Investment Analysis:
Picking the Right Projects:
First Principles

- Invest in projects that yield a return greater than the minimum acceptable hurdle rate.

The form of returns - dividends and stock buybacks – will depend upon cash to stockholders.

- Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.

If there are not enough investments that earn the hurdle rate, return the

- Form of returns - dividends and stock buybacks - will depend upon cash to stockholders.

- Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.

Returns on projects should be measured based on cash flows generated (debt) and negative side effects of these projects.

Financing mix used - owners’ funds (equity) or borrowed money.

The hurdle rate should be higher for riskier projects and reflect the acceptable hurdle rate.

The form of returns - dividends and stock buybacks – will depend upon cash to stockholders.
What is an investment or a project?

Any decision that requires the use or transfer of resources (financial or otherwise) is a project.

Broad strategic decisions
- Entering new areas of business
- Entering new markets
- Acquiring other companies

Tactical decisions
- The product mix to carry
- The level of inventory and credit terms
- Decisions on delivering a needed service

Management decisions
- Lease or buy a distribution system
- Creating and delivering a management information system

Is a project.
Aswath Damodaran

The notion of a benchmark

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The notion of a benchmark

Since financial resources are finite, there is a hurdle that projects have to cross before being deemed acceptable.

This hurdle will be higher for riskier projects than for safer projects.

A simple representation of the hurdle rate is as follows:

\[
\text{Hurdle rate} = \text{Riskless Rate} + \text{Risk Premium}
\]

The two basic questions that every risk and return model in finance tries to answer are:

- How do you measure risk?
- How do you measure risk?
- How do you measure risk?
What is Risk?

Risk, in traditional terms, is viewed as a negative. Webster's dictionary, for instance, defines risk as "exposing to danger or hazard." Opportunity, in contrast, is perceived as a positive. Yet, the Chinese symbols for risk, reproduced below, give a much better description of risk: the first symbol is the symbol for "danger," while the second is the symbol for "opportunity." Thus, risk is a mix of danger and opportunity.
The Capital Asset Pricing Model

Works as well as the next best alternative in most cases.

Expected Return = Risk-free Rate + Beta * Risk Premium

Translates beta into expected return, around one.

Measures the non-diversifiable risk with beta, which is standardized.

Only the non-diversifiable portion that is rewarded.

Specifies that a portion of variance can be diversified away, and that is

Uses variance as a measure of risk.
The variance on any investment measures the disparity between actual and expected returns. The Mean-Variance Framework.
The Importance of Diversification: Risk Types

The risk (variance) on any individual investment can be broken down into two sources. Some of the risk is specific to the firm, and is called firm-specific. Whereas the rest of the risk is market wide and affects all investments, whereas the rest of the risk is market wide and affects all firms, whereas the rest of the risk is market wide and affects all firms, whereas the rest of the risk is market wide and affects all firms. Some of the risk is specific to the firm, and is called firm-specific. Where

(1) Project-specific: an individual project may have higher or lower cash flows than expected.

(2) Competitive Risk, which is that the earnings and cash flows on a project can be affected by the actions of competitors.

(3) Industry-specific Risk, which covers factors that primarily impact the earnings and cash flows of a specific industry.

(4) International Risk, arising from having some cash flows in currencies other than the one in which the earnings and cash flows are measured and stock is priced.

(5) Market risk, which reflects the effect on earnings and cash flows of macroeconomic factors that essentially affect all companies.
Firm-specific risk can be reduced, if not eliminated, by increasing the number of investments in your portfolio (i.e., by being diversified). In a large portfolio, if is argued, these effects will average out to zero. (For every firm, where something bad happens, there will be some other firm, where something good happens.)

- On economic grounds, diversifying and holding a larger portfolio eliminates firm-specific risk for two reasons:
  - (a) Each investment is a much smaller percentage of the portfolio, muting the effect (positive or negative) on the overall portfolio.
  - (b) Firm-specific actions can be either positive or negative. In a large portfolio, it is argued, these effects will average out to zero. (For every firm, where something bad happens, there will be some other firm, where something good happens.)

- On statistical grounds, market-wide risk cannot. This can be justified on either economic or statistical grounds. The number of investments in your portfolio (i.e., by being diversified), Firm-specific risk can be reduced, if not eliminated, by increasing the size of your portfolio.
The marginal investor in a firm is the investor who is most likely to be the buyer or seller on the next trade.

Generally speaking, the marginal investor in a stock has to own a lot of stock and also trade a lot. Since trading is required, the largest investor may not be the marginal investor. Especially if the investor is a founder/manager of the firm (Michael Dell at Dell Computers or Bill Gates at Microsoft), he or she is likely to be the investor, especially if he or she is a founder/manager of the firm.

In all risk and return models in finance, we assume that the marginal investor is well diversified.
Aswath Damodaran

The Market Portfolio

Assuming diversification costs nothing (in terms of transactions costs), and that all assets can be traded, the limit of diversification is to hold a portfolio of every single asset in the economy (in proportion to market value). This portfolio is called the market portfolio. Individual investors will adjust for risk, by adjusting their allocations to this market portfolio and a riskless asset (such as a T-Bill).

Every investor holds some combination of the risk free asset and the market portfolio.

- No risk: 100% in T-Bills
- Some risk: 50% in T-Bills; 50% in Market Portfolio
- A little more risk: 25% in T-Bills; 75% in Market Portfolio
- Even more risk: 0% in T-Bills; 100% in Market Portfolio
- A risk hog: Borrow money; Invest in market portfolio.

 Allocation decision

Preferred risk level

25% in T-Bills; 75% in Market Portfolio; 50% in T-Bills; 50% in Market Portfolio; 100% in T-Bills.
The risk of any asset is the risk that it adds to the market portfolio.

Statistically, this risk can be measured by how much an asset moves with the market (called the covariance) with the market (called the covariance).

The risk of any asset is the risk that it adds to the market portfolio.

Beta is a standardized measure of this covariance with the market (called the covariance).

Beta is a measure of the non-diversifiable risk for any asset can be measured by the covariance of its returns with returns on a market index, which is defined to be the asset's beta.

Beta is a standardized measure of this covariance.

The cost of equity will be the required return, which is defined to be the asset's beta.

\[
\text{Cost of Equity} = R_f + \text{Equity Beta} \times (E(R_m) - R_f)
\]

where,

\[
E(R_m) = \text{Expected Return on the Market Index}
\]

\[
R_f = \text{Risk-free rate}
\]
Limitations of the CAPM

1. The model makes unrealistic assumptions
2. The parameters of the model cannot be estimated precisely
   - Definition of a market index
   - Firm may have changed during the 'estimation' period'
3. The model does not work well
   - If the model is right, there should be
     a linear relationship between returns and betas
     the only variable that should explain returns is betas
   - The reality is that
     the relationship between betas and returns is weak
     Other variables (size, price/book value) seem to explain differences in returns better.
Alternatives to the CAPM

Step 1: Defining Risk

- **Expected Return (E(R))**: High Risk Investment
- **Riskless Investment**: Low Risk Investment
- **Expected Earnings (E(R))**: Non-Risk Investment

Step 2: Differentiating between Rewarded and Unrewarded Risk

- Risk that is specific to investment (Firm Specific)
- Risk that affects all investments (Market Risk)

- Can be diversified away in a diversified portfolio
- Can't be diversified away since most assets are affected

Step 3: Measuring Market Risk

- The marginal investor is assumed to hold a diversified portfolio. Thus, only market risk will be rewarded and priced.

1. No private information
2. No transaction costs
3. No arbitrage opportunities

Equation relating returns to proxy variables (from a regression)

Market Risk = Risk added to any asset by market risk exposures of any asset to market factors

Beta of asset relative to unspecified market factors (from a factor analysis)

Market Risk = Risk exposures of any asset to macro economic factors.

In an efficient market, differences in returns across long periods must be due to market risk. Looking for variables correlated with returns should then give you an empirical measure of market risk.

