FINA 1082 Financial Management

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Session 3

Valuation of Equity Securities

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At different levels business decisions involves valuation

Capital Budgeting: involves consideration of how a particular project will affect firm value.

Strategic planning: focuses on how value is influenced by larger sets of actions.

Security analysts: conduct valuation to support their buy/sell decisions, and potential acquirers.

Basics in Valuation Approaches

- perception that markets are inefficient and make mistakes in assessing value

- an assumption about how and when these inefficiencies will get corrected

In an efficient market, the market price is the best estimate of value.

The purpose of any valuation model is then the justification of this value.

Valuation objective is to search for “true” value

Valuations are biased. The question is how much and in which direction.

The direction and magnitude of the bias is *directly proportional* to who pays you and how much you are paid.

Valuation Approaches

Discounted Cash Flow: value of any asset is estimated by computing the PV of the expected cash flows on that asset, discounted back at a rate that reflects the riskiness of the cash flows (measure of the intrinsic value of an asset).

Relative Valuation: The value of any asset can be estimated by looking how similar assets are priced in the market place.

Academic Studies

Mainly focus on the comparison of two model approaches:

- Discounted Dividends
- Discounted Cash Flows

Ratios or multiple based models are discussed in isolation or in addition of the three previous models.

Main valuation models:

Discounted Dividends: This approach expresses the value of firm's equity as the present value of forecasted future dividends.

Discounted Cash Flow (DCF): involves detailed production of multiple year forecasts of cash flows. Cash Flows are then discounted at the firm's estimated cost of capital to arrive at an estimated present value.

*Discounted Abnormal Earnings: Value of firm's equity is expressed as the sum of its book value and the present value of the forecasted abnormal earnings.

*Discounted abnormal earnings growth: Value of the firm's equity as the sum of its capitalized next-period earnings forecast and the present value of forecasted abnormal earnings growth beyond the next period.

*Real Options: Contingent Claim (Option) Valuation

Valuation based on price multiples: Current measure of performance or single forecast of performance is converted into a value by applying an appropriate price multiple derived from the value of comparable firms.

Example: firm value can be estimated by applying a price-to-earnings ratio to a forecast of the firm's earnings for the coming year. Other commonly used multiples include price-to-book ratios and price-to-sales ratios.

Discounted Cashflow Valuation

$$\text{Value} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}$$

Where

- CF_t is the cash flow in period t,
- *r* is the discount rate appropriate given the riskiness of the cash flow, and
- t is the life of the asset.

For an asset to have value, the expected cash flows have to be positive some time over the life of the asset.

Assets that generate cash flows early in their life will be worth more than assets that generate cash flows later; the later may however have greater growth and higher cash flows to compensate.

Characteristics of Ordinary Shares

Ordinary shares typically provide investors with an infinite stream of uncertain cash flows or dividends - D_1, D_2, ..., D_n,... The price of ordinary shares today is the present value of all future expected dividends discounted at the "appropriate" required rate of return (or discount rate)

