Cost of Capital

CFA Level –I Corporate Finance Module

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Cost of Capital Agenda

- Determine and interpret the weighted average cost of capital (WACC) of a company, and explain the adjustments to it that an analyst should make in developing a cost of capital for a specific project.
- Describe the role of taxes in the cost of capital from the different capital sources.
- Describe alternative methods of calculating the weights used in the WACC, including the use of the company ‘s target capital structure.
- Explain the analyst ’ s concern with the marginal cost of capital in evaluating investment projects, and explain the use of the marginal cost of capital and the investment opportunity schedule in determining the optimal capital budget for a company.
- Explain the marginal cost of capital ’ s role in determining the net present value of a project.

Cost of Capital Agenda

- Calculate and analyze the cost of fixed - rate debt capital using the yield - to – maturity approach and the debt - rating approach.
- Calculate the cost of non-callable, nonconvertible preferred stock.
- Calculate and analyze the cost of equity capital using the capital asset pricing model approach, the dividend discount approach, and the bond yield plus risk premium approach.
- Calculate an unlevered beta using the pure - play method and use this unlevered beta to estimate a levered beta for a project or company.
- Explain the country risk premium in the estimation of the cost of equity for a company situated in a developing market.
- Describe the marginal cost of capital schedule, explain why it may be upward sloping with respect to additional capital, and calculate and interpret its break points.
- Explain and demonstrate the correct treatment of flotation costs

Weighted Average Cost of Capital

- The **cost of capital is the rate of return that the suppliers of capital** require as compensation for their contribution of capital.
- Alternatively it can be defined as the opportunity cost of funds for the suppliers of capital who will not voluntarily invest in a company unless its return meets or exceeds what the supplier could earn elsewhere in an investment of comparable risk.
- There are different sources (suppliers) of capital. Each source constitute the components of funding and has a cost or required return.
- WACC of capital is a weighted average of the **marginal cost** of various components of capital.
- MCC or WACC is the cost of next dollar to be raised.

WACC

- $WACC = w_d r_d(1-t) + w_p r_p + w_e r_e$
  - w_d *proportion of debt that the company uses when it raises new funds*
  - r_d *before - tax marginal cost of debt*
  - t *company ' s marginal tax rate*
  - w_p *proportion of preferred stock the company uses when it raises new funds*
  - r_p *marginal cost of preferred stock*
  - w_e *proportion of equity that the company uses when it raises new funds*
  - r_e *marginal cost of equit*

After Tax Cost of Debt

- Note that tax deductibility of interest reduces the effective cost of debt.
- We adjust the pretax cost of debt for the tax shield multiplying pretax cost of debt r_d by (1-t) which results in an estimate of the after - tax cost of debt.
  - **Example:**
  - Suppose a company pays € 1 million in interest on its € 10 million of debt.
  - The cost of this debt is not € 1 million because this interest expense reduces taxable income by € 1 million, resulting in a lower tax.
  - If the company is subject to a tax rate of 40 percent, this € 1 million of interest costs the company (€ 1 million)(1 - 0.4) = € 0.6 million because the interest reduces the company ' s tax bill by € 0.4 million.
  - In this case, the before - tax cost of debt is 10 percent, whereas the after - tax cost of debt is (€ 0.6 million)/(€ 10 million)=6 %.

Component Weights

- How do we determine what weights to use? Ideally, we want to use the proportion of each source of capital that the company would use in the project or company.
- If we assume that a company has a target capital structure and raises capital consistent with this target, we should use this target capital structure.
- Someone outside the company, however, such as an analyst, typically does not know the target capital structure and must estimate it using one of several approaches:

Estimating Component Weights

- Method 1: Assume the company ’ s current capital structure, at market value weights for the components, represents the company ’ s target capital structure.
- Method 2: Examine trends in the company ’ s capital structure or statements by management regarding capital structure policy to infer the target capital structure.
- Method 3: Use averages of comparable companies ’ capital structures as the target capital structure.

- In the absence of knowledge of a company ’ s target capital structure, we may take Method 1 as the baseline.
- Note that in applying Method 3, we use un-weighted, arithmetic average, as is often done for simplicity.
- An alternative is to calculate a weighted average, which would give more weight to larger companies.

Example

- The following information about XYZ is provided:
- Market value of debt $50 million
- Market value of equity $60 million
- Primary competitors and their capital structures (in millions):

Competitor	Market Value of Debt	Market Value of Equity
A	25	50
B	101	190
C	40	60

- What are XYZ's proportions of debt and equity that an analyst would use if estimating these proportions using the company's
  - Current capital structure?
  - Competitors' capital structure?