Equation relating returns to proxy variables (from a regression)

Beta of asset relative to specified macro economic factors (from a regression)

Market Risk = Risk exposures of any asset to specified macro economic factors.
<table>
<thead>
<tr>
<th>Institution Type</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Individual Investor, fairly diversified</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Wealthy Individual Investor (often undiversified)</td>
<td>High (held by wealthy individual)</td>
<td>Low</td>
</tr>
<tr>
<td>Insider Influence</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Institutional Investor, with insider influence</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Marginal Investor</td>
<td>Percent of stock held by insiders</td>
<td>Percent of stock held by institutions</td>
</tr>
</tbody>
</table>

Identifying the Marginal Investor in Your Firm...
Who is the marginal investor in Disney?

- Percent of stock held by institutions = 62%
- Percent of stock held by insiders = 1%
Aswath Damodaran

Application Test: Who is the marginal investor in your firm?

You can get information on insider and institutional holdings in your firm from:

http://finance.yahoo.com/
Enter your company's symbol and choose profile.

Looking at the breakdown of stockholders in your firm, consider whether the marginal investor is:

- An institutional investor
- An individual investor
- An insider

You can get information on insider and institutional holdings in your firm.
Inputs required to use the CAPM -

(a) the current risk-free rate
(b) the expected market risk premium (the premium expected for investing in risky assets over the riskless asset)
(c) the beta of the asset being analyzed.
On a risk-free asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.

Therefore, the actual return is equal to the expected return. For an investment to be risk-free, i.e., to have an actual return equal to the expected return, two conditions have to be met -

- There has to be no default risk, which generally implies that the security has to be issued by the government. Note, however, that not all governments can be viewed as default-free.
- There can be no uncertainty about reinvestment rates, which implies that the security is a zero coupon security with the same maturity as the cash flow being analyzed.
The riskfree rate is the rate on a zero coupon government bond matching the time horizon of the cash flow being analyzed. Theoretically, this translates into using different riskfree rates for each cash flow. Practically speaking, if there is substantial uncertainty about expected cash flows, the present value effect of using time varying riskfree rates is small enough that it may not be worth it.
The Bottom Line on Riskfree Rates

Data Source: You can get riskfree rates for the US in a number of sites. Try http://www.bloomberg.com/markets.

- In which the valuation is being done, set equal, approximately, to the long term real growth rate of the economy.
- From an inflation-indexed government bond, if one exists.
- Use a real riskfree rate, which can be obtained in one of two ways:
  - For short term analysis, it is entirely appropriate to use a short term government security rate as the riskfree rate.
  - Using a long term government rate (even on a coupon bond) as the riskfree rate on all of the cash flows in a long term analysis will yield a close approximation of the true value.

Q Using a long term government rate (even on a coupon bond) as the riskfree rate on all of the cash flows in a long term analysis will yield a

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Measurement of the risk premium

Aswath Damodaran

The risk premium is the premium that investors demand for investing in an average risk investment in an average risk investment, relative to the risk-free rate.

As a general proposition, this premium should be:

- greater than zero
- increase with the risk aversion of the investors in that market
- increase with the riskiness of the "average" risk investment

Q l

Q l

Q l

Q l

Q l

Q l
What is your risk premium?

Assume that stocks are the only risky assets and that you are offered two investment options:

• a riskless investment (say a Government Security), on which you can make 5%.

• a mutual fund of all stocks, on which the returns are uncertain.

How much of an expected return would you demand to shift your money from the riskless asset to the mutual fund?

☐ More than 13%
☐ Between 11 - 13%
☐ Between 9 - 11%
☐ Between 7 - 9%
☐ Between 5 - 7%
☐ Less than 5%

Check your premium against the survey premium on my web site.
RISK AVERSION AND RISK PREMIUMS

As investors become more risk averse, you would expect the "equilibrium" premium to increase. Thus, Warren Buffett's risk aversion counts more towards determining the "equilibrium" premium than yours' and mine. The weights will be determined by the magnitude of wealth that each investor has. Thus, Warren Buffett's risk aversion counts more towards determining the "equilibrium" premium than yours' and mine. If this were the capital market line, the risk premium would be a weighted average of the risk premiums demanded by each and every investor.
Risk Premiums do change..

Go back to the previous example. Assume now that you are making the same choice but that you are making it in the aftermath of a stock market crash (it has dropped 25% in the last month). Would you change your answer?

- I would demand a larger premium
- I would demand a smaller premium
- I would demand the same premium
Estimating Risk Premiums in Practice

1. Survey investors on their desired risk premiums and use the average premium from these surveys.
2. Assume that the actual premium delivered over long time periods is equal to the expected premium - i.e., use historical data.
3. Estimate the implied premium in today's asset prices.
The Survey Approach

Surveying all investors in a marketplace is impractical. Even the longest surveys do not go beyond one year. However, you can survey a few investors (especially the larger investors) and use these results. In practice, this translates into surveys of money managers’ expectations of expected returns on stocks over the next year.

The limitations of this approach are:

- They tend to be short term; even the longest surveys do not go beyond one year.
- They are extremely volatile.
- Negative risk premiums or risk premiums of 50% are not uncommon (the survey could produce these).
- There are no constraints on reasonableness (the survey could produce unreasonable results).

However, you can survey a few investors in a marketplace and use these results.
The Historical Premium Approach

This is the default approach used by most to arrive at the premium to use in the model. In most cases, this approach does the following:

- It assumes that the risk aversion of investors has not changed in a systematic way across time.
- It assumes that the risk aversion of investors has not changed in a systematic way across time, and reverts back to historical averages.
- It calculates average returns on a stock index over the period.
- It calculates average returns on a riskless security over the period.
- It defines a time period for the estimation (1926-Present, 1962-Present,...).

The limitations of this approach are:

- It assumes that the risk aversion of investors has not changed in a systematic way across time.
- It assumes that the risk aversion of investors has not changed in a systematic way across time, and reverts back to historical averages.
- It uses it as a premium looking forward.

In most cases, this approach does the following:

- It assumes year, but it reverts back to historical averages.
- It calculates the difference between the two.
- It calculates the difference between the two.
- It calculates the difference between the two.
Historical Average Premiums for the United States

<table>
<thead>
<tr>
<th>Arithmetic Average</th>
<th>Geometric Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks</td>
<td>T.Bills</td>
</tr>
<tr>
<td>1928-2002</td>
<td>7.67%</td>
</tr>
<tr>
<td>1962-2002</td>
<td>5.17%</td>
</tr>
<tr>
<td>1992-2002</td>
<td>6.32%</td>
</tr>
</tbody>
</table>

Data Source: Check out the returns by year and estimate your own historical geometric premiums for estimates of long-term costs of equity. Use arithmetic premiums for one-year estimates of costs of equity and be consistent in your use of a risk-free rate.

What is the right premium?

- Go back as far as you can. Otherwise, the standard error in the estimate will be large.
- Be consistent in your use of a risk-free rate.

Historical Period | T.Bills | T.Bonds |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1992-2002</td>
<td>6.25%</td>
<td>7.67%</td>
</tr>
<tr>
<td>1996-2002</td>
<td>5.17%</td>
<td>3.66%</td>
</tr>
<tr>
<td>1998-2002</td>
<td>2.15%</td>
<td>6.32%</td>
</tr>
</tbody>
</table>
### What about historical premiums for other markets?

