**A** **NOTE ON THE COST OF CAPITAL**

The cost of capital is a central concept of the finance theory. It is an integral part of any corporate decision-making. Its estimate is critically important in maximizing the value of a firm, making investment decisions in capital budgeting, valuing a firm, and making many other financial decisions.

The primary objective of this note is to provide students with a brief explanation and estimation of the cost of capital and its components. Students are advised to consult their finance books for a detailed discussion of this topic.

**DEFINITION OF THE COST OF CAPITAL**

Different approaches to defining the cost of capital are conceptually equivalent. This concept is closely linked to the financial concept of a required rate of return. **The required rate of return is defined as the minimum rate necessary to induce an investor to buy and hold an asset.**

The cost of capital is the minimum required rate of return that investors, bondholders, and stockholders will demand as compensation for the risk they bear if they are not to employ their savings elsewhere in alternative, identically risky securities. **That is, the cost of capital is an opportunity cost that the management must expect to earn on any new investments at least as much for the shareholders as the shareholders can anticipate earning elsewhere.**

**COST OF CAPITAL AND ITS COMPONENTS**

The estimate of the cost of capital depends on the company and its capital structure. If a company has debt and preferred stocks in its capital structure, then the appropriate cost of capital is the weighted average of the component cost, that is:

**WACC = Wdebt (1-TC) Rdebt  + Wpreferred stock . RpF + Wcommon stocks . Rstocks**

where

**Wdebt** =(D/V)

**Wpreferred stock**=(PF/V)

**Wcommon stocks =(E/V)**

Rdebt = cost of debt

Rpreferred  = cost of preferred stocks

**Rstocks** = cost of common stocks

TC= Corporate tax rate

However, for a firm with no debt and preferred stocks (equity financed) in its capital structure the cost of capital is the same as the cost of equity.

**ESTIMATION OF THE COST OF EQUITY:**

There are several methods to estimate the cost of equity capital. These methods are: (1) Comparable Companies, (2) Discounted Cash Flow, (3) CAPM, and (4) Risk Premium Positioning.

**1. COMPARABLE COMPANIES METHOD**

The comparable method typically starts by selecting a sample of firms believed to be of comparable size, earnings, capital structure, and risk. The procedure used to select the comparable method varies widely, depending on the financial analysts' judgment of what factors indicate size, earnings, and risk. Sales, total assets, the line of business, or other factors could be used. But there is no generally accepted way of defining comparable methods.

Once the sample of the comparable is determined, the financial analyst calculates the required rate of return on equity, RE, for companies in the sample. ROE is the book rate of return to stockholders. The cost of capital for the company is inferred from these rates either as a simple average or after some adjustments.

**2. DISCOUNTED CASH FLOW**

The discounted cash flow (DCF) method of calculating the cost of equity has been based on the Gordon model. It was the first widely used alternative to comparable methods and remains the most widely used alternative today. A simple form of DCF is based on the sum of the expected dividend yield D1/P0 and the expected growth rate of dividends in the future. That is:



To estimate the cost of equity, one needs the current stock price, an estimate of expected dividends over the next period, and the estimated long-term growth rate of dividends. Dividends and the expected growth rate can be estimated in several ways.

The dividends for the next period can be estimated by multiplying this year's dividends by the estimated growth rate. However, estimating an expected growth rate, g is more complex. Two approaches are common.

**A.** Historical growth rates of dividends over some period. Post-growth earnings or book value per share are sometimes used as a proxy.

**B.** **Sustainable growth rate**, g, is estimated by multiplying ROE by the retention rate (RR). That is

**g = ROE x RR**

**3. CAPITAL ASSET PRICING MODEL, CAPM**

In the CAPM, the rate of return on equity is based on the risk-free rate and risk premium which is measured by the Beta times the mark-risk premium. That is:

**RLE = Risk-free rate + Beta x (Historical Market Risk Premium)**

RLE = Rf +Beta L (MRP) (Rm – Rf) = MRP =Historical Risk Premium



The R**E** is the estimated cost of equity capital, **RF** is the risk-free rate, estimated as the average or expected rate of return on Treasury bills in the future, and **RM**is the rate of return on the market portfolio.

