Cost of Capital

Presented by
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Cost of Capital

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Speaker Biography – Harold Martin

Harold G. Martin, Jr., CPA/ABV/CFF, ASA, CFE, is the Partner-in-Charge of the Valuation and Forensic Services Group for Keiter, a full-service CPA firm located in Richmond, Virginia. He has over 30 years of experience in financial consulting, public accounting, and financial services. He specializes in valuation and forensic accounting, including financial investigations and litigation consulting and expert witness services. He has appeared as an expert witness in federal and state courts, served as a court-appointed neutral appraiser, served as a federal court-appointed accountant for receiverships, and served as a neutral appraiser or forensic accountant for various types of disputes.

Harold is also an adjunct faculty member of The College of William and Mary Mason Graduate School of Business where he teaches forensic accounting in the Master of Accounting program.

Prior to joining Keiter, he was affiliated with Price Waterhouse as a Senior Manager in Management Consulting Services, Coopers & Lybrand as a Director in Financial Advisory Services, and First & Merchants National Bank as a Direct Loan Officer in retail banking.

He is a former member of the American Institute of Certified Public Accountants Business Valuation Committee, former Chair of the AICPA National Business Valuation Conference Steering Committee, former editor of the AICPA ABV e-Alert, and former editorial adviser and contributing author for the AICPA CPA Expert. In 2012, he was inducted into the AICPA Business Valuation Hall of Fame. He is a two-time recipient of the AICPA Business Valuation Volunteer of the Year Award. He currently serves as an instructor for the AICPA’s National Business Valuation School and ABV Exam Review Course. He is also the former Chair of the Virginia Society of Certified Public Accountants Business Valuation and Litigation Committees, and created and chairs the annual VSCPA Business Valuation, Fraud, and Litigation Services Conference.


He received his A.B. degree from The College of William and Mary and his M.B.A. degree from Virginia Commonwealth University.

Presentation Outline
Cost of Capital
Presentation Outline

› Cost of Capital
  › Risk
  › Alternative Models:
    › Direct to Equity
    › Invested Capital
  › Alternative Methods to Estimate Cost of Equity:
    › Buildup
    › CAPM
  › Components of Cost of Equity:
    › Risk Free Rate
    › Equity Risk Premium
    › Size Premium
    › Industry Risk Premium
    › Specific Company Risk
  › The Weighted Average Cost of Capital
  › Case Studies

Cost of Capital Risk
Risk = “degree of uncertainty as to the realization of expected future economic income”

1. Maturity Risk
   › Risk that value may go up/down because of changes in interest rates

2. Systematic (Market) Risk
   › Uncertainty because of sensitivity of return on subject investment to movements in returns for the market

3. Unsystematic (Specific) Risk
   › Uncertainty of return on subject investment arising from factors specific to the subject
Cost of Capital

Risk | Impact of Risk on Cost of Capital

› Cost of capital is comprised of:
   › Riskless rate – compensation to investors for renting of money
   › Risk premium – compensation to investors for uncertainty of expected returns

› The higher the risk, the higher the required rate of return (cost of capital)

Cost of Capital, 4th ed., p. 75.

Cost of Capital

Risk | Relationship Between Cost of Capital and the Discount Rate

› Cost of Capital = Discount rate

› Cost of capital is “the expected rate of return that the market requires in order to attract funds to a particular investment”

› Characteristics
   › Economic opportunity cost
   › Forward-looking
   › Based on market values
   › Nominal rate (includes inflation)
Cost of Capital
Alternative Models

Alternative Models for Computing the Cost of Capital

› Direct to Equity

› Invested Capital
Investment in Company = Capital Structure

Cost of Capital
Alternative Models
Alternative Models for Computing the Cost of Capital

Cost of Capital
Alternative Methods for Computing Cost of Equity
Cost of Capital
Alternative Methods for Computing Cost of Equity

Methods

› Two Methods:
  › CAPM
  › Buildup Method

› Differences:
  › Beta is used in CAPM
  › In the Buildup Method, any risk otherwise reflected in beta is included in the specific risk component.

Capital Asset Pricing Model (CAPM)

\[ E(R_i) = R_f + (R_{P_m})B \]

Where:
\[ E(R_i) \] = Expected return for an investment
\[ R_f \] = Risk-free rate of return
\[ R_{P_m} \] = Risk premium for equity (market risk)
\[ B \] = Beta

Cost of Capital
Alternative Methods for Computing Cost of Equity
Capital Asset Pricing Model (CAPM) – Security Market Line

Ibbotson SBBI 2012 Valuation Yearbook
Graph 4-1 Security Market Line
Calculated Using CAPM

Expected Return for S&P 500

\[ E(R_i) = R_f + (RP_m) B \]
\[ E(R_i) = 5.15 + (6.62) 1 \]
\[ E(R_i) = 11.77\% \]

Cost of Capital
Alternative Methods for Computing Cost of Equity

Buildup Model

\[ E(R_i) = R_f + RP_m \beta + RP_s + RP_u \]

Where:
- \( E(R_i) \) = Expected return for an investment
- \( R_f \) = Risk-free rate of return
- \( RP_m \) = Risk premium for the equity (market risk)
- \( RP_s \) = Risk premium for size
- \( RP_u \) = Risk premium for unsystematic (specific company)

Note: \( RP_u \) will include risk that would otherwise be reflected in beta.


Cost of Capital
Alternative Methods for Computing Cost of Equity

Alternative BUM Using Ibbotson Industry Risk Premia

\[ E(R_i) = R_f + RP_m \beta + RP_s +/\- RP_i + RP_u \]

Where:
- \( E(R_i) \) = Expected return for an investment
- \( R_f \) = Risk-free rate of return
- \( RP_m \) = Risk premium for the equity (market risk)
- \( RP_s \) = Risk premium for size
- \( RP_i \) = Risk premium for industry
- \( RP_u \) = Risk premium for unsystematic (specific company)

Note: If the \( RP_i \) is used, the \( RP_u \) should be reduced to remove industry risk

Cost of Capital, 4th ed., p. 95.
Cost of Capital
Components of Cost of Equity

Risk Free Rate

- Rate investor could receive from an investment free of risk of default
- Components:
  - Rental rate
  - Inflation
  - Maturity risk
- Source: yield to maturity on U.S. Treasury Bond with maturity of 20 years as of the valuation date
  - Note: 20 year maturity is used because Ibbotson data used to derive the ERP begins in 1926 and 20 years was the longest maturity on a U.S. Treasury security at that time

Cost of Capital
Components of Cost of Equity
Risk Free Rate

FEDERAL RESERVE statistical release

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<td>6-month</td>
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<td>3-year</td>
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<td>5-year</td>
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<td>7-year</td>
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<td>1.41</td>
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<td>10-year</td>
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<td>1.93</td>
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<td>2.59</td>
<td>2.58</td>
<td>2.57</td>
<td>2.62</td>
<td>2.63</td>
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<td>30-year</td>
<td>3.94</td>
<td>2.91</td>
<td>2.90</td>
<td>2.89</td>
<td>2.94</td>
<td>2.95</td>
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</table>

Cost of Capital
Components of Cost of Equity
Equity Risk Premium

› Additional risk associated with investing in a portfolio of large publicly traded common stocks over the risk free rate of return

› Four alternative approaches
  › Historical – ERP derived from historical returns between stocks and bonds
  › Supply Side – ERP derived from earnings, dividends, or overall economic productivity
  › Demand Side – ERP derived from payoff demanded by investors for bearing risk of equity investments
  › Financial Professional surveys

Ibbotson SBBI 2012 Valuation Yearbook, p. 53.
Cost of Capital
Components of Cost of Equity
Equity Risk Premium - Historical

Formula
\[ RP_m = R_m - R_f \]

Where:
- \( RP_m \) = Risk premium for equity (market risk)
- \( R_m \) = Expected return on fully diversified portfolio of equity securities
- \( R_f \) = Risk-free rate of return

Cost of Capital, 4th ed., p.117.

