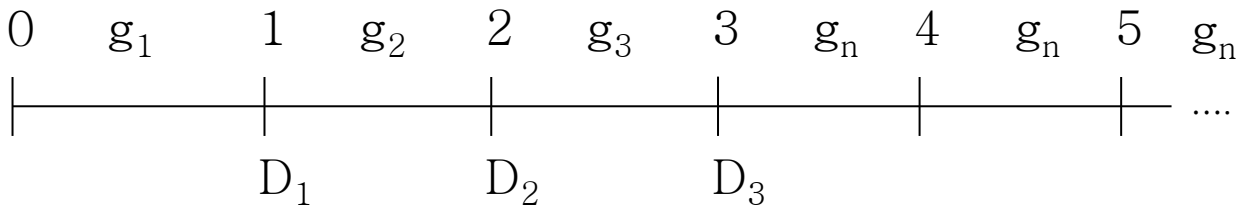
Zero Growth Stock Valuation

Just a special case of constant growth valuation, g = 0

$P = D/k_s$, and $k_s = D/P$

“Supernormal” Growth Stock Valuation

- Framework: Assume Stock has period of non-constant growth in dividends and earnings and then eventually settles into a normal constant growth pattern (g_n)



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- ***Supernormal Growth Valuation Process*** (3 Step Process)

Step 1: Estimate dividends during “supernormal” growth period

Step 2: Estimate price, which is the PV of the constant growth dividends, at the end of “supernormal” growth period which is also the beginning of the constant growth period.

Step 3: Find the PV of “supernormal” dividends and constant growth price. The total of these PVs = Today’s estimated stock value.

Example

Webscape Software currently pays no dividends. Webscape plans to pay a $1 per share dividend a year from today. Analysts predict that Webscape's dividends and earnings per share will grow by 30% in year 2, and 50% in year 3. After year three, analysts predict that Webscape's dividends and earnings will grow at a constant 10% annual rate forever. What is the value of Webscape's stock if the stock's required return is 20%?

- Solution

D_1 = \$1, g_2 = 30% or 0.3, g_3 = 50% or 0.5, g_n = 10% or 0.1, k_s = 20% or 0.2

Example – cont'd…

Find "Supernormal" Dividends:

D_1 =
D_2 =
D_3 =

Need to find P3 : Recall g_n = 10%, $_{ks}$ = 20%

P_3 =

Now, we need to find the PV of the supernormal dividends and PV of P_3 at the required rate of return.
The sum of these PVs will be the today's value of the stock.

Preferred Stock Characteristics

- Unlike common stock, no ownership interest
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- Annual dividend yield as a percentage of par value
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- Promises to pay the same dividend year after year forever, never matures.
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- $V_{ps} = D/k_{ps}$

Preferred Stock Valuation – cont'd…

- Example: GM preferred stock has a $25 par value with a 8% dividend yield. What price would you pay if your required return is 9%?

D =

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Expected Return on Preferred Stock

Just adjust the valuation model:

$$\bar{k}_{ps} = \frac{D}{P_0}$$

Example:

If we know the preferred stock price is $40, and the preferred dividend is $4.125, the expected return is:

Corporate value model

- Also called the free cash flow method. Suggests the value of the entire firm equals the present value of the firm's free cash flows.
- Remember, free cash flow is the firm's after-tax operating income less the net capital investment
  - FCF = NOPAT – Net capital investment