If a firm has no debt in its capital structure, the unlevered beta is the business risk inherent in the cost of equity. That is: 

Under the assumptions of the CAPM the relationship between levered and unlevered betas can be stated based on Hamada's relationship: 

If the company has preferred stock in its capital structure, then the levered beta is:

 L =  U [1 + (1- T C) D/E+ PF/E]

If the tax rate is equal to zero, TC=o, then

This relationship is based on the asset beta of a firm which is a weight average of its debt and equity beta. That is



A firm’s asset beta reflects its business risk. The difference between its equity and asset beta reflects financial risk. More debt means more financial risk. If a company decides to use more debt and less equity, this will not affect the firm’s business risk. There would be no change in the firm’s asset beta or the beta of a portfolio of the firm’s debt-equity security. The equity beta is estimated by simplifying the above equation:





If the firm has preferred stock in its capital structure, then levered beta is calculated using the modified Hamada relationship: Levered β=Unlevered β× [1 + [(D/E) × (1−TC) + P/E]]

**ESTIMATION OF RISK PREMIUM**

The figure most often used for the market-risk premium (RM – RF) is a historical market risk premium (based on1926-2004 period) based on work by Ibbotson & Sinquefield.1

|  |  |  |
| --- | --- | --- |
| Investment | Average Return | Risk Premium Relative to U.S. T-bills |
| Large stocks | 12.40% | 8.60% |
| Small Stocks | 17.50% | 13.70% |
| Long-term Corporate Bonds | 6.20% | 2.40% |
| Long-term Government Bonds | 5.80% | 2.00% |
| U.S. Treasury Bills | 3.80% | 0.00% |
| Inflation | 3.10% | -0.70% |

# ESTIMATING THE RATE OF RETURN ON EQUITY

The return on a share of common stock is from two sources:

**RE =capital gain yields + dividend yield.**

The one-period rate of return, then, is equal to: 

**ESTIMATION OF BETA**

Estimating beta is derived from a regression model called the Characteristic Line with the market portfolio. 

Using the ordinary least-squares method, the coefficients of  and  are estimated.

# ALTERNATIVE METHODS OF ESTIMATING THE COST OF EQUITY

The risk Premium method is less used as a stand-alone method. This method is based on adding an explicit premium for risk to the current long-term interest rate, usually the interest rate on government bonds. **RE = Bond Yield + Risk Premium**

**Estimating Market Value of Debt and Cost of Debt**

**Estimating the market value of debt when debt is not traded**The market value of debt is usually more difficult to obtain directly since very few firms have all of their debt in the form of outstanding bonds trading in the market. Many have non-traded debt, such as bank debt, specified in book value terms but not market value. A simple way to convert book value debt into market value debt is to treat the entire debt on the books as one coupon bond, with a coupon set equal to the interest expenses on all of the debt and the maturity set equal to the face-value weighted average maturity of the debt, and to then value this coupon bond at the current cost of debt for the company. Thus, the market value of $ 1 billion in debt, with interest expenses of $ 60 million and a maturity of 6 years, when the current cost of debt is 7.5%, can be estimated as follows: Estimated Market Value of Debt =

  
**Which is a better estimate of the cost of debt - the rating-based interest rate or the yield to maturity on an issued bond?**The yield to maturity on an issued bond has the advantage of being a market-determined rate. Any special features will skew the bond and the degree to which the bond is secured relative to other debt. For instance, if the bonds issued by a firm have priority on the assets, the yield to maturity on these bonds will be lower than the company's actual cost of debt, which should represent the cost of the entire debt pool. That is why using the ratings and estimating the cost of debt based on the rating may provide a better estimate of debt.

**Estimating Cost of Debt and Synthetic Ratings**   
To estimate the cost of debt, you need to have either the bond rating or interest coverage ratio. For example, if a firm has an interest coverage ratio of 5.2, which falls in the range of 4.90-5.999, the company has a bond rating of A3/A-. The spread for this rating is 1.29%, which will be added to 20 or 30-year treasury bonds.

Interest Coverage Ratio =ICR = EBIT/ INTEREST EXP.

Cost of Debt = Rd = T. BOND 20 OR 30 YEARS + SPREAD

|  |  |  |  |
| --- | --- | --- | --- |
| *If the interest coverage ratio is* |  |  |  |
| greater than | ≤ to | Rating is | Spread is |
| -100000 | 0.499999 | D2/D | 14.34% |
| 0.5 | 0.799999 | C2/C | 10.76% |
| 0.8 | 1.249999 | Ca2/CC | 8.80% |
| 1.25 | 1.499999 | Caa/CCC | 7.78% |
| 1.5 | 1.999999 | B3/B- | 4.62% |
| 2 | 2.499999 | B2/B | 3.78% |
| 2.5 | 2.999999 | B1/B+ | 3.15% |
| 3 | 3.499999 | Ba2/BB | 2.15% |
| 3.5 | 3.9999999 | Ba1/BB+ | 1.93% |
| 4 | 4.499999 | Baa2/BBB | 1.59% |
| 4.5 | 5.999999 | A3/A- | 1.29% |
| 6 | 7.499999 | A2/A | 1.14% |
| 7.5 | 9.499999 | A1/A+ | 1.03% |
| 9.5 | 12.499999 | Aa2/AA | 0.82% |
| 12.5 | 100000 | Aaa/AAA | 0.67% |