Ibbotson calculates ERP (historical) for 2011 as follows:

\[ \begin{align*}
R_m & = \text{Market Total Return for large stocks} & 11.77 \\
R_f & = \text{Risk-Free Rate} & (5.15) \\
RP_m & = \text{Long-Horizon Equity Risk Premium} & 6.62
\end{align*} \]

Market Total Return – S&P 500 is used by Ibbotson as the benchmark for the “market”

Risk-Free Rate – Long term government bond rate

Ibbotson SBBI 2012 Valuation Yearbook, Table 5-2, p. 54, Table C-1, p. 202.
Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Historical

› Appropriate Time Period for Estimating ERP
  › Ibbotson ERP covers the time period from 1926 to the present
  › Center for Research in Security Prices (“CRSP”) is source of data for ERP
  › CRSP selected long-term period because:
    › It is the time at which quality financial data became available
    › Includes the volatile markets of the 1920’s and 1930’s


Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Historical

› Ibbotson further notes:
  › Reasons to use long-term period
    › Long-term historical returns have been stable
    › Long-term considers unusual events and all periods contain unusual events
    › Short-term returns may lead to illogical conclusions
    › Short-term averages can be distorted by one or more observations
  › Reasons to use a short-term period
    › Current periods are more indicative of near future
    › Historical events are unlikely to be repeated (e.g., great depression, WWII)
      › Ignores fact that many unusual events have taken place since these earlier periods (e.g., 1973-74 oil embargo, 1987 stock market crash, collapse of high yield bond market, etc.)

Cost of Capital
Components of Cost of Equity
Equity Risk Premium - Historical

Stock Market Return and Equity Risk Premium Over Time

<table>
<thead>
<tr>
<th>Length (Years)</th>
<th>Period Dates</th>
<th>Large Company Stock Arithmetic Mean Total Return (%)</th>
<th>Long-Horizon Equity Risk Premium %</th>
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<tr>
<td>86</td>
<td>1926-2011</td>
<td>11.8</td>
<td>6.6</td>
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<tr>
<td>80</td>
<td>1932-2011</td>
<td>12.5</td>
<td>7.2</td>
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<td>70</td>
<td>1942-2011</td>
<td>12.8</td>
<td>7.2</td>
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<tr>
<td>60</td>
<td>1952-2011</td>
<td>11.9</td>
<td>5.7</td>
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<tr>
<td>50</td>
<td>1962-2011</td>
<td>10.7</td>
<td>3.9</td>
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<td>40</td>
<td>1972-2011</td>
<td>11.5</td>
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<td>1982-2011</td>
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<td>20</td>
<td>1992-2011</td>
<td>9.6</td>
<td>4.1</td>
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<td>1997-2011</td>
<td>7.5</td>
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<td>10</td>
<td>2002-2011</td>
<td>5.0</td>
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<tr>
<td>5</td>
<td>2007-2011</td>
<td>2.4</td>
<td>-1.7</td>
</tr>
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Ibbotson SBBI 2012 Valuation Yearbook, Table 5-5, p. 59.

ERP is more stable over longer time periods

Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Historical – Control v. Minority

- Most practitioners believe that the nature of the cash flows determines whether or not a control or minority interest value is derived
- Some analysts believe that because data used to calculate the cost of capital is derived from public company data which represents minority interests, the cost of capital reflects a minority interest value
- Ibbotson notes:
  - While most public companies are minority held, there is no evidence that higher rates of return could be earned if these companies were suddenly acquired by majority shareholders.
  - When performing DCF analysis, adjustments for minority or control may be more suitably made to the projected cash flows than to the discount rate.

The economic income stream and the discount rate must be consistent with respect to taxes

After Tax

- Ibbotson data is based on after tax cash flows, therefore a discount rate derived using Ibbotson data is an after tax rate.

Pre-Tax

- If pre-tax cash flows are valued, then the discount rate should be adjusted to a pre-tax rate.
- There is no simple methodology for adjusting the Ibbotson data to a pretax basis

Applicable Tax Rate

- The combined federal and state tax rate for the subject company should be used
- Alternatives to calculating the tax rate:
  - Marginal statutory tax rate for subject (used most often in practice)
  - Expected tax rate for subject
    - Ibbotson, quoting research by Graham, notes that a majority of firms can expect to pay less than the marginal rate.
    - However, at issue is whether or not the subject company being valued can duplicate this.
Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Issues with Historical Data

- **WWII Interest Rate Bias**
  - During WWII, the U.S. Treasury decided interest rates had to be kept at artificially low levels to reduce government financing costs.
  - After WWII, Fed continued maintaining the interest rate ceiling, due to the Treasury’s pressure and a fear of returning to the high un-employment levels of the Great Depression.
  - To better understand the effect of the interest rate accord on the realized risk premiums, Grabowski recalculated the realized risk premiums for 1926-2008 after normalizing the income return on long-term U.S. government bonds for the years 1942-1951 to an amount at least equal to the annual rate of inflation as reported in the SBBI Yearbook (except 1949, when inflation was —1.8%).
  - Making this adjustment lowered the realized risk premium from the published 6.5% to 6.0% for 1926–2008.
  - One can interpret these results as the realized risk premium data reported in the SBBI Yearbook is biased high by 50 basis points.

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Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Supply Side

Roger G. Ibbotson and Peng Chen used a historical earnings model to forecast “supply side” ERP

Term “supply side” means it only takes into account company-generated returns

The earnings model breaks historical returns into four pieces:

- Inflation
- Income return
- Growth in real earnings per share
- Growth in P/E ratio

The Supply Side ERP excludes the growth in P/E based on the assumption that the P/E will not continue to increase in the future.

The historical ERP includes the growth in P/E.
Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Historical v. Supply Side

Supply Side v. Historical ERP Over Time

<table>
<thead>
<tr>
<th>Period Length (Years)</th>
<th>Period Dates</th>
<th>g(P/E)</th>
<th>Supply Side ERP Arithmetic Avg.</th>
<th>Historical ERP Arithmetic Avg.</th>
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<tr>
<td>86</td>
<td>1926-2011</td>
<td>0.33</td>
<td>6.14</td>
<td>6.62</td>
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<td>85</td>
<td>1926-2010</td>
<td>0.46</td>
<td>6.10</td>
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<td>84</td>
<td>1926-2009</td>
<td>0.77</td>
<td>5.74</td>
<td>6.67</td>
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<td>83</td>
<td>1926-2008</td>
<td>0.79</td>
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<td>82</td>
<td>1926-2007</td>
<td>1.15</td>
<td>5.74</td>
<td>7.06</td>
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Ibbotson SBBI 2012 Valuation Yearbook, Table 5-6, p. 66.

Cost of Capital
Components of Cost of Equity
Equity Risk Premium – Supply Side

› Supply Side ERP Adjusted

› Using the Supply Side estimate of the long-term ERP presented in the SBBI 2012 Yearbook of 6.14%, minus the 0.50% WWII Interest Rate bias, equals 5.64% for one-year holding period returns.

Supply Side ERP Adjusted

The crisis of 2008–2009 and the resulting recession were not ordinary times.

If the cost of equity were calculated by summing the ERP from commonly used sources and the yield on 20-year U.S. government bonds on December 31, 2008, the estimate would be too low:

- As of December 2007, the yield on 20-year U.S. government bonds equaled 4.5%, and the Morningstar realized risk premium for 1926–2007 was 7.1%, resulting in a base cost of equity of 11.6%.

- But at December 2008, the yield on 20-year U.S. government bonds was 3.0%, and the Morningstar realized risk premium for 1926–2008 was 6.5%, resulting in a base cost of equity of 9.5%.

So just when the risk in the economy increased to the highest point, the base cost of equity using realized risk premiums decreased from 11.6% (4.5% + 7.1%) to 9.5% (3.0% + 6.5%).

Conditional ERP – ERP that reflects current market conditions

Given the unusual market conditions as of December 31, 2008, the conditional ERP should be at the high end of the long-term range relative to normalized long-term U.S. government bond yields.

