Estimating Cost of Capital - Issues Confronting the Practitioner

presented by:
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Managing Director, Valuation Advisory Services

Roger J. Grabowski, FASA, is a Managing Director at Duff & Phelps LLC. He was formerly Managing Director of the Standard & Poor’s Corporate Value Consulting practice, a partner of PricewaterhouseCoopers LLP and one of its predecessor firms, Price Waterhouse (where he founded its U.S. Valuation Services practice and managed the real estate appraisal practice).

He has directed valuations of businesses, interests in businesses, intellectual property, intangible assets, real property and machinery and equipment. Roger has testified in court as an expert witness on matters of solvency, the value of closely held businesses and business interests, valuation and amortization of intangible assets and other valuation issues. His testimony in U.S. District Court was referenced in the U.S. Supreme Court opinion decided in his client’s favor in the landmark Newark Morning Ledger case.


Roger teaches courses for the American Society of Appraisers including Cost of Capital, a course he developed.
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How Risk is Priced is Still a Relative Unknown

- Professor John Cochrane recently summarized the changes in our knowledge of estimating rates of return for equity over the last 40 years:

  “In the beginning, there was chaos. Then came CAPM. Every clever strategy to deliver high returns ended up delivering high market betas as well. Then anomalies erupted and there was chaos again.”

- Researchers such as Professors Fama and French found that market returns were a function of other factors and not simply market betas.

- CAPM as it is taught predicts that on the average portfolios of stocks with high beta estimates will earn greater returns than portfolios of stocks with low beta estimates. Variation in returns is not explained by differences in market betas. Rather, differences in returns are explained by a “zoo of new variables.”

http://faculty.chicagobooth.edu.john.cochrane/research/papers
Professor Cochrane concluded:

“Discount rates vary a lot more than we thought. The puzzles and anomalies that we face amount to discount rate variation we don’t understand. Our theoretical controversies are about how discount rates are formed….Theories are in their infancy….”

Cost of capital is all about pricing risk-matching the risk inherent in the net cash flows with the rate of return demanded by the market for accepting that level of risk.

Probably the most widely accepted definition of risk in the context of business valuation is the degree of uncertainty of achieving future expectations at the times and in the amounts forecast.
Issue: *pure* CAPM is a not a good indicator of expected returns

Pablo Fernandez, “CAPM: an absurd model,”

- The CAPM is an absurd model because its assumptions and its predictions/conclusions have no basis in the real world.

- It is quite clear that the CAPM is neither a theory nor a model because it does not “explain facts or events”, nor does it “describe the past, present, or future state of something”.

- It is important to differentiate between a **fact** *(something that truly exists or happens: something that has actual existence; a true piece of information)* and an **opinion** *(what someone thinks about a particular thing)*.

- The CAPM could be described as an *uninformed opinion*, and not as a sensible opinion.
**Issue: pure CAPM is not a good indicator of expected returns**


- CAPM states that assets are priced commensurate with a trade-off between undiversifiable risk and expectations of return. The model underpins the status of academic finance, as well as the belief that asset pricing is an appropriate subject for economic study.

- Re-examination of the research of Black et al. (1972), which did much to lay the empirical foundation for the CAPM, reveals that the data do not actually provide a justification of the CAPM as claimed.

- Findings imply that in adhering to the CAPM we are choosing to encounter the market on our own terms of rationality, rather than the market’s.
Issue: *pure* CAPM does not price market risk

While the “textbook” capital asset pricing model (CAPM) is the most widely used asset pricing model, risk pricing has moved beyond considering CAPM beta as the sole measure of risk.

Empirical tests of CAPM have shown that “textbook” CAPM does not do a good job in pricing risk:

- Have we been mismeasuring the risk-free rate and equity risk premium?
- High (low) beta stocks do not always generate high (low) returns
  - Is beta measurement the problem: beta a forward measure of risk, yet we use backwards looking methods to estimate beta
  - Are we misinterpreting the meaning of beta?
- Does the market price more factors (systematic risks measures) beyond beta?
- Does the market work the way the underlying assumptions of the Sharpe-Lintner-Mossin CAPM predict (maximize expected return and minimize volatility)?
The so-called risk-free rate reflects three components:

- Rental rate (real return)
- Inflation
- Maturity risk or investment rate risk

All three of these economic factors are embedded in the yield to maturity for any given maturity length.

Not possible to observe the market consensus about how much of the yield for any given maturity is attributable to these factors, with the exception of expected inflation, which can be roughly estimated based on Treasury inflation-protected securities (TIPS).

- “Breakeven” inflation rate is the difference between the U.S. Treasury yield (nominal) and TIPS yield of similar maturity (real).
- “Breakeven” inflation is not a good reflection of inflation expectations because there are other “factors” that the TIPS yield may be capturing (e.g. liquidity premium, inflation risk premium, etc.)
Trailing Averages of Yields-to-Maturity
U.S. 20-year Treasury Yield

Source: Board of Governors of the Federal Reserve System and S&P Capital IQ
Marketable U.S. Treasury Securities Held by the Public
December 2003–March 2015

U.S. Federal Reserve inventory of monetized debt vs. S&P 500

Source: Federal Reserve Bank of Cleveland and S&P Capital IQ

Duff & Phelps

April 22 - 24, 2015
Methods of Risk-free Rate Normalization

During periods in which risk-free rates appear to be abnormally low due to flight to quality or other issues (e.g. massive monetary interventions), Duff & Phelps recommends normalizing the risk-free rate.

Normalization can be accomplished in a number of ways:

- Calculating trailing averages of yields-to-maturity on long-term government securities over various periods.

- Incorporate one of the various possible “build-up” methods. All build-up methods are based upon two fundamental relationships for nominal interest rates:
  1) Relationship between nominal and real interest rates
  2) Relationship between short and long-term horizons.

To learn more about the equity risk premium, the risk free rate, and other cost of capital related issues, download a free copy of “Developing the Cost of Equity Capital: Risk-Free Rate and ERP During Periods of ‘Flight to Quality’”, August 2011, by Roger J. Grabowski at www.DuffandPhelps.com/CostofCapital
Nominal vs. Real Interest Rates

The “Fisher equation”, a tenet of corporate finance, states in general terms that in equilibrium the nominal yield on a bond is equal to its real yield plus a compensation for inflation:

\[(1 + \text{Nominal Interest Rate}) = (1 + \text{Real Interest Rate}) \times (1 + \text{Expected Inflation})\]

This relationship is often expressed using the following linear approximation:

Nominal Interest Rate $\sim$ Real Interest Rate + Expected Inflation
Methods of Risk-free Rate Normalization – Real Interest Rate as base

Some academic studies have suggested the long-term real risk-free rate to be somewhere in the range of 1.3% to 2.0% based on the study of inflation swap rates and/or yields on long-term U.S. Treasury Inflation-Protected Securities (TIPS).

From a practical standpoint, we also look at the average yield on long-term TIPS and use these as a proxy for the long-term real rate. Daily, weekly, and monthly TIPS yields are available from the Fed’s website for various maturities. Data on 20-year TIPS yields are available from July 2004–March 2015. The average monthly 20-year TIPS yield over this period is 1.6%.

Based on academic study findings, and on average long-term TIPS yields, a reasonable estimate representing the long-term real rate is therefore within the range of 1.3% to 2.0%.

## Methods of Risk-free Rate Normalization – Long-term Expected Inflation Estimates – U.S.

<table>
<thead>
<tr>
<th>Source</th>
<th>As of December 2014 (approximately) (%)</th>
<th>As of March 2015 (approximately) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livingston Survey (Federal Reserve Bank of Philadelphia)</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>Survey of Professional Forecasters (Federal Reserve Bank of Philadelphia)</td>
<td>2.2</td>
<td>2.1</td>
</tr>
<tr>
<td>Cleveland Federal Reserve</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Blue Chip Financial Forecasts</td>
<td>2.3</td>
<td>2.0</td>
</tr>
<tr>
<td>IHS Outlook</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>University of Michigan Survey 5-10 Year Ahead Inflation Expectations</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td><strong>Range of Expected Inflation Forecasts</strong></td>
<td><strong>1.8%–2.8%</strong></td>
<td><strong>1.7%–2.8%</strong></td>
</tr>
</tbody>
</table>


## Methods of Risk-free Rate Normalization – U.S.

<table>
<thead>
<tr>
<th>Metric</th>
<th>As of December 2014</th>
<th>As of March 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of Estimated Long-term Real Rate</td>
<td>1.3% to 2.0%</td>
<td>1.3% to 2.0%</td>
</tr>
<tr>
<td>Range of Estimated Expected Inflation Forecasts</td>
<td>1.8% to 2.8%</td>
<td>1.7% to 2.8%</td>
</tr>
<tr>
<td>Range of Estimated Long-term Normalized Risk-free Rate</td>
<td>3.1% to 4.8%</td>
<td>3.0% to 4.8%</td>
</tr>
<tr>
<td>Midpoint (rounded)</td>
<td>4.0%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>
## Forecasted 10-year U.S. T-Bond Yield and Implied 20-year U.S. Risk-free Rate (Dec 2014)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey of Professional Forecasters</td>
<td>2.9</td>
<td>3.4</td>
<td>3.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Livingston Survey</td>
<td>3.2</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>U.S. Consensus Forecast</td>
<td>3.1</td>
<td>3.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Blue Chip Economic Indicators</td>
<td>3.2</td>
<td>3.7</td>
<td>4.3</td>
<td>4.6</td>
<td>4.7</td>
<td>4.7</td>
</tr>
<tr>
<td>Blue Chip Financial Forecasts</td>
<td>3.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>3.1</td>
<td>3.6</td>
<td>4.1</td>
<td>4.6</td>
<td>4.7</td>
<td>4.7</td>
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<tr>
<td>Plus: Average Maturity (Term) Premium (*)</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
<td>0.7</td>
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<tr>
<td><strong>Implied 20-year U.S. T-Bond Yield (%)</strong></td>
<td>3.8</td>
<td>4.3</td>
<td>4.8</td>
<td>5.3</td>
<td>5.4</td>
<td>5.4</td>
</tr>
</tbody>
</table>

(*') Maturity premium based on monthly average yield spread between 20-year and 10-year U.S. Treasury bonds from December 2008 to December 2014.