Component Weights

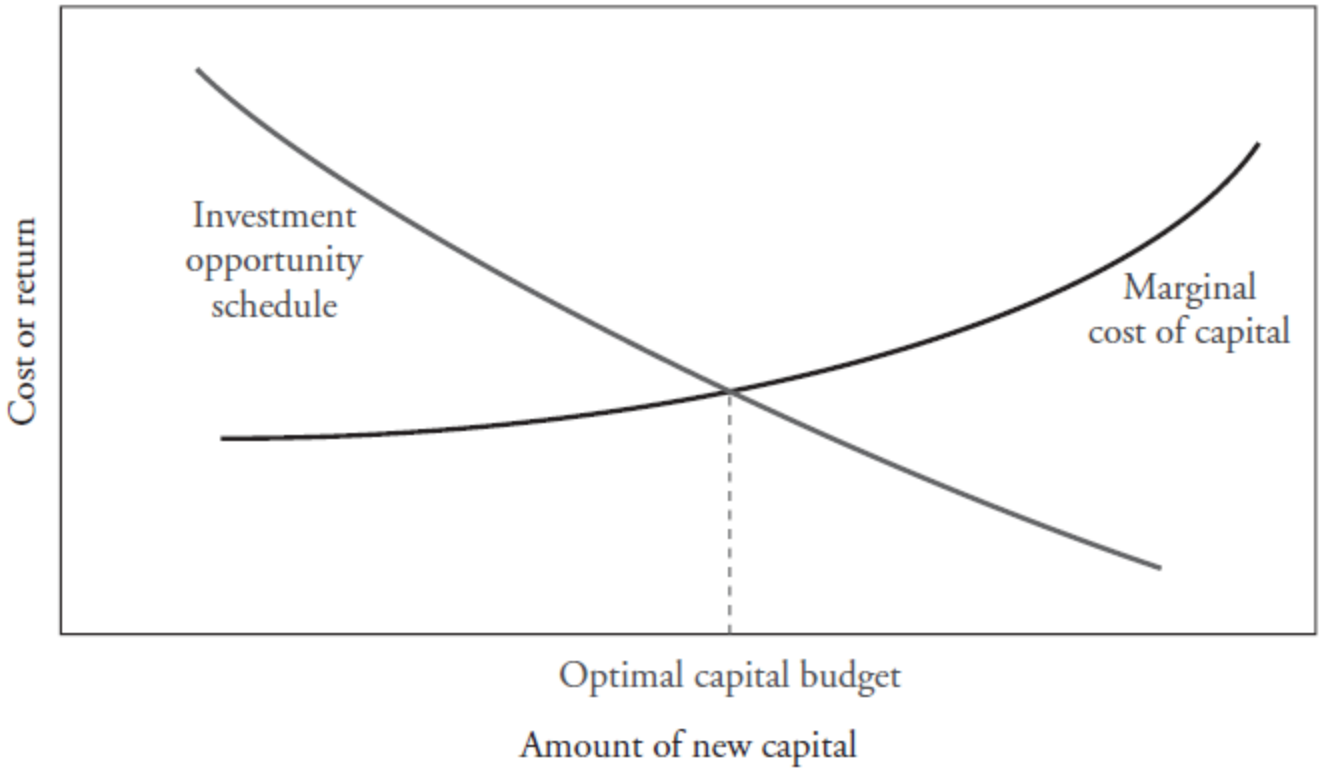
- Current Capital Structure:
  - W_d=D/(D+E)=50/(50+60)=0.4545
  - W_e=E/(D+E)=60/(50+60)=0.5454
- Competitor's Capital Structure/Unweighted Average:
  - [W_d(A)+W_d(B)+W_d(C)]/3
  - {[25/(25+50)]+[101/(101+190)]+[40/(40+60)]}/3=0.36
  - [W_e(A)+W_e(B)+W_e(C)]/3
  - {[50/(25+50)]+[190/(101+190)]+[60/(40+60)]}/3=0.64

Component Weights

- Competitor's Capital Structure/Weighted Average:
  - Total Debt=25+101+40=166
  - Total Equity=50+190+60=300
  - Debt/Debt+Equity=166/(166+300)=0.3562
  - Equity/Debt+Equity=300/(166+300)=0.6438
- Suppose XYZ announces that a debt-to-equity ratio of 0.7 reflects its target capital structure. What would be the respective weights?
  - When we are given D/E ratio, we can calculate the debt ratio simply by using D/E/(1+D/E) → D/(D+E)=W_d=0.7/1.7=0.4118
  - W_e=1-W_d=(1-0.4118)=0.5882

Optimal Capital Budget

While MCC may increase as additional capital is raised, returns to a company ' s investment opportunities generally decline with additional investments represented by investments opportunity schedule (IOS).



The optimal capital budget is the amount of capital raised and invested at which the marginal cost of capital is equal to the marginal return from investing.