Therefore, Grawboski recommends using a normalized long-term U.S. government bond yield of 4.5% and an ERP of 6%, or a base cost of equity of 10.5% as of December 31, 2008.
Cost of Capital
Components of Cost of Equity
Equity Risk Premium - Summary

› The long-term average (or unconditional) ERP should be used in developing discount rates in normal economic conditions.
› A reasonable long-term estimate of the average (or unconditional) ERP ranges from 3.5% to 6%.
› This ERP is consistent with the SBBI Yearbook supply side ERP estimate (6.14%) minus the WWII Interest Rate bias (.5%), or 5.64%.


Cost of Capital
Components of Cost of Equity
Equity Risk Premium – In the Courts

› An April 23, 2010 decision by the Delaware Court of Chancery may have a broad impact on how discount rates used in valuation models are determined.

› In *Global GT LP and Global GT LTD v. Golden Telecom, Inc.* the valuation decision was hinged upon the methodology used to develop two key inputs in developing cost of capital estimates: the beta and the equity risk premium (ERP).

› Golden’s expert selected 7.1%, the long-term “historical” ERP from Morningstar’s 2008 Ibbotson SBBI Valuation Yearbook.

› Petitioners’ expert selected an ERP of 6.0% “… based on his teaching experience, the relevant academic and empirical literature, and the ‘supply side’ ERP reported in the 2007 Ibbotson Yearbook.” Morningstar/Ibbotson publishes both a “historical” ERP and a “supply side” ERP in the *SBBI Valuation Yearbook.*
Court rejected the use of the Morningstar/Ibbotson ERP of 7.1% and instead chose the lower estimate of 6%.

Citing the “…wealth of recent academic and professional writings that supports a lower ERP estimate…” that were put forth in the hearing.

The Court reasoned that the “…relevant professional community has mined additional data and pondered the reliability of past practice and come, by a healthy weight of reasoned opinion, to believe that a different practice should become the norm…”

The Court went on to say that: “to cling to the Ibbotson Historic ERP blindly gives undue weight to Ibbotson’s use of a single data set. 1926 might have been a special year because, for example, that was the year when Marilyn Monroe was born, but it has no magic as a starting point for estimating long-term equity returns.”

In arguing that continued use of the simple Historic ERP is unjustifiable, (the petitioners’ expert) has substantial support in the professional and academic valuation literature.

Shannon Pratt, for example, has urged his readers who still use an ERP of 7% to ‘immediately make a downward adjustment to reflect recent research results,’ and has written that the ‘ERP as of the beginning of 2007 should be in the range of 3.5% to 6%’…
Cost of Capital

Components of Cost of Equity

Beta

› Measure of the sensitivity of returns of an individual company stock relative to the market (systematic risk)
› Calculated by regressing a stock’s excess return against the market's excess return over a period of time
› Beta equals the slope of the regression equation:

\[ B > 1 \text{ stock is more risky than the market and expected returns higher than the market} \]
\[ B = 1 \text{ stock is as risky as the market and expected returns equal the market} \]
\[ B < 1 \text{ stock is less risky than the market and expected returns less than the market} \]

› Sources:
  › Selected guideline public companies
  › Ibbotson Associates Beta Book
  › Ibbotson Associates Cost of Capital Yearbook


Beta - Sources

› For publicly traded stock, beta is estimated by regressing the excess returns on the individual security \( (R_i - R_f) \) against the excess returns on the market \( (R_m - R_f) \). The resulting slope is the beta \( (B) \).
Cost of Capital

Components of Cost of Equity

Beta – Regression Formula

\[(R_i - R_f) = \alpha + B \times (R_m - R_f) + \varepsilon\]

Where:

- \(R_i\) = Historical Return for publicly traded stock, \(i\)
- \(R_f\) = Risk-free rate
- \(\alpha\) = Regression constant
- \(B\) = Estimated beta based on historical data over the look-back period
- \(R_m\) = Historical return on market portfolio, \(m\)
- \(\varepsilon\) = Regression error term


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Cost of Capital

Components of Cost of Equity

Beta – Adjustment for Leverage in Public Company

- The public company betas are “levered,” i.e., the betas reflect the amount of debt in the public companies’ capital structure

  - If:
    - The public company debt differs from that of the subject company
    - The amount of debt in the subject company cannot be adjusted to the level of the public companies

  - Then:
    - The public company beta should be adjusted to remove the effect of leverage

Cost of Capital, 4th ed., p. 185.
Cost of Capital

Components of Cost of Equity

Beta – Unlevering the Public Company Beta

- Two step process
  - Step 1 - The public company beta is unlevered to remove the effect of leverage
  - Step 2 - The unlevered beta is then “relevered” to reflect the subject company’s capital structure


Cost of Capital

Components of Cost of Equity

Beta – Alternative Formulas

- Hamada
- Miles- Ezzell
- Harris-Pringle
- Practitioner’s Method
- Fernandez

Cost of Capital, 4th ed., p. 188.
Cost of Capital
Components of Cost of Equity

Assumptions

- Discount rate used to calculate tax shield equals cost of debt
- Tax deductions on the interest expense will be realized in the periods in which interest is paid
- Value of the tax shield is proportionate to the value of the market value of debt capital
- The amount of debt is fixed as of the valuation date and remains constant
- Consider alternative formulas if assumptions differ


UNLEVERED BETA FOR INDUSTRY (OR GUIDELINE COMPANIES)

\[ B_{Ui} = \frac{B_{Li}}{[1 + (1 - t_i)W_{di}/W_{ei}]} \]

Where:

- \( B_{Ui} \): Beta unlevered for industry (or guideline companies)
- \( B_{Li} \): Beta levered for industry (or guideline companies)
- \( t_i \): Federal and state income tax rate for industry (or guideline companies)
- \( W_{di} \): Weight of long term interest bearing debt in capital structure at market for industry (or guideline companies)
- \( W_{ei} \): Weight of common equity in capital structure at market for industry (or guideline companies)

Cost of Capital, 4th ed., p. 188-189.
RE-LEVERED BETA FOR SUBJECT COMPANY

\[ B_L = B_{Ui} \left[ 1 + (1 - t)\frac{W_d}{W_e} \right] \]

Where:

- \( B_L \) = Beta re-levered for subject company
- \( B_{Ui} \) = Beta unlevered for industry (or guideline companies)
- \( t \) = Federal and state income tax rate for subject company
- \( W_d \) = Weight of long term interest bearing debt in capital structure for subject company estimated using iterative approach
- \( W_e \) = Weight of common equity in capital structure for subject company estimated using iterative approach


Cost of Capital
Components of Cost of Equity
Size Premium

- Additional risk relating to investing in the common stock of smaller public companies
- Two Primary Sources:
  - *Ibbotson SBBI 2011 Valuation Yearbook*
    - Table C-1
    - Tables 7-5 and 7-8
  - *Duff & Phelps Studies*
Cost of Capital
Components of Cost of Equity
Size Premium – Size and Liquidity

Issue of whether size premium is a disguise for a lack of liquidity premium

- Many small public companies lack full liquidity
- While liquidity may be a major factor in stock risk premiums, liquidity and size are highly related

Ibbotson notes:

- While liquidity cannot be directly measured, capitalization can be
- Therefore, size premium can serve as a partial measure of the increased cost of capital for a less liquid stock
- Size premiums are measured from public companies and do not represent the full cost of capital for a closely held company