Forecasted 10-year U.S. T-Bond Yield and Implied 20-year U.S. Risk-free Rate (Dec 2014) (cont’d)

## Forecasted 10-year U.S. T-Bond Yield and Implied 20-year U.S. Risk-free Rate (March 2015) (cont’d)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Survey of Professional Forecasters</td>
<td>2.3</td>
<td>3.1</td>
<td>3.9</td>
<td>4.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Livingston Survey</td>
<td>3.2</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>U.S. Consensus Forecast</td>
<td>2.7</td>
<td>3.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Blue Chip Economic Indicators</td>
<td>2.4</td>
<td>3.2</td>
<td>3.9</td>
<td>4.2</td>
<td>4.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Blue Chip Financial Forecasts</td>
<td>2.7</td>
<td>3.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>2.7</strong></td>
<td><strong>3.3</strong></td>
<td><strong>3.9</strong></td>
<td><strong>4.1</strong></td>
<td><strong>4.3</strong></td>
<td><strong>4.3</strong></td>
</tr>
</tbody>
</table>

| Plus: Average Maturity (Term) Premium (*) | 0.7  | 0.7  | 0.7  | 0.7  | 0.7  | 0.7  |
| **Implied 20-year U.S. T-Bond Yield (%)** | **3.4** | **4.1** | **4.6** | **4.9** | **5.0** | **5.0** |

(*) Maturity premium based on monthly average yield spread between 20-year and 10-year U.S. Treasury bonds from December 2008 to March 2015.

Forecasted 10-year U.S. T-Bond Yield and Implied 20-year U.S. Risk-free Rate (March 2015) (cont’d)

German 10-year Bund Yield

Source: Deutsche Bundesbank (http://www.bundesbank.de)
German 15-year Bund Yield

Source: Deutsche Bundesbank ([http://www.bundesbank.de](http://www.bundesbank.de))
## Long-term Expected Inflation Estimates – Germany

<table>
<thead>
<tr>
<th>Source</th>
<th>As of December 2014 (approximately) (%)</th>
<th>As of March 2015 (approximately) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWC Global Outlook</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>IHS Outlook</td>
<td>1.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Economist Intelligence Unit</td>
<td>1.8</td>
<td>1.7</td>
</tr>
<tr>
<td>IMF World Economic Outlook (WEO)</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Range of Expected Inflation Forecasts</td>
<td>1.5% to 1.8%</td>
<td>1.6% to 1.7%</td>
</tr>
</tbody>
</table>

Sources of information: PWC Global Outlook; Germany - IHS Economics and Country Risk; Economist Intelligence Unit; IMF Work Economic Outlook (WEO).
## Methods of Risk-free Rate Normalization – Germany

<table>
<thead>
<tr>
<th>Category</th>
<th>As of December 2014</th>
<th>As of March 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of Estimated Long-term Real Rate *</td>
<td>1.3%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Range of Expected Inflation Forecasts</td>
<td>1.5% to 1.8%</td>
<td>1.6% to 1.7%</td>
</tr>
<tr>
<td>Range of Estimated Long-term Normalized Risk-free Rate</td>
<td>2.8% to 3.1%</td>
<td>2.9% to 3.0%</td>
</tr>
<tr>
<td>Midpoint (rounded)</td>
<td>3.0%</td>
<td>3.0%</td>
</tr>
</tbody>
</table>

* Credit Suisse *Global Investment Returns Sourcebook and Yearbook 2015* by Elroy Dimson, Paul Marsh, and Mike Staunton
Defining the Equity Risk Premium (ERP)

The ERP (or notational $RP_m$) is defined as:

$$RP_m = R_m - R_f$$

- $RP_m$ = Expected equity risk premium
- $R_m$ = Expected return on a fully diversified portfolios of equity securities
- $R_f$ = Expected rate of return on a risk-free security

The ERP is *expectational* (i.e., forward-looking) over the expected duration of the net cash flows.
Unconditional ERP

*Unconditional ERP* – the long-term average ERP.

Commonly use realized risk premium data (the *ex post* approach):

- While academics and practitioners agree that ERP is a forward-looking concept, some practitioners, including taxing authorities and regulatory bodies, use historical data to estimate the ERP under the assumption that historical data are a valid proxy for current investor expectations – provides *appearance* of accuracy.

- Estimate of the ERP is the risk premium (realized return on stocks in excess of the risk-free rate) that investors have, on the average, realized over some historical holding period

- Underlying theory is that the past provides a reasonable indicator of how the market will behave in the future, and also that investors’ expectations are influenced by the historical performance of the market
Unconditional ERP (cont’d)

- The long-term average of realized risk premiums is calculated from varying rates of returns on common stocks over shifting risk-free rates.
- They are generally reported annually.
- It is common practice to add the same long-term average realized risk premium (an *ex post* estimate of the ERP) to the market interest rate of the risk-free security throughout the following year regardless of the level of the rate on that security as of the valuation date.
- This common practice implicitly assumes either that:
  1. during upcoming periods the difference between the expected return on common stocks and U.S. government bonds is constant; or
  2. any decrease or increase in the ERP as of the valuation date is short-term and that the ERP is mean reverting to the long-term average of realized risk premiums rather quickly.
Problem with relying on unadjusted “Historical” ERP

# Realized Equity Risk Premiums:

<table>
<thead>
<tr>
<th>Length (Yrs.)</th>
<th>Period Dates</th>
<th>Arithmetic Average (%)</th>
<th>Standard Deviation (%)</th>
<th>Standard Error (%)</th>
<th>Geometric Average (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1995-2014</td>
<td>6.84</td>
<td>19.59</td>
<td>4.38</td>
<td>4.72</td>
</tr>
<tr>
<td>30</td>
<td>1985-2014</td>
<td>6.79</td>
<td>17.22</td>
<td>3.14</td>
<td>5.01</td>
</tr>
<tr>
<td>40</td>
<td>1975-2014</td>
<td>6.60</td>
<td>16.55</td>
<td>2.62</td>
<td>4.93</td>
</tr>
<tr>
<td>50</td>
<td>1965-2014</td>
<td>4.63</td>
<td>16.95</td>
<td>2.40</td>
<td>3.02</td>
</tr>
<tr>
<td>89</td>
<td>1926-2014</td>
<td>7.00</td>
<td>20.17</td>
<td>2.14</td>
<td>4.83</td>
</tr>
<tr>
<td>115</td>
<td>1900-2014</td>
<td>6.69</td>
<td>19.79</td>
<td>1.85</td>
<td>4.61</td>
</tr>
<tr>
<td>143</td>
<td>1872-2014</td>
<td>5.92</td>
<td>18.80</td>
<td>1.57</td>
<td>4.07</td>
</tr>
<tr>
<td>217</td>
<td>1798-2014</td>
<td>5.13</td>
<td>17.99</td>
<td>1.22</td>
<td>3.45</td>
</tr>
</tbody>
</table>

Bias in Realized Risk Premium Data

- Researchers estimating the long-term average ERP adjust average realized risk premiums for what they believe were non-recurring factors in prior periods or changing economic conditions.

- The years 1942 through 1951 reflected a period of artificial stability in U.S. government bond interest rates. During World War II, the U.S. Treasury decreed that interest rates had to be kept at artificially low levels in order to reduce government financing costs. This led to the Federal Reserve’s April 1942 public commitment to maintain an interest rate ceiling on government debt, both long term and short term.

- After World War II, the Fed continued maintaining an interest rate ceiling, due to the Treasury’s pressure and, to a lesser extent, a fear of returning to the high unemployment levels of the Great Depression.

- But postwar inflationary pressures caused the Treasury and the Fed to reach an accord announced March 4, 1951, freeing the Fed of its obligation of pegging interest rates.

- The artificially low rates of 1942–1951 creates an upward bias in realized risk premium data from 1926-2014 of approximately 1.1%
# Realized Risk Premiums

Including and Excluding the Years 1942–1951

<table>
<thead>
<tr>
<th>Period Dates</th>
<th>Realized Risk Premiums (arithmetic average) (%)</th>
<th>Standard Deviations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926–2014</td>
<td>7.00</td>
<td>20.17</td>
</tr>
<tr>
<td>1926–2014 (excluding 1942–1951)</td>
<td>5.89</td>
<td>20.68</td>
</tr>
</tbody>
</table>

Ibbotson and Chen report on a study in which they estimated forward-looking long-term sustainable equity returns and expected ERPs since 1926.