Historical data for markets outside the United States tends to be sketchy and unreliable. For instance, estimates the following premiums for major markets from 1970-1996:

<table>
<thead>
<tr>
<th>Country</th>
<th>Stock Return</th>
<th>Bond Return</th>
<th>Equity Risk Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>15.73%</td>
<td>12.69%</td>
<td>3.04%</td>
</tr>
<tr>
<td>France</td>
<td>9.49%</td>
<td>7.84%</td>
<td>-2.35%</td>
</tr>
<tr>
<td>Germany</td>
<td>11.30%</td>
<td>12.10%</td>
<td>-1.80%</td>
</tr>
<tr>
<td>Italy</td>
<td>5.49%</td>
<td>7.84%</td>
<td>-0.80%</td>
</tr>
<tr>
<td>Japan</td>
<td>11.51%</td>
<td>9.17%</td>
<td>2.34%</td>
</tr>
<tr>
<td>Mexico</td>
<td>11.88%</td>
<td>10.71%</td>
<td>1.17%</td>
</tr>
<tr>
<td>Singapore</td>
<td>15.48%</td>
<td>6.45%</td>
<td>9.03%</td>
</tr>
<tr>
<td>Spain</td>
<td>8.22%</td>
<td>7.91%</td>
<td>0.31%</td>
</tr>
<tr>
<td>Switzerland</td>
<td>13.49%</td>
<td>10.11%</td>
<td>3.38%</td>
</tr>
<tr>
<td>UK</td>
<td>12.42%</td>
<td>7.81%</td>
<td>4.61%</td>
</tr>
</tbody>
</table>

For more information, see Ibbotson.
<table>
<thead>
<tr>
<th>Country</th>
<th>Rating</th>
<th>Typical Spread</th>
<th>Market Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venezuela</td>
<td>B2</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>Uruguay</td>
<td>Baa3</td>
<td>145</td>
<td>7</td>
</tr>
<tr>
<td>Peru</td>
<td>B2</td>
<td>550</td>
<td>500</td>
</tr>
<tr>
<td>Paraguay</td>
<td>Baa3</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>Mexico</td>
<td>B3</td>
<td>145</td>
<td>50</td>
</tr>
<tr>
<td>Honduras</td>
<td>Ba2</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Ba2</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>Ecuador</td>
<td>Caa2</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>Colombia</td>
<td>Baa3</td>
<td>750</td>
<td>50</td>
</tr>
<tr>
<td>Brazil</td>
<td>B2</td>
<td>550</td>
<td>50</td>
</tr>
<tr>
<td>Bolivia</td>
<td>B1</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>Argentina</td>
<td>B1</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
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<td>B2</td>
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<td>450</td>
<td>450</td>
</tr>
</tbody>
</table>
The simplest way of dealing with country risk is to view the default spread as the country equity risk premium.

Country ratings measure default risk. While default risk premiums and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.

One way to adjust the country spread upwards is to use information from the US market. In the US, the equity risk premium has been roughly twice the default spread on junk bonds.

Another is to multiply the bond spread by the relative volatility of stock and bond prices in that market. For example,

- Adjusted Equity Spread = 4.83% (30.64%/15.28%) = 9.69%
- Standard Deviation in Bovespa (Equity) = 30.64%
- Standard Deviation in Brazil C-Bond = 15.28%

Data Source: Check out the latest ratings and country premiums by going to updated data on my web site.
If we use a basic discounted cash flow model, we can estimate the implied risk premium from the current level of stock prices. For instance, if stock prices are determined by the simple Gordon Growth Model:

\[ \text{Value} = \frac{\text{Expected Dividends next year (Required Returns on Stocks)}}{\text{Expected Growth Rate}} \]

Subtracting out the risk-free rate will yield the implied premium.

The problems with this approach are:

- The discounted cash flow model used to value the stock index has to be the right one.
- The inputs on dividends and expected growth have to be correct.
- It implicitly assumes that the market is currently correctly valued.

If we use a basic discounted cash flow model, we can estimate the implied equity premiums.
Implied Premiums in the US: 1960-2002
Aswath Damodaran

Application Test: A Market Risk Premium

Based upon our discussion of historical risk premiums so far, the risk premium looking forward should be:

- About 4%, which is the implied premium in the stock market today.
- About 4.5%, which is the geometric average premium since 1928, for stocks over T.Bills since 1981.
- About 7.5%, which is what the arithmetic average premium has been.
The standard procedure for estimating betas is to regress stock returns ($R_j$) against market returns ($R_m$) -

$$R_j = a + b R_m$$

where $a$ is the intercept and $b$ is the slope of the regression.

The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.

The standard procedure for estimating betas is to regress stock returns ($R_j$) against market returns ($R_m$):
Estimating Performance

The intercept of the regression provides a simple measure of performance during the period of the regression, relative to the capital asset pricing model.

\[ R_j = R_f + b (R_m - R_f) \]

\[ R_j = a + b R_m \]

If \( a > R_f (1-b) \), then the stock did better than expected during the regression period.

If \( a = R_f (1-b) \), then the stock did as well as expected during the regression period.

If \( a < R_f (1-b) \), then the stock did worse than expected during the regression period.

This is Jensen's alpha.
The R squared ($R^2$) of the regression provides an estimate of the proportion of the risk (variance) of a firm that can be attributed to market risk; the balance ($1 - R^2$) can be attributed to firm specific risk.
Setting up for the Estimation

Choose a market index, and estimate returns (inclusive of dividends)

Estimated returns (inclusive dividends) on stock

Estimate returns (inclusive dividends) on stock

Return = \frac{\text{Price}_{\text{End}} - \text{Price}_{\text{Beginning}} + \text{Dividends}_{\text{Period}}}{\text{Price}_{\text{Beginning}}}

Inclusive dividends only in ex-dividend month

Included dividends only in ex-dividend month

Decide on an estimation period

• Services use periods ranging from 2 to 5 years for the regression

• Longer estimation period provides more data, but firms change.

• Shorter periods can be affected more easily by significant firm-specific

Decide on an estimation period

• Shorter estimation periods use periods ranging from 2 to 5 years for the regression

• Shorter intervals yield more observations, but suffer from more noise.

• Noise is created by stocks not trading and biases all betas towards one.

Decide on the return interval - daily, weekly, monthly

Even though occurred during the period (Example: ITT for 1995-1997)

Even that occurred during the period (Example: ITT for 1995-1997)

• Services use periods ranging from 2 to 5 years for the regression

• Long estimation periods change, but short periods can be affected more easily by significant firm-specific
Choosing the Parameters: Disney

- Period used: 5 years
- Return Interval = Monthly
- Market Index: S&P 500 Index
- Return Interval = Monthly

For instance, to calculate returns on Disney in April 1992:

\[
\text{Return} = \frac{\text{Price for Disney at end of April} - \text{Price for Disney at end of March}}{\text{Price for Disney at end of March}} = \frac{36.42 - 37.87}{37.87} = -3.69\%
\]

Dividends during month = $0.05 (It was an ex-dividend month)

\[
\text{Return} = \frac{\text{Index level (including dividends) at end of April} - \text{Index level (including dividends) at end of March}}{\text{Index level (including dividends) at end of March}} = \frac{415.53 - 404.35}{404.35} = 2.76\%
\]

To estimate returns on the index in the same month:

\[
\text{Return} = \frac{\text{Index level (including dividends) at end of April} - \text{Index level (including dividends) at end of March}}{\text{Index level (including dividends) at end of March}} = \frac{36.42 - 37.87}{37.87} = -3.69\%
\]
Disney's Historical Beta

The Regression Output

\[ \text{Returns}_{\text{Disney}} = -0.01\% + 1.40 \text{ Returns}_{\text{S & P 500}} \]

\[ (R^{2}=32.41\%) \]

\[ \text{Slope} = 1.40 \]

\[ \text{Intercept} = -0.01\% \]

\[ (0.27) \]
Analyzing Disney's Performance

1996, Disney did 0.15% better than expected, per month, between 1992 and 1996.

\[ \text{Jensen's Alpha} = \text{Intercept} - (\text{Riskfree Rate} \times (1 - \text{Beta})) \]

\[ = -0.01\% - 0.4\% \times 1.40 = -0.16\% \]

The comparison is then between

\[ \text{Riskfree Rate} \times (1 - \text{Beta}) = 0.4\% \times 0.16 = 0.064\% \]

- Monthly Riskfree Rate

Between 1992 and 1996,

\[ \text{Annualized excess return} = (1.0015)^{12} - 1 = 1.81\% \]

Annualized, Disney's annual excess return = (1.0015)^{12} - 1 = 1.81%

This is an intercept based on monthly returns. Thus, it has to be compared to a monthly riskfree rate.

\[ \text{Intercept} = -0.01\% \]
If you did this analysis on every stock listed on an exchange, what would the average Jensen’s alpha be across all stocks?