### Table 7-2 Size-Decile Portfolios of the NYSE/AMEX/NASDAQ Largest Company and Its Market Capitalization by Decile

<table>
<thead>
<tr>
<th>Decile</th>
<th>Market Cap of Largest Company (in thousands)</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Largest</td>
<td>$354,351,912</td>
<td>Apple, Inc.</td>
</tr>
<tr>
<td>2</td>
<td>15,408,314</td>
<td>Marathon Oil Corp.</td>
</tr>
<tr>
<td>3</td>
<td>6,896,389</td>
<td>Waters Corp.</td>
</tr>
<tr>
<td>4</td>
<td>3,577,774</td>
<td>Solera Holdings Inc.</td>
</tr>
<tr>
<td>5</td>
<td>2,362,532</td>
<td>Pandora Media Inc.</td>
</tr>
<tr>
<td>6</td>
<td>1,620,860</td>
<td>Cabot Corp.</td>
</tr>
<tr>
<td>7</td>
<td>1,090,515</td>
<td>Vitamin Shoppe Inc.</td>
</tr>
<tr>
<td>8</td>
<td>682,750</td>
<td>Stepan co.</td>
</tr>
<tr>
<td>9</td>
<td>422,811</td>
<td>Boyd Gaming Corp.</td>
</tr>
<tr>
<td>10 - Smallest</td>
<td>206,795</td>
<td>Miller Industries</td>
</tr>
</tbody>
</table>

Ibbotson SIBBI 2012 Valuation Yearbook, Table 7-2, p. 86.
Cost of Capital
Components of Cost of Equity
Size Premium - Ibbotson Stratification of Companies by Market Cap

**Ibbotson SBBI 2012 Valuation Yearbook**
Tables 7-5 Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Long-Term Returns in Excess of CAPM

<table>
<thead>
<tr>
<th>Decile</th>
<th>Beta</th>
<th>Arithmetic Mean Return (%)</th>
<th>Actual Return In Excess of Riskless Rate (%)</th>
<th>CAPM Return In Excess of Riskless Rate (%)</th>
<th>Size Premium (Return in Excess Of CAPM) (%)</th>
</tr>
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<tr>
<td>1 – Largest</td>
<td>.91</td>
<td>10.82</td>
<td>5.67</td>
<td>6.05</td>
<td>-.38</td>
</tr>
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<td>2</td>
<td>1.04</td>
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<td>6.85</td>
<td>.78</td>
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<td>3</td>
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<td>7.28</td>
<td>.94</td>
</tr>
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<td>4</td>
<td>1.13</td>
<td>13.78</td>
<td>8.63</td>
<td>7.45</td>
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<td>1.30</td>
<td>16.27</td>
<td>11.12</td>
<td>8.61</td>
<td>1.71</td>
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<tr>
<td>9</td>
<td>1.35</td>
<td>16.88</td>
<td>11.73</td>
<td>8.92</td>
<td>2.60</td>
</tr>
<tr>
<td>10 - Smallest</td>
<td>1.41</td>
<td>20.56</td>
<td>15.40</td>
<td>9.31</td>
<td>6.10</td>
</tr>
<tr>
<td>Mid-Cap, 3-5</td>
<td>1.12</td>
<td>13.70</td>
<td>8.55</td>
<td>7.41</td>
<td>1.14</td>
</tr>
<tr>
<td>Low-Cap, 6-8</td>
<td>1.23</td>
<td>15.16</td>
<td>10.01</td>
<td>8.13</td>
<td>1.88</td>
</tr>
<tr>
<td>Micro-Cap, 9-10</td>
<td>1.36</td>
<td>18.04</td>
<td>12.88</td>
<td>8.99</td>
<td>3.69</td>
</tr>
</tbody>
</table>

As size decreases, the rate of return increases – Size does matter.

Cost of Capital
Alternative Methods for Computing Cost of Equity
Capital Asset Pricing Model (CAPM) – Security Market Line

**Ibbotson SBBI 2012 Valuation Yearbook**
Graph 7-2 Security Market Line
Versus Size-Decile Portfolios

Expected Return for S&P 500

\[
E(R_i) = R_f + (\beta_i \times (R_{m} - R_f)) \\
E(R_i) = 5.15 + (6.62) \times 1 \\
E(R_i) = 11.77\%
\]

Risk Free Rate
\(R_f = 5.15\%\)

Equity Risk Premium
\(R_{m} - R_f = 6.62\%\)

Expected Rate of Return
\(E(R_i) = 11.77\%\)
Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data

› Issue No.1: Which Size Premium to Use?
  › Micro-Cap includes a broader sample of companies, but also includes large companies
  › 10th Decile includes companies that may be closer in size, but still includes many large companies
  › Beginning with the Ibbotson SBBI 2010 Valuation Yearbook, 10a and 10b are further broken down:
    › 10a is split into 10w and 10x
    › 10b is split into 10y and 10z
  › Criticisms of the 10th Decile break outs
    › Fewer data points
    › Infrequent trading biases
    › Delisting bias
    › Impact of trading transaction costs on lower priced stocks in relation to the value of the underlying shares

Cost of Capital
Components of Cost of Equity
Size Premium – Ibbotson Stratification of Companies by Market Cap

Ibbotson SBBI 2012 Valuation Yearbook
Table 7-6 Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
10th Decile of Sub-Portfolios

<table>
<thead>
<tr>
<th>Decile</th>
<th>Recent Number of Companies</th>
<th>Market Cap of Largest Company (in thousands)</th>
<th>Company Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>10a</td>
<td>372</td>
<td>$206,795</td>
<td>Miller Industries</td>
</tr>
<tr>
<td>10w</td>
<td>168</td>
<td>206,795</td>
<td>Miller Industries</td>
</tr>
<tr>
<td>10x</td>
<td>204</td>
<td>170,594</td>
<td>Stewart Information Services Inc.</td>
</tr>
<tr>
<td>10b</td>
<td>1,190</td>
<td>128,672</td>
<td>JMP Group Inc.</td>
</tr>
<tr>
<td>10y</td>
<td>233</td>
<td>128,672</td>
<td>JMP Group Inc.</td>
</tr>
<tr>
<td>10z</td>
<td>957</td>
<td>86,757</td>
<td>Entravision Communications Corp.</td>
</tr>
</tbody>
</table>
### Cost of Capital

#### Components of Cost of Equity

**Size Premium - Ibbotson Stratification of Companies by Market Cap**

**Ibbotson SBBI 2012 Valuation Yearbook**

Table 7-5 Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ with 10th Decile Split

<table>
<thead>
<tr>
<th>Decile</th>
<th>Beta</th>
<th>Arithmetic Mean Return (%)</th>
<th>Actual Return in Excess of Riskless Rate (%)</th>
<th>CAPM Return In Excess of Riskless Rate (%)</th>
<th>Size Premium (Return in Excess Of CAPM) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10a</td>
<td>1.42</td>
<td>18.88</td>
<td>13.73</td>
<td>9.39</td>
<td>4.34</td>
</tr>
<tr>
<td>10w</td>
<td>1.39</td>
<td>18.17</td>
<td>13.02</td>
<td>9.22</td>
<td>3.80</td>
</tr>
<tr>
<td>10x</td>
<td>1.45</td>
<td>19.51</td>
<td>14.36</td>
<td>9.61</td>
<td>4.75</td>
</tr>
<tr>
<td>10b</td>
<td>1.37</td>
<td>24.05</td>
<td>18.90</td>
<td>9.10</td>
<td>9.81</td>
</tr>
<tr>
<td>10y</td>
<td>1.40</td>
<td>23.34</td>
<td>18.19</td>
<td>9.26</td>
<td>8.93</td>
</tr>
<tr>
<td>10z</td>
<td>1.34</td>
<td>25.80</td>
<td>20.65</td>
<td>8.88</td>
<td>11.77</td>
</tr>
</tbody>
</table>

Ibbotson SBBI 2012 Valuation Yearbook, Table 7.8, p. 92.

---

**Cost of Capital**

**Components of Cost of Equity**

**Size Premium – Using Ibbotson Data**

- **Issue No. 2: ERP and Size Premium Consistency**
  - Ibbotson currently only reports the Size Premium using historical data and does not report supply side data
  - If you use an ERP based on supply side data, is there an inconsistency?
  - Ibbotson agrees that there is an inconsistency
  - However, it is still the most practical way to apply this forward looking adjustment to the cost of equity

Ibbotson SBBI 2012 Valuation Yearbook, p. 68.
Cost of Capital
Components of Cost of Equity
Size Premium – Financially Distressed Companies

› Issue No. 3: Inclusion of Financially Distressed Companies in Data

› Historically, Ibbotson has not removed the effect of financially distressed companies

› However, Ibbotson recently examined the impact of removing these companies

› The results of this study indicated that the difference in the returns of the standard portfolio (healthy and distressed) and the cleansed portfolio (healthy only) were not significant

Ibbotson SBBI 2012 Valuation Yearbook, p. 98.

Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in Buildup Model

› Some practitioners use the same size premium for the BUM as that used for CAPM

› Alternative school argues that this size premium is incomplete because the size premium captured in beta for the CAPM Model is not reflected in the BUM

› In order to capture this additional increment in the size premium, the difference between the actual return in excess of the riskless rate and the equity risk premium should be used
### Cost of Capital

#### Components of Cost of Equity

#### Size Premium – Using Ibbotson Data in Buildup Model

---

**Alternative (Non-Beta Adjusted) Size Premium**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual return in excess of riskless rate 10th decile (Table 7-5)</td>
<td>15.40</td>
</tr>
<tr>
<td>Equity risk premium (Table C-1)</td>
<td>6.62</td>
</tr>
<tr>
<td><strong>Size premium (non-beta adjusted)</strong></td>
<td>8.78</td>
</tr>
<tr>
<td>Size premium in excess of CAPM 10th decile (beta adj.)</td>
<td>6.10</td>
</tr>
</tbody>
</table>

*Non-beta adjusted size premium assumes the subject company has the same systematic risk (beta) as the portfolio of stocks for the 10th decile*

---

**Notes:**

- Pratt and Grabowski note that consistent with the discussion on the ERP, the selected time period should represent the current expectations of investors.

- For example, from 1926 to 2008, the Small Company Premium is 8.46% and the standard deviation is 44.95%.

- However, if examine more recent periods, the Small Stock Premium is less and the standard deviations are lower.

- Results indicate that the current Small Company Premium should be in the range of 2 – 5% for companies that would fall in the 10th decile.
Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in Buildup Model

Small Company Premium Based on CRSP Decile Long-Term Total Returns for the 10th Decile Portfolios of the NYSE/AMEX/NASDAQ for Various Time Periods

<table>
<thead>
<tr>
<th>Period</th>
<th>Years</th>
<th>Arithmetic Mean Return (%)</th>
<th>Standard Deviation (%)</th>
<th>Small Company Premium (%)</th>
<th>Arithmetic Mean/Standard Deviation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989-2008</td>
<td>20</td>
<td>13.13</td>
<td>30.37</td>
<td>2.78</td>
<td>0.432</td>
</tr>
<tr>
<td>1979-2008</td>
<td>30</td>
<td>14.06</td>
<td>27.34</td>
<td>1.53</td>
<td>0.514</td>
</tr>
<tr>
<td>1969-2008</td>
<td>40</td>
<td>12.55</td>
<td>30.24</td>
<td>1.95</td>
<td>0.415</td>
</tr>
<tr>
<td>1959-2008</td>
<td>50</td>
<td>15.35</td>
<td>32.27</td>
<td>4.73</td>
<td>0.476</td>
</tr>
<tr>
<td>1926-2008</td>
<td>83</td>
<td>20.13</td>
<td>44.95</td>
<td>8.46</td>
<td>0.448</td>
</tr>
</tbody>
</table>


Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in Buildup Model

› For the BUM, Ibbotson recommends using the Size Premium (Return in Excess of CAPM)

› Sources:
  › Ibbotson SBBI 2012 Valuation Yearbook
Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in Buildup Model

**Ibbotson S&B 2012 Valuation Yearbook**
Tables 7-5 Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Long-Term Returns in Excess of CAPM

<table>
<thead>
<tr>
<th>Decile</th>
<th>Beta</th>
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</thead>
<tbody>
<tr>
<td>1 – Largest</td>
<td>0.91</td>
<td>10.82</td>
<td>5.67</td>
<td>6.05</td>
<td>-0.38</td>
</tr>
<tr>
<td>2</td>
<td>1.04</td>
<td>12.78</td>
<td>7.63</td>
<td>6.85</td>
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<td>13.37</td>
<td>8.22</td>
<td>7.28</td>
<td>0.94</td>
</tr>
<tr>
<td>4</td>
<td>1.13</td>
<td>13.78</td>
<td>8.63</td>
<td>7.45</td>
<td>1.17</td>
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<tr>
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<tr>
<td>Mid-Cap, 3-5</td>
<td>1.12</td>
<td>13.70</td>
<td>8.55</td>
<td>7.41</td>
<td>1.14</td>
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<td>Low-Cap, 6-8</td>
<td>1.23</td>
<td>15.16</td>
<td>10.01</td>
<td>8.13</td>
<td>1.88</td>
</tr>
<tr>
<td>Micro-Cap, 9-10</td>
<td>1.36</td>
<td>18.04</td>
<td>12.88</td>
<td>8.99</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Ibbotson suggests use for computing size premium for Build-Up Model.

Ibbotson further recommends adding or subtracting an Industry Risk Premium (IRP).

The IRP is calculated using the full information beta estimation process.

How to interpret IRP:

> 0 industry is more risky than the market
= 0 industry is as risky as the market
< 0 industry is less risky than the market

Sources:

> Ibbotson S&B 2012 Valuation Yearbook
Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in Buildup Model

› Issues When Using the Industry Risk Premium (IRP)
  › Does the use of the IRP double count the size premium?

› Ibbotson says “no”

› Ibbotson notes that the size premium measures the excess return over what would be predicted by CAPM – i.e., the size premium measures the part of the return not predicted by CAPM.

› The IRP measures how risky the industry is in relation to the market, regardless of size.

Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in CAPM

› Ibbotson recommends using the Size Premium (Return in Excess of CAPM) when using the CAPM
Cost of Capital
Components of Cost of Equity
Size Premium – Using Ibbotson Data in CAPM

Ibbotson SBBI 2012 Valuation Yearbook
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<td>.94</td>
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<td>15.40</td>
<td>9.31</td>
<td>6.10</td>
</tr>
<tr>
<td>Mid-Cap, 3-5</td>
<td>1.12</td>
<td>13.70</td>
<td>8.55</td>
<td>7.41</td>
<td>1.14</td>
</tr>
<tr>
<td>Low-Cap, 6-8</td>
<td>1.23</td>
<td>15.16</td>
<td>10.01</td>
<td>8.13</td>
<td>1.88</td>
</tr>
<tr>
<td>Micro-Cap, 9-10</td>
<td>1.36</td>
<td>18.04</td>
<td>12.88</td>
<td>8.99</td>
<td>3.89</td>
</tr>
</tbody>
</table>

Ibbotson suggests use for computing size premium for CAPM

Cost of Capital
Components of Cost of Equity
Size Premium – Using Duff & Phelps Data

› In 1990, Grubbowski and King began analysis of the returns by size of companies using alternative measures of size
› Their work was published as the Grubbowski-King Study, now the Duff & Phelps Study
› The D&P Study uses eight measures of size:
  › Measure of Equity Size
    › Market value of common equity
    › Book value of common equity
    › Five-year average net income before extraordinary items
  › Measures of Company size
    › Market value of invested capital
    › Total assets
    › Five-year average EBITDA
    › Sales
    › Number of employees
› The D&P Study stratifies the data into 25 size categories
Cost of Capital

Components of Cost of Equity

Size Premium – Using Duff & Phelps Data

- The D&P Study reports the following statistics for each of the 25 size categories:
  - Average of size measure for the latest year
  - Log (base-10) of the median of the size measure
  - Number of companies in each portfolio for latest year
  - Beta estimate relative to S&P 500 for monthly returns for 1963 to latest year
  - Standard deviation of annual realized equity returns for each portfolio since 1963
  - Geometric average realized equity return for each portfolio since 1963
  - Arithmetic average realized equity return for each portfolio since 1963
  - Arithmetic average realized risk premium (realized equity return over long term government bonds) since 1963
  - Smoothed average realized risk premium (fitted premium from a regression with the average realized risk premium as the dependent variable and the logarithm of the size measure as the independent variable)
  - Average carrying value of the sum of preferred stock plus long-term debt plus notes payable as a percent of MVIC since 1963