In the update to this study, reported in the 2015 Valuation Handbook – Guide to Cost of Capital, the long-term ERP since 1926 that could have been expected, given the underlying economics (the “supply side” model estimate), was less than the historical returns.

Goetzmann and Ibbotson, commenting on the supply side approach of estimating expected risk premiums, note:

“These forecasts tend to give somewhat lower forecasts than historical risk premiums, primarily because part of the total returns of the stock market have come from price-earnings ratio expansion. This expansion is not predicted to continue indefinitely, and should logically be removed from the expected risk premium.”
Unconditional ERP Estimates

As reported in the *Valuation Handbook – Guide to Cost of Capital*:

<table>
<thead>
<tr>
<th>Description</th>
<th>1926-2013</th>
<th>1926-2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-horizon expected “historical” U.S. equity risk premium</td>
<td>6.96%</td>
<td>7.00%</td>
</tr>
<tr>
<td>Long-horizon expected “historical” U.S. equity risk premium adjusted for WW II Interest Rate Bias (excluding 1942–1951)</td>
<td>5.84%</td>
<td>5.89%</td>
</tr>
<tr>
<td>Long-horizon expected “supply side” U.S. equity risk premium</td>
<td>6.18%</td>
<td>6.21%</td>
</tr>
<tr>
<td>Long-horizon expected “supply side” U.S. equity risk premium adjusted for WW II Interest Rate Bias (excluding 1942–1951)</td>
<td>5.06%</td>
<td>5.10%</td>
</tr>
</tbody>
</table>
Conditional ERP

ERP is cyclical - *conditional* ERP represents ERP at specific point in the cycle.

Forward-looking (*ex ante*) approaches can be grouped into four categories:

- **Bottom-up implied ERP estimates** This is a company-by-company approach. This approach typically uses expected growth in earnings or dividends as a basis for estimating a “bottom-up”, company-by-company rate of return for the companies in the universe analyzed.

- **Top-down implied ERP estimates** This approach uses aggregate estimates for the entire market. This approach typically uses expected growth in earnings or dividends for the aggregate of the companies comprising a stock index (e.g., the S&P 500), not company-by-company.

- **Top-down risk premium estimates** This approach estimates the ERP or changes in the ERP using observed relationships between interest rates or other factors that impact the ERP.

- **Surveys** This approach relies on opinions of investors and financial professionals through surveys of their views on the prospects of the overall market and the return expected in excess of a risk-free benchmark.
Factors Considered in ERP Recommendation as of beginning of January 2015

Duff & Phelps Recommended U.S. Equity Risk Premium (ERP) and Corresponding Risk-Free Rates (Rf): 5.0% (ERP) and matching 4.0% (Rf)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Change</th>
<th>Effect on ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Equity Markets</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Implied Equity Volatility</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Corporate Spreads</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>GDP Growth and GDP Growth Forecasts</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Unemployment Environment</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>Consumer and Business Sentiment</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Sovereign Credit Ratings</td>
<td>↔</td>
<td>↔</td>
</tr>
<tr>
<td>Default Spread Model</td>
<td>↔</td>
<td>↔</td>
</tr>
<tr>
<td>Damodaran Implied ERP Model</td>
<td>↔</td>
<td>↔</td>
</tr>
</tbody>
</table>
Spread of U.S. High Yield Corporate Bond Yields over U.S. Investment Grade Corporate Bond Yields
January 2011–March 2015

Source: Federal Reserve Bank of St. Louis (FRED)
## 2015 U.S. Real GDP Forecast at December 2014 and March 2015

<table>
<thead>
<tr>
<th>2015 Real GDP Forecasts</th>
<th>As of December 2014 (%)</th>
<th>As of March 2015 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Livingston Survey</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Survey of Professional Forecasters (SPF)</td>
<td>3.0</td>
<td>3.2</td>
</tr>
<tr>
<td>Blue Chip Economic Indicators</td>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Consensus Economics</td>
<td>3.0</td>
<td>3.1</td>
</tr>
<tr>
<td>Bloomberg U.S. Economic Forecasts</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>3.0%</strong></td>
<td><strong>3.1%</strong></td>
</tr>
</tbody>
</table>

U.S. Unemployment Rate: Official (U-3); Unemployment Including “persons marginally attached to the labor force” (U-6); Civilian Labor Force Participation Rate

December 1993–March 2015

Source: Federal Reserve Bank of St. Louis (FRED)
University of Michigan Consumer Sentiment Index
December 1978–March 2015

Source: Federal Reserve Bank of St. Louis (FRED) and Bloomberg L.P.
Default Spread Model
December 2008–March 2015

Hassett Risk Premium Factor Model
December 2007–March 2015

Hassett Risk Premium Factor Model (cont’d)
December 2007–March 2015

Professor Aswath Damodaran calculates implied ERP monthly estimates for the S&P 500 and publishes his estimates on his website.

1. Damodaran estimates an implied ERP by first solving for the discount rate that equates the current S&P 500 index level with his estimates of cash distributions (dividends and stock buybacks) in future years.
2. He then subtracts the current yield on 10-year U.S. government bonds to arrive at the implied ERP.

- Duff & Phelps adjust the ERP estimates (based on this model) that Professor Damodaran publishes since they are *geometric* average ERP in terms of a 10-year U.S. Government bond.

- Duff & Phelps first converts both of Damodaran’s published geometric ERP estimates to an equivalent estimate in terms of normalized yields on 20-year U.S. government bonds and then converts the geometric ERP estimates to their *arithmetic* average equivalents.

Additional information and data is available at Professor Damodaran’s website at [http://pages.stern.nyu.edu/~adamodar/](http://pages.stern.nyu.edu/~adamodar/)
Duff & Phelps Recommended ERP vs. Arithmetic Adjusted Damodaran Implied ERP (with Normalized Rf) at December 2014

<table>
<thead>
<tr>
<th>Risk Premium Calculator Inputs</th>
<th>Damodaran Implied ERP (as published)</th>
<th>Damodaran Implied ERP Normalized</th>
<th>Extreme Case 1: Lowest Cash Yield &amp; Lowest Expected Growth Rate</th>
<th>Extreme Case 2: Lowest Cash Yield &amp; Highest Expected Growth Rate</th>
<th>Extreme Case 3: Highest Cash Yield &amp; Lowest Expected Growth Rate</th>
<th>Extreme Case 4: Highest Cash Yield &amp; Highest Expected Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTM Cash Yield</td>
<td>4.88%</td>
<td>5.24%</td>
<td>3.47%</td>
<td>3.47%</td>
<td>5.24%</td>
<td>5.24%</td>
</tr>
<tr>
<td>10-year Cash Yield</td>
<td>5.24%</td>
<td>3.47%</td>
<td>5.24%</td>
<td>3.47%</td>
<td>5.24%</td>
<td>5.24%</td>
</tr>
<tr>
<td>Cash yield (dividends and stock buybacks) on Index</td>
<td>4.88%</td>
<td>5.24%</td>
<td>3.47%</td>
<td>3.47%</td>
<td>5.24%</td>
<td>5.24%</td>
</tr>
<tr>
<td>Expected Growth Choices (next 5 years)</td>
<td>5.58%</td>
<td>5.58%</td>
<td>4.14%</td>
<td>7.23%</td>
<td>0.92%</td>
<td>7.23%</td>
</tr>
<tr>
<td>Long Term Risk Free Rate</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
</tr>
<tr>
<td>Expected growth rate in the long term (after year 5)</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
<td>2.17%</td>
</tr>
<tr>
<td>Geometric Average Implied ERP</td>
<td>5.78%</td>
<td>6.21%</td>
<td>3.87%</td>
<td>4.43%</td>
<td>5.07%</td>
<td>6.65%</td>
</tr>
<tr>
<td>Arithmetic Adjustments:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normalized RF</td>
<td>4.00%</td>
<td>4.00%</td>
<td>4.00%</td>
<td>4.00%</td>
<td>4.00%</td>
<td>4.00%</td>
</tr>
<tr>
<td>Treasury Yield Difference</td>
<td>-1.83%</td>
<td>-1.83%</td>
<td>-1.83%</td>
<td>-1.83%</td>
<td>-1.83%</td>
<td>-1.83%</td>
</tr>
<tr>
<td>Geometric Average Implied ERP (Adjusted)</td>
<td>3.95%</td>
<td>4.38%</td>
<td>2.04%</td>
<td>2.60%</td>
<td>3.24%</td>
<td>4.82%</td>
</tr>
<tr>
<td>Arithmetic Average ERP Conversion Factor</td>
<td>1.44%</td>
<td>1.44%</td>
<td>1.44%</td>
<td>1.44%</td>
<td>1.44%</td>
<td>1.44%</td>
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<tr>
<td>D&amp;P Arithmetic Adjusted Implied ERP</td>
<td>5.39%</td>
<td>5.81%</td>
<td>3.48%</td>
<td>4.03%</td>
<td>4.67%</td>
<td>6.25%</td>
</tr>
</tbody>
</table>

Expected growth will vary based on selected cash yield. Additional information and data is available at Professor Damodaran’s website at http://pages.stern.nyu.edu/~adamodar/
Duff & Phelps Recommended ERP vs. Arithmetic Adjusted Damodaran Implied ERP (with Normalized Rf) at March 2015