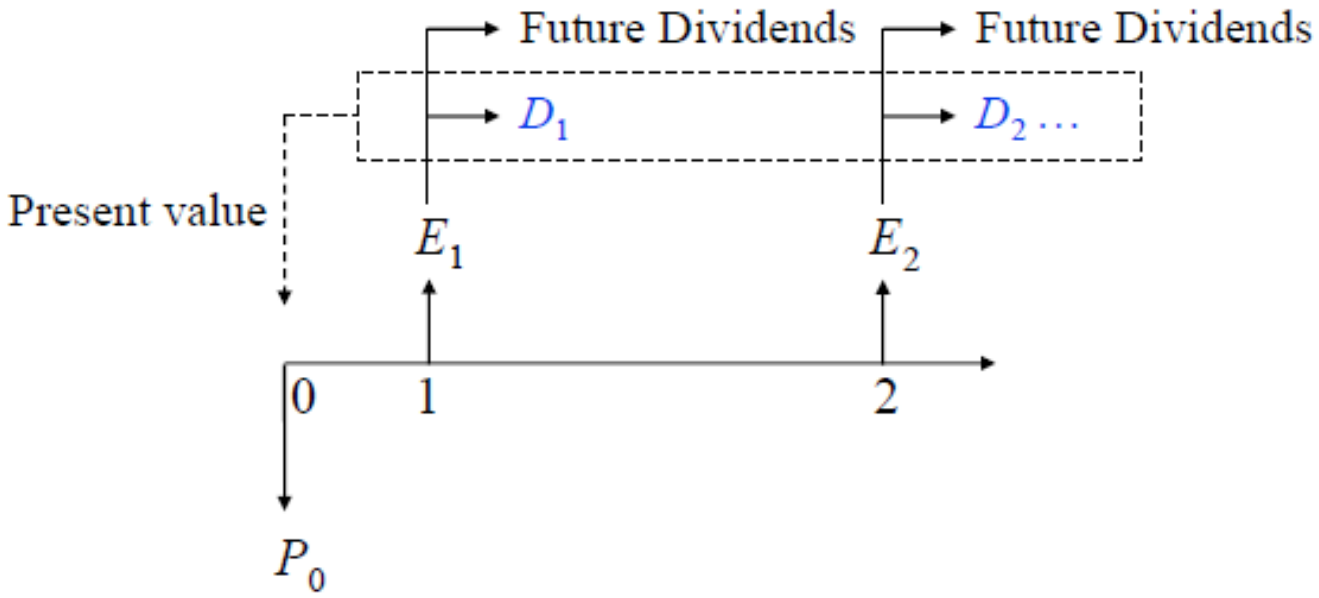
$$P_0 = \sum_{t=1}^{N} \frac{CF_t}{(1+k_e)^t}$$

where k_e is the rate of return required by investors for the time value and risk associated with the security's cash flows (CFt)

What cash flows are relevant?

Characteristics of Ordinary Shares

Need to consider dividends, which are paid from earnings



Pricing Ordinary Shares

In a one period framework, the stock price is equal to the sum of the next period's dividend and the expected price discounted at the required return

$$P_0 = \frac{D_1 + P_1}{1 + k_e} \quad \text{and} \quad P_1 = \frac{D_2 + P_2}{1 + k_e} \quad \text{and} \quad P_t = \frac{D_{t+1} + P_{t+1}}{1 + k_e}$$

Over any period, the expected rate of return (*ke) is*

$$k_e = \frac{D_{t+1} + P_{t+1}}{P_t} - 1 = \frac{D_{t+1}}{P_t} + \frac{P_{t+1} - P_t}{P_t}$$

$$k_e = \text{Dividend yield} + \text{Percent price change}$$

Pricing Ordinary Shares

Example: The price and dividend per share for OzCo Ltd next period are expected to be \$5.00 and \$0.50, respectively. If the expected return on these shares is 10% p.a. what is OzCo's current stock price? If the current price changes to \$4.80 what has happened to the expected return on these shares? Why?

Given: P_{t+1} = \$5.00, D_{t+1} = \$0.50 and k_e = 10%

$$P_t = \frac{0.50 + 5.00}{1 + 0.10} = \$5.00$$

If the current price changes to \$4.80, the expected return rises to

$$k_e = \frac{0.50 + 5.00}{4.80} - 1 = 14.6\%$$

Note that prices and expected returns are inversely related

Pricing Ordinary Shares

The stock price over periods 0, 1 and 2 can be written as

$$P_0 = \frac{D_1 + P_1}{1 + k_e} \quad \text{and} \quad P_1 = \frac{D_2 + P_2}{1 + k_e} \quad \text{and} \quad P_2 = \frac{D_3 + P_3}{1 + k_e}$$

Substituting P_2 and P_1 recursively, we get P_0 as

$$P_0 = \frac{D_1}{1 + k_e} + \frac{D_2}{(1 + k_e)^2} + \frac{D_3 + P_3}{(1 + k_e)^3}$$

- The current dividend (D_0) is not relevant to our estimate of the current price - all prices estimated are ex-dividend prices
- Ex-dividend prices are prices after the current period's dividend has been paid