Investment Projects and Cost of Capital

- The cost of capital in these applications should reflect the riskiness of the future cash flows of the project, product, or division.
- For an average - risk project, the opportunity cost of capital is the company ’s WACC.
- If the systematic risk of the project is above or below average relative to the company ’ s current portfolio of projects, an upward or downward adjustment, respectively, is made to the company ’ s WACC.
- Companies may take an ad hoc or a systematic approach to making such adjustments.

NPV and Cost of Capital

- NPV is difference between the present value of the cash inflows, discounted at the opportunity cost of capital applicable to the specific project, and the present value of the cash outflows, discounted using that same opportunity cost of capital:
- NPV = {Present value of inflows} –{Present value of outflows}
- If an investment ’ s NPV is positive, the company should undertake the project.
- If we choose to use the company ’ s WACC in the calculation of the NPV of a project, we are assuming that the project
  - Has the same risk as the average - risk project of the company, and
  - Will have a constant target capital structure throughout its useful life

MCC and Security Valuation

- MCC is also widely used in security valuation typically in the context of discounted cash flow valuation models available.
- For a particular valuation model, if these cash flows are cash flows to the company ’ s suppliers of capital (that is, free cash flow to the firm), the analyst uses the weighted average cost of capital of the company in the valuation.
- If these cash flows are strictly those belonging to the company ’ s owners, such as the free cash flow to equity, or dividends, the analyst uses the cost of equity capital to find the present value of these flows

Specific Sources of Capital: Long Term Debt

- The cost of debt is the cost of debt financing to a company when it issues a bond or takes out a bank loan.
- There are two widely used methods to estimate the before - tax cost of debt, r_d :
  - The yield - to - maturity approach and
  - Debt - rating approach

Specific Sources of Capital: The Cost of Long-Term Debt

- The pretax cost of debt is equal to the the yield-to-maturity on the firm's debt adjusted for flotation costs.
- Recall that a bond's yield-to-maturity depends upon a number of factors including the bond's coupon rate, maturity date, par value, current market conditions, and selling price.
- After obtaining the bond's yield, a simple adjustment must be made to account for the fact that interest is a tax-deductible expense.
- This will have the effect of reducing the cost of debt.

Bond Yield Calculation-Annual Coupon Payments

$$P = \frac{PMT}{(1+r_d)} + \frac{PMT}{(1+r_d)^2} + \ldots\ldots + \frac{PMT}{(1+r_d)^{n-1}} + \frac{FV + PMT}{(1+r_d)^n}$$

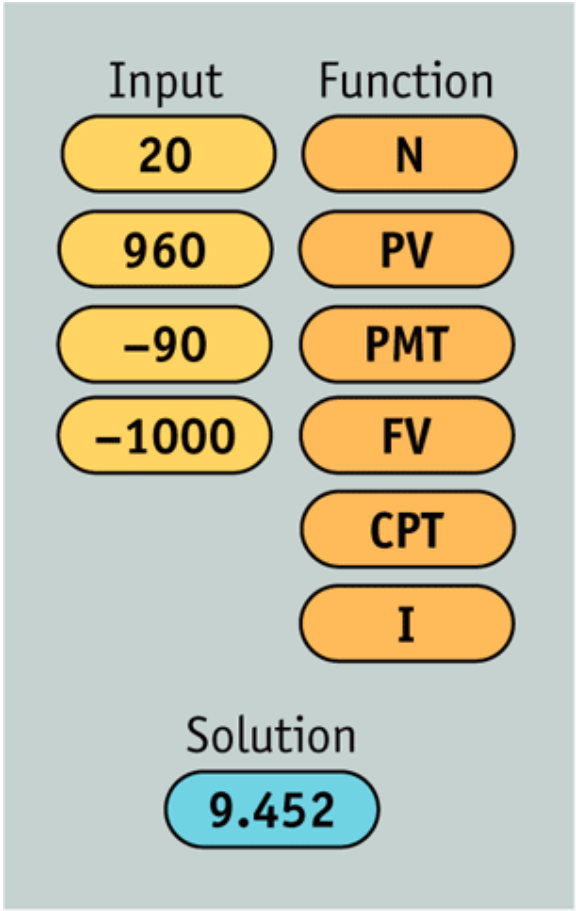
Specific Sources of Capital: The Cost of Long-Term Debt

- Duchess Corporation, a major hardware manufacturer, is contemplating selling $10 million worth of 20-year, 9% coupon bonds with a par value of $1,000.
- Because current market interest rates are greater than 9%, the firm must sell the bonds at $980.
- Flotation costs are 2% or $20. The net proceeds to the firm for each bond is therefore $960 ($980 - $20).