<table>
<thead>
<tr>
<th></th>
<th>Damodaran Implied ERP (as published)</th>
<th>Damodaran Implied ERP (as published)</th>
<th>Extreme Case 1: Lowest Cash Yield &amp; Lowest Expected Growth Rate</th>
<th>Extreme Case 2: Lowest Cash Yield &amp; Highest Expected Growth Rate</th>
<th>Extreme Case 3: Highest Cash Yield &amp; Lowest Expected Growth Rate</th>
<th>Extreme Case 4: Highest Cash Yield &amp; Highest Expected Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTM Cash Yield</td>
<td>4.93%</td>
<td>5.25%</td>
<td>3.45%</td>
<td>3.45%</td>
<td>5.25%</td>
<td>5.25%</td>
</tr>
<tr>
<td>Damodaran Implied ERP Normalized</td>
<td>5.25%</td>
<td>4.27%</td>
<td>4.27%</td>
<td>7.13%</td>
<td>1.02%</td>
<td>7.13%</td>
</tr>
<tr>
<td>10-year Cash Yield</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Damodaran Implied ERP (as published)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Case 1:</td>
<td>Lowest Cash Yield &amp; Lowest Expected Growth Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Case 2:</td>
<td>Lowest Cash Yield &amp; Highest Expected Growth Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Case 3:</td>
<td>Highest Cash Yield &amp; Lowest Expected Growth Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme Case 4:</td>
<td>Highest Cash Yield &amp; Highest Expected Growth Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Risk Premium Calculator Inputs**

- Cash yield (dividends and stock buybacks) on Index: 4.93% 5.25% 3.45% 3.45% 5.25% 5.25%
- Expected Growth Choices (next 5 years): 5.48% 5.48% 4.27% 7.13% 1.02% 7.13%
- Long Term Risk Free Rate: 1.93% 1.93% 1.93% 1.93% 1.93% 1.93%
- Expected growth rate in the long term (after year 5): 1.93% 1.93% 1.93% 1.93% 1.93% 1.93%

**Geometric Average Implied ERP**

- 5.86% 6.24% 3.91% 4.43% 5.14% 6.68%

**Arithmetic Adjustments:**

- Normalized RF: 4.00% 4.00% 4.00% 4.00% 4.00% 4.00%
- Treasury Yield Difference: -2.07% -2.07% -2.07% -2.07% -2.07% -2.07%
- Geometric Average Implied ERP (Adjusted): 3.79% 4.17% 1.84% 2.36% 3.07% 4.61%
- Arithmetic Average ERP Conversion Factor: 1.44% 1.44% 1.44% 1.44% 1.44% 1.44%

**D&P Arithmetic Adjusted Implied ERP**

- 5.23% 5.61% 3.28% 3.80% 4.51% 6.05%

Expected growth will vary based on selected cash yield. Additional information and data is available at Professor Damodaran's website at http://pages.stern.nyu.edu/~adamodar/
Duff & Phelps Recommended ERP vs. Arithmetic Adjusted Damodaran Implied ERP (with Normalized Rf)

December 2008–March 2015

Source: Damodaran Website (http://pages.stern.nyu.edu/~adamodar/). These figures are presented after Duff & Phelps adjustments. The ERP estimates (based on this model) that Professor Damodaran publishes are geometric average ERP in terms of a 10-year U.S. Government bond. Damodaran calculates his ERP based on a range of varying assumptions, but the two main “headline” ERP estimates utilize: 1.) the average annual cash flow yield (dividends + stock buybacks) of S&P 500 constituent companies from the prior 10 years, and 2.) use the average of the previous 12 months’ cash flow yield of S&P 500 constituent companies. Duff & Phelps first converts both of Damodaran’s published geometric ERP estimates to an equivalent estimate in terms of normalized yields on 20-year U.S. government bonds and then converts the geometric ERP estimates to their arithmetic average equivalents.
Duff & Phelps Recommended ERP vs. Arithmetic Adjusted Damodaran Implied ERP (with Spot Rf)
December 2008–March 2015

Source: Damodaran Website (http://pages.stern.nyu.edu/~adamodar/). These figures are presented after Duff & Phelps adjustments. The ERP estimates (based on this model) that Professor Damodaran publishes are geometric average ERP in terms of a 10-year U.S. Government bond. Damodaran calculates his ERP based on a range of varying assumptions, but the two main "headline" ERP estimates utilize: 1.) the average annual cash flow yield (dividends + stock buybacks) of S&P 500 constituent companies from the prior 10 years, and 2.) use the average of the previous 12 months’ cash flow yield of S&P 500 constituent companies. Duff & Phelps first converts both of Damodaran’s published geometric ERP estimates to an equivalent estimate in terms of actual yields on 20-year U.S. government bonds and then converts the geometric ERP estimates to their arithmetic average equivalents.
Conditional ERP Estimates

Reported in the 2015 Valuation Handbook – Guide to Cost of Capital:

- The Duff & Phelps Recommended ERP as of December 31, 2014 is 5.0%

- Developed in relation to (and should be used in conjunction with) a 4.0% normalized) risk-free rate.

This implies a “base” U.S. cost of equity of 9.0% (5.0% + 4.0%) as of December 31, 2014.
# Duff & Phelps Recommended U.S. ERP and Corresponding Risk-free Rates

## January 2008–Present

<table>
<thead>
<tr>
<th>Year-end 2014 Guidance</th>
<th>Duff &amp; Phelps Recommended ERP</th>
<th>Risk-Free Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 31, 2014</td>
<td>5.0%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year-end 2013 Guidance</th>
<th>5.0%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 31, 2013</td>
<td></td>
<td>4.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change in ERP Guidance</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 1, 2013 – February 27, 2013</td>
<td></td>
<td>4.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year-end 2012 Guidance</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 31, 2012</td>
<td></td>
<td>4.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change in ERP Guidance</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 15, 2012 – February 27, 2013</td>
<td></td>
<td>4.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change in ERP Guidance</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 30, 2011 – January 14, 2012</td>
<td></td>
<td>4.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>July 1 2011 – September 29, 2011</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>June 1, 2011 – June 30, 2011</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>May 1, 2011 – May 31, 2011</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>December 1, 2010 – April 30, 2011</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>June 1, 2010 – November 30, 2010</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Change in ERP Guidance</th>
<th>5.5%</th>
<th>Normalized 20-year Treasury yield *</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 1, 2009 – May 31, 2010</td>
<td></td>
<td>4.0%</td>
</tr>
</tbody>
</table>

---

* Normalized in this context means that in months where the risk-free rate is deemed to be abnormally low, a proxy for a longer-term sustainable risk-free rate is used. As seen in the 2015 Valuation Handbook – Guide to Cost of Capital
Conditional ERP Estimate with a Normalized Risk-free Rate – Germany

ERP as of December 31, 2014 = 5.5%
matched with a normalized risk-free rate* = 3.5%
(Base cost of equity capital, rounded = 9.0%)

ERP as of March 31, 2015 = 5.5%
matched with a normalized risk-free rate* = 3.5%
(Base cost of equity capital, rounded = 9.0%)

* Based on the consideration of the risk-free rate build up and long-term historical moving average. 30-year German bund yield spot risk-free rate as of December 31, 2014 and March 31, 2015 was 1.37% and 0.58%, respectively.
Dealing with Expected Increases in the Risk-free Rate

- Any estimate of the ERP must be made in relation to a risk-free security. That is, the ERP is measured as the difference between the expected return on a well-diversified portfolio of large company common stocks and the rate of return expected on a risk-free security. The selection of an appropriate risk-free security on which to base the ERP estimate is a function of the expected maturity for the investment to which the discount rate (rate of return) is to apply.

- In theory, when determining the risk-free rate and the corresponding risk premium, the analyst should match the duration of the risk-free security and the risk premium with the period over which the net cash flows are expected (not over the expected period any one investor may expect to hold the investment). That is, the risk-premium must be measured relative to the duration of the risk-free security, and the maturity of the risk-free security must equal the expected life of the investment.

- The generalized cost of capital relationship is:

\[ E(R_i) = R_f + RP_i \]

where: 
- \( E(R_i) \) = expected return of asset \( i \)
- \( R_f \) = risk-free rate
- \( RP_i \) = risk premium for asset \( i \)
Dealing with Expected Increases in the Risk-free Rate (cont’d)

- As a short-cut, analysts often use the maturity of the risk-free instrument instead of the duration as the expected life of the investment. Often this makes little difference.

- For example, if you were estimating the expected equity return on a highly liquid investment with an expected short-term maturity, a U.S. government short-term note (e.g., T-bill) may be an appropriate instrument to use in benchmarking a risk premium.

- Alternatively, if you were estimating the equity return on a long-term investment such as the valuation of a business where the value can be equated to the present value of a series of future cash flows over many years, then the yield on a long-term U.S. government bond (e.g., T-bond) may be the more appropriate instrument in benchmarking a risk premium.