Pricing Ordinary Shares

Extending the above process to H periods, we get

$$P_0 = \frac{D_1}{1+k_e} + \frac{D_2}{(1+k_e)^2} + \frac{D_3}{(1+k_e)^3} + \ldots + \frac{D_H + P_H}{(1+k_e)^H}$$

$$P_0 = \sum_{t=1}^{H} \frac{D_t}{(1+k_e)^t} + \frac{P_H}{(1+k_e)^H}$$

$$As\ H \to \infty, PV(P_H) \to 0$$

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t}$$

Market analysts often make simplifying assumptions about future expected dividends

Constant Dividend Growth Model

A constant growth rate in dividends implies

$$D_2 = D_1(1+g),\ D_3 = D_1(1+g)^2,\ \ldots,\ D_t = D_1(1+g)^{t-1}$$

Substituting the above dividends in the expression for P_0 we get

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t} = \sum_{t=1}^{\infty} \frac{D_1(1+g)^{t-1}}{(1+k_e)^t}$$

$$As\ t \to \infty,\ \sum_{t=1}^{\infty} \frac{(1+g)^{t-1}}{(1+k_e)^t} \to \frac{1}{k_e - g}$$

The above expression simplifies to

$$P_0 = \frac{D_1}{k_e - g} \quad \text{where } k_e > g \qquad \text{or} \qquad P_t = \frac{D_{t+1}}{k_e - g}$$

Constant Dividend Growth Model

Application 1: Assume that year 0 is the end of 2004. Telstra Ltd is expected to pay annual dividends of $0.26 in 2005 (year 1). Assume that this dividend grows at an annual rate of 5% in the foreseeable future and investors require a return of 10% p.a.

a) Estimate Telstra's stock price today
b) What is Telstra's price expected to be at the end of 2005?
c) Based on Telstra's current price of $4.75, what is the constant dividend growth rate implied?
d) How sensitive is the price estimate to different assumptions regarding the growth in dividends over time?
e) How sensitive is the price estimate to different assumptions regarding the required rate of return?

Constant Dividend Growth Model

Given: $D_1 = 0.26$, $g = 0.05$ and $ke = 0.10$

a) $P_0 = 0.26/(0.10 - 0.05) = \$5.20$
b) $P_1 = D2/(ke - g) = 0.26(1.05)/(0.10 - 0.05) = \$5.46$ (a 5% rise)
c) $ke = D_1 /P_0 + g$ or $g = ke - D_1 /P_0$
$g = 0.10 - 0.26/4.75 = 0.0453$ or 4.5%
d) Sensitivity of Telstra's price to changes in expectations of g

$g = 3\%$: $P_0 = 0.26/(0.10 - 0.03) = \$3.71$ (-28.7%)
$g = 4\%$: $P_0 = 0.26/(0.10 - 0.04) = \$4.33$ (-16.7%)
$g = 5\%$: $P_0 = 0.26/(0.10 - 0.05) = \$5.20$
$g = 6\%$: $P_0 = 0.26/(0.10 - 0.06) = \$6.50$ (+25.0%)
$g = 7\%$: $P_0 = 0.26/(0.10 - 0.07) = \$8.67$ (+66.7%)

Constant Dividend Growth Model

Sensitivity of Telstra's price to changes in ke

ke = 8%: P_0 = 0.26/(0.08 - 0.05) = $8.67 (+66.7%)
ke = 9%: P_0 = 0.26/(0.09 - 0.05) = $6.50 (+25.0%)
ke = 10%: P_0 = 0.26/(0.10 - 0.05) = $5.20
ke = 11%: P_0 = 0.26/(0.11 - 0.05) = $4.33 (-16.7%)
ke = 12%: P0 = 0.26/(0.12 - 0.05) = $3.71 (-28.7%)

- Price estimates are very sensitive to assumptions regarding future dividends, growth in dividends and required rate of return

- It is often more realistic to assume a variable growth rate in dividends with higher initial growth in dividends followed by subsequent lower (or zero) growth in dividends

Variable Dividend Growth Model

Application 2: In the previous application, assume that Telstra's current dividend of $0.25 grows at 10% for 3 years and then stabilizes at 5% thereafter. What price should Telstra shares sell for today if the required rate of return remains at 10%?