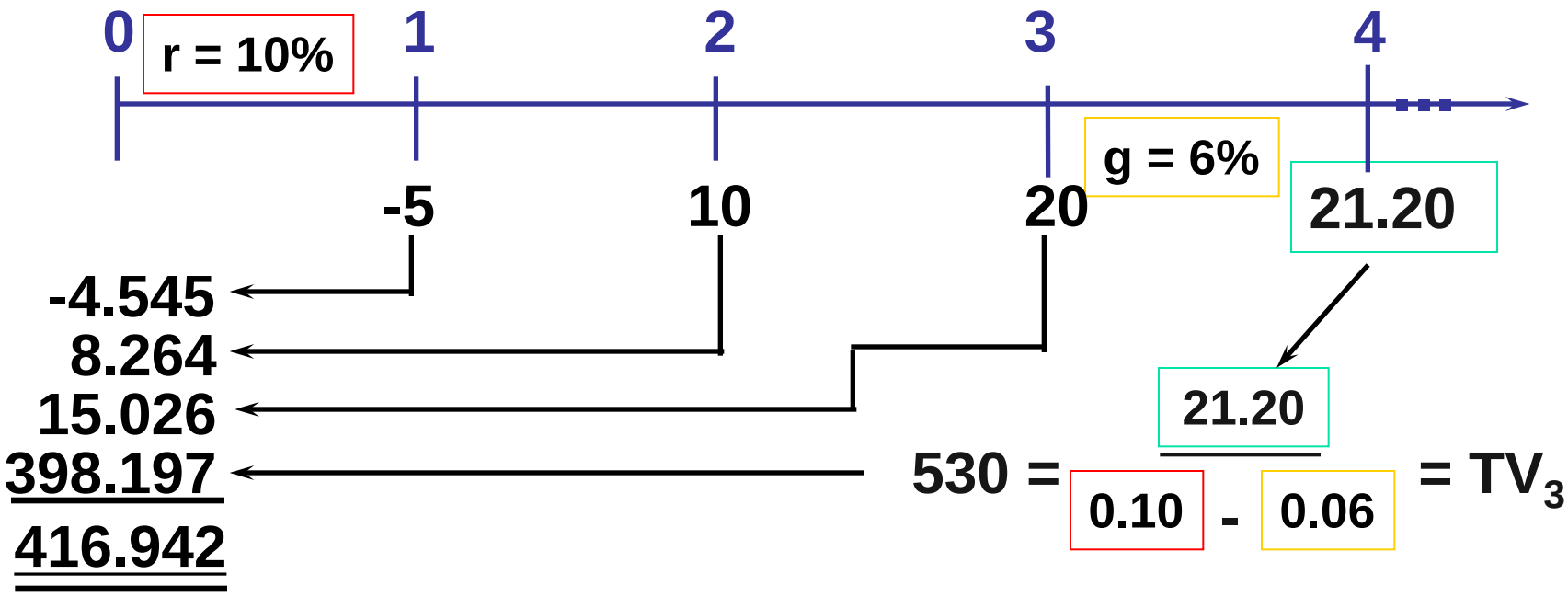
Applying the corporate value model

- Find the value of the firm, by finding the PV of the firm's future FCFs.
- Subtract the value of firm's debt and preferred stock to get the value of common stock.
- Divide the value of common stock by the number of shares outstanding to get intrinsic stock price.

Issues regarding the corporate value model

- Often preferred to the dividend growth model, especially when considering number of firms that don't pay dividends or when dividends are hard to forecast.
- Similar to dividend growth model, assumes at some point free cash flow will grow at a constant rate.
- Terminal value (TV_N) represents value of firm at the point that growth becomes constant.

Given the long-run g_{FCF} = 6%, and r= 10%, use the corporate value model to find the firm's intrinsic value.



If the firm has $40 million in debt and has 10 million shares of stock, what is the firm's intrinsic value per share?

- Value of equity= value of firm – value of debt
  = $416.94 - $40
  = $376.94 million
- Value per share=value of equity / # of shares
  = $376.94 / 10
  = $37.69

Firm multiples method

- Analysts often use the following multiples to value stocks.
  - P / E
  - P / CF
  - P / Sales
- EXAMPLE: Based on comparable firms, estimate the appropriate P/E. Multiply this by expected earnings to back out an estimate of the stock price.

What is market equilibrium?

- In equilibrium, stock prices are stable and there is no general tendency for people to buy versus to sell.
- In equilibrium, two conditions hold:
  - The current market stock price equals its intrinsic value ($P_0 = P_0$).
  - Expected returns must equal required returns.

$$\hat{r}_s = \frac{D_1}{P_0} + g \quad = \quad \hat{r}_s = r_{RF} + (r_M - r_{RF})b$$

Market equilibrium

- Expected returns are determined by estimating dividends and expected capital gains.
- Required returns are determined by estimating risk and applying the CAPM.

How is market equilibrium established?

- If price is below intrinsic value …
  - The current price (P_0) is “too low” and offers a bargain.
  - Buy orders will be greater than sell orders.
  - P_0 will be bid up until expected return equals required return.

What is a bond?

- A long-term debt instrument in which a borrower agrees to make payments of principal and interest, on specific dates, to the holders of the bond.