- Assuming that the risk premium is a function of a relative risk measure, $\beta$, multiplied by the equity risk premium (notationally $RP_m$), the analyst should be discounting expected cash flows as follows:

Note: We are using the term $\beta$ here to indicate a generalized relative risk measure; that is, it measures how the returns of the respective investment are expected to vary relative to changes in returns on the market. For simplicity, we are assuming $\beta$ is constant.
Dealing with Expected Increases in the Risk-free Rate
(cont’d)

<table>
<thead>
<tr>
<th>Period</th>
<th>Risk-free Rate</th>
<th>Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short-term cash flows</td>
<td>T-bill rate</td>
<td>+ ( \beta \times (R_{P_m} \text{ relative to T-bills}) )</td>
</tr>
<tr>
<td>Cash flows expected in:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 1</td>
<td>1-year rate</td>
<td>+ ( \beta \times (R_{P_m} \text{ relative to 1-year T-bonds}) )</td>
</tr>
<tr>
<td>2</td>
<td>2-year rate</td>
<td>+ ( \beta \times (R_{P_m} \text{ relative to 2-year T-bonds}) )</td>
</tr>
<tr>
<td>3</td>
<td>3-year rate</td>
<td>+ ( \beta \times (R_{P_m} \text{ relative to 3-year T-bonds}) )</td>
</tr>
<tr>
<td>... and so on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10-year rate</td>
<td>+ ( \beta \times (R_{P_m} \text{ relative to 10-year T-bonds}) )</td>
</tr>
<tr>
<td>... and so on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>long-term</td>
<td>long-term rate</td>
<td>+ ( \beta \times (R_{P_m} \text{ relative to long-term T-bonds}) )</td>
</tr>
</tbody>
</table>
Issue: are the assumptions of CAPM violated?


- Over last 40 years, high volatility and high beta stocks have substantially underperformed low volatility and low beta stocks

- In an inefficient market, “mispricing” comes from:
  
  - Some investors not fully rational – prefer lotteries (prefer positive skewness of low priced, high volatile stocks) representativeness (assumes one can pick out winners among start-up companies while ignoring high probability of failure) overconfidence (confidence intervals too narrow – overconfidence in accuracy of knowledge)

  - Limits to arbitrage – high volatility/high beta stocks should be “shorted” but these are generally small cap, costly to trade and difficult to short
Issue: do we know how to measure beta?

- While beta is a forward concept, our tools to estimate beta are based on look-back methods. This can create errors in the estimation.

- For example, assume the subject business had become distressed and had recently emerged from restructuring its debt and an infusion of equity. The following exhibit presents an example of an adjustment in pricing for a stock of this hypothetical company.

- In period A, the company returns had essentially moved with the market. In period B, the company is distressed, and its stock is experiencing a downward repricing. During this period, the company’s returns are not correlated with the movement of the overall market at all. In period C, the restructuring of the company and the repricing of the company’s stock is complete, and the company’s returns are once again moving more in tandem with market returns.
Issue: do we know how to measure beta? (cont’d)
Issue: do we know how to measure beta? (cont’d)

- If one were to compute beta at time 1, which includes period A as the look-back period, the beta estimate would reflect a normal relationship between the company’s returns and the market’s returns. In fact, its beta estimate would be near 1.

- In contrast, computing a beta estimate at time 2, which includes period B (the period of the company’s stock repricing) as the look-back period, would not yield a reliable forward-looking beta estimate. In fact, it would yield a beta estimate lower than expected since the company’s return was negative in a period when the market’s return was generally positive. This result is counterintuitive, given the company’s downward repricing; that is, the operating risk of the company has not declined over period B, and in fact, its operating risk was greatest during this period.

- Once the restructuring of the company and the repricing of the company’s stock is complete, its normal relationship to the market will resume in period C.
To estimate beta at time 2 for the company, one should use a bottom-up beta estimate because a top-down estimate will result in an erroneous beta estimate.

Using betas of guideline public companies for estimating a bottom-up beta has been found to provide reasonably accurate estimates of the subject company.

The more guideline companies used in the sample size, the better the accuracy. The accuracy is also enhanced if the guideline public companies are reasonably close in size to the subject company. When the guideline public companies are larger than the subject company, the beta estimate for the subject company is biased low, because of the propensity of betas of larger companies to be smaller than the betas of smaller companies.

Use of the beta estimate derived from guideline public companies larger than the subject company will generally result in too low an estimate of the cost of equity capital. Hence, one needs to consider adjusting for the size effect.
Issue: do the formulas for unlevering and levering equity betas reflect the market?

Published and calculated betas for publicly traded stocks typically reflect the capital structure of each respective company at market values.

These betas sometimes are referred to as levered betas, betas reflecting the leverage in the company’s capital structure.

Levered betas incorporate two risk factors that bear on systematic risk:

1. business (or operating) risk and
2. financial (or capital structure) risk.

Removing the effect of financial leverage (i.e., unlevering the beta) leaves the effect of business risk only (“asset beta”).
Issue: how does the market price risk?

Exhibit 21.5 Beta as a Function of Leverage

Issue: is the market pricing more systematic factors?

\[ R_i = R_f + B_{i,m} R_{P,m} + B_{i,s} R_{P,i,s} + B_{i,BV} R_{P,i,BV} + \ldots + B_{i,u} R_{P,i,u} + \ldots + \epsilon_i \]

where:

- \( R_i \) = Realized return for stock of company \( i \)
- \( R_f \) = Risk-free rate of return
- \( B_{i,m} \) = Sensitivity of return of stock of company \( i \) to the market risk premium, \( R_{P,m} \) (ERP)
- \( B_{i,s} \) = Sensitivity of return of stock of company \( i \) to a measure of size, \( S \), of company \( i \) and \( S_i \) = Measure of size of company \( i \)
- \( R_{P,i,s} \) = \( B_{i,s} \times S_i \) = Risk premium for size of company \( i \)
- \( B_{i,BV} \) = Sensitivity of return of stock of company \( i \) to a measure of BV (typically measure of book-value-to-market-value) of stock of company \( i \) and \( BV_i \)
- \( R_{P,i,BV} \) = \( B_{i,BV} \times BV_i \) = Risk premium for book value of company \( i \)
- \( \ldots \) = Other factors
- \( B_{i,u} \) = Sensitivity of return of stock of company \( i \) to a measure of unique risk of company \( i \)
- \( U_i \) = Measure of unique risk of company \( i \)
- \( R_{P,i,u} \) = \( B_{i,u} \times U_i \) = Risk premium for unique risk of company \( i \)
- \( \epsilon_i \) = Error term, difference between predicted return and realized return.
Modified CAPM Cost of Capital Formula

Modifying CAPM, we can expand the cost of equity capital formula to add two correction factors – size effect and company-specific risk:

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

where:
- \( E(R_i) \) = Expected rate of return on security \( i \)
- \( R_f \) = Rate of return available on a risk-free security as of the valuation date
- \( B \) = Beta
- \( RP_m \) = Market ERP
- \( RP_s \) = Risk premium for small size
- \( RP_c \) = Risk premium attributable to other company risk factors

If you do not modify CAPM do you believe in the pure CAPM?
The market prices more systematic risk factors than just pure CAPM beta - examples

- Size – a systematic risk factor that proxies for characteristics of small company size (lower operating margins, more volatility in margins), low liquidity.
  - See Pratt & Grabowski, Chapter 15, “Criticisms of the Size Effect”

- Information uncertainty- large beta estimation errors correlated with low quality of earnings, low persistence of earnings, high volatility of returns
  - See Pratt & Grabowski, Chapter 16, “Company-Specific Risk,” p 386-391

- Distress risk – a systematic risk factor that varies depending on recession or expansion
Empirically observed: average returns on small firms greater than for large firms after adjusting for differences in beta (market risk)

Two studies:

- CRSP Decile Size Premia – measures size by market value of equity
- Risk Premium Report – measures size by two market value based measures of size (equity and Market Value of Invested Capital) plus six “fundamental” measures of company size

Issues:

- Has size effect disappeared?
- Is size effect a proxy for other risks (e.g., variability of cash flows, lack of liquidity)?
Size Effect Over Recent Time Periods
Alternative Measures of Size – Market Capitalization

Sources of underlying data: 1.) CRSP U.S. Stock Database and CRSP U.S. Indices Database © 2014 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. 2.) Morningstar EnCorr database. Used with permission. All rights reserved. Calculations performed by Duff & Phelps LLC.
Size Effect Over Recent Time Periods
Alternative Measures of Size – 5-Year Average Net Income

Sources of underlying data: 1.) CRSP U.S. Stock Database and CRSP U.S. Indices Database © 2014 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. 2.) Morningstar EnCorr database. Used with permission. All rights reserved. Calculations performed by Duff & Phelps LLC.
Differences in Returns Between Large and Small Companies in Europe

- This study is published as part of the ongoing research that Duff & Phelps performs and sponsors in the area cost of capital and other valuation issues.
- This study consists of a (i) a Research Note and (ii) a set of Sample Exhibits.
- The full Research Note “Differences in Returns Between Large and Small Companies in Europe”, is available at http://ssrn.com/abstract=2499205
- Erik Peek is the Duff & Phelps Professor of Business Analysis & Valuation at Rotterdam School of Management, Erasmus University (RSM).
Research Note: The broad conclusions of this analysis were:

- Using various measures of firm size, the findings suggest that small stocks have outperformed large stocks, on average, suggesting that in Europe investors perceive small firms as more risky and thus demand a size premium.

- The evidence also indicates that the relationship between firm size and returns is strongly non-linear, and that the size premium is significant only for the smallest companies.