Three step procedure to estimate P_0

Step 1: Compute the dividends up to the point where g becomes constant (over years 1 to 4 in this case)

Step 2: Compute the price at the end of the year after which dividends grow at a constant rate (year 3 in this case)

Step 3: Add the present value of dividends from Step 1 to the present value of the price from Step 2 to get P_0

Variable Dividend Growth Model

Given: D_0 = \$0.25, g_1 = 10% over years 1 - 3,
g_2 = 5% from year 4 onwards, ke = 10%

Step 1: Obtain dividends up to where g becomes constant

$D_1 = 0.2500(1.10) = \$0.2750$
$D_2 = 0.2750(1.10) = \$0.3025$
$D_3 = 0.3025(1.10) = \$0.3328$
$D_4 = 0.3328(1.05) = \$0.3494$

Step 2: Obtain P_n (after which dividend growth is constant)

$P_3 = D_4 /(ke - g_2) = 0.3494/(0.10 - 0.05) = \$6.988$

Step 3: Add the present values of dividends and P_n to get P_0

$P_0 = D_1/(1 + ke) + D_2 /(1 + ke)^2 + (D_3 + P_3)/(1 + ke)^3$
$P_0 = 0.2750/1.1 + 0.3025/1.1^2 + (0.3328 + 6.988)/1.1^3 = \$6.00$

Equity versus Firm Valuation

- Value just the equity stake in the business.

- Value the entire business, which includes, besides equity, the other claimholders in the firm

Equity Valuation

The value of equity is obtained by:

Discounting expected *cashflows to equity* (the residual cashflows after meeting all expenses, tax obligations and interest and principal payments) at the cost of equity (required return to shareholders).

$$\text{Value of Equity} = \sum_{t=1}^{n} \frac{\text{CF to Equity}_t}{(1+k_e)^t}$$

$\text{CF to Equity}_t = \text{Expected Cashflow to Equity in period t}$

$k_e = \text{Cost of Equity}$

Note: The dividend discount model is a specialized case of equity valuation

Firm Valuation

The value of the firm is obtained by:

Discounting expected *cashflows to the firm* (the residual cashflows after meeting all operating expenses and taxes, but prior to debt payments) *at the WACC* (cost of the different components of financing used by the firm, weighted by their market value proportions)

$$\text{Value of Firm} = \sum_{t=1}^{n} \frac{\text{CF to Firm}_t}{(1+\text{wacc})^t}$$

Adjusted Present Value approach:

Firm Value = Unlevered Firm Value + PV of tax benefits of debt - Expected Bankruptcy Cost

Generic DCF Valuation Model

Firm is a stable growth
Grows at constant rate
forever

Cash Flows
Firm: Pre-debt cash flows
Equity: After-debt cash flows

Expected Growth
Firm: Growth in Operating Earnings
Equity: Growth NI/EPS

Value
Firm: Value of Firm
Equity: Value of Equity

CF_1 CF_2 CF_3 CF_4 CF_5 CF_n

Terminal Value
Forever

Length of period of High Growth

Discount Rate
Firm: Cost of Capital
Equity: Cost of Equity

Valuing ABC

Retention Ratio = 41.56% ROE = 16%

Dividends

$EPS_0 = \$1.54$

Payout Ratio = 58.44%

$DPS_0 = \$0.90$

Expected Growth

41.56% ×16.00% = 6.65%

$g = 4\% : ROE = 8.95\%$ (Cost of equity)

$Beta = 1.00$

$$Payout = 1 - \frac{g}{ROE} = 1 - \frac{0.04}{0.0895} = 55.31\%$$

$$\text{Terminal value} = \frac{EPS_6 \times Payout}{r - g} = \frac{\$2.12 \times 1.04 \times 0.553}{(0.895 - 0.04)} = \$24.69$$

$EPS_1 = \$1.64$ $EPS_2 = \$1.75$ $EPS_3 = \$1.87$ $EPS_4 = \$1.99$ $EPS_5 = \$2.12$

$DPS_1 = \$0.96$ $DPS_2 = \$1.02$ $DPS_3 = \$1.09$ $DPS_4 = \$1.16$ $DPS_5 = \$1.24$

Value of equity per share = $20.48

Forever

Discount at Cost of Equity

4.95% = 0.95 × 4% = 8.75%

Risk free rate (Long term bond rate in USD) + Beta ×Risk Premium

= 4.95% + 0.95 × 4%

Risk Premium = Mature Market (4%) + Country Risk (0%)

Discounted Free Cash Flow Model

Considers cash that is available to shareholders and lenders of the company.