Cost of Capital

Components of Cost of Equity

Size Premium – Using Duff & Phelps Data for the Buildup Model

- When using the BUM:
  - The Equity Risk Premium and Size Premium are reported as a combined rate
  - The Equity Risk Premium used in the calculations is based on the historic average realized premium since 1963 for large company stocks (4.27% in the Duff & Phelps 2012 Report)
  - For closely-held companies, only 6 of the 8 size measures are used and the following measures are excluded:
    - Market value of common equity
    - Market value of invested capital
Cost of Capital
Components of Cost of Equity
Size Premium – Using Duff & Phelps Data for the Buildup Model

\[ E(R_i) = R_f + RP_{m+s} + RP_u \]

Where: When using the D&P Study for the BUM
\[ E(R_i) = \text{Expected return for an investment} \]
\[ R_f = \text{Risk-free rate of return} \]
\[ RP_{m+s} = \text{Risk premium for market risk plus risk premium for size} \]
\[ RP_u = \text{Risk premium for unsystematic (specific company)} \]

Cost of Capital, 4th ed., p. 245.
Cost of Capital
Components of Cost of Equity
Size Premium – Using Duff & Phelps Data for the CAPM

When using the CAPM:
- The Equity Risk Premium and Size Premium are reported separately
- The Equity Risk Premium used in the calculations is based on the historic average realized premium since 1963 for large company stocks (4.27% in 2012 Duff & Phelps Report)
- For closely-held companies, only 6 of the 8 size measures are used and the following measures are excluded:
  - Market value of common equity
  - Market value of invested capital

\[
E(R_i) = R_f + (RP_m)B + RP_s + RP_u
\]

Where:
- \( E(R_i) \) = Expected return for an investment
- \( R_f \) = Risk-free rate of return
- \( RP_m \) = Risk premium for market risk
- \( B \) = Beta
- \( RP_s \) = Risk premium for size
- \( RP_u \) = Risk premium for unsystematic (specific company) risk

Specific company risk attempts to account for factors that are unique to the company that would cause investors to consider the risk for that company to be different from comparable companies in the industry.

Specific company risk may be determined using:

- Qualitative methods
- Quantitative methods

Cost of Capital
Components of Cost of Equity
Specific Company Risk – Qualitative Method

- Component Detail Method
  - Lists factors and assigns weights

- Component Observation Method
  - Lists factors and assigns +/-neutral

- Component Summary Method
  - Lists factors and assigns
### Cost of Capital
### Components of Cost of Equity
#### Specific Company Risk – Qualitative Methods

<table>
<thead>
<tr>
<th>Component</th>
<th>Component Detail Method RPu (%)</th>
<th>Component Observation Method RPu (%)</th>
<th>Component Summary Method RPu (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small company</td>
<td>0.5%</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Management Depth</td>
<td>1.0</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Access to capital</td>
<td>0.5</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Customer concentration</td>
<td>(0.5)</td>
<td>-</td>
<td>5.0%</td>
</tr>
<tr>
<td>Customer pricing leverage</td>
<td>(0.5)</td>
<td>-</td>
<td>5.0%</td>
</tr>
<tr>
<td>Supplier concentration</td>
<td>0.0</td>
<td>N</td>
<td>5.0%</td>
</tr>
<tr>
<td>Supplier pricing leverage</td>
<td>0.5</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Product/service diversification</td>
<td>1.0</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Geographic distribution</td>
<td>1.0</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Volatility of earnings</td>
<td>0.5</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Technology life cycle</td>
<td>0.5</td>
<td>+</td>
<td>5.0%</td>
</tr>
<tr>
<td>Potential new competitors</td>
<td>0.0</td>
<td>N</td>
<td>5.0%</td>
</tr>
<tr>
<td>Life cycle of current products/services</td>
<td>0.0</td>
<td>N</td>
<td>5.0%</td>
</tr>
<tr>
<td>Availability of labor</td>
<td>0.5</td>
<td>±</td>
<td>5.0%</td>
</tr>
<tr>
<td>Total RPu</td>
<td>5.0%</td>
<td>5.0%</td>
<td>5.0%</td>
</tr>
</tbody>
</table>


---

### Cost of Capital
### Components of Cost of Equity
#### Specific Company Risk – Quantitative Methods

- **Duff & Phelps Risk Study**
- **Butler-Pinkerton Study**
Duff & Phelps Risk Study

The Risk Study can be used to develop a risk premium for the subject company that measures risk in terms of the total effect of market risk, size premium, and specific company risk.

\[ E(R_i) = R_f + RP_{m+s+u} \]

Where:

- \( E(R_i) \) = Expected return for an investment
- \( R_f \) = Risk-free rate of return
- \( RP_{m+s+u} \) = Risk premium for market risk + size + specific company (unsystematic) risk
Cost of Capital

Components of Cost of Equity

Specific Company Risk – Quantitative Methods – Duff & Phelps

› Duff & Phelps Risk Study
  › Risk Study uses same methodology as Size Study
  › Three measures of risk:
    › Operating margin
    › Coefficient of variation of operating margin
    › Coefficient of variation of return on book value of equity

Cost of Capital, 4th ed., p. 293.
Cost of Capital
Weighted Average Cost of Capital
When to Use the WACC

› Can be applied using the capitalization method or discounted cash flow method.
› Can also be used in valuing a control or minority interest position.
› Can be used in all valuation situations
› The most obvious instance in which to use the WACC is when the objective is to value the overall business enterprise.

WACC Formula

\[ \text{WACC} = (k_e \times W_e) + (k_p \times W_p) + (k_d (1-t) \times W_d) \]

Where:

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WACC</td>
<td>Weighted average cost of capital (after-tax)</td>
</tr>
<tr>
<td>Ke</td>
<td>Cost of common equity capital</td>
</tr>
<tr>
<td>We</td>
<td>Percentage of common equity capital at market value</td>
</tr>
<tr>
<td>Kp</td>
<td>Cost of preferred equity capital</td>
</tr>
<tr>
<td>Wp</td>
<td>Percentage of preferred equity capital at market value</td>
</tr>
<tr>
<td>Kd(pt)</td>
<td>Cost of debt capital (pretax)</td>
</tr>
<tr>
<td>Wd</td>
<td>Percentage of debt capital at market value</td>
</tr>
<tr>
<td>t</td>
<td>Income tax rate</td>
</tr>
</tbody>
</table>

Cost of Capital
Weighted Average Cost of Capital
Computing the WACC for a Private Company – Ownership Interest

› Weighting of Debt and Equity
  › Control interest
    › Standard of value = *Fair Market Value*
      › Use subject company’s capital structure
      › Use optimal capital structure as control buyer has ability to change capital structure *(Subject company must have ability to attain optimal structure)*
    › Standard of value = *Investment Value*
      › Use specific owner’s or buyer’s capital structure
  › Minority interest
    › Use subject company’s capital structure as minority interest lacks control to change capital structure

Cost of Capital
Weighted Average Cost of Capital
Computing the WACC for a Private Company – Market Weights

› In determining the WACC, the market values of debt and equity are required to determine the relative weights of each component
  
  › Estimating the market values of debt and equity to assign relative weights presents a “Catch-22” scenario:
    › Our objective is to determine the market value of equity based on some unknown WACC
    › To determine the WACC, we must solve for an unknown value of equity!
    › To circumvent this problem, an “iterative process” may be used to calculate the debt/equity weightings for the WACC and the estimated market value of equity
Cost of Capital
Weighed Average Cost of Capital
Computing the WACC for a Private Company – Iterative Model

**Step 1:** Estimate the market value of senior securities (debt and preferred equity), and hold that dollar amount fixed throughout the process.