Bond Characteristics

- Par Value = Stated face value that is the amount the issuer must repay
- Coupon Interest Rate
- Coupon = Coupon Rate * Par Value
- Maturity Date = when the par value is repaid
- Call provisions = right of issuer to repay (buy back) the bond before maturity (call premium)
- Sinking Funds = mechanism for retirement of bond issue
- Other Features: Convertible Bonds

Bond markets

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- Full information on bond trades in the OTC market is not published.

Bond Valuation

Time Line,

$$V_B = INT(PVIFA_{k_d,N}) + M(PVIF_{k_d,N})$$

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Let's play with this example.

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The coupon rate was $80/$1000 or 8%

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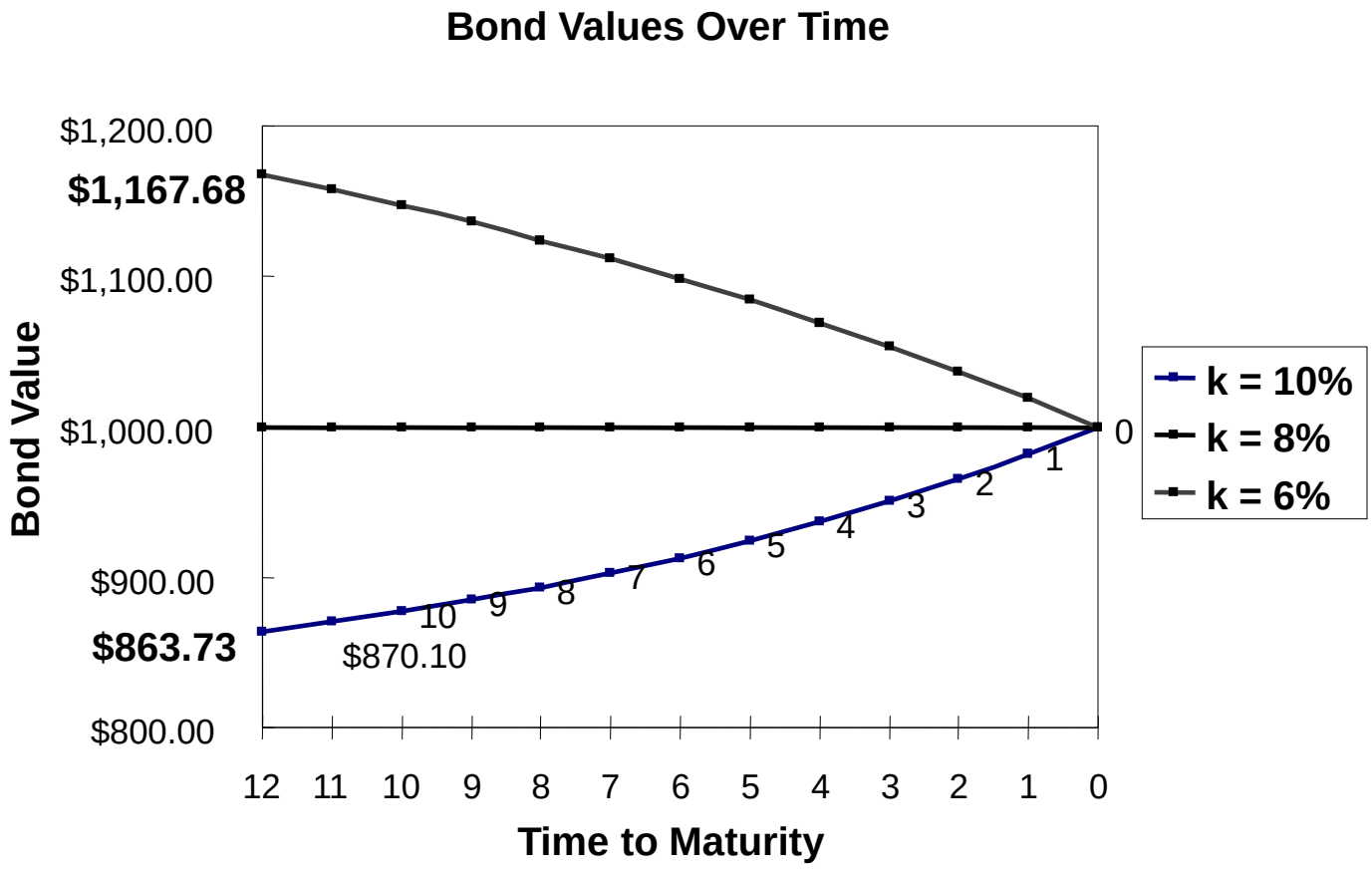