Should be greater than zero, because stocks tend to go up more often than down.

Should be exactly zero.

Depend upon whether the market went up or down during the period.

If you did this analysis on every stock listed on an exchange, what would More on Jensen’s Alpha
Estimating Disney's Beta

The slope of the regression is 1.40 is the beta estimate.

Regression parameters are always estimated with noise. The noise is captured in the standard error of the beta estimate, which in the case of Disney is 0.27.

What is your best point estimate?

What range would you give me, with 67% confidence?

What range would you give me, with 95% confidence?

Assume that I asked you what Disney's true beta is, after this regression.

Disney is 0.27.
The Dirty Secret of "Standard Error"

Distribution of Standard Errors: Beta Estimates for U.S. Stocks
Breaking down Disney’s Risk

\[ R^2 = 32\% \]

This implies that

- \( 32\% \) of the risk at Disney comes from market sources
- \( 68\% \), therefore, comes from firm-specific sources

The firm-specific risk is diversifiable and will not be rewarded.
The Relevance of R Squared

You are a diversified investor trying to decide whether you should invest in Disney or Amgen. They both have betas of 1.40, but Disney has an R Squared of 32% while Amgen’s R Squared is only 15%. Which one would you invest in?

Would your answer be different if you were an undiversified investor?

You would be indifferent

Disney, because it has the higher R squared

Amgen, because it has the lower R squared

Would you invest in:

Disney, because it has the higher R squared
Beta Estimation in Practice: Bloomberg

**Adjusted Beta**

Adjusted Beta = (0.67) * Raw Beta

**Equation:**

\[ Y = 1.40x + 0.06 \]

- **Number of Points**: 9
- **S.E. of Beta**: 0.27
- **S.D. of Error**: 0.95
- **R² (Correlation)**: 0.32
- **Alpha (Intercept)**: -0.06
- **Raw Beta**: 1.40
- **Adj Beta**: 1.27

**Data Sources:**

- **58P S&P 500 Index**: The Walt Disney Co.
- **SPX**
- **DIS**

**Historical Beta**

**DGE8 Equity Beta**

**Beta Estimation in Practice: Bloomberg**

Inputs to the expected return calculation

- Disney’s Beta = 1.40
- Riskfree Rate = 7.00% (Long term Government Bond rate)
- Risk Premium = 5.50% (Approximate historical premium)

Expected Return = Riskfree Rate + Beta (Risk Premium)

= 7.00% + 1.40 (5.50%) = 14.70%
As a potential investor in Disney, what does this expected return of 14.70% tell you?

This is the return that I can expect to make in the long term on Disney, if the stock is correctly priced and the CAPM is the right model for risk.

This is the return that I need to make on Disney in the long term to break even on my investment in the stock.

Assume now that you are an active investor and that your research suggests that an investment in Disney will yield 25% a year for the next 5 years. Based upon the expected return of 14.70%, you would

- Buy the stock
- Sell the stock
- Both

As a potential investor in Disney, what does this expected return of 14.70% tell you?
Managers at Disney

- need to make at least 14.70% as a return for their equity investors to break even.
- this is the hurdle rate for projects, when the investment is analyzed from an equity standpoint

In other words, Disney’s cost of equity is 14.70%.

What is the cost of not delivering this cost of equity?
Questions:

Using your Bloomberg risk and return print out, answer the following:

1. How well or badly did your stock do, relative to the market, during the period of the regression? (You can assume an annualized risk-free rate of 4.8%.)

   Intercept - 0.4% (1 - Beta) = Jensen’s Alpha

   4.8% during the regression period

   How well or badly did your stock do, relative to the market, during the period of the regression? (You can assume an annualized risk-free rate of 4.8% during the regression period.)

   What is the historical estimate of beta for your stock? What is the range on this estimate with 67% probability? With 95% probability?

   What proportion of the risk in your stock is attributable to the market? What proportion is firm-specific?

   Based upon this beta, what is your estimate of the required return on this stock?

   Riskless Rate + Beta * Risk Premium
A Quick Test

You are advising a very risky software firm on the right cost of equity to use in project analysis. You estimate a beta of 2.0 for the firm and come up with a cost of equity of 18%. The CFO of the firm is concerned about the high cost of equity and wants to know whether there is anything he can do to lower his beta.

How do you bring your beta down?

Should you focus your attention on bringing your beta down?

Yes  ☐

No ☐
Disney's Beta Calculation: An Update from 2002

Jensen's alpha = -0.39% - 0.30 (1 - 0.94) = -0.41%
Annualized = (1 - 0.41%)^{12} - 1 = -4.79%
Aswath Damodaran

Aracruz’s Beta?
Telebras: High R Squared?
A Few Questions

The beta for every other stock in the index is also misestimated. Is there a way to get a better estimate?

• Is this an appropriate measure of risk?

• If not, why not?

The beta for Telebras is 1.11.

Why is that?

The R squared for Telebras is very high (70%), at least relative to U.S.
As your index gets broader, your standard error gets larger.

<table>
<thead>
<tr>
<th>Index</th>
<th>Beta</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan Stanley Capital Index (with ADR)</td>
<td>0.46</td>
<td>0.30</td>
</tr>
<tr>
<td>Brazil I-Sennet</td>
<td>0.69</td>
<td>0.32</td>
</tr>
<tr>
<td>S &amp; P 500 (with ADR)</td>
<td>0.35</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Try different indices?
Beta: Exploring Fundamentals

- Beta = 0
- Beta < 1
- Beta > 1

Companies with Beta values:
- Bank (Gold Mines): 0.10
- Exxon Mobil: 0.40
- Philip Morris: 0.65
- Enron: 0.95
- General Electric: 1.10
- Microsoft: 1.25
- Qwest Communications: 2.60
- Real Networks: 3.24
- Enron: 0.95
- Exxon Mobil: 0.40
- Philip Morris: 0.65
- General Electric: 1.10
- Microsoft: 1.25
- Qwest Communications: 2.60
- Real Networks: 3.24
- Enron: 0.95
- Exxon Mobil: 0.40
- Philip Morris: 0.65
- General Electric: 1.10
- Microsoft: 1.25
- Qwest Communications: 2.60
- Real Networks: 3.24
Determinant 1: Product Type

Aswath Damodaran

Determinant 1: Product Type

The beta value for a firm depends upon the sensitivity of the demand for its products and services and of its costs to macroeconomic factors that affect the overall market. Cyclic companies have higher betas than non-cyclical firms.

- Firms which sell more discretionary products will have higher betas than firms that sell less discretionary products.
- Cyclical companies have higher betas than non-cyclical firms.

Industry Effects: The beta value for a firm depends upon the...
Consider an investment in Tiffany’s. What kind of beta do you think this investment will have?

- Much higher than one
- Close to one
- Much lower than one
Determinant 2: Operating Leverage Effects

Operating leverage refers to the proportion of the total costs of the firm that are fixed. Other things remaining equal, higher operating leverage results in greater earnings variability which in turn results in higher betas.
Measures of Operating Leverage

**Measures of Operating Leverage**

1. **Fixed Costs Measure** = Fixed Costs / Variable Costs

   This measures the relationship between fixed and variable costs. The greater the proportion, the higher the fixed costs.

2. **EBIT Variability Measure** = % Change in EBIT / % Change in Revenues

   This measures how quickly the earnings before interest and taxes change as revenue changes. The higher this number, the greater the operating leverage.