**Steps for Calculating the Cost of Capital**

## PUBLICLY HELD COMPANY

**Unlevered Firm** **Levered Firm**

 **R WACC = Wd (1-TC) x Rd + WE REL**



Rd = Cost of Debt:

Estimation of Rd

1. Based on Bond Valuation Model

2. Market rate based on bond rating of the company 1. 

2. 

where 

## PRIVATELY HELD COMPANY OR PROJECT

**ESTIMATING COST OF EQUITY FOR A PRIVATE FIRM**

 Basic Problem: Most models of risk and return (including the CAPM and the APM) use past prices of an asset to estimate its risk parameters (beta(s)). Private firms and divisions of firms are not traded and thus do not have past prices.

***Solution 1:*** *Estimate the beta based on comparable firms and after adjusting for risk.*

* Step 1: Collect a group of publicly traded comparable firms, preferably in the same line of business, but more generally, affected by the same economic forces that affect the firm’s value.

A Simple Test: To see if the group of comparable firms is truly comparable, estimate a correlation between the revenues or operating income of the comparable firms and the firm being valued. Of course, if they are high (and positive), you have comparable firms.

* Step 2: Estimate the average beta for the publicly traded comparable firms (if the firms are relatively the same size). Estimate comparable firms' average market value debt-equity ratio and calculate the unlevered beta for the business.

unlevered = levered / (1 + (1 - tax rate) (Debt/Equity))

* If the firm size significantly differs among the comparable firms, calculate the unleveled beta of each comparable beta and then use the weight of each firm to estimate the average unlevered beta.
* Step 3: Relevere the unlevered beta using the target company capital structure.
* Step 4: Estimate a debt-equity ratio for the private firm. The fundamental problem, however, is that you have only book values for the private firms. This can be corrected in one of two ways:

Assume that the private firm will move to the industry average debt ratio. The beta for the private firm will then also converge on the industry average beta. This might not happen immediately but in the long term.

**BetaPrivate firm = etaunlevered (1 + (1 - tax rate) (Industry Average Debt/Equity))**

* Estimate the optimal debt ratio for the private firm based on its operating income and cost of capital. Use this optimal debt ratio to calculate the beta. (Be consistent about using the same debt ratio in your cash flow estimates)

**private firm = unlevered (1 + (1 - tax rate) (Optimal Debt/Equity))**

* Step 5: Estimate the private firm’s equity cost based on this beta.

Example of estimating the cost of capital for a new food company:

|  |  |  |  |
| --- | --- | --- | --- |
| Estimation Cost of Capital New Food Co. | *Comparable Firms* | Beta | D/E |
| Assuming they are the same size. | Bob Evans farms | 0.88 | 23.39% |
| P F Chang's China | 0.79 | 35.12% |
| Cheesecake Factory Inc | 1.8 | 19.38% |
| Average | 1.16 | 25.96% |
| *Unlevered Beta for Comparable Firms using the Hamada relationship* | 1.00 |  |  |
| *Food Company Debt/Equity Ratio* | 30% |  |  |
| Tax rate | 25% |  |  |
| *Estimated Beta for this firm* | 1.225 |  |  |
| *Market Risk Premium (MRP)* | 6% |  |  |
| *Risk Free-Rate* | 4.0 % |  |  |
| *Estimated Cost of Equity* | 11.35% |  |  |

***Solution 2:*** *Estimate an accounting beta.*

**Step 1**: Collect accounting earnings for the private company for as long as there is a history.

**Step 2**: Collect accounting earnings for the S&P 500 for the same period.

**Step 3**: Regress changes in earnings for the private company against changes in the S&P 500.

**Step 4**: The slope of the regression is the accounting beta

 There are two severe limitations: (a) The number of observations in the regression is small, and (b) Accountants' smooth earnings.

1. R. G. Ibbotson and R. A. Sinquefield, Stocks, Bonds, Bills, and Inflation: 2000 Yearbook.
2. Aswath Damodaran, Estimating the cost of debt.