- The relationship between firm size and returns likely varies across regions. Size premiums in Ireland, the United Kingdom, and the Nordic countries (Denmark, Finland, Norway, and Sweden) appear to be statistically significant, while the size premiums in the other European countries studied may not be significant.
As such, the results of the Research Note were mixed. This does not automatically imply that firm size does not matter for cost of capital estimation in some countries – splitting up the sample unavoidably affects the statistical power of the study’s tests and tends to reduce statistical significance in at least some of the subsamples.

Leaving aside statistical significance, the Research Note’s findings suggest that the average return spread between small and large firms is positive in each of the examined regional subsamples, and that size and liquidity distributions likely differ across regions.

Professor Peek posits that such differences may potentially explain why the size effect appears strong in some regions but less strong in others.
Differences in Returns Between Large and Small Companies in Europe: Countries Included

<table>
<thead>
<tr>
<th>Country</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>Luxembourg</td>
</tr>
<tr>
<td>Belgium</td>
<td>The Netherlands</td>
</tr>
<tr>
<td>Denmark</td>
<td>Norway</td>
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<tr>
<td>Finland</td>
<td>Portugal</td>
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<td>France</td>
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<td>Germany</td>
<td>Sweden</td>
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<td>Greece</td>
<td>Switzerland</td>
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<td>Ireland</td>
<td>United Kingdom</td>
</tr>
<tr>
<td>Italy</td>
<td></td>
</tr>
</tbody>
</table>
Average Annual Return Spreads Between Top and Bottom Market Capitalization Quartiles by Country or Region

Average of “Premia Over CAPM” (Size Premia): Exhibits B-1 Through B-7 – Beta measured by Sum Beta Method

### Companies Ranked by Size Factor

### Premia over CAPM (Size Premia, $RP_s$)

#### Exhibit B-7

**Historical Equity Risk Premium: Average Since 1990**

Data for Year Ending December 31, 2013

Data Smoothing with Regression Analysis

Dependent Variable: Premium over CAPM

Independent Variable: Log of Average Size Factor

**Regression Output:**

- Intercept: 1.228%
- Log(Size): -0.528%
- Log(Size)$^2$: 1.323%
- Log(Size)$^3$: -0.528%
- Adj. R$^2$: 70%

**Smoothed Premium** = 1.228% - 0.528% * Log(Size Factor) + 1.323% * Log(Size Factor)$^2$ - 0.528% * Log(Size Factor)$^3$

<table>
<thead>
<tr>
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<th></th>
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<tbody>
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<td>1 (big)</td>
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<td>-</td>
<td>0.95</td>
<td>5.28%</td>
<td>4.59%</td>
<td>0.69%</td>
<td>-</td>
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<td>-</td>
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<td>5.10%</td>
<td>5.03%</td>
<td>0.07%</td>
<td>-0.495</td>
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<td>7.23%</td>
<td>5.03%</td>
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<td>0.894</td>
<td>1.59%</td>
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<td>0.90</td>
<td>-</td>
<td>1.07</td>
<td>7.66%</td>
<td>5.17%</td>
<td>2.49%</td>
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<td>1.44%</td>
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<td>-</td>
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<td>6.07%</td>
<td>5.12%</td>
<td>0.95%</td>
<td>0.089</td>
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<td>6.68%</td>
<td>5.12%</td>
<td>1.56%</td>
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<td>4.98%</td>
<td>0.47%</td>
<td>-0.122</td>
<td>1.17%</td>
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<td>-0.17%</td>
<td>-0.478</td>
<td>1.23%</td>
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<td>(0.20)</td>
<td>-</td>
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<td>7.00%</td>
<td>4.83%</td>
<td>2.17%</td>
<td>0.706</td>
<td>1.39%</td>
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<tr>
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<td>(0.40)</td>
<td>-</td>
<td>0.97</td>
<td>7.35%</td>
<td>4.69%</td>
<td>2.66%</td>
<td>1.044</td>
<td>1.69%</td>
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<td>11</td>
<td>(0.50)</td>
<td>-</td>
<td>1.02</td>
<td>6.93%</td>
<td>4.93%</td>
<td>2.00%</td>
<td>0.596</td>
<td>1.89%</td>
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<td>12</td>
<td>(0.70)</td>
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<td>0.92</td>
<td>9.34%</td>
<td>4.45%</td>
<td>4.89%</td>
<td>1.962</td>
<td>2.43%</td>
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<td>4.79%</td>
<td>2.32%</td>
<td>0.712</td>
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<td>14</td>
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<td>1.02</td>
<td>5.87%</td>
<td>4.93%</td>
<td>0.94%</td>
<td>0.099</td>
<td>4.11%</td>
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<tr>
<td>15</td>
<td>(1.40)</td>
<td>-</td>
<td>1.07</td>
<td>11.89%</td>
<td>5.17%</td>
<td>6.72%</td>
<td>2.181</td>
<td>6.01%</td>
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<tr>
<td>6 (small)</td>
<td>(1.80)</td>
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<td>1.31</td>
<td>16.39%</td>
<td>6.33%</td>
<td>10.06%</td>
<td>1.955</td>
<td>9.54%</td>
</tr>
</tbody>
</table>

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Source of underlying data: Thomson Reuters *Datastream* and *Worldscope.*

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Risk in Projections

Management prepared forecasts: The analysts’ first task is to test the forecasts to determine if forecasts prepared in prior periods have consistently been biased: are the forecast aspirational or expectational.

That is, do they represent management’s belief as to what can be accomplished if they succeed in carrying out their business plan. Businessmen by their nature are optimists. Rarely are the projections tempered for possible downside outcomes.

The following exhibit graphically displays the valuation process where net cash flows are represented by skewed distributions of possible outcomes. In the short-term, year-by-year, the distributions of net cash flows are likely skewed. Upside possibilities are limited by available resources while downside possibilities are only limited by the backlog of orders carried over from prior periods.
Risk in Projections (cont’d)

Valuation of Risky Net Cash Flows with Skewed Distributions

\[ PV_{\text{Total}} = PV_1 + PV_2 + PV_3 + PV_4 + PV_5 \]

Source: Pratt & Grabowski, Chapter 6, “Relationship between Risk and the Cost of Capital” Exhibit 6.2
Risk in Projections (cont’d)

- The premise of developing discount rates is to estimate the risk of an investment and applying those discount rates to the expected cash flows of the investment, which results in an estimate of value.

- Expected cash flows should account for downside scenarios, of course, but sometimes the forecasts prepared by management and used in a valuation can be somewhat rosy in that they may reflect successful outcomes only, rather than reflecting the range of possible outcomes (both good and bad) that should be included in estimated expected cash flows.

- Adding a C-SRP to the discount rate is a commonly applied method to account for the overly optimistic forecasts provided to the analyst. For example, in the context of the modified CAPM we get the following:

\[ E(R_i) - R_f + \text{Beta} \times \text{ERP} + RP_s + RP_c \text{ (C-SRP due to biased cash flow estimates)} \]
Risk in Projections (cont’d)

- Forecasts may also be biased high because they do not take into account the possibility that cash flows will in fact stop because of a possible downside risk that simply causes the business to stop operating (e.g., loss of the contract with the sole customer of the business).

- But, developing a probability analysis of possible net cash flows with one of the outcomes net cash flows equal to zero can assist the analyst in understanding the relative magnitude of his or her subjective assessment of the risk represented by the addition of a C-SRP.

- We recommend that an analyst examine the probability of a zero net cash flow scenario in the distribution of possible net cash flows as a check on any C-SRP added to the discount rate to account for the chance that the subject company may be forced to shut down because of a company-specific risk factor.
Risk Differences Often Cannot Be Adjusted for in Net Cash Flows

According to the generally held theory surrounding using CAPM as the basis for estimating the cost of capital (for example), bad outcomes should be reflected in the various possible cash flows with the expected cash flows reflecting both the more likely scenarios but also scenarios that will have a negative impact on net cash flows.

But adjusting the mean of the cash flow distribution does not adjust for differences in the distribution itself.

Examples of companies with likely different variability of possible net cash flow outcomes compared to the guideline public companies:

- Drug companies: stage of development of testing and approval of subject company differ from guideline companies which have many drugs at various stages of their life cycles;
- Entertainment company (films, TV stations, radio stations): guideline companies more geographically and outlet diversified than subject company.

Examine the dispersion of operating cash flows- is the dispersion greater for the subject company than for the guideline public companies? If “yes”, more operating risk and greater cost of capital.
Common Mistakes in Estimating Overall Cost of Capital (WACC)

- Relying on simple WACC formula
  - While the WACC is by far the most widely used discount rate for valuing the business enterprise, the WACC handling of income tax issues is simplistic and ignores investor level taxes and capital gains treatment that are important considerations in the valuing of pass-through entities.
  - Implicitly, the interest tax shield equals the cost of debt capital times the market value of debt and assumes that the income tax deductions from interest expense result in reduced cash income taxes in the period in which the interest is paid.
  - There may be a risk of realizing the interest tax shield.
Common Mistakes in M&A

Common mistakes that we believe are made when the value of an M&A transaction is being assessed:

- Using the acquiring firm’s overall cost of capital to value the acquisition. The correct cost of capital matches the risks of the expected cash flows being valued.
- Basing the cost of capital to value an acquisition on the cost of the capital used to finance the acquisition.