Value of firm is determined as the present value of future cash flows plus excess cash and marketable securities, minus debt and preferred shares.

As valuation is completely dependent on future expectations, the model is vulnerable to mistakes in these assumptions. On average 82% of the firm value is determined by the terminal value.

$$V_{FCF} = \sum_{t=1}^{T} \frac{FCF_T}{(1+WACC)^t} + \frac{TV_{FCF}}{(1+WACC)^t} + ECMS - D - PS$$

$$with\ FCF = (Sales - OpExp - DepExp)(1-\tau) + (DepExp - \Delta WC - CapExp)$$

$V = Market\ Value$

$WACC = Weighted\ Average\ Cost\ of\ Capital$

$FCF = Free\ Cash\ Flow$

$TV = Terminal\ Value$

$ECMS = Excessive\ Cash\ and\ Marketable\ Securities$

$D = Debt$

$OpExp = Operating\ Expenses$

$DepExp = Depreciation\ Expenses$

$WC = Working\ Capital$

$CapExp = Capital\ Expenditures$

$PS = Preferred\ Shares$

$g = expected\ FCF\ growth$

Estimating the Intrinsic Value

Most investment valuation involves:

Estimating the amount and timing of the cash flows

Interest, dividends, and capital gains

Estimating the growth rate of returns

common stock / Real estate
(Can grow over time)

Preferred Stock / Bonds
(fixed)

Applying an appropriate discount rate to the cash flows to estimate the investment's intrinsic value

The required return for the risk assumed Amount & timing of cash flow

Comparing the intrinsic value to the market price

If estimated intrinsic value > market price, then BUY!

Discounted Cash Flow Models

Preferred Stock

$$P_{pdf} = \frac{DIV}{r_P}$$

- Fixed/Perpetual Income-never matures
- Market Rate

Common Stock

Projected (not fixed)

$$P_{cs} = \frac{DIV_1}{(1+R_{CE})} + \frac{DIV_2}{(1+R_{CE})^2} + \ldots + \frac{DIVn + P_{CS_n}}{(1+RCE)^n} = \frac{DIV_n + 1}{r-g}$$

Constant (Gordon) Growth DDM

- g ≤ g economy

$$P_{CS} = \frac{DIV_1}{R_{CE} - g_{DIV}}$$

DIV_1:

- $DIV_0 \times (1+g)$
- $EPS_1 \times \text{Payout Rate}$
- $ROE \times \text{Retention Rate}$

The Weighted Average Cost of Capital

- The weighted average cost of capital (WACC or k_0) is the benchmark required rate of return used by a firm to evaluate its investment opportunities
  - The discount rate used to evaluate projects of similar risk to the firm

- It takes into account how a firm finances its investments
  - How much debt versus equity does the firm employ?

- The WACC depends on…
  - Qualitative factors
  - The market values of the alternative sources of funds
  - The market costs associated with these sources of funds

Estimating the WACC

- The main steps involved in the estimation of the WACC are…
  - Identify the financing components
  - Estimate the current (or market) values of the financing components
  - Estimate the cost of each financing component
  - Estimate the WACC

- We will consider each step for typical financing components

Identify the Financing Components

- Debt
  - Identify all externally supplied debt items
  - Do not include creditors and accruals as these costs are already included in net cash flows

- Ordinary shares
  - Obtain number of issued shares from the balance sheet
  - Do not include reserves and retained earnings

- Preference shares
  - Obtain number of issued shares from the balance sheet

Valuing the Financing Components

- Use market values and not book values
- Value coupon paying debt using the following pricing relation (see Lecture 3)

$$P_0 = \frac{C_1}{(1+k_d)} + \frac{C_2}{(1+k_d)^2} + \ldots + \frac{C_n}{(1+k_d)^n} + \frac{F_n}{(1+k_d)^n}$$

$$P_0 = \sum_{t=1}^{n} \frac{C_t}{(1+k_d)^t} + \frac{F_n}{(1+k_d)^n}$$

where P_0 = Market price of the debt security

C_t = Periodic interest payment on debt in period t

k_d = Required rate of return on debt

Valuing Long Term Debt

Example: BLD Ltd has 10,000 bonds outstanding and each bond has a face value of $1,000 with two years remaining to maturity. The bonds pay coupons (or interest) at a rate of 10% p.a. every six months. If the market interest rate appropriate for the bond is 15% p.a., what is the current price of each bond? What is the total market value of debt in BLD Ltd's capital structure?

