**WACC – Chapt. 13 in RWJJ**



Ct is not known for certain. It is a random variable. It has a probability distribution with a mean and standard deviation.

Ct = E(Ct) = expected cash flow

“r” is the appropriate cost of capital. It should have the same riskiness as Ct

If Ct is a normal extension of the firm’s operations, and the firm is entirely equity financed, we use the stockholders’ required return as found through the CAPM for the appropriate value of ‘r’.

E(Ri) = Rf + βi (Rm – Rf)

However, if Ct is a normal extension of the firm’s operations and the firm is financed through a combination of equity and debt, we must discount the free cash flows at the Weighted Average Cost of Capital (WACC), which as a weighted average of the stockholers’ required rate of return and the bondholders’ required rate of return.

**Weighted-Average Cost of Capital** - WACC - The expected return on a portfolio of all the firm’s securities. This is the return you would get on your total investment in the company if you owned all its equity and debt.

**WACC** =  + 

This is the required rate of return for the company as a whole. This is also the required rate of return for projects with the same risk as the company as a whole.

**Shareholders’ Required Return** - Expected Rate of Return that stockholders require for investing in this company. - Found by CAPM. E (Ri) = Rf + βi (Rm – Rf) where E(Ri) is the expected return on the firm’s *equity*.

**Bondholders’ Required Return** - Expected Rate of Return Bondholders require for lending money to this company - found by **YTM** (don’t forget how to find it!) Note: Due to default risk, the expected return for the bondholders is actually < YTM.

 Price =  Solve for “r” and double it to get YTM

**Value of Debt** - Total dollar amount (market value) of money borrowed by the firm.

 Since bank debt is not traded, it may not be possible to determine its

 market value. In that case, we usually use the book value of the debt as a proxy for its market value when we can’t determine its market value.

**Value of Equity** - Number of shares outstanding multiplied by current price per share

 Note: Same definition for Value of Preferred Stock if there is any

**Value of Company –** Total Market Value of all equity and debt (if you subtract out the

 amount of cash, this is called the firm’s Enterprise Value)

**Debt Ratio** - D/V - Value of debt divided by value of company

**Equity Ratio** - E/V - Value of equity divided by value of company

**After-tax Cost of Debt** - (Pretax cost) (1 - tax rate) Note interest payments are

 (rdebt ) (1 - t) tax deductible.

 With 8% interest rate and 21% tax bracket: 8% (1 - .21) = 6.32%

Note that because debtholders require a lower return than equity-holders, and because interest payments are tax-deductable to the corporation, taking on more debt should lower a firm’s WACC. However, remember that taking on more debt increases a firm’s beta which raises its WACC. To see which effect is more powerful, take some more finance cousres.

**Determining WACC**

**1**. Calculate the value of each security as a proportion of the firm’s value

**2**. Determine the required rate of return on each security

**3**. Calculate a weighted average of the cost of the after-tax return on debt and the return on the stock.

**Example**: Freeman Ind. has the following:

One million shares of common stock outstanding

Current Price = $60.60/share

Publicly traded bonds with a total face value of $20 million. The bonds are currently trading at 101. Their coupon rate is 8% and they mature in 12 years.

Corporate tax rate = 21%

Beta = 1.1

Risk-free rate = 3%

Market Risk Premium = 5.7%

**What is Freeman’s WACC?**

Firm’s Value = Value of Common Stock + Value of Bonds

 Value of Common Stock = (1 million) ($60.60) = $60.6 million

 Value of Corp Bonds = (1.01) ($20 million) = $20.2 million

 Value of Company = $60.6 + $20.2 = $80.8 million

Proportion of Stock Value = $60.6 million = 75%

 $80.8 million

Proportion of Debt Value = $20.2 million = 25%

 $80.8 million

Required Return of Stock: E(RFreeman) = Rf + βf (Rm – Rf)

 = 3% + 1.1 (5.7%)

 = 9.27%



Required Return on Bonds is the Yield to Maturity

 101 = 

 r = 3.93% ⇒ YTM = 7.87%

WACC = .75 (9.27%) + .25 (7.87%) (1 - .21)

 = 8.51%

Note: This is the opportunity cost of capital for Freeman. It is the discount value to be used when considering projects that have the same risk as the company.

Why do Common Stockholders require more expected return than Bondholders? Risk.

Question: If Freeman wants to open a new office in New Orleans (with the same risk as the company as a whole), is it a good idea if the free cash flows are:?

Year CF

0 -114 mill.

1 45 mill.

2 45 mill.

3 45 mill.

NPV = -114 + \_\_45\_\_ + \_\_45\_\_ + 45 .

 1.0851 (1.0851)2 (1.0851)3

 = $917,064

Since it is a Positive NPV we do it.

 IRR = 8.95% so we also do it because 8.95% > 8.51%.

So WACC = 8.51% and IRR = 8.95%

When the NPV is positive, the bondholders receive their required rate of return (YTM), the stockholders receive their required rate of return (found through the CAPM), **AND** there is money left over for the stockholders (the NPV).

WACC is an appropriate discount rate only for a project that is a carbon copy of the firm’s existing business in terms of risk and capital structure.

If a project is more risky, the discount rate must increase

If a project is less risky, the discount rate must decrease

If, to finance a new project, a firm must issue new equity or new debt, the discount rate must be figured based on the new WACC. That is the WACC after the new debt or equity is issued.