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$1000 face value bond with a 10% coupon rate paid annually with 20 years left to maturity sells for $1091.29

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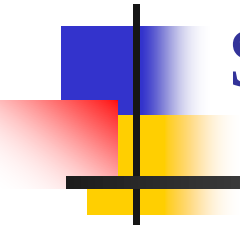

Stocks and Their Valuation

Facts about Common Stock

- Claim on income after interest and dividend payments to the creditors and preferred stock holders
- Represents ownership and Ownership implies control
- Limited liability
- Stockholders elect directors = voting rights
- Directors elect management
- Management's goal: Maximize shareholders' wealth (= Maximize stock price)

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- No required fixed payments
- No maturity
- Improves capital structure

Disadvantages of Financing with Stock

- Controlling shareholders may lose some control
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ABC Inc. currently pays a dividend of $3 per share, and this dividend is expected to grow at a constant annual rate of 8% forever. ABC's stock has a beta of 1.6, the risk-free rate is 5%, and the market risk premium is 9%. What is the most a well-diversified investor would be willing to pay for a share of ABC Inc.?

Example – cont'd…

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Can find required return from

$\hat{P}_0 =$

Expected Return of Constant Growth Stocks

Expected rate of return = Expected dividend yield + Expected Capital Gains Yield

D_1/P_0 = Expected Dividend Yield

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From our example, D_1 = \$3.24, P_0 = \$28.42, g = 8%

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Expected Return of Constant Growth Stocks -cont'd..

What happens if $g > k_s$?

We can't use model unless (1) $k_s > g$ and (2) g is expected to be constant forever.

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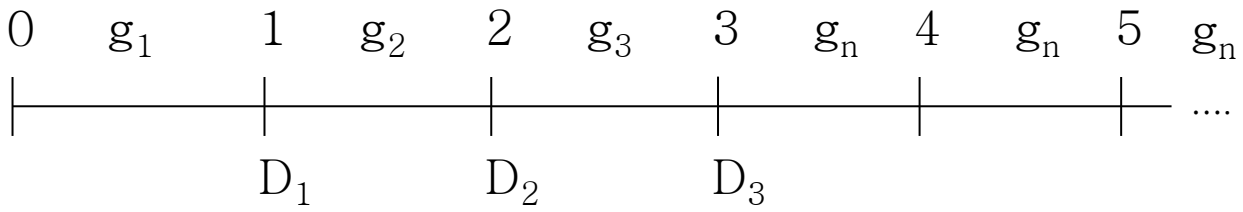

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D_1 = \$1, g_2 = 30% or 0.3, g_3 = 50% or 0.5, g_n = 10% or 0.1, k_s = 20% or 0.2

Example – cont'd…

Find "Supernormal" Dividends:

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Need to find P3 : Recall g_n = 10%, $_{ks}$ = 20%

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- Unlike common stock, no ownership interest
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- Annual dividend yield as a percentage of par value
- Preferred dividends must be paid before common dividends
- If cumulative preferred, all missed past dividends must be paid before common dividends can be paid

Preferred Stock Valuation

- Promises to pay the same dividend year after year forever, never matures.
- A perpetuity
- $V_{ps} = D/k_{ps}$

Preferred Stock Valuation – cont'd…

- Example: GM preferred stock has a $25 par value with a 8% dividend yield. What price would you pay if your required return is 9%?

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Corporate value model

- Also called the free cash flow method. Suggests the value of the entire firm equals the present value of the firm's free cash flows.
- Remember, free cash flow is the firm's after-tax operating income less the net capital investment
  - FCF = NOPAT – Net capital investment