Specific Sources of Capital: The Cost of Long-Term Debt

- Before-Tax Cost of Debt
  - Calculating the Cost

End of year(s)	Cash flow
0	$ 960
1–20	−$ 90
20	−$1,000



Specific Sources of Capital: The Cost of Long-Term Debt

- Calculating Before-Tax Cost of Debt by Using Excel
  - Calculating the Cost

1	A	B	C	D	E
2	Net Proceeds from Sale of a Bond	960			
3	Coupon	90			
4	Number of Years	20			
5	Par Value/Face Value	1,000			
6	Bond Yield	0.0945			
7					
8					
9	**Bond Value**	**PVIFA**	**PVIF**	**Coupon**	**Par Value**
10	960	8.8417	0.1642	90	1,000

Bond Value=(PVIFA x Coupon)+(PVIF x Par Value)

$[(1+i)^{20}-1]/[i(1+i)^{20}]$

$[1/(1+i)^{20}$

Trial and Error in Excel

- The best way to conduct a trial and error calculation in Excel is to use “Goal Seek” under Data tab.
- First set up your bond value formula by using PVIFA and PVIF.
- Use n=20 years and an arbitrary yield to calculate the bond value
- Then use goal seek and set cell A10 to 960 by changing cell B6. Goal Seek delivers the yield that produces bond value of 960.

A Short Cut: Yield Approximation

$$r_d = \frac{I + \frac{FV - P}{n}}{\frac{FV + P}{2}} = \frac{90 + \frac{1{,}000 - 960}{20}}{\frac{1000 + 960}{2}} = 9.387\%$$

With a an observed price, and coupon rate, we can approximate the yield as above. Note that this is not as a accurate as internal rate of return method. In the exam, you should use a financial calculator!

Specific Sources of Capital: The Cost of Long-Term Debt

- Find the after-tax cost of debt for Duchess assuming it has a 40% tax rate:

$$r_d = 9.4\% (1-.40) = 5.6\%$$

- This suggests that the after-tax cost of raising debt capital for Duchess is 5.6%.

Cost of Preferred Equity

- The cost of preferred stock (r_p) is the cost that a company has committed to pay preferred stockholders as a preferred dividend (D_p) when it issues preferred stock.
- In the case of nonconvertible, non-callable preferred stock that has a fixed dividend rate and no maturity date (fixed rate perpetual preferred stock), we can use the formula for the value of a preferred stock:

$$P_0 = \frac{D_p}{r_p}$$

- The valuation formula can re-arranged to calculate the cost of preferred equity:

$$r_p = \frac{D_p}{P_0 - f}$$

Cost of Preferred Equity

- ABC Inc is contemplating the issuance of a 10% preferred stock that is expected to sell for its $87-per share value.
- The cost of issuing and selling the preferred stock is expected to be $5 per share.
- Calculate the cost of preferred equity!
  - The preferred fixed dividend is $8.70 (10% x $87).
  - The net proceeds from issue is $82 ($87 - $5).
  - Accounting for the floatation costs, the cost of preferred equity is:

$$r_p = \frac{D_p}{P_0 - f} = \frac{8.7}{87 - 5} = 10.6\%$$

Best Estimate of Cost of Preferred Equity

- The CFO of AAA, a leading German producer and distributor of Digitally Controlled Machine Tools, has been asked by the CEO to calculate the cost of preferred equity and has recently obtained the following information:
  - The issue price of preferred stock was €3.5 million and the preferred dividend is 5 percent.
  - If the company issued new preferred stock today, the preferred coupon rate would be 7.5 percent. The company's marginal tax rate is 30.5 percent.
  - What is the cost of preferred equity for AAA?

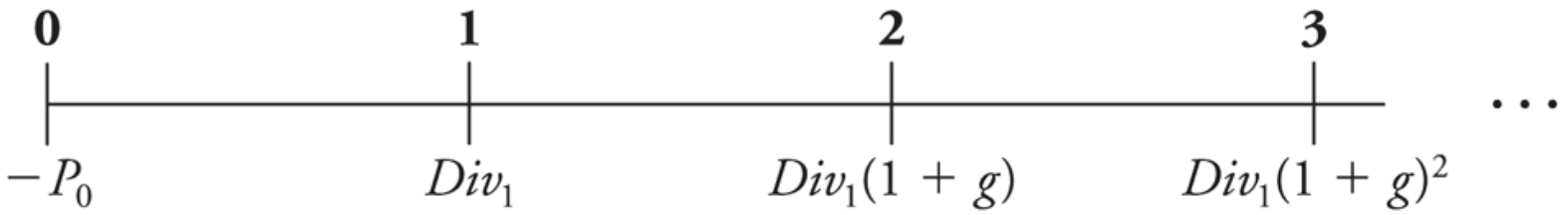
Cost of Equity

- There are two forms of common stock financing: retained earnings and new issues of common stock.
- In addition, there are two different ways to estimate the cost of common equity: any form of the dividend valuation model, and the capital asset pricing model (CAPM).
- The dividend valuation models are based on the premise that the value of a share of stock is based on the present value of all future dividends.