For example, a large strategic acquirer may make a small acquisition using all debt and analyze the transaction based on its cost of debt. This may be the cost incurred by the acquirer but not the appropriate cost of capital to assess the value of the acquisition.
The cost of capital of an acquisition should reflect the risk of the target, not the risk of the buyer.

Value and Price Differ:

Pricing can be thought of as a three-pronged analysis:

1. Start with stand-alone analysis.

2. Layer in synergies that likely bidders (sometimes termed the pool of willing buyers or market participants) may need to give away to the target owners to get the transaction done.

3. Any of these synergies are due to the market participant characteristics, not the risk characteristics of the target; these can include cash flow synergies and risk (discount rate) synergies.

4. Layer in your specific synergies, which again can include cash flow synergies and risk (discount rate) synergies.
Common Mistakes in M&A (cont’d)

- Adding the value of synergies to the stand-alone value to determine a price for the target by sharing any of these synergies is due to the bidder consciously giving up some of its value to the target’s owners.
- But in no case is the correct cost of capital the cost of capital of the buyer.
- The buyer has its own portfolio of operations with their risks reflected in the buyer’s cost of capital. Those risks may be the same as those of the target, but that is a chance event.
Common Mistakes in M&A (cont’d)

- Failure to differentiate the risks of the different cash flow stream categories (i.e., integration costs, target company operating cash flows, and synergies). Cash flows from synergies are typically riskier than the target company’s stand-alone operating cash flows and integration costs.
Contact Information

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Valuation Advisory
+1 312 697 4720
Roger.Grabowski@duffandphelps.com
Company Level Cost of Capital Data

Morningstar/Ibbotson SBBI Valuation Yearbook (discontinued)


Company-level Cost of Capital
Valuation Handbook- Guide to Cost of Capital

Where to Purchase

The 2015 Valuation Handbook is available from:

John Wiley & Sons
www.wiley.com/go/ValuationHandbooks

Or through one of the distributors:

AICPA
www.cpa2biz.com
1-(888) 777-7077

service@aicpa.org

Business Valuation Resources
www.bvresources.com/costofcapital
1-(503) 291-7963 ext. 2

2015 Valuation Handbook and ToolKit
(formerly the Calculator)

ValuSource
www.valusource.com/vhb
1 (800) 825-8763

The Valuation Handbook was released March 11, 2015.
Industry Level Cost of Capital Data

Morningstar / Ibbotson
Cost of Capital Yearbook
(discontinued)

Industry Cost of Capital

Industry-level Cost of Capital
What is the difference between (i) annual Valuation Handbook – Guide to Cost of Capital and (ii) annual Valuation Handbook – Industry Cost of Capital?


- Data through December, with optional March, June, and September quarterly updates.
What is the difference between 
(i) annual Valuation Handbook – Guide to Cost of Capital and 
(ii) annual Valuation Handbook – Industry Cost of Capital?

The Valuation Handbook – Industry Cost of Capital is the book that includes industry data, similar to the (now discontinued) Morningstar/Ibbotson Cost of Capital Yearbook.

Data through March, with optional June, September, and December quarterly updates.
The Valuation Handbook – Industry Cost of Capital...What’s in it?

- Industry Cost of Capital Estimates
- Industry Valuation Multiples
- Industry Levered and Unlevered Betas
- Analysis of Off-Balance-Sheet Debt by Industry

* Depending on data availability; some industries may not include all estimates.
The Valuation Handbook – Industry Cost of Capital includes analysis of:

- Over **200 U.S. industries**
- And **4 size groupings** (large-, mid-, low-, and micro-cap stocks)
Industry-level cost of equity capital and weighted average cost of capital (WACC) are calculated eight ways for each industry:

1.) Capital Asset Pricing Model (CAPM)

2.) CAPM + Size Premium  
(using the CRSP Deciles Size Study)

3.) Build-up + Industry Risk Premium  
(using the CRSP Deciles Size Study)

4.) CAPM + Size Premium  
(using the Risk Premium Report Study)
The Valuation Handbook – Industry Cost of Capital...What’s in it?

Industry-level cost of equity capital and weighted average cost of capital (WACC) are calculated eight ways for each industry:

5.) Build-up + Risk Premium Over the Risk-free Rate (using Risk Premium Report Study)

6.) 1-Stage Discounted Cash Flow (DCF) model

7.) 3-Stage DCF model

8.) Fama-French (F-F) Factor Model
Industry-level **valuation multiples** and **capital structure** statistics are calculated for each industry:

**Valuation Multiples**
- Price to Earnings
- Price to Book
- Market to Book
- Enterprise Value to Sales
- Enterprise Value to EBITDA
- Capital Structure

**Capital Structure**
- Capital structure
- Debt to Equity
- Debt to Total Capital
The Valuation Handbook – Industry Cost of Capital...What’s in it?

Levered and unlevered betas for each industry:

- Raw (OLS) betas
- Blume-adjusted betas
- Peer group betas
- Vasicek-adjusted betas
- Sum betas
- Downside betas

If you use the capital asset pricing model, you need betas.

Analysis of capital structure *including* off-balance-sheet liabilities

This analysis enables the valuation analyst to gauge the impact of off-balance-sheet debt-like items (specifically, capitalized operating leases and unfunded pension obligations) on the capital structure of the subject industry.

The capital structure (and unlevered betas) of each industry are calculated *with* and *without* these off-balance-sheet debt-equivalent items.
<table>
<thead>
<tr>
<th>SIC</th>
<th>Industry Description</th>
<th>Debt-to-Total-Capital (%)</th>
<th>Calculated Using Book Debt</th>
<th>Debt-to-Total-Capital (%)</th>
<th>Calculated Using Book Debt + Off-Balance-Sheet Debt</th>
</tr>
</thead>
<tbody>
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<td>57</td>
<td>Home Furnishings, Furnishing, and Equipment Stores</td>
<td>5.8</td>
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<td>591</td>
<td>Drug Stores and Proprietary Stores</td>
<td>13.9</td>
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<td>3711</td>
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<td>45.8</td>
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</table>

<table>
<thead>
<tr>
<th>SIC</th>
<th>Industry Description</th>
<th>Primary Driver of Change in Capital Structure</th>
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<tbody>
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<td>57</td>
<td>Home Furnishings, Furnishing, and Equipment Stores</td>
<td>Operating Leases</td>
</tr>
<tr>
<td>591</td>
<td>Drug Stores and Proprietary Stores</td>
<td>Operating Leases</td>
</tr>
<tr>
<td>3711</td>
<td>Motor Vehicles and Passenger Car Bodies</td>
<td>Unfunded Pension Liabilities</td>
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</tbody>
</table>
Country-level Cost of Capital

The annual *International Valuation Handbook – Guide to Cost of Capital* provides the same type of country-level analysis previously published in the Morningstar/Ibbotson “international” cost of capital reports.

The 2014 *International Valuation Handbook – Guide to Cost of Capital* provides country-level country risk premia (CRPs) and country-level equity risk premia (ERPs) which can be used to estimate country-level cost of equity capital globally for up to 188 countries globally, from the perspective of investors based in 55 different countries.
Global Cost of Capital Models

“I know how to value a business in my country, but this one is in Country X, a developing economy. What should I use for a discount rate?”

The risks associated with international investing can be broadly characterized as:

• *Financial*

• *Economic*

• *Political*

A good understanding of cost of capital concepts is essential information for executives making global investment decisions.
Commonly Used International Cost of Equity Capital Models

There are several common approaches to estimate an international cost of equity capital. The following are just a few of the more commonly used models:

1. Global CAPM (a.k.a. World CAPM model)
2. Single country version of the CAPM
3. Country or Sovereign Yield Spread model
4. Relative Volatility model
5. Erb-Harvey-Viskanta Country Credit Rating (CCR) model
Country Credit Rating Model to Estimate Cost of Equity Capital
As of September 30, 2014

Erb-Harvey-Viskanta CCR Model

- United Kingdom: 9.5%
- Developed Markets: 9.5% (Median), 10.4% (Average)
- Emerging Markets: 13.6% (Median), 14.5% (Average)
- Frontier Markets: 16.6% (Median), 17.7% (Average)

Erb, Harvey, Viskanta CCR Model

Duff & Phelps

April 22 - 24, 2015
Erb-Harvey-Viskanta CCR Model

Median COE Based on S&P Credit Rating

Average COE Based on S&P Credit Rating

China (AA-)

AAA

AA

A

BBB

BB

B – SD

10.3%

7.3% 7.4%

9.8% 9.7%

11.8% 12.3%

14.8% 14.8%

21.5% 20.9%

27.9% 28.4%
Erb-Harvey-Viskanta CCR Model

- United States: 8.5%
- China: 10.9%
- Japan: 10.2%
- Germany: 8.3%
- France: 9.8%
- United Kingdom: 9.2%
- Brazil: 12.9%
- Russia: 12.9%
- Italy: 13.0%
- India: 15.1%
Erb-Harvey-Viskanta CCR Model

Financial Crisis
Less Healthy Economies (Greece, Portugal, Spain)
Healthier Economies (Germany, U.K., France)
International Cost of Capital Data Sources

- Credit Suisse *Global Investment Returns Sourcebook* and *Yearbook 2014* by Elroy Dimson, Paul Marsh, and Mike Staunton – 21 countries
- *Market Risk Premium used in 88 countries in 2014: a survey with 8,228 answers* by Pablo Fernandez, Palo Linares, and Isabel Fernandez Acin
- Damodaran website
- Bloomberg Implied Equity Risk Model

1. Company-level data
2. Industry-level data
3. Country-level data
4. International Industry-level data
Comprehensive Valuation Methodology Resource

- The *Valuation Handbook – Guide to Cost of Capital* is the annual source of the equity risk premia, risk premia, and size premia inputs used for calculating custom cost of equity capital estimates for your subject company.