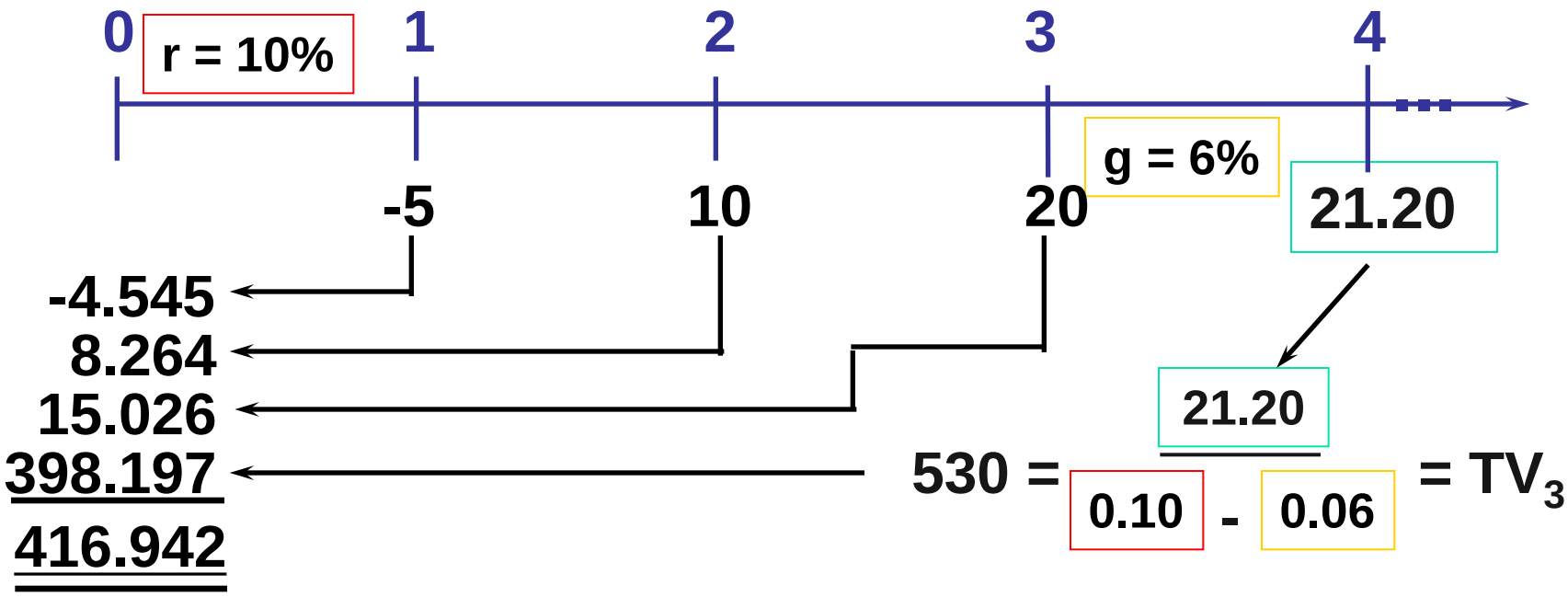
Applying the corporate value model

- Find the value of the firm, by finding the PV of the firm's future FCFs.
- Subtract the value of firm's debt and preferred stock to get the value of common stock.
- Divide the value of common stock by the number of shares outstanding to get intrinsic stock price.

Issues regarding the corporate value model

- Often preferred to the dividend growth model, especially when considering number of firms that don't pay dividends or when dividends are hard to forecast.
- Similar to dividend growth model, assumes at some point free cash flow will grow at a constant rate.
- Terminal value (TV_N) represents value of firm at the point that growth becomes constant.

Given the long-run g_{FCF} = 6%, and r= 10%, use the corporate value model to find the firm's intrinsic value.



If the firm has $40 million in debt and has 10 million shares of stock, what is the firm's intrinsic value per share?

- Value of equity= value of firm – value of debt
  = $416.94 - $40
  = $376.94 million
- Value per share=value of equity / # of shares
  = $376.94 / 10
  = $37.69

Firm multiples method

- Analysts often use the following multiples to value stocks.
  - P / E
  - P / CF
  - P / Sales
- EXAMPLE: Based on comparable firms, estimate the appropriate P/E. Multiply this by expected earnings to back out an estimate of the stock price.

What is market equilibrium?

- In equilibrium, stock prices are stable and there is no general tendency for people to buy versus to sell.
- In equilibrium, two conditions hold:
  - The current market stock price equals its intrinsic value ($P_0 = P_0$).
  - Expected returns must equal required returns.

$$\hat{r}_s = \frac{D_1}{P_0} + g \quad = \quad \hat{r}_s = r_{RF} + (r_M - r_{RF})b$$

Market equilibrium

- Expected returns are determined by estimating dividends and expected capital gains.
- Required returns are determined by estimating risk and applying the CAPM.

How is market equilibrium established?

- If price is below intrinsic value …
  - The current price (P_0) is “too low” and offers a bargain.
  - Buy orders will be greater than sell orders.
  - P_0 will be bid up until expected return equals required return.