   - **Operating Leverage**
     
     The higher the proportion, the higher the operating leverage.
A Look at Disney’s Operating Leverage

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Sales</th>
<th>% Change</th>
<th>EBIT</th>
<th>% Change</th>
<th>Net Sales</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>2877</td>
<td>756</td>
<td>18739</td>
<td>966</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>3438</td>
<td>19.50%</td>
<td>12112</td>
<td>1195</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>4594</td>
<td>33.62%</td>
<td>11773</td>
<td>38.80%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>5844</td>
<td>27.21%</td>
<td>13681</td>
<td>16.23%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1991</td>
<td>6182</td>
<td>5.78%</td>
<td>1124</td>
<td>19.14%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1992</td>
<td>7504</td>
<td>21.38%</td>
<td>7529</td>
<td>13.79%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>8529</td>
<td>13.66%</td>
<td>883</td>
<td>16.90%</td>
<td>119</td>
<td></td>
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<tr>
<td>1994</td>
<td>10055</td>
<td>27.14%</td>
<td>584</td>
<td>10.68%</td>
<td>119</td>
<td></td>
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<tr>
<td>1995</td>
<td>12112</td>
<td>38.80%</td>
<td>4594</td>
<td>18.73%</td>
<td>119</td>
<td></td>
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<tr>
<td>1996</td>
<td>18739</td>
<td>17.89%</td>
<td>438</td>
<td>11.78%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td>2295</td>
<td>19.71%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1998</td>
<td>1933</td>
<td>19.50%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td>2540</td>
<td>19.71%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
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<tr>
<td>2000</td>
<td>11773</td>
<td>19.50%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>1124</td>
<td>19.71%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>7529</td>
<td>19.50%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
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</tr>
<tr>
<td>2003</td>
<td>883</td>
<td>19.71%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>584</td>
<td>19.50%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>4594</td>
<td>19.71%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>438</td>
<td>19.50%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>2877</td>
<td>19.71%</td>
<td>2877</td>
<td>11.77%</td>
<td>119</td>
<td></td>
</tr>
</tbody>
</table>

Average: 23.80% 16.56%
Reading Disney's Operating Leverage

Operating Leverage 1987-95: 17.29%/19.44% = 0.87

Operating Leverage for 1987-1995:

The acquisition of Capital Cities by Disney in 1996 may be skewing the operating leverage downwards. For instance, looking at the operating leverage for 1987-1995:

Operating Leverage 1987-95 = 17.29% / 19.44% = 0.87

This is lower than the operating leverage for other entertainment firms, which we computed to be 1.15. This would suggest that Disney has lower fixed costs than its competitors.

= 16.56% / 23.80% = 0.70

Operating Leverage = % Change in EBIT / % Change in Sales

Realigning Disney's Operating Leverage
Assume that you are comparing a European automobile manufacturing firm with a U.S. automobile manufacturing firm. European firms are generally more constrained in terms of laying off employees, if they get into financial trouble. What implications does this have for betas, if they are estimated relative to a common index?

- European firms will have much lower betas than U.S. firms
- European firms will have similar betas to U.S. firms
- European firms will have much higher betas than U.S. firms
Determinant 3: Financial Leverage

As firms borrow, they create fixed costs (interest payments) that make their earnings to equity investors more volatile. This increased earnings volatility which increases the equity beta.
The beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio:

$$\beta_L = \beta_u \left(1 + \frac{(1-t)D}{E}\right)$$

where:
- $E = \text{Market Value of Equity}$
- $D = \text{Market Value of Debt}$
- $t = \text{Corporate marginal tax rate}$
- $\beta_u = \text{Unlevered Beta}$
- $\beta_L = \text{Levered or Equity Beta}$

Equity Betas and Leverage
Effects of leverage on betas: Disney

The regression beta for Disney is 1.40. This beta is a levered beta (because it is based on stock prices, which reflect leverage) and the leverage implicit in the beta estimate is the average market debt/equity ratio during the period of the regression (1992 to 1996), which reflects leverage and the leverage implicit in the beta estimate is the average market debt/equity ratio during this period. The average debt/equity ratio during this period was 14%.

The unlevered beta for Disney can then be estimated (using a marginal tax rate of 36%):

\[ \text{Unlevered Beta} = \frac{\text{Current Beta}}{1 + (1 - \text{tax rate}) \times \left( \frac{\text{Average Debt}}{\text{Equity}} \right)} \]

\[ \text{Unlevered Beta} = \frac{1.40}{1 + (1 - 0.36) \times (0.14)} = 1.28 \]
<table>
<thead>
<tr>
<th>Debt to Capital</th>
<th>Debt/Equity Ratio</th>
<th>Beta Effect of Leverage</th>
<th>Disney : Beta and Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0.00%</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>10.00%</td>
<td>11.11%</td>
<td>1.38</td>
<td></td>
</tr>
<tr>
<td>25.00%</td>
<td>1.49</td>
<td>1.50%</td>
<td></td>
</tr>
<tr>
<td>42.86%</td>
<td>1.64</td>
<td>1.64%</td>
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</tr>
<tr>
<td>66.67%</td>
<td>1.83</td>
<td>1.83%</td>
<td></td>
</tr>
<tr>
<td>100.00%</td>
<td>2.11</td>
<td>2.11%</td>
<td></td>
</tr>
<tr>
<td>50.00%</td>
<td>2.52</td>
<td>2.52%</td>
<td></td>
</tr>
<tr>
<td>100.00%</td>
<td>2.11</td>
<td>2.11%</td>
<td></td>
</tr>
<tr>
<td>150%</td>
<td>3.00%</td>
<td>3.00%</td>
<td></td>
</tr>
<tr>
<td>200%</td>
<td>3.20%</td>
<td>3.20%</td>
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<td>300%</td>
<td>3.20%</td>
<td>3.20%</td>
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<td>3.20%</td>
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<td>3.20%</td>
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<td>3.20%</td>
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<td>800%</td>
<td>3.20%</td>
<td>3.20%</td>
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<td>900%</td>
<td>3.20%</td>
<td>3.20%</td>
<td></td>
</tr>
<tr>
<td>1000%</td>
<td>3.20%</td>
<td>3.20%</td>
<td></td>
</tr>
</tbody>
</table>

**Effect of Leverage**
The beta of a mutual fund is the market-value weighted average of the betas of the stocks in the portfolio. The beta of a firm after a merger is the weighted average of the betas of the companies involved in the merger, and other investments in that portfolio. Thus, the betas of the individual investments in that portfolio are weighted averages of the betas of the new entity.
The Disney/Cap Cities Merger: Pre-Merger

*Disney:*
- Beta = 1.15
- Debt = $3,186 million  Equity = $31,100 million  Firm = $34,286
- D/E = 0.10

*ABC:*
- Beta = 0.95
- Debt = $615 million  Equity = $18,500 million  Firm = $19,115
- D/E = 0.03
Disney Cap Cities Beta Estimation: Step 1

1. Calculate the unlevered betas for both firms
   - Disney’s unlevered beta = \( \frac{1.15}{1 + 0.64 \times 0.10} = 1.08 \)
   - Cap Cities unlevered beta = \( \frac{0.93}{1 + 0.64 \times 0.03} = 0.93 \)

2. Calculate the unlevered beta for the combined firm
   - Unlevered Beta for combined firm = \( \frac{1.08 \times 34.286/53.401 + 0.93 \times 19.115/53.401}{1.026} \)
   - Remember to calculate the weights using the firm values of the two firms

3. Calculate the unlevered betas for both firms
   - Cap Cities unlevered beta = 0.93/1.026 = 0.93
   - Disney’s unlevered beta = 1.08/1.026 = 1.08
If Disney had used all equity to buy Cap Cities:

- Debt = $13,801 million
- Equity = $39,600 million
- D/E Ratio = 3,801/39,600 = 7.66%
- New Beta = 1.026 (1 + 0.64(7.66)) = 1.08

Since Disney borrowed $10 billion to buy Cap Cities/ABC:

- Debt = $13,801 million + $10,000 million = $23,801 million
- Equity = $39,600 + $10,000 = $49,600 million
- D/E Ratio = 23,801/49,600 = 47.8%
- New Beta = 1.026 (1 + 0.64(47.8)) = 1.25

Disney Cap Cities Beta Estimation: Step 2
Firm Betas versus divisional Betas

Firm Betas as weighted averages: The beta of a firm is the weighted average of the betas of its individual projects.

