#### Chapter 12

The Weighted-Average Cost of Capital and Company Valuation

## **Topics Covered**

- Geothermal's Cost of Capital
- Weighted Average Cost of Capital (WACC)
- Measuring Capital Structure
- Calculating Required Rates of Return
- Calculating WACC
- ⇒Interpreting WACC
- **Costs**
- **OValuing Entire Business**

Cost of Capital - The return the firm's investors could expect to earn if they invested in securities with comparable degrees of risk.

**Capital Structure** - The firm's mix of long term financing and equity financing.

#### Example

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Market Value Debt\$19430%Market Value Equity\$45370%Market Value Assets\$647100%

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Portfolio Return = (.3x8%) + (.7x14%) = 12.2%

★ P.325 Figure 12-1 (capital structure vs. share of income)

**Example** - Geothermal Inc. has the following structure. Given that geothermal pays 8% for debt and 14% for equity, what is the company's cost of capital if the tax is considered?

Interest is tax deductible. Given a 35% tax rate, debt only costs us 5.2% (i.e. 8% x .65).

WACC = (.3x5.2%) + (.7x14%) = 11.4%

Weighted Average Cost of Capital (WACC) -The expected rate of return on a portfolio of all the firm's securities.

Company cost of capital = Weighted average of debt and equity returns.

$$\mathbf{r}_{asset} = \frac{\text{total income}}{\text{value of investments}}$$

$$\mathbf{r}_{asset} = \frac{(D \times r_{debt}) + (E \times r_{equity})}{V}$$

$$\mathbf{r}_{asset} = \left(\frac{D}{V} \mathbf{X} \mathbf{r}_{debt}\right) + \left(\frac{E}{V} \mathbf{X} \mathbf{r}_{equity}\right)$$

Taxes are an important consideration in the company cost of capital because interest payments are deducted from income before tax is calculated.

After tax cost of debt = pretax cost x (1-tax rate) =  $r_{debt} x (1-Tc)$ 

Weighted-average cost of capital =

WACC = 
$$\left[\frac{D}{V} \times (1 - Tc)r_{debt}\right] + \left[\frac{E}{V} \times r_{equity}\right]$$

Three Steps to Calculating Cost of Capital

- 1. Calculate the value of each security as a proportion of the firm's market value.
- 2. Determine the required rate of return on each security.
- 3. Calculate a weighted average of these required returns.



**Example** - Executive Fruit has issued debt, preferred stock and common stock. The market value of these securities are \$4mil, \$2mil, and \$6mil, respectively. The required returns are 6%, 12%, and 18%, respectively.

Q: Determine the WACC for Executive Fruit, Inc.

#### **Example** - continued

Step 1 Firm Value = 4 + 2 + 6 = \$12 milStep 2 Required returns are given Step 3 WACC =  $\left[\frac{4}{12}x(1-.35).06\right] + \left(\frac{2}{12}x.12\right) + \left(\frac{6}{12}x.18\right)$ = .123 or 12.3%

- The proposal of Geothermal estimates expansion costs \$30 million and should generate a perpetual cash flow of \$4.5 million per year (p.329)
- Note that these cash flows do not include the tax benefits of using debt
- The interest tax shields generated by the project's actual debt financing are not forgotten. They are accounted for by using the after-tax cost of debt in the WACC
- ★算CF時,想成all-equity firm,至於用debt的好處,會反映在WACC
- **\star**NPV = PV of CF for equity and PV of tax shield (p.329)

- In estimating WACC, do not use the Book Value of securities.
- In estimating WACC, use the Market Value of the securities.
- Book Values often do not represent the true market value of a firm's securities.

Market Value of Bonds - PV of all coupons and par value discounted at the current interest rate.

Market Value of Equity - Market price per share multiplied by the number of outstanding shares.