- The *Valuation Handbook – Industry Cost of Capital* is the annual source of industry-level (i) cost of equity capital, (ii) cost of debt capital, (iii) weighted average cost of capital (WACC), (iv) valuation multiples, (v) capital structure, (vi) betas, etc. that the valuation practitioner can use to (i) benchmark, (ii) supplement, and (iii) strengthen the valuator’s own cost of capital estimates for his or her subject company.

- The *Cost of Capital 5th edition* by Dr. Shannon Pratt and Roger J. Grabowski is a comprehensive overview of valuation theory, and proper use of data.

- Updated every 4 years.
About Duff & Phelps
Duff & Phelps
Dedicated to Delivering Value

Valuation and Corporate Finance Advisors
- More than 7,500 engagements performed in 2014
- 3,000 clients including more than 40% of the S&P 500

2,000+ Employees in more than 70 offices globally

Advisory Capability
- Valuation Advisory
- Dispute and Legal Management Consulting
- M&A Advisory
- Transaction Opinions
- Restructuring Advisory
- Alternative Asset Advisory
- Compliance and Regulatory Consulting
- Tax Services

HISTORY
- 1932-1994
  Duff & Phelps founded and evolves into diversified financial services firm
- 1994
  Credit ratings business spun-off
- 2005
  Acquired Corporate Value Consulting (CVC) from Standard & Poor's
- 2007-2012
  Listed on the NYSE
  Financial advisor to examiner in Lehman Brothers bankruptcy
  Engaged by the Congressional Oversight Panel on the Troubled Asset Relief Program
  Acquired 14 complementary businesses to expand our service offering
- 2013
  Taken private by The Carlyle Group, Stone Point Capital, Pictet & Cie, Edmond de Rothschild Group and Duff & Phelps Management Team
- 2015
  Acquired Kinetic Partners and launched Compliance and Regulatory Consulting practice
  Acquired American Appraisal, significantly enhancing our global Valuation practice
Powering Sound Decisions

We Serve

74% of the largest private equity firms and hedge funds
88% of Am Law 100 law firms
59% of Fortune 100 companies
52% of the top 25 Euro STOXX companies
5,000 middle-market companies

We are the largest independent valuation advisory firm.

We Rank

#1 Fairness Opinion Provider in the U.S.¹
#1 for IP Litigation Consulting in the U.S.²
#3 U.S. Middle Market M&A Advisor³
Top 10 for U.S. Restructuring Cases⁴

We Performed

Over 7,500 engagements in 2014 for more than 3,000 clients
Nearly 4,000 valuation advisory engagements in 2014 for more than 1,700 clients
Portfolio valuation advisory services for over 70% of top-tier private equity firms in 2014
Over 1,000 Fairness and Solvency Opinions for $2 trillion in deal value since 2005

⁴. Source: The Deal. Full Year 2014 League Table.
# Enhancing Value Across a Range of Expertise

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<th>Valuation</th>
<th>Corporate Finance</th>
<th>Dispute and Legal Management Consulting</th>
<th>Tax Services</th>
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<td>Technical expertise in the valuation of businesses or assets, including intangibles and intellectual property, machinery and equipment, real estate and alternative assets, for financial reporting, tax or management planning purposes</td>
<td>Objective guidance to management teams and stakeholders throughout restructuring, financing and M&amp;A transactions, including independent transaction opinions</td>
<td>Advisory solutions designed to help law firms and corporations solve complex business issues and improve efficiencies</td>
<td>Expertise in implementing tax solutions surrounding property tax, business incentives, transfer pricing and unclaimed property</td>
<td>Helping financial services firms navigate the compliance and regulatory landscape, mitigating risk throughout the business lifecycle</td>
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M&A advisory and capital raising services in the United States are provided by Duff & Phelps Securities, LLC. Member FINRA/SIPC. Pagemill Partners is a Division of Duff & Phelps Securities, LLC. M&A advisory and capital raising services in the United Kingdom and Germany are provided by Duff & Phelps Securities Ltd., which is authorized and regulated by the Financial Conduct Authority.
Our Services

Valuation

Valuation Advisory
- Purchase Price Allocation
- Goodwill and Intangible Asset Impairment
- Impairment of Long-Lived Assets
- Tax Valuation
- Intellectual Property Valuation
- Transfer Pricing
- Business Valuation
- Contingent Asset and Liability Valuation
- Fresh Start Accounting
- Complex Securities Valuation
- Strategic Value Advisory

Alternative Asset Advisory
- Portfolio Valuation
- Complex Asset Solutions

Real Estate Services
- Real Estate Valuation and Consulting
- Corporate Real Estate Services
- Real Estate Restructuring
- Collateral Valuation / Loan Services
- Lease Renegotiation
- Right of Way Appraisal
- Cost Segregation
- Underwriting Due Diligence

Fixed Asset Management and Insurance Solutions
- Fixed Asset Inventory and Reconciliation
- Property Record Outsourcing
- Fixed Asset Componentization
- Property Insurance Appraisal
- Machinery and Equipment Valuation
- IT Fixed Asset Inventory Services

Corporate Finance

M&A Advisory
- Buy-Side and Sell-Side Advisory
- Transaction Advisory Services
- Private Placement of Debt and Equity
- Financial Sponsor Coverage

Transaction Opinions
- Fairness Opinions
- Solvency Opinions
- ESOP and ERISA Advisory
- Commercially Reasonable Debt Opinions

Restructuring Advisory
- Corporate Restructuring
- Debt Advisory
- Distressed M&A and Special Situations

Dispute and Legal Management Consulting

Disputes and Investigations
- Intellectual Property Disputes
- Commercial and Shareholder Disputes
- Fraud, Forensic and Investigative Services
- M&A Purchase Price Disputes and Arbitration
- Bankruptcy Litigation
- Business Insurance Consulting
- Monitoring Trustee Services
- Forensic Technology and Analytics

Legal Management Consulting
- Technology
- Strategy and Operations
- Information Governance

Compliance and Regulatory Consulting

Compliance Consulting
- Registration / Authorization Assistance
- Ongoing Compliance Support and Tax Advisory
- Compliance Manuals, Policies and Procedures

Regulatory Consulting
- Governance, Risk and Compliance Services
- Markets and CASS-Related Services
- Financial Crime Defense Advisory
- Regulatory Commissioned Reviews

Risk Consulting and Infrastructure
- Third Party Management Company Services
- Outsourcing of Risk Management Function
- Risk Reporting, Model Reviews and Validation

Tax Services

Property Tax Services
- Business Incentives Advisory
- Unclaimed Property and Tax Risk Advisory
- Tax Litigation

Tax Technology
- Sales and Use Tax Services
- Strategic Tax Advisory Review Services
Services Across the Transaction Lifecycle

Assessment of Strategic Alternatives
- Transaction Consulting
  - Transaction identification
  - Buy-side / Sell-side advisory
  - Industry and market scoping studies
  - Financial projections and transaction modeling

Investment
- **Transaction Pursuit**
  - Financial due diligence
  - Business valuation
  - Fairness opinions
  - Accretion/Dilution analyses
  - Carve-out analyses
  - Strategic tax planning

**Change of Control Acquisition**
- Purchase price allocation
- Valuation and structuring of contingent consideration, earn-outs and stock-based compensation
- Valuation of guarantees and indemnifications
- Tax valuations

Reporting and Operating Performance Improvement
- **Financial and Tax Reporting**
  - Goodwill and intangible asset impairment testing
  - Transfer pricing
  - Tax legal entity valuations
  - Unclaimed property reporting

**Cash Flow Improvement**
- Property tax consulting
- Real property cost segregation
- Real estate consulting
- Business incentives advisory

**Financing**
- Private placement of debt and equity
- ESOP and ERISA advisory
- Collateral valuation

**Financial Distress**
- Restructuring advisory
- Solvency opinions
- Fresh start accounting

Exit Planning and Sale
- **Exit Preparation**
  - Sell-side M&A advisory
  - Sell-side due diligence

**Post Sale**
- Dispute analysis/litigation support
- Post acquisition disputes
- Shareholder disputes
- Expert witness testimony
- Recurring asset valuations for financial reporting
Regulatory Affiliations

Duff & Phelps advises the world's leading standard setting bodies on valuation issues and best practices.

U.S. Securities and Exchange Commission
International Accounting Standards Board
Financial Accounting and Standards Board
Appraisal Institute
American Institute of CPAs
International Valuation Standards Council
The Appraisal Foundation
Institute of Management Accountants
Industry Expertise
Serving Nearly 60% of Fortune 100 Companies

Fortune 100 Market Share

1. Real Estate market share reflects share of Fortune 500 as there are no real estate companies in Fortune 100.