Valuing Long Term Debt

- Coupon (or interest) payments are made every six months
- Number of payments, n = 4, semi-annual payments
- Annual interest payments = 0.10(1000) = $100.00
    - So, semi-annual interest payments = $50.00
- Repayment of principal at the end of year 2 = $1000.00
- Required return on debt, k_d = 15% p.a.
- So, semi-annual required return on debt, k_d = 7.5%

Valuing Long Term Debt

The price of the bond is…

$$P_0 = \frac{50}{(1.075)^1} + \frac{50}{(1.075)^2} + \frac{50}{(1.075)^3} + \frac{1050}{(1.075)^4}$$

P_0 = \$916.27

- So, total value of debt = 10000(916.27) = \$9,162,700

- Note: As the coupon rate is lower than the market rate, the price is less than the face value, that is, the bond is selling at a discount to face value
  - If the coupon rate is greater than the market rate, the price would be at a premium to face value

Valuing Ordinary Shares

- Example: ABC Ltd has 300,000 shares on issue which each have a par value of $1.00. If the shares are currently trading at $3.50 each what is the total market value of ABC's ordinary shares?

- There are 300,000 shares on issue with a market value of $3.50 per share

- Market value of equity = 300000 × 3.50 = $1,050,000
    - The par (or book) value of shares is not relevant here

Valuing Preference Shares

- Preference shares pay a fixed dividend at regular intervals
- If the shares are non-redeemable, then the cash flows represent a perpetuity and the market value can be computed as…

- $P_0 = D_p/k_p$

Where

P_0 = The current market price
D_p = Value of the periodic dividend
k_p = Required return on preference shares

Valuing Preference Shares

- Example: Assume the preference shares of XYZ Ltd pay a dividend of \$0.40 p.a. and the cost of preference shares is 10% p.a. What is the price of the preference shares? If XYZ Ltd has 500,000 preference shares outstanding, what is the market value of these shares?

- The cash flows from the preference shares are…
  - D_p = \$0.40 per share
  - So, P_0 = 0.40/0.10 = \$4.00
  - Market value of shares = 500000 × 4.00 = \$2,000,000

Estimating the Costs of Capital

- The costs of a firm's financing instruments can be obtained as follows…
  - Use observable market rates - may need to be estimated
  - Use effective annual rates
  - For the cost of debt use the market yield

- Focus here is on the costs of debt, ordinary shares and preference shares
  - Note: We ignore the complications of flotation costs and franking credits associated with dividends (sections 15.5.3 and 15.5.5 of the text)

Cost of Debt

- Example: The bonds of ABD Ltd have a face value of $1,000 with one year remaining to maturity. The bonds pay coupons at the rate of 10 percent p.a. If the current market price of the bonds is $1,018.50, what is the firm's cost of debt?

- The annual interest (coupon) paid on the debt is…
  - 1000 × 0.10 = $100

- So, 1018.50 = (1000 + 100)/(1 + kd)
- k_d = (1100/1018.50) – 1 = 8.0%

Cost of Ordinary Shares

It is common to use CAPM to estimate the cost of equity capital, where the cost of equity is…

$$k_e = r_f + [E(r_m) - r_f]\beta_e$$

where $E(r_m) - r_f$ = Expected market risk premium

r_f = Risk free rate

β_e = Equity beta

- Note that the equity beta is the estimate of the firm's relative "risk" compared to movements in the market portfolio
  - The market risk premium is typically estimated using historical market data
  - The riskfree rate is typically based on the long term government bond rate

Cost of Ordinary Shares

Example: Assume that the risk free rate is 6 percent, the expected market risk premium is 8 percent and the equity beta of XYW Ltd's equity is 1.2. What is the firm's cost of equity capital?