Dividend Discount Model to Cost of Equity

$$P_0 = \frac{Div_1}{1 + r_s} + \frac{Div_2}{(1 + r_s)^2} + \cdots + \frac{Div_N}{(1 + r_s)^N} + \frac{P_N}{(1 + r_s)^N}$$

$$P_0 = \frac{Div_1}{1 + r_s} + \frac{Div_2}{(1 + r_s)^2} + \frac{Div_3}{(1 + r_s)^3} + \cdots = \sum_{n=1}^{\infty} \frac{Div_n}{(1 + r_s)^n}$$



$$P_0 = \frac{Div_1}{r_s - g} \quad \Rightarrow \quad r_s = \frac{Div_1}{P_0} + g$$

Growth Rate

- There are at least two ways to estimate the growth rate.
- The first is to use a forecasted growth rate from a published source or vendor.
- A second is to use a relationship between the growth rate, the retention rate, and the return on equity. The **sustainable growth rate** depends on the new investments and return these investments earn.
- g = Retention Ratio x Return on Equity
- g = (1-D/EPS) x ROE
- where
  - D /EPS assumed stable dividend payout ratio
  - ROE historical return on equity
- The term (1 - D /EPS) is the company ’s earnings retention rate. g , or sustainable growth rate is the growth rate that results from the reinvestment of retained earnings.

Capital Asset Pricing Model

- Assuming that we expect to earn risk free rate of return on a risk free investment (i.e. investment with no return variability), it would be intuitive think that we would expect to earn the following when we take risk:

$$R = R_f + \text{Risk Premium}$$

- In this model the key issues are:
  - Determining the appropriate risk free rate
  - Determining the appropriate risk premium

- First one is relatively easy to resolve. For instance in US a common preference for the risk free rate is the T-Bill Yields !
- The second one is more complicated. Risk Premium calculation requires two inputs:
  - A risk measure, i.e quantification of risk in some way
  - A price for risk, i.e compensation for the unit risk taken!
  - RP=(Extent of Risk) x (Price of Unit Risk)

CAPM and the Risk Premium

- CAPM provides an elegant answer, and formulates these two inputs:
- In the CAPM framework Measure of Risk is the Systematic Risk or Beta
  - $\text{Beta}=\text{Cov}(R_i,R_m)/\text{Var}(R_m)=\rho_{i,m}(\sigma_i/\sigma_m)$
- Price of Unit Risk is the Equity Market Risk Premium EMRP (or ERP)
  - $\text{EMRP}=(R_m-R_f)$
- $E(R_i)=R_f+\beta\ (R_m-R_f)$

Estimating Equity Market Risk Premium

- There are three widely used methods in estimation of EMRP:
  - Historical Equity Risk Premium Approach
  - Dividend Discount Model Approach
  - Survey Approach

Estimating Equity Market Risk Premium-Historical Method

- The **historical equity risk premium approach is based on** the assumption that the realized equity risk premium observed over a long period of time is a good indicator of the expected equity risk premium.
- This approach requires compiling historical data to find the average rate of return of a country ’ s market portfolio and the average rate of return for the risk - free rate in that country.
- The historical premium approach has several limitations.
  - The level of risk of the stock index may change over time.
  - The risk aversion of investors may change over time.
  - The estimates are sensitive to the method of estimation and the historical period covered.

1900-2002 Historical Average ERP-Dimson et.al (2003)

Country	Geometric	Arithmetic
Australia	6.3	7.9
Belgium	2.8	4.7
Canada	4.2	5.7
Denmark	1.8	3.1
France	4.6	6.7
Germany	6.3	9.6
Ireland	3.1	4.5
Italy	4.6	8.0
Japan	5.9	10.0
The Netherlands	4.4	6.4
South Africa	5.4	7.1
Spain	2.2	4.1
Sweden	4.9	7.1
Switzerland	2.4	3.9
United Kingdom	4.2	5.5
United States	4.8	6.7
World	4.3	5.4

Example: Historical ERP

- Assume that the arithmetic average T-bond rate observed over the last 100 years is an unbiased estimator for the risk-free rate and amounts to 4.5%.
- Also suppose the arithmetic average of return on the market observed over the last 100 years is an unbiased estimator for the expected return for the market. The average rate of return of the market was 8.5 percent.
- Given these historical averages the equity risk premium is:
- ERP=0.085-0.045=0.04 or 4%

Dividend Discount Model Approach to ERP

- DDM (or implied risk premium approach) is implemented using the Gordon growth model (also known as the constant - growth dividend discount model).
- The model works best for mature developed markets as it assumes a long - run trend growth rate. We extract the premium by analyzing how the market prices an index.
- That is, we use the relationship between the value of an index and expected dividends, assuming a constant growth in dividends.