**Step 2:** Make a first estimate of the market value weights of the senior securities and the common equity.

**Step 3:** Using the first-approximation weights, make a first-approximation computation of the WACC.

**Step 4:** Project (a) the net cash flows available to all invested capital and (b) the projected growth rate necessary for either a DCF or a capitalizing model.

**Step 5:** Using the first-approximation WACC from step 3 and the projected cash flows from step 4, compute a first-approximation MVIC.

**Step 6:** Subtract from the MVIC from step 5 the value of the senior securities from step 1. This gives the first-approximation value of the common equity.

**Step 7:** Compute the capital structure weights using the equity value from step 6.

**Step 8:** Repeat the process, starting with step 3, until the computed market value weights come reasonably close to the weights used in computing the WACC.

Note: The iterative process can be easily implemented using the Excel “Goal Seek” function.

Case Studies

Assuming Industry Capital Structure
### Build-Up Method - Using Ibbotson Data

<table>
<thead>
<tr>
<th>Rate Notes</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate (Rf)</td>
<td>0.0257 (2)</td>
</tr>
<tr>
<td>Equity risk premium (RPm)</td>
<td>0.0662 (3)</td>
</tr>
<tr>
<td>Risk premium for size (RPs)</td>
<td>0.0610 (4)</td>
</tr>
<tr>
<td>Specific (unsystematic) risk (RPu)</td>
<td>0.0500 (5)</td>
</tr>
<tr>
<td>Discount rate for net cash flow (Ke)</td>
<td>0.2029</td>
</tr>
</tbody>
</table>

(1) Discount rate for net cash flow to equity calculated using the Build-Up Method as follows:

\[ E(R_i) = R_f + RP_m + R_P_s + RP_u \]

where:
- \( E(R_i) \) = Expected return on an individual security
- \( R_f \) = Rate of return available on a risk-free security as of the valuation date
- \( RP_m \) = Risk premium for equities
- \( R_P_s \) = Risk premium for size
- \( RP_u \) = Risk premium for specific company (unsystematic risk)

(5) Premium for other risk factors judgmentally determined.

### CAPM - Using Ibbotson Data

<table>
<thead>
<tr>
<th>Rate Notes</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate (Rf)</td>
<td>0.0257 (2)</td>
</tr>
<tr>
<td>Equity risk premium (RPm)</td>
<td>0.0662 (3)</td>
</tr>
<tr>
<td>( \times ) Beta (B)</td>
<td>1.07 (4)</td>
</tr>
<tr>
<td>Systematic risk</td>
<td>0.0708</td>
</tr>
<tr>
<td>Risk premium for size (RPs)</td>
<td>0.0610 (5)</td>
</tr>
<tr>
<td>Specific (unsystematic) risk (RPu)</td>
<td>0.0500 (6)</td>
</tr>
<tr>
<td>Discount rate for net cash flow (Ke)</td>
<td>0.2075</td>
</tr>
</tbody>
</table>

(1) Discount rate for net cash flow to equity calculated using CAPM as follows:

\[ E(R_i) = R_f + B(RP_m) + R_P_s + RP_u \]

where:
- \( E(R_i) \) = Expected return on an individual security
- \( R_f \) = Rate of return available on a risk-free security as of the valuation date
- \( B \) = Beta
- \( RP_m \) = Risk premium for equities
- \( B(RP_m) \) equals systematic risk
- \( R_P_s \) = Risk premium for size
- \( RP_u \) = Risk premium for specific company (unsystematic risk)

(4) Source: Ibbotson Cost of Capital Quarterly 2011 - Statistics for SIC Code 7373 - Median. The median unlevered beta is relevered based on the median capital structure of the industry.
(6) Premium for other risk factors judgmentally determined.
Cost of Capital
Build-Up Method - Using Duff & Phelps Data

Build-Up Method (1)

<table>
<thead>
<tr>
<th>Rate Notes</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate (Rf)</td>
<td>0.0257</td>
</tr>
<tr>
<td>Equity risk and size premium (RPm+s)</td>
<td>0.1273</td>
</tr>
<tr>
<td>Specific (unsystematic) risk (RPu)</td>
<td>0.0500</td>
</tr>
<tr>
<td>Discount rate for net cash flow (Ke)</td>
<td>0.2030</td>
</tr>
</tbody>
</table>

(1) Discount rate for net cash flow to equity calculated using the Build-Up Method as follows:

\[ E(R_i) = R_f + \text{RPm+s} + \text{RPu} \]

where:

- \( E(R_i) \) = Expected return on an individual security
- \( R_f \) = Rate of return available on a risk-free security as of the valuation date
- \( \text{RPm} \) = Smoothed Average Equity Risk premium
- \( \text{RPu} \) = Risk premium for specific company (unsystematic risk)

(2) Source: Federal Reserve Statistical Release H.15(519) Selected Interest Rates
20 year U.S. Treasury yield as of December 31, 2011.

(3) Source: Duff & Phelps, LLC Risk Premium Report - 2012
Median Smoothed Average Equity Risk Premium over risk free rate for selected size criteria.

(4) Premium for other risk factors judgmentally determined.

---

Cost of Capital
Build-Up Method - Using Duff & Phelps Data
Estimation of Risk Premium Sorted by Size Portfolio

<table>
<thead>
<tr>
<th>Sorting Criteria</th>
<th>Company Size</th>
<th>Relevant Exhibit</th>
<th>Portfolio Rank</th>
<th>Smoothed Premium</th>
<th>Smoothed risk premium for smaller sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Value of Equity</td>
<td>$3,961,093</td>
<td>A-1</td>
<td>25</td>
<td>13.52%</td>
<td>16.24%</td>
</tr>
<tr>
<td>Book Value of Equity</td>
<td>695,000</td>
<td>A-2</td>
<td>25</td>
<td>12.05%</td>
<td>15.11%</td>
</tr>
<tr>
<td>5-year Average Net Income</td>
<td>695,000</td>
<td>A-3</td>
<td>25</td>
<td>13.01%</td>
<td>15.95%</td>
</tr>
<tr>
<td>Market Value of Invested Capital</td>
<td>21,675</td>
<td>A-4</td>
<td>25</td>
<td>13.35%</td>
<td>14.62%</td>
</tr>
<tr>
<td>Total Assets</td>
<td>1,176,621</td>
<td>A-5</td>
<td>25</td>
<td>12.65%</td>
<td>23.49%</td>
</tr>
<tr>
<td>5-year Average EBITDA</td>
<td>$9,234,645</td>
<td>A-6</td>
<td>25</td>
<td>12.81%</td>
<td>15.95%</td>
</tr>
<tr>
<td>Sales</td>
<td>$9,234,645</td>
<td>A-7</td>
<td>25</td>
<td>11.90%</td>
<td>14.62%</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>A-8</td>
<td>25</td>
<td>12.06%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean Premium over Riskless Rate</td>
<td></td>
<td></td>
<td></td>
<td>12.67%</td>
<td>17.07%</td>
</tr>
<tr>
<td>Median Premium over Riskless Rate</td>
<td></td>
<td></td>
<td></td>
<td>12.73%</td>
<td>15.95%</td>
</tr>
</tbody>
</table>

(1) Source: Duff & Phelps, LLC Risk Premium Report - 2012
Cost of Capital

Components of Cost of Equity

Size Premium – Using Duff & Phelps Data for the CAPM

CAPM Method (1)

<table>
<thead>
<tr>
<th>Rate</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate (Rf)</td>
<td>0.0257</td>
</tr>
<tr>
<td>Equity risk premium (RPm)</td>
<td>0.0427</td>
</tr>
<tr>
<td>x Beta (B)</td>
<td>1.07</td>
</tr>
<tr>
<td>Systematic risk</td>
<td>0.0457</td>
</tr>
<tr>
<td>Plus premium in excess of CAPM (RPs)</td>
<td>0.0678</td>
</tr>
<tr>
<td>Specific (unsystematic) risk (RPu)</td>
<td>0.0500</td>
</tr>
<tr>
<td>Discount rate for net cash flow (Ke)</td>
<td>0.1892</td>
</tr>
</tbody>
</table>

(1) Discount rate for net cash flow to equity calculated using CAPM as follows:

\[ E(R_i) = R_f + B(RP_m) + R_P + RP_u \]

where:

- \( E(R_i) \) = Expected return on an individual security
- \( R_f \) = Rate of return available on a risk-free security as of the valuation date
- \( B \) = Beta
- \( RP_m \) = Risk premium for equities
- \( B(RP_m) \) equals systematic risk
- \( R_P \) = Smoothed premium in excess of CAPM
- \( RP_u \) = Risk premium for specific company (unsystematic risk)

(2) Source: Federal Reserve Statistical Release H.15(519) Selected Interest Rates
20 year U.S. Treasury yield as of December 31, 2011.