\$ 200	25.0%
\$ 200	25.0%
\$ 100	12.5%
\$ 300	37.5%
\$ \$ \$ \$	<ul> <li>\$ 200</li> <li>\$ 200</li> <li>\$ 100</li> <li>\$ 300</li> </ul>

Bank Debt	\$ 200	25.0%
LT Bonds	\$ 200	25.0%
Common Stock	\$ 100	12.5%
Retained Earnings	\$ 300	37.5%
Total	\$ 800	100%

If the long term bonds pay an 8% coupon and mature in 12 years, what is their market value assuming a 9% YTM?

$$PV = \frac{16}{1.09} + \frac{16}{1.09^2} + \frac{16}{1.09^3} + \dots + \frac{216}{1.09^{12}}$$
$$= \$185.70$$

Value Balan	ce Sheet (m
\$ 200.0	12.6%
\$ 185.7	11.7%
\$ 385.7	24.3%
\$1,200.0	75.7%
\$1,585.7	100.0%
	Value Balan \$ 200.0 \$ 185.7 \$ 385.7 \$ 1,200.0 \$ 1,585.7

### **Required Rates of Return**

#### **Bonds**

$$r_d$$
 = yield to maturity

#### **Common Stock**

1. From CAPM

$$r_e = r_f + \beta (r_m - r_f)$$

#### **Required Rates of Return**

2. Dividend Discount Model Cost of Equity

Perpetuity Growth Model 
$$\Rightarrow P_0 = \frac{Div_1}{r_e - g}$$

solve for  $r_{\rho}$ 



#### **Required Rates of Return**

#### **Expected Return on Preferred Stock**

Price of Preferred Stock = 
$$P_0 = \frac{Div_1}{r_{preferred}}$$

solve for 
$$r_{preferred}$$
  $r_{preferred} = \frac{Div_1}{P_0}$ 

### **Real Companies' WACCs**

Table 12-4 on p.334 shows the estimations of the weight-average cost of capital for a sample of real companies

## **Interpreting WACC**

- WACC is the rate of return that the firm must expected to earn on its average-risk investment
- WACC is used to value new assets that have the same risk as the old ones
- WACC is viewed as a companywide benchmark discount rate

## **Interpreting WACC**

- Increasing the use of debt incurs two kinds of costs
  - → The explicit one is the rate that bondholders demand ( 增加再借債之成本)
  - → The implicit one is that borrowing increases the required return to equity due to the increase in risk (因為增加了破產風險,所以equity holder 會要求更高的報酬)

## **Interpreting WACC**

- If there is no corporate taxes, the change in capital structure does not affect the risk of cash flows, so WACC should not change with capital structure
- Corporate taxes complicate the analysis and may change the above result

### **Flotation Costs**

- The cost of implementing any financing decision must be incorporated into the cash flows of the project being evaluated
- Only the incremental costs of financing should be included
  - → Flotation costs should not affect the WACC
  - → Flotation costs should be treated as incremental (negative) cash flows

## Valuing Entire Businesses by DCF

- Free Cash Flows: Cash flow that is not required for investment in fixed assets or working capital and is therefore available to investors (FCF = Operating CF - Investment in plant and working capital)
- ⇒FCF is a more accurate measurement of PV than either Div or EPS (這些只跟equity的價值 有關) when valuing the entire business
   ⇒When valuing a business for purchase, always
  - use FCF

### **Valuing Entire Businesses by DCF**

#### **Staluing a Business**

→The value of a business or project is usually computed as the discounted values of FCF out to a *valuation horizon*(*H*) plus the forecasted value of the business at the horizon (the horizon value)

$$PV = \frac{FCF_1}{(1+r)^1} + \frac{FCF_2}{(1+r)^2} + \dots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H}$$

#### Valuing Entire Businesses by DCF

*Example - Concatenator Manufacturing* (Table 12-5 on p.338)

Horizon Value = 
$$\left(\frac{79.5}{.085 - .05}\right) = 2,271.4$$

 $PV(FCF) = -\frac{73.6}{(1.085)} - \frac{87.1}{(1.085)^2} - \frac{102.9}{(1.085)^3} - \frac{34.1}{(1.085)^4} + \frac{40.2}{(1.085)^5} + \frac{2,271.4}{(1.085)^5} = 1,290.4$