At a broader level of aggregation, the beta of a firm is the weighted average of the betas of its individual division.

Firm Betas versus divisional Betas
Bottom-up versus Top-down Beta

The top-down beta for a firm comes from a regression period of the regression. The firm has reorganized or restructured itself substantially during the period. A firm is very different from the average for the business, and the beta for the firm is very different from the average for the business. The standard error of the beta from the regression is high (and) the beta for the firm is not traded.

When
- the standard error of the beta from the regression is high (and) the beta for the firm is very different from the average for the business
- the firm has reorganized or restructured itself substantially during the period of the regression
- the firm is very different from the average for the business
- the firm is not traded

The bottom-up beta will give you a better estimate of the true beta when
- Lever up using the firm’s debt/equity ratio
- Take a weighted (by sales or operating income) average of these unlevered betas
- Find the unlevered betas of other firms in this business
- Find out the businesses that a firm operates in

The bottom-up beta can be estimated by doing the following:
- The top-down beta for a firm comes from a regression
## Decomposing Disney’s Beta in 1997

<table>
<thead>
<tr>
<th>Business</th>
<th>Estimated vA Comparable Firms</th>
<th>Distribution of Weight</th>
<th>Business Unlevered D/E Ratio</th>
<th>Levered Riskfree Risk</th>
<th>Cost of Beta</th>
<th>Beta Rate Premium Equity</th>
<th>Beta</th>
<th>Premium Equity Cost of Levered Risk</th>
<th>Beta</th>
<th>Risk</th>
<th>Beta Rate Premium Equity Cost of Levered Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creative Content</td>
<td>$22.167</td>
<td>1.25</td>
<td>3.57%</td>
<td>5.00%</td>
<td>1.25</td>
<td>21.97%</td>
<td>0.75</td>
<td>1.09</td>
<td>5.00%</td>
<td>1.25</td>
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</tr>
<tr>
<td>Retailing</td>
<td>$2.217</td>
<td>0.75</td>
<td>3.57%</td>
<td>5.00%</td>
<td>1.25</td>
<td>21.97%</td>
<td>0.75</td>
<td>1.09</td>
<td>5.00%</td>
<td>1.25</td>
<td></td>
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<tr>
<td>Broadcasting</td>
<td>$18.842</td>
<td>0.36</td>
<td>0.36%</td>
<td>0.92%</td>
<td>1.25</td>
<td>22.167</td>
<td>0.75</td>
<td>1.09</td>
<td>5.00%</td>
<td>1.25</td>
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<tr>
<td>Theme Parks</td>
<td>$1.625</td>
<td>0.26</td>
<td>0.26%</td>
<td>0.92%</td>
<td>1.25</td>
<td>22.167</td>
<td>0.75</td>
<td>1.09</td>
<td>5.00%</td>
<td>1.25</td>
<td></td>
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<tr>
<td>Real Estate</td>
<td>$2.217</td>
<td>0.75</td>
<td>3.57%</td>
<td>5.00%</td>
<td>1.25</td>
<td>21.97%</td>
<td>0.75</td>
<td>1.09</td>
<td>5.00%</td>
<td>1.25</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>$62.068</td>
<td>1.00</td>
<td>1.00%</td>
<td>7.00%</td>
<td>1.25</td>
<td>21.97%</td>
<td>0.75</td>
<td>1.09</td>
<td>5.00%</td>
<td>1.25</td>
<td></td>
</tr>
</tbody>
</table>
If you were the chief financial officer of Disney, what cost of equity would you use in capital budgeting in the different divisions?

The cost of equity for Disney as a company

The cost of equity for each of Disney's divisions?

Would you use in capital budgeting in the different divisions?

Discussion Issue
Aswath Damodaran

Estimating Aracruz's Bottom Up Beta

Comparable Firms

<table>
<thead>
<tr>
<th>Firm</th>
<th>D/E Ratio</th>
<th>Unlevered Beta</th>
<th>Levered Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin American Paper &amp; Pulp (5)</td>
<td>0.70</td>
<td>65.00%</td>
<td>0.49</td>
</tr>
<tr>
<td>U.S. Paper and Pulp (45)</td>
<td>0.85</td>
<td>35.00%</td>
<td>0.69</td>
</tr>
<tr>
<td>Global Paper &amp; Pulp (187)</td>
<td>0.80</td>
<td>50.00%</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Aracruz has a cash balance which was 20% of the market value in 1997, much higher than the typical cash balance at other paper firms.

Unlevered Beta for Aracruz = (0.8) (0.61) + 0.2 (0) = 0.488

Levered Beta for Aracruz = 0.49 (1 + (1-.33) (.6667)) = 0.71

Real Cost of Equity for Aracruz = 5% + 0.71 (7.5% - 10.33%) = 0.1%

Risk Premium = 5.7% (US premium) + 2% (1996 Brazilian default spread) + 5% (long term growth rate in Brazilian economy)

Real Riskfree Rate = 5%

Risk Premium = 5.7% (US premium) + 2% (1996 Brazilian default spread) + 5% (long term growth rate in Brazilian economy)

Risk Premium = 5.7% (US premium) + 2% (1996 Brazilian default spread) + 5% (long term growth rate in Brazilian economy)
Deutsche Bank is in two different segments of business - commercial banking and investment banking.

To estimate its commercial banking beta, we will use the average beta of commercial banks in Germany.

To estimate the investment banking beta, we will use the average beta of U.K. and U.S. investment banks in Germany.

<table>
<thead>
<tr>
<th>Comparable Firms</th>
<th>Average Beta</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial banks in Germany</td>
<td>1.30%</td>
<td>90%</td>
</tr>
<tr>
<td>U.K. and U.S. investment banks</td>
<td>0.90%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Beta for Deutsche Bank = 0.9 (1.30) + 0.1 (0.90) = 0.94

Cost of Equity for Deutsche Bank (in DM) = 7.5% + 0.94 (5.5%) = 12.67%
Estimating Betas for Non-Traded Assets

- The conventional approaches of estimating betas from regressions do not work for assets that are not traded.
- There are two ways in which betas can be estimated for non-traded assets
  - using comparable firms
  - using accounting earnings
Using comparable firms to estimate betas

Assume that you are trying to estimate the beta for a independent bookstore in New York City.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Beta</th>
<th>D/E Ratio</th>
<th>Market Cap ($ Mil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barnes &amp; Noble</td>
<td>1.10</td>
<td>23.31%</td>
<td>1,416</td>
</tr>
<tr>
<td>Books-A-Million</td>
<td>1.30</td>
<td>44.35%</td>
<td>85</td>
</tr>
<tr>
<td>Borders Group</td>
<td>1.20</td>
<td>2.15%</td>
<td>1,706</td>
</tr>
<tr>
<td>Crown Books</td>
<td>0.80</td>
<td>3.03%</td>
<td>55</td>
</tr>
</tbody>
</table>

Average Beta of comparable firms: \( \frac{1.10}{1 + (1 - .36) (.1821)} = 0.99 \)

If independent bookstore has similar leverage, beta = 1.10

If independent bookstore decides to use a debt/equity ratio of 25%:

\[
\text{Beta for bookstore} = 0.99 \left(1 + \frac{.25}{.75}\right) = 1.13 \quad \text{(Tax rate used=42%)}
\]

\[
\text{Beta for bookstore} = 1.10 \quad \text{Unlevered Beta of comparable firms} \frac{1.10}{1 + (1 - .36) (.1821)} = 0.99
\]