(3) Source: Duff & Phelps, LLC Risk Premium Report - 2012
Average historical large stock risk premium.

(4) Source: Ibbotson Cost of Capital Quarterly 2011 - Statistics for SIC Code 7373 - Median. The median unlevered beta is relevered based on the median capital structure of the industry.

(5) Source: Duff & Phelps, LLC Risk Premium Report - 2012
Median Smoothed Average Equity Risk Premium over CAPM for selected size criteria.

(6) Premium for other risk factors judgmentally determined.

Cost of Capital

CAPM – Using Duff & Phelps Data

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<td>8.13%</td>
</tr>
<tr>
<td>Book Value of Equity</td>
<td>$9,234,645</td>
<td>B-7</td>
<td>25</td>
<td>6.28%</td>
<td>7.29%</td>
</tr>
<tr>
<td>5-year Average Net Income</td>
<td>695,000</td>
<td>B-3</td>
<td>25</td>
<td>7.07%</td>
<td>7.47%</td>
</tr>
<tr>
<td>Market Value of Invested Capital</td>
<td>21,675</td>
<td>B-5</td>
<td>25</td>
<td>6.69%</td>
<td>12.49%</td>
</tr>
<tr>
<td>Total Assets</td>
<td>1,176,621</td>
<td>B-6</td>
<td>25</td>
<td>6.86%</td>
<td>7.93%</td>
</tr>
<tr>
<td>5-year Average EBITDA</td>
<td>1,176,621</td>
<td>B-6</td>
<td>25</td>
<td>6.86%</td>
<td>7.93%</td>
</tr>
<tr>
<td>Sales</td>
<td>21,675</td>
<td>B-5</td>
<td>25</td>
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<td>12.49%</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>9,234,645</td>
<td>B-7</td>
<td>25</td>
<td>6.28%</td>
<td>7.29%</td>
</tr>
</tbody>
</table>

(1) Source: Duff & Phelps, LLC Risk Premium Report - 2012
# Cost of Capital

## Components of Cost of Equity

### Specific Company Risk – Using Component Observation Method

<table>
<thead>
<tr>
<th>Component</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance of key personnel</td>
<td>++</td>
</tr>
<tr>
<td>Industry growth</td>
<td>-</td>
</tr>
<tr>
<td>Diversification of customer base</td>
<td>+++</td>
</tr>
<tr>
<td>Diversification of product line</td>
<td>+</td>
</tr>
<tr>
<td>Diversification / stability of suppliers</td>
<td>NA</td>
</tr>
<tr>
<td>Geographic location</td>
<td>N</td>
</tr>
<tr>
<td>Stability of earnings</td>
<td>--</td>
</tr>
<tr>
<td>Size</td>
<td>N</td>
</tr>
<tr>
<td>Years in business</td>
<td>--</td>
</tr>
<tr>
<td>Financial position (debt level)</td>
<td>--</td>
</tr>
<tr>
<td>Efficient use of capital</td>
<td>N</td>
</tr>
<tr>
<td>Larger competitors</td>
<td>+</td>
</tr>
<tr>
<td>Low return on equity</td>
<td>N</td>
</tr>
</tbody>
</table>

Total specific company risk premium: 0.05

---

# Cost of Capital

## Components of Cost of Equity

### Cost of Equity - Summary

<table>
<thead>
<tr>
<th></th>
<th>Ibbotson Build-Up Method</th>
<th>Ibbotson CAPM</th>
<th>Duff &amp; Phelps Build-Up Method</th>
<th>Duff &amp; Phelps CAPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk-free rate (Rf)</td>
<td>0.0257</td>
<td>0.0257</td>
<td>0.0257</td>
<td>0.0257</td>
</tr>
<tr>
<td>Equity risk premium (RPm) x Beta (B)</td>
<td>0.0662 x 1.0700</td>
<td>0.0662 x 1.0700</td>
<td>0.0427 x 1.0700</td>
<td>0.0427 x 1.0700</td>
</tr>
<tr>
<td>Risk premium for size (RPs)</td>
<td>0.0610</td>
<td>0.0600</td>
<td>0.1273</td>
<td>0.0678</td>
</tr>
<tr>
<td>Specific (unsystematic) risk (RPu)</td>
<td>0.0500</td>
<td>0.0500</td>
<td>0.0500</td>
<td>0.0500</td>
</tr>
<tr>
<td>Discount rate for net cash flow (Ke)</td>
<td>0.2029</td>
<td>0.2075</td>
<td>0.2030</td>
<td>0.1892</td>
</tr>
</tbody>
</table>

Average: 0.2006

Median: 0.2030
Cost of Capital
Components of Cost of Equity
WACC – Assuming Industry Capital Structure

Estimation of Discount and Capitalization Rates for Invested Capital (1)

<table>
<thead>
<tr>
<th>Estimated Market Value (2)</th>
<th>Percent Capital (2) (W)</th>
<th>Cost of Capital Rate (3) (k)</th>
<th>Tax Rate (4) (t)</th>
<th>Tax-Effect Capital Rate (k[1-t])</th>
<th>Weighted Average Cost (W) WACC</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
<td>0.09</td>
<td>0.09</td>
<td>0.0525</td>
<td>0.38</td>
<td>0.0326</td>
<td>0.0629</td>
</tr>
<tr>
<td>Equity</td>
<td>0.91</td>
<td>0.91</td>
<td>0.2000</td>
<td>N/A</td>
<td>0.2000</td>
<td>0.1825</td>
</tr>
<tr>
<td>Total</td>
<td>1.00</td>
<td>1.00</td>
<td>0.2000</td>
<td>N/A</td>
<td>0.2000</td>
<td>0.1854</td>
</tr>
</tbody>
</table>

Calculation of WACC

Discount rate for net cash flow
Less sustainable average growth rate
Capitalization rate for net cash flow for future year

Calculation of Capitalization rate

Discount rate for net cash flow
Less sustainable average growth rate
Capitalization rate for net cash flow for future year

Notes

(1) Weighted Average Cost of Capital calculated as follows:

\[ \text{WACC} = \left( ke \times We \right) + \left( kd \times (1-t) \times Wd \right) \]

where:

- \( WACC \): weighted average cost of capital
- \( ke \): company's cost of common equity capital
- \( kd \): company's cost of debt capital
- \( We \): percentage of equity capital in capital structure
- \( Wd \): percentage of debt capital in capital structure
- \( t \): company's effective income tax rate


(3) Source:

| Equity: Estimated based on consideration of alternative costs of equity. |

(4) Source: Federal and state income tax estimated.

(5) Source: Estimated average long term compounded growth rate for subject's net cash flow to invested capital.
Cost of Capital

Selected Readings

- Cost of Capital - Estimation and Applications, 4th ed., Pratt and Grabowski
- Duff & Phelps Risk Premium Report 2009 and 2012, Grabowski and King
- Ibbotson SBBI 2009 and 2012 Valuation Yearbooks
- Ibbotson Cost of Capital 2008 and 2011 Yearbooks
- Understanding Business Valuation, 4th ed., Trugman
- Valuing a Business: The Analysis and Appraisal of Closely Held Companies, 5th ed., Pratt