DDM Approach

$$r_e = \frac{Div_1}{P_0} + g$$

- P_0 current market value of the equity market index
- D_1 dividends expected next period on the index
- r_e required rate of return on the market (expected return on the market)
- g expected growth rate of dividends

Therefore, the **expected return on the market** is the sum of the dividend yield and the growth rate in dividends. The **equity risk premium** thus is the difference between the expected return on the equity market and the risk - free rate.

Example: DDM Approach to ERM

- Suppose the expected dividend yield on S&P500 index is 6.5 percent and the expected growth rate of dividends on the index is 2 percent. Also assume that risk free interest rate is 2.5%. What would be the ERP based on DDM?
  - The expected return on the market according to the Gordon growth model is: E(R)=0.065+0.02%=0.085 or 8.5%
  - ERP=0.085-0.025=0.06 or 6%

Survey Approach

- Another approach to estimate the equity risk premium is quite direct: Ask a panel of experts for their estimates and take the mean response. This is the **survey approach .**
- For example, one set of U.S. surveys conducted by Ivo Welch of Brown University found that the expected U.S. equity risk premium over the next 30 years was 5.5 percent to 7 percent, forecasting from 2001 as the baseline year, and 7.1 percent, using 1998 as the baseline year.

Beta Estimation

- When using the CAPM to estimate the cost of equity, the analyst must estimate beta. The estimation of beta presents many choices as well as challenges. One common method of estimating the company ' s stock beta is to use a market model:

$$R_i = \alpha_i + \beta_i R_m + \varepsilon_i$$

- The slope of the regression line measures an asset's beta or systematic risk.

Issues in Beta Estimation

- The estimated beta is sensitive to the **length of the estimation period**, Selection of the estimation period is a trade - off between data richness captured by longer estimation periods and company - specific changes that are better reflected with shorter estimation periods.
- **Periodicity of the return interval** (e.g., daily, weekly, or monthly): empirical observations suggest that coefficient estimation improves with frequency of data.
- Selection of an appropriate **market index**: The choice of market index affects the estimate of beta.
- Use of a **smoothing** technique: Some analysts adjust historical betas to reflect the tendency of betas to revert to 1.
- **Adjustments for small - capitalization stocks**: Small - capitalization stocks have generally exhibited greater risks and greater returns than large - capitalization stocks over the long run. Ibbotson et.al (1997) argue that betas for small – capitalization companies be adjusted upward.

Estimating Project Beta using Comparables

- Financial analysts use pure-play method to estimate beta for a company or project that is not publicly traded.
- Pure - play method requires using a comparable publicly traded company ’ s beta and adjusting it for financial leverage differences.
- This requires a process of “ unlevering ” and “ levering ” the beta. The beta of the comparable is first “ unlevered ” by removing the effects of its financial leverage.
- The unlevered beta is referred to as the **asset beta because it reflects the business** risk of the assets. Once we determine the unlevered beta, we adjust it for the capital structure of the company or project that is the focus of analysis.

Relationship between Asset Beta and Equity Beta

- Because a levered company's risk is shared between creditors and owners, we can represent the company's risk, β_{asset} , as the weighted average of the company ' s creditors ' market risk, β_{debt} ,and the market risk of the owners, β_{equity} :

$$\beta_{asset} = \frac{D}{D+E}\beta_{debt} + \frac{E}{D+E}\beta_{equity}$$

- Since interest on debt is deducted by the company to arrive at taxable income, the claim that creditors have on the company 's assets does not cost the company the full amount but rather the after - tax claim; the burden of debt financing is actually less due to interest deductibility.

Asset Beta and Equity Beta

- If we account for tax deductibility of interest, we can express asset beta as follows:

$$\beta_{asset} = \frac{(1-t)D}{(1-t)D+E}\beta_{debt} + \frac{E}{(1-t)D+E}\beta_{equity}$$

- We generally assume that a company ' s debt does not have market risk; so $\beta_{debt} = 0$. With this assumption asset beta reduces to the following:

$$\beta_{asset} = \frac{1}{1+(1-t)(D/E)}\beta_{equity}$$

Asset Beta and Equity Beta

- Therefore, the market risk of a company's equity is affected by both the asset's market risk, β_{asset} and a factor representing the non-diversifiable portion of the company's financial risk, $[1 / (1 - t)(D / E)]$:

Example

- ABC Inc is evaluating a project. The ABC intends to use 20% debt in funding the project. ABC identifies a comparable company with an equity beta of 1.2 and debt/equity ratio of 0.125. While comparable has a marginal tax rate of 35%, ABC's marginal tax rate is 25%. Calculate the levered beta for the project (or project beta).