If independent bookstore has similar leverage, beta = 1.10

\[
\text{Beta for bookstore} = 0.99 \left(1 + \frac{.25}{.75}\right) = 1.13 \quad \text{(Tax rate used=42%)}
\]

\[
\text{Unlevered Beta of comparable firms} \frac{1.10}{1 + (1 - .36) (.1821)} = 0.99
\]

<table>
<thead>
<tr>
<th>816</th>
<th>$</th>
<th>%</th>
<th>1.10</th>
<th>Average 1.10</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>$</td>
<td>3.03%</td>
<td>0.80</td>
<td>Crown Books</td>
</tr>
<tr>
<td>906</td>
<td>$</td>
<td>2.15%</td>
<td>1.20</td>
<td>Borders Group</td>
</tr>
<tr>
<td>85</td>
<td>$</td>
<td>44.35%</td>
<td>1.30</td>
<td>Books-A-Million</td>
</tr>
<tr>
<td>1,416</td>
<td>$</td>
<td>23.31%</td>
<td>1.10</td>
<td>Barnes &amp; Noble</td>
</tr>
</tbody>
</table>

\( (\text{M}\text{il}) \)
Using Accounting Earnings to Estimate Beta

<table>
<thead>
<tr>
<th>Year</th>
<th>S&amp;P 500</th>
<th>Bookescape</th>
<th>S&amp;P 500</th>
<th>Bookescape</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>45.17%</td>
<td>%</td>
<td>41.80%</td>
<td>%</td>
</tr>
<tr>
<td>1987</td>
<td>41.50%</td>
<td>%</td>
<td>7.00%</td>
<td>%</td>
</tr>
<tr>
<td>1986</td>
<td>5.05%</td>
<td>%</td>
<td>11.80%</td>
<td>%</td>
</tr>
<tr>
<td>1985</td>
<td>37.50%</td>
<td>%</td>
<td>41.80%</td>
<td>%</td>
</tr>
<tr>
<td>1984</td>
<td>47.40%</td>
<td>%</td>
<td>41.00%</td>
<td>%</td>
</tr>
<tr>
<td>1983</td>
<td>20.00%</td>
<td>%</td>
<td>47.55%</td>
<td>%</td>
</tr>
<tr>
<td>1982</td>
<td>37.00%</td>
<td>%</td>
<td>52.50%</td>
<td>%</td>
</tr>
<tr>
<td>1981</td>
<td>-10.00%</td>
<td>%</td>
<td>47.00%</td>
<td>%</td>
</tr>
<tr>
<td>1980</td>
<td>2.60%</td>
<td>%</td>
<td>3.55%</td>
<td>%</td>
</tr>
<tr>
<td>1979</td>
<td>31.00%</td>
<td>%</td>
<td>45.00%</td>
<td>%</td>
</tr>
<tr>
<td>1978</td>
<td>-14.33%</td>
<td>%</td>
<td>37.00%</td>
<td>%</td>
</tr>
<tr>
<td>1977</td>
<td>4.05%</td>
<td>%</td>
<td>41.50%</td>
<td>%</td>
</tr>
<tr>
<td>1976</td>
<td>15.50%</td>
<td>%</td>
<td>65.00%</td>
<td>%</td>
</tr>
<tr>
<td>1975</td>
<td>11.55%</td>
<td>%</td>
<td>41.80%</td>
<td>%</td>
</tr>
<tr>
<td>1974</td>
<td>47.40%</td>
<td>%</td>
<td>11.00%</td>
<td>%</td>
</tr>
<tr>
<td>1973</td>
<td>20.00%</td>
<td>%</td>
<td>47.55%</td>
<td>%</td>
</tr>
<tr>
<td>1972</td>
<td>64.50%</td>
<td>%</td>
<td>52.50%</td>
<td>%</td>
</tr>
<tr>
<td>1971</td>
<td>75.00%</td>
<td>%</td>
<td>32.00%</td>
<td>%</td>
</tr>
<tr>
<td>1970</td>
<td>-32.00%</td>
<td>%</td>
<td>47.40%</td>
<td>%</td>
</tr>
<tr>
<td>1969</td>
<td>-18.00%</td>
<td>%</td>
<td>41.50%</td>
<td>%</td>
</tr>
<tr>
<td>1968</td>
<td>41.80%</td>
<td>%</td>
<td>41.80%</td>
<td>%</td>
</tr>
<tr>
<td>1967</td>
<td>65.00%</td>
<td>%</td>
<td>41.80%</td>
<td>%</td>
</tr>
<tr>
<td>1966</td>
<td>47.55%</td>
<td>%</td>
<td>52.50%</td>
<td>%</td>
</tr>
<tr>
<td>1965</td>
<td>37.00%</td>
<td>%</td>
<td>47.40%</td>
<td>%</td>
</tr>
<tr>
<td>1964</td>
<td>11.55%</td>
<td>%</td>
<td>41.80%</td>
<td>%</td>
</tr>
<tr>
<td>1963</td>
<td>20.00%</td>
<td>%</td>
<td>47.55%</td>
<td>%</td>
</tr>
<tr>
<td>1962</td>
<td>64.50%</td>
<td>%</td>
<td>52.50%</td>
<td>%</td>
</tr>
<tr>
<td>1961</td>
<td>75.00%</td>
<td>%</td>
<td>32.00%</td>
<td>%</td>
</tr>
</tbody>
</table>
Regressing the changes in profits at Bookscape against changes in the S&P 500 yields the following:

Bookscape Earnings Change = 0.09 + 0.80 (S & P 500 Earnings Change)

Based upon this regression, the beta for Bookscape’s equity is 0.80.

Using operating earnings for both the firm and the S&P 500 should yield the equivalent of an unlevered beta.
Is Beta an Adequate Measure of Risk for a Private Firm?
Adjust the beta to reflect total risk rather than market risk. This adjustment is relatively simple, since the $R^2$ measures the proportion of the risk that is market risk. In the Bookscape example, where the market beta is 1.10 and the average correlation of the comparable publicly traded firms is 33%,

Total Beta = \frac{1.10}{0.33} = 3.30

Total Cost of Equity = 7\% + 3.30 (5.5\%) = 25.05\%

Total Risk Versus Market Risk
Based upon the business or businesses that your firm is in right now, and its current financial leverage, estimate the bottom-up unlevered beta for your firm.

Data Source: You can get a listing of unlevered betas by industry on my website by going to updated data.
The cost of capital is a composite cost to the firm of raising financing. In addition to equity, firms can raise capital from debt to fund its projects.

From Cost of Equity to Cost of Capital
What is debt?

Any lease obligation, whether operating or capital.

Any interest-bearing liability, whether short term or long term.

As a consequence, debt should include any interest-bearing liability, whether short term or long term.

Any lease obligation, whether operating or capital.

Failure to make the payments can lead to either default or loss of control.

The fixed payments are tax deductible.

Commitment to make fixed payments in the future.