Using the CAPM, we have…

- $k_e = r_f + [E(r_m) - r_f]\beta_e$
- $k_e = 0.06 + 0.08 \times 1.2 = 15.6\%$

Note: Can also use the dividend discount models covered in Lecture 4 (but not commonly used by managers…)

- $P_0 = D_1/(k_e - g)$
- So, $k_e = D_1/P_0 + g$

Cost of Preference Shares

- Recall that, $P_0 = D_p/k_p$

- Thus, $k_p = D_p/P_0$

- Example: The preference shares of DBB Ltd pay a dividend of $0.50 p.a. If the preference shares are currently selling for $4.00 per share, what is the cost of these shares to the firm?

- The cost of preference shares is given as…

$$k_p = D_p/P_0$$

So, $k_p = 0.50/4.00 = 12.5\%$

Weighted Average Cost of Capital

The weighted average cost of capital (ko) uses the cost of each component of the firm's capital structure and weights these according to their relative market values

Assuming that only debt and equity are used, we have…

$$k_o = k_d(D/V) + k_e(E/V)$$

where k_d = Cost of debt

k_e = Cost of equity

D = Market value of debt

E = Market value of equity

$V = D + E$

Weighted Average Cost of Capital

Assuming that preference shares are used as well as debt and equity…

$$k_o = k_d(D/V) + k_e(E/V) + k_p(P/V)$$

where P = Market value of preference shares

k_p = Cost of preference shares

$V = D + E + P$

- Be careful of rounding errors in initial calculations
- Be careful to work in consistent terms
  - Calculations in percentages versus decimals
- Check your answers with some common sense logic…

❖ $k_e > k_p > k_d > k_d(1 - t_c)$ (Why?)

Taxes and the WACC

- Under the classical tax system…
  - Interest on debt is tax deductible
  - Dividends have no tax effect for the firm

- The after-tax cost of debt, $k'_d = (1 - t_c)\, k_d$
  where t_c *corporate tax rate*

- The cost of equity (*ke) is unaffected*

- The after-tax WACC is defined as…

$$k_o = k_d(1 - t_c)(D/V) + k_e(E/V) \qquad \textit{and}$$

$$k_o = k_d(1 - t_c)(D/V) + k_e(E/V) + k_p(P/V)$$

Calculating and Using the WACC

Example: You are given the following information for BCA Ltd. Note that book values are obtained from the firm's balance sheet while market values are based on market data.

The firm's marginal tax rate is 30%. Estimate the firm's before-tax and after-tax weighted average costs of capital

	Book values	Market values	Market costs
Bonds	$30,000,000	$50,000,000	8.0%
Preference shares	$10,000,000	$20,000,000	10.0%
Ordinary shares	$60,000,000	$80,000,000	14.0%
Total	$100,000,000	$150,000,000	

Calculating and Using the WACC

- Before-tax weighted average cost of capital
  - WACC weights are based on market values so book values are not relevant

$$k_o = k_d(D/V) + k_e(E/V) + k_p(P/V)$$
$$V = D + E + P$$

	Market values	Weights	Market costs	Weights×Costs
Bonds	$50,000,000	0.333	8.0%	2.67%
Preference shares	$20,000,000	0.133	10.0%	1.33%
Ordinary shares	$80,000,000	0.533	14.0%	7.47%
Total	$150,000,000	1.000		11.47%

Note: Weight in bonds, D/V = 50/150 = 0.333, and so on

- Before-tax cost of capital = 11.47%

Calculating and Using the WACC

The after-tax cost of capital requires the after tax **cost of debt**

$$k'_d = k_d(1 - t_c)$$
$$k'_d = 0.08(1 - 0.30) = 5.6\%$$

	Market values	Weights	After tax market costs	Weights×Costs
Bonds	$50,000,000	0.333	5.6%	1.87%
Preference shares	$20,000,000	0.133	10.0%	1.33%
Ordinary shares	$80,000,000	0.533	14.0%	7.47%
Total	$150,000,000	1.000		10.67%

- Note: Weight in bonds, D/V = 50/150 = 0.333, and so on
  - After-tax cost of capital = 10.67%