Solution

- Step-1: Select the comparable √
- Step-2: Estimate Comparable Company Equity Beta =1.2 √
- Step-3:Unlever the comparable's beta:
  - $\beta_{asset} = \beta_{comparable}/(1+(1-t_{comparable})D_{comparable}/E_{comparable})$
  - $\beta_{asset}=1.2/[1+(1-0.35)x0.125]=1.0983$
- Step-4:Lever Beta for Project's Financial Risk
  - $\beta_{project} =\beta_{asset} \times [(1+(1-t_{project}) \times(D_{projec}/E_{project})]$
  - $\beta_{project} =1.0983/[1+(1-0.25)x0.25]=1.3179$

Example

- Raymond Cordier is the business development manager of Aerotechnique S.A., a private Belgian subcontractor of aerospace parts. Although Aerotechnique is not listed on the Belgian stock exchange, Cordier needs to evaluate the levered beta for the company. He has access to the following information:
  - The average levered and average unlevered betas for the group of comparable companies operating in different European countries are 1.6 and 1.0, respectively.
  - Aerotechnique's debt-to-equity ratio, based on market values, is 1.4.
  - Aerotechnique's corporate tax rate is 34 percent.

How do we account for country risk?

- Simply calculate the expected return of the project as if the project is in the domestic market, and then add sovereign spread to account for the foreign market risk → Assumes that project risk and country risk are independent
- Calculate a country risk premium and add country risk premium to home market equity risk premium. Use project beta to calculate required return for the project:
  - Country Risk Premium=Sovereign Spread x Relative Volatility of Foreign Equity and Bond Markets
  - CRP=Sovereign Spread(SP) x ($\sigma_{equity}/\sigma_{bond}$)
  - ERP+CRP=Adjusted ERP
  - $E(R) = R_f + \beta_{project}$ x (ERP+CRP)

Example

- A US company considering investment in Argentina. Project beta was calculated as 1.2. The US ERP=4.5%. Dollar denominated 10 year Argentinean government bonds yield 9.5% while corresponding bonds in US yield only 4.5. The volatility of Argentinean stocks and bonds are 40% and 28% respectively. Calculate the required return from this project!
- Solution:
  - SP=9.5-4.5=5%
  - CRP=5% x (0.4/0.28)=0.0714 or 7.14%
  - R(P)=0.045+1.2 x (4.5+7.14)=14.01%

Marginal Cost of Capital

- As a company raises more funds, the costs of the different sources of capital may change, resulting in a change in the weighted average cost of capital for different levels of financing. Why?
  - Existing debt with a bond covenant that restricts the company from issuing debt with similar seniority as existing debt.
  - **debt incurrence test may restrict a company ' s ability to incur** additional debt at the same seniority based on one or more financial tests or conditions.
  - As the company experiences deviations from the target capital structure, the marginal cost of capital may inc rease, reflecting these deviations
- The amount of capital at which the weighted average cost of capital changes — which means that the cost of one of the sources of capital changes — is referred to as a **break point .**

Example: Star Products

- It is a growing manufacturer of automobile accessories. Company has been experiencing high growth and the treasurer wants to make sure that company uses all available funds to make value creating investments.
- Management wants to maintain its current capital structure of 30% long term debt, 10% preferred stock and 60% common stock for at least in the next three years. Current tax bracket is 40%.
- Firm has the following investment opportunities schedule

Investment Opportunities Schedule

Project	IRR	Investment
A	15%	$400,000
B	22	200,000
C	25	700,000
D	23	400,000
E	17	500,000
F	19	600,000
G	14	500,000

Example

- **Long Term Debt:** 450,000 can be raised by selling 15 year, 1,000 par value 9% coupon bond. After floatation receipt is projected to be $960. An debt beyond this amount will cost 13%.
- **Preferred Stock:** $70 par value and 14% annual dividend rate and will net $65 after floatation costs.
- **Common Equity:** D_1=$0.96 E_1=$3.2 in 2010 and expected to grow at 11%pa. Stock sells at $12. R/E available is $1.5m.
- If more equity financing needed, expected net proceeds after floatation costs $9 per share.

Breaking Points

- We can calculate the Breaking Points by using:
  - $BP_j = AF_j/w_j$
  - where:
  - BP_j= breaking point from financing source j
  - AF_j = amount of funds available at a given cost
  - w_j=target capital structure weight for source j
- Breaking Point for Debt:

$$\frac{\$450,000}{0.30} = \$1,500,000$$

- Breaking Point for Equity:

$$\frac{\$1,500,000}{0.60} = \$2,500,000$$

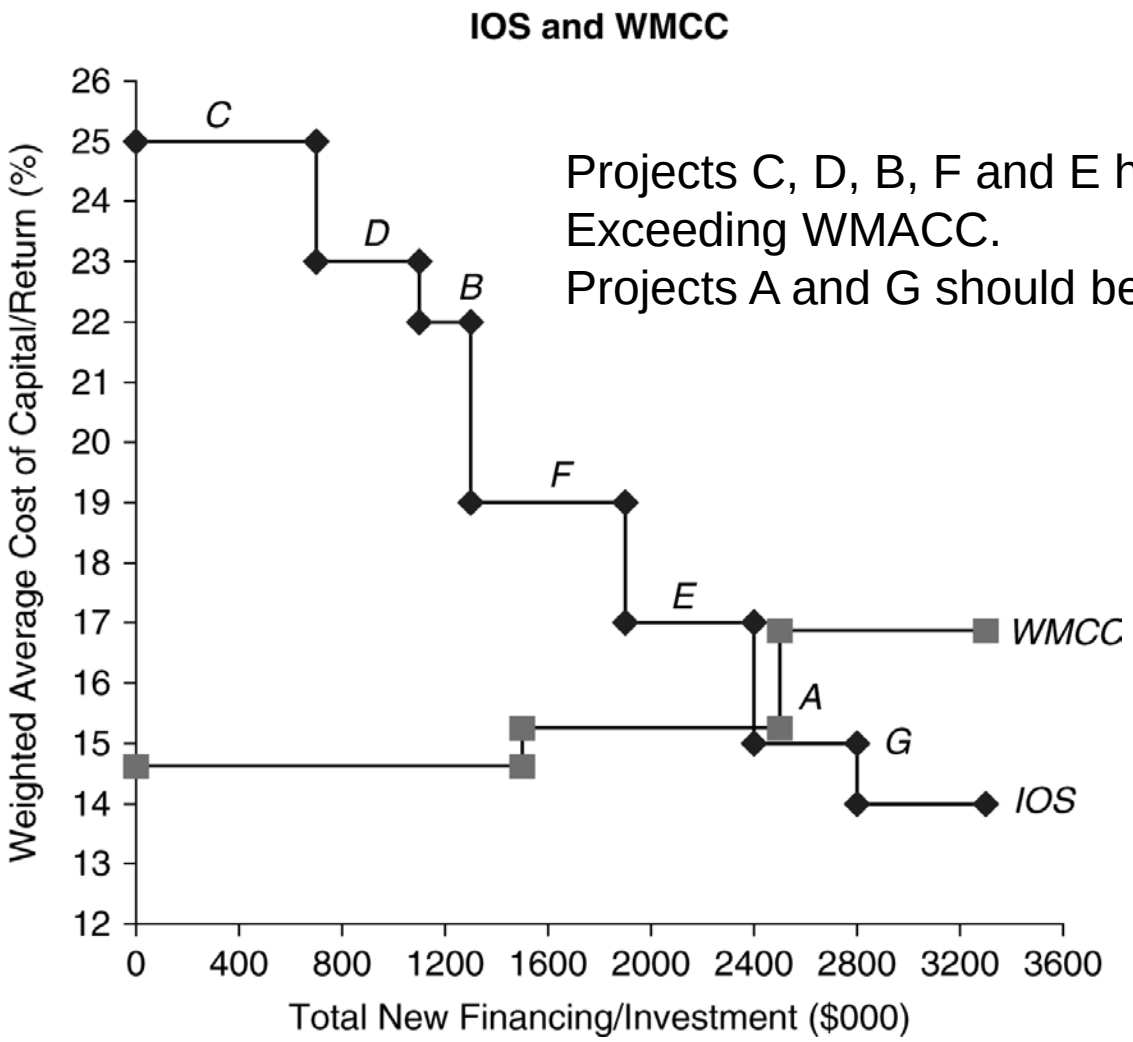
Component Costs

- Debt:
  - 0-450,000 →Before tax cost is 9.46% after tax cost is 5.68% or 5.7%
  - Above 450,000 → 13%
- Preferred Equity →
  - 9.8/65=15.08 or 15.1%
- Equity
  - 0-1,500,000→(0.96/12)+0.11=19%
  - Above 1,500,000→ (0.96/9)+0.11=21.67% or 21.7%

WMCC

	Type of Capital	Target Capital Structure %	Cost of Capital Source	Weighted Cost
1.	From $0 to $1,500,000:			
	Long-term debt	0.30	5.7%	1.71%
	Preferred stock	0.10	15.1%	1.51%
	Common stock equity	0.60	19.0%	11.40%
		1.00	WACC =	14.62%
2.	From $1,500,000 to $2,500,000:			
	Long-term debt	0.30	7.8%	2.34%
	Preferred stock	0.10	15.1%	1.51%
	Common stock equity	0.60	19.0%	11.40%
		1.00	WACC =	15.25%
3.	Above $2,500,000:			
	Long-term debt	0.30	7.8%	2.34%
	Preferred stock	0.10	15.1%	1.51%
	Common stock equity	0.60	21.7%	13.02%
		1.00	WACC =	16.87%

IOS and WMCC



Projects C, D, B, F and E have IRR Exceeding WMACC.
Projects A and G should be rejected.