**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 and its estimate is critically important in: maximizing the value of a firm, investment decisions in capital budgeting, valuation of a firm, and many other financial decisions.

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

**DEFINITION OF THE COST OF CAPITAL**

There are different approaches to defining the cost of capital that are conceptually equivalent. This concept is closely linked to the financial concept of a required rate of return. **The required rate return is defined as the minimum rate of return 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 alternatives, 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)=(B/V)

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

**Wcommon stocks =(E/V)=(S/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 to vary widely, depending on the financial analysts' judgment of what factors indicates 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 method.

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 method 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 next period can be estimated by multiplying this year's dividends by the estimated rate of growth. However, estimation of an expected growth rate, g, is a more difficult task. Two approaches are common.

**A.** Historical growth rates of dividends over some period. Sometimes post growth in earnings or book value per share is used as a proxy.

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

**g = ROE . 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:

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





The R**E** is the estimated cost of equity capital, **RF**, the risk-free rate, which is 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 the Hamada's relationship: 

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. Now if a company decides to use more debt and less equity, this would not affect the firm’s business risk. There would be no change in the firm’s asset beta, and no change in the beta of a portfolio of the firm’s debt-equity security. The equity beta is estimated by simplifying the above equation:





**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**

Estimation of beta is derived from a regression model, referred to as the Characteristic Line with the market portfolio. 

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

# ALTERNATIVE METHODS OF ESTIMATING THE COST OF EQUITY

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**

**Estimating 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 bonds outstanding trading in the market. Many of them have non-traded debt, such as bank debt, which is specified in book value terms but not market value terms. 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 $ 1billion 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. It will be skewed by any special features that the bond may have and the degree to which the bond is secured, relative to other debt. For instance, if the bonds issued by a firm have first priority on the assets, the yield to maturity on these bonds will be lower than the company's true cost of debt, which should represent the cost of the entire debt pool. That is why using the ratings and estimating a cost of debt based on the rating may provide a better estimate of debt.

**Estimating Synthetic Ratings**   
To estimate synthetic ratings we use the financial characteristics of the firm under question. As an example, if a firm has an interest coverage ratio of 5.2, and other firms with similar interest coverage ratios have an A rating, this firm's synthetic rating is A.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **For large manufacturing firms** | | | | | | |  | | |
| *If interest coverage ratio is* | | | |  |  | |  | | |
| *>* | | *≤ to* | | | *Rating is* | | *Spread is* | | |
| -100000 | | 0.199999 | | | D | | 14.00% | | |
| 0.2 | | 0.649999 | | | C | | 12.70% | | |
| 0.65 | | 0.799999 | | | CC | | 11.50% | | |
| 0.8 | | 1.249999 | | | CCC | | 10.00% | | |
| 1.25 | | 1.499999 | | | B- | | 8.00% | | |
| 1.5 | | 1.749999 | | | B | | 6.50% | | |
| 1.75 | | 1.999999 | | | B+ | | 4.75% | | |
| 2 | | 2.499999 | | | BB | | 3.50% | | |
| 2.5 | | 2.999999 | | | BBB | | 2.25% | | |
| 3 | | 4.249999 | | | A- | | 2.00% | | |
| 4.25 | | 5.499999 | | | A | | 1.80% | | |
| 5.5 | | 6.499999 | | | A+ | | 1.50% | | |
| 6.5 | | 8.499999 | | | AA | | 1.00% | | |
| 8.5 | | 100000 | | | AAA | | 0.75% | | |
| **For financial service firms** | | | | | | | | | | | |
| *If long term interest coverage ratio is* | | | | | |  | | |  | | |
| greater than | ≤ to | | Rating is | | | Spread is | | | Operating Income Decline | | |
| -100000 | 0.049999 | | D | | | 14.00% | | | -50.00% | | |
| 0.05 | 0.099999 | | C | | | 12.70% | | | -40.00% | | |
| 0.1 | 0.199999 | | CC | | | 11.50% | | | -40.00% | | |
| 0.2 | 0.299999 | | CCC | | | 10.00% | | | -40.00% | | |
| 0.3 | 0.399999 | | B- | | | 8.00% | | | -25.00% | | |
| 0.4 | 0.499999 | | B | | | 6.50% | | | -20.00% | | |
| 0.5 | 0.599999 | | B+ | | | 4.75% | | | -20.00% | | |
| 0.6 | 0.799999 | | BB | | | 3.50% | | | -20.00% | | |
| 0.8 | 0.999999 | | BBB | | | 2.25% | | | -20.00% | | |
| 1 | 1.49999 | | A- | | | 2.00% | | | -17.50% | | |
| 1.5 | 1.99999 | | A | | | 1.80% | | | -15.00% | | |
| 2 | 2.49999 | | A+ | | | 1.50% | | | -10.00% | | |
| 2.5 | 2.99999 | | AA | | | 1.00% | | | -5.00% | | |
| 3 | 100000 | | AAA | | | 0.75% | | | 0.00% | | |
| **For smaller and riskier firms** | | | | | |  | |  | | |
| *If interest coverage ratio is* | | | | | |  | |  | | |
| greater than | | | ≤ to | | | Rating is | | Spread is | | |
| -100000 | | | 0.499999 | | | D | | 14.00% | | |
| 0.5 | | | 0.799999 | | | C | | 12.70% | | |
| 0.8 | | | 1.249999 | | | CC | | 11.50% | | |
| 1.25 | | | 1.499999 | | | CCC | | 10.00% | | |
| 1.5 | | | 1.999999 | | | B- | | 8.00% | | |
| 2 | | | 2.499999 | | | B | | 6.50% | | |
| 2.5 | | | 2.999999 | | | B+ | | 4.75% | | |
| 3 | | | 3.499999 | | | BB | | 3.50% | | |
| 3.5 | | | 4.499999 | | | BBB | | 2.25% | | |
| 4.5 | | | 5.999999 | | | A- | | 2.00% | | |
| 6 | | | 7.499999 | | | A | | 1.80% | | |
| 7.5 | | | 9.499999 | | | A+ | | 1.50% | | |
| 9.5 | | | 12.49999 | | | AA | | 1.00% | | |
| 12.5 | | | 100000 | | | AAA | | 0.75% | | |

**Steps for Calculating the Cost of Capital**

## PUBLICLY HELD COMPANY

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

 **R WACC = Wd (1-TC)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 upon 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 being valued.

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. If it is high (and positive), of course, you have comparable firms.

* Step 2: Estimate the average beta for the publicly traded comparable firms.
* Step 3: Estimate the average market value debt-equity ratio of these comparable firms, and calculate the unlevered beta for the business.

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

* Step 4: Estimate a debt-equity ratio for the private firm. The basic 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 over the long term.

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

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

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

* Step 5: Estimate a cost of equity for the private firm, based upon this beta.

Example for estimating cost of capital for new Food Company.

|  |  |  |  |
| --- | --- | --- | --- |
| Estimation Cost of Capital New Food Co. | *Comparable Firms* | Beta | D/E |
|  | 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* | 1.00 |  |  |
| *Debt/Equity Ratio for this firm* | 25.96% |  |  |
| (Assumed move to industry average) |  |  |  |
| *Estimated Beta for this firm* | 1.16 |  |  |
| *MRP* | 7.50% |  |  |
| *Risk Free-Rate* | 4.78% |  |  |
| *Estimated Cost of Equity* | 13.46% |  |  |

***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 time 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 serious limitations - (a) The number of observations in the regression is small (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.