General Rule: Debt generally has the following characteristics:
Estimating the Cost of Debt

The cost of debt has to be estimated in the same currency as the cost of equity and the cash flows in the valuation. To arrive at a default spread and a cost of debt estimate a synthetic rating for the company, and use the synthetic rating to estimate a cost of debt. If the firm is not rated, with that rating to estimate the cost of debt. If the firm is rated, use the rating and a typical default spread on bonds used as the interest rate. If the firm has maturing long-term, straight (no special features) bond can be to maturity on a long-term, straight (no special features) bond can be
Estimating Synthetic Ratings

The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, the rating can be estimated using the financial characteristics of the firm. For a firm, which has earnings before interest and taxes of $3,500 million and interest expenses of $700 million:

\[
\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expenses}} = \frac{3,500}{700} = 5
\]

Based upon the relationship between interest coverage ratios and ratings, we would estimate a rating of A for the firm.
<table>
<thead>
<tr>
<th>Default Spread</th>
<th>Estimated Bond Rating</th>
<th>Interest Coverage Ratio is Greater Than</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0.20%</td>
<td>0.65 - 0.80</td>
<td>0.20 - 0.65</td>
</tr>
<tr>
<td>1.25 - 1.75</td>
<td>1.75 - 2.00</td>
<td>1.50 - 1.75</td>
</tr>
<tr>
<td>2.00 - 2.50</td>
<td>2.50 - 3.00</td>
<td>2.25 - 2.50</td>
</tr>
<tr>
<td>3.00 - 4.00</td>
<td>4.00 - 4.25</td>
<td>3.50 - 4.00</td>
</tr>
<tr>
<td>4.25 - 5.00</td>
<td>5.00 - 6.00</td>
<td>4.25 - 5.00</td>
</tr>
<tr>
<td>5.50 - 6.50</td>
<td>6.50 - 8.00</td>
<td>5.50 - 6.50</td>
</tr>
<tr>
<td>6.50 - 8.50</td>
<td>8.00 - 1.25</td>
<td>6.50 - 8.50</td>
</tr>
<tr>
<td>7.00 - 9.00</td>
<td>9.00 - 12.25</td>
<td>7.00 - 9.00</td>
</tr>
<tr>
<td>9.00 - 15.00</td>
<td>15.00 - 25.00</td>
<td>9.00 - 15.00</td>
</tr>
<tr>
<td>11.50 - 15.00</td>
<td>15.00 - 25.00</td>
<td>11.50 - 15.00</td>
</tr>
<tr>
<td>12.70%</td>
<td>&gt; 0.20</td>
<td>12.70%</td>
</tr>
<tr>
<td>14.00%</td>
<td>&gt; 0.20</td>
<td>14.00%</td>
</tr>
</tbody>
</table>
Application Test: Estimating a Cost of Debt

Based upon your firm’s current earnings before interest and taxes, it is necessary to estimate:

- An after-tax cost of debt for your firm
- A pre-tax cost of debt for your firm
- A synthetic rating for your firm (use the table from previous page)
- An interest coverage ratio for your firm
- An interest expenses estimate

An interest coverage ratio for your firm (use the table from previous page)
Estimating Market Value Weights

Market Value of Equity should include the following:

- Market Value of Shares outstanding
- Market Value of Warrants outstanding
- Market Value of Conversion Option in Convertible Bonds
- Market Value of Shares outstanding

Market Value of Debt is more difficult to estimate because few firms have only publicly traded debt. There are two solutions:

- Estimate the market value of debt from the book value
- Assume book value of debt is equal to market value

For Disney, with book value of $12.342 million, interest expenses of $479 million, a current cost of borrowing of 7.5% and an weighted average maturity of 3 years:

Estimated MV of Disney Debt =

\[
\frac{1.075^{3}}{1} + \left[ \frac{1.075}{1} \right]^{479} = 479
\]

\[
\frac{12.342}{1.075^{3}}\]

Estimated Market Value of Disney Debt.
The "debt value" of operating leases is the present value of the lease payments, at a rate that reflects the risk.

In general, this rate will be close to or equal to the rate at which the company can borrow.
The pre-tax cost of debt at the Home Depot is 6.25%.

Debt outstanding at the Home Depot = $1,205 + $2,571 = $3,776 million.

Present Value of Operating Leases = $2,571 + $1,205 (PV of 10-yr annuity)

<table>
<thead>
<tr>
<th>Year</th>
<th>Present Value Expense</th>
<th>Operating Lease Expense</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>1</td>
<td>$174</td>
<td>$174</td>
<td>$1,450</td>
</tr>
<tr>
<td>2</td>
<td>$192</td>
<td>$192</td>
<td>$270</td>
</tr>
<tr>
<td>3</td>
<td>$220</td>
<td>$220</td>
<td>$245</td>
</tr>
<tr>
<td>4</td>
<td>$258</td>
<td>$258</td>
<td>$264</td>
</tr>
<tr>
<td>5</td>
<td>$245</td>
<td>$245</td>
<td>$236</td>
</tr>
<tr>
<td>6-15</td>
<td>$270</td>
<td>$270</td>
<td>$231</td>
</tr>
<tr>
<td>15</td>
<td>$277</td>
<td>$277</td>
<td></td>
</tr>
</tbody>
</table>

Present Value = $2,571.

The Home Depot has other debt outstanding of $1,205 million.
Application Test: Estimating Market Value

Estimate the

• Market value of equity at your firm
• Book Value of equity

Weights for equity and debt based upon market value

Weights for equity and debt based upon book value

Estimate the market value of debt.

Value of operating leases and add them on to both the book value and the average maturity of your debt (use 3 years); Remember to capitalize the value of operating leases and add them on to both the book value and the average maturity of your debt (use 3 years);

Market value of debt and book value of debt (If you cannot find the average maturity of your debt, use 3 years).
Current Cost of Capital: Disney

**Equity**
- Cost of Equity = Riskfree rate + Beta * Risk Premium
  - = 7% + 1.25 * (5.5%) = 13.85%
- Market Value of Equity = $50.88 Billion
- Equity/(Debt + Equity) = 82%

**Debt**
- After-tax Cost of debt = (Riskfree rate + Default Spread) (1 - t)
  - = (7% + 0.50) (1 - 0.36) = 4.80%
- Market Value of Debt = $11.18 Billion
- Debt/(Debt + Equity) = 18%

Cost of Capital = 13.85% * 0.82 + 4.80% * 0.18 = 12.22%
## Disney’s Divisional Costs of Capital

<table>
<thead>
<tr>
<th>Business</th>
<th>E/(D+E)</th>
<th>Cost of Equity</th>
<th>D/(D+E)</th>
<th>After-tax Cost of Debt</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creative Content</td>
<td>82.70%</td>
<td>14.80%</td>
<td>17.30%</td>
<td>4.80%</td>
<td>13.07%</td>
</tr>
<tr>
<td>Retailing</td>
<td>82.70%</td>
<td>16.35%</td>
<td>17.30%</td>
<td>4.80%</td>
<td>14.36%</td>
</tr>
<tr>
<td>Broadcasting</td>
<td>82.70%</td>
<td>12.61%</td>
<td>17.30%</td>
<td>4.80%</td>
<td>11.26%</td>
</tr>
<tr>
<td>Theme Parks</td>
<td>82.70%</td>
<td>13.91%</td>
<td>17.30%</td>
<td>4.80%</td>
<td>12.32%</td>
</tr>
<tr>
<td>Real Estate</td>
<td>62.79%</td>
<td>12.31%</td>
<td>37.21%</td>
<td>4.80%</td>
<td>9.52%</td>
</tr>
<tr>
<td>Disney</td>
<td>81.99%</td>
<td>13.85%</td>
<td>18.01%</td>
<td>4.80%</td>
<td>12.22%</td>
</tr>
</tbody>
</table>
Application Test: Estimating Cost of Capital

Using the bottom-up unlevered beta that you computed for your firm, and the values of debt and equity you have estimated for your firm, estimate a bottom-up levered beta and cost of equity for your firm.

Based upon the costs of equity and debt that you have estimated, and the weights for each, estimate the cost of capital for your firm.

How different would your cost of capital have been, if you used book value weights?
Choosing a Hurdle Rate

Either the cost of equity or the cost of capital can be used as a hurdle rate, depending upon whether the returns measured are to equity investors or to all claimholders on the firm. The appropriate hurdle rate is the cost of capital if returns are measured to capital (or the firm), and the appropriate hurdle rate is the cost of equity if returns are measured to equity investors.
Invest in projects that yield a return greater than the minimum acceptable hurdle rate.

The hurdle rate should be higher for riskier projects and reflect the financing mix used - owners' funds (equity) or borrowed money.

Returns on projects should be measured based on cash flows generated (debt) and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.

The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.

Cash to stockholders.

If there are not enough investments that earn the hurdle rate, return the assets being financed.

Choose a financing mix that minimizes the hurdle rate and matches the assets being financed.

The form of returns - dividends and stock buybacks - will depend upon the stockholders' characteristics.

Back to First Principles