Applied Corporate Finance

Aswath Damodaran

www.damodaran.com

For material specific to this package, go to

www.stern.nyu.edu/~adamodar/New_Home_Page/cf2day.html
What is corporate finance?

- Every decision that a business makes has financial implications, and any decision which affects the finances of a business is a corporate finance decision.
- Defined broadly, everything that a business does fits under the rubric of corporate finance.
First Principles

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

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

Objective: Maximize the Value of the Firm
The Objective in Decision Making

- In traditional corporate finance, the objective in decision making is to **maximize the value of the firm**.
- A narrower objective is to **maximize stockholder wealth**. When the stock is traded and markets are viewed to be efficient, the objective is to **maximize the stock price**.
The Classical Objective Function

STOCKHOLDERS

Maximize stockholder wealth

- Hire & fire managers
  - Board
  - Annual Meeting

BONDHOLDERS

Lend Money

Protect bondholder interests

Managers

Reveal information honestly and on time

FINANCIAL MARKETS

Markets are efficient and assess effect on value

No Social Costs

Costs can be traced to firm

SOCIETY
What can go wrong?

STOCKHOLDERS

Managers put their interests above stockholders

Managers

Lend Money

Bondholders can get ripped off

Delay bad news or provide misleading information

FINANCIAL MARKETS

BONDHOLDERS

Have little control over managers

Bondholders

SOCIETY

Significant Social Costs

Some costs cannot be traced to firm

Markets make mistakes and can over react

Aswath Damodaran
A dysfunctional board? The Disney Experience - 1997

Reveta P. Bowers 1,5
Head of School
Center for Early Education

Roy E. Disney 3
Vice Chairman
The Walt Disney Company

Michael D. Eisner 9
Chairman and Chief Executive Officer
The Walt Disney Company

Sidney Poitier 2,4
Chief Executive Officer
Vencon-Cedic Productions

Irwin E. Russell 2,4
Attorney at Law

Robert A.M. Stern
Senior Partner Productions

E. Carolyn Walker 1
Former Chairman and Chief Executive Officer
The Walt Disney Company

Raymond L. Watson 1,2,3
Vice Chairman
The Irvine Company

Gary L. Wilson 5
Co-Chairman
Northwest Airlines Corporation

1 Member of Audit Review Committee
2 Member of Compensation Committee
3 Member of Executive Committee
4 Member of Executive Performance Plan Committee
5 Member of Nominating Committee
The Tata Board...

<table>
<thead>
<tr>
<th>Name of member</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ratan N Tata (Chairman)</td>
<td>Promoter, non-executive</td>
</tr>
<tr>
<td>R Gopalakrishnan (Vice-Chairman)</td>
<td>Promoter, non-executive</td>
</tr>
<tr>
<td>Keshub Mahindra</td>
<td>Independent, non-executive</td>
</tr>
<tr>
<td>D M Ghia</td>
<td>-do-</td>
</tr>
<tr>
<td>Nusli N Wadia</td>
<td>-do-</td>
</tr>
<tr>
<td>R C Khanna</td>
<td>-do-</td>
</tr>
<tr>
<td>Dr D V Kapur</td>
<td>-do-</td>
</tr>
<tr>
<td>U M Rao (ICICI Bank Nominee) (Nomination withdrawn w.e.f. November 4, 2004)</td>
<td>-do-</td>
</tr>
<tr>
<td>Homi Khusrokhan (Managing Director)</td>
<td>Executive</td>
</tr>
<tr>
<td>Dr T Mukherjee</td>
<td>Non-independent, non-executive</td>
</tr>
<tr>
<td>Dr Vijay L Kelkar (Additional Director w.e.f. October 19, 2004)</td>
<td>Independent, non-executive</td>
</tr>
</tbody>
</table>
Application Test: Who owns/runs your firm?

Look at: Bloomberg printout HDS for your firm

- Who are the top stockholders in your firm?
- What are the potential conflicts of interests that you see emerging from this stockholding structure?
- If you can, take a look at the board of directors for your firm and the corporate governance structure?
Disney’s top stockholders in 2003

<table>
<thead>
<tr>
<th>Holder Name</th>
<th>Portfolio Name</th>
<th>Source</th>
<th>Held</th>
<th>Outstanding</th>
<th>Change Date</th>
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</thead>
<tbody>
<tr>
<td>DEBARCLAYS GLOBAL</td>
<td>BARCLAYS BANK PLC</td>
<td>13F</td>
<td>83,630M</td>
<td>4.095</td>
<td>1,750M 09/02</td>
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<tr>
<td>2CITIGROUP INC</td>
<td>CITIGROUP INCORPORAT</td>
<td>13F</td>
<td>62,057M</td>
<td>3.078</td>
<td>4,811M 09/02</td>
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<tr>
<td>FIDELITY MANAGEMENT</td>
<td>FIDELITY MANAGEMENT</td>
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<td>56,125M</td>
<td>2.748</td>
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</tr>
<tr>
<td>STATE STREET</td>
<td>STATE STREET CORPORA</td>
<td>13F</td>
<td>54,635M</td>
<td>2.675</td>
<td>2,239M 09/02</td>
</tr>
<tr>
<td>SOUTHEASTERN ASSET M</td>
<td>SOUTHEASTERN ASSET M</td>
<td>13F</td>
<td>47,333M</td>
<td>2.318</td>
<td>14,604M 09/02</td>
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<tr>
<td>6ST FARM Mutual</td>
<td>STATE FARM MUTUAL AU</td>
<td>13F</td>
<td>41,938M</td>
<td>2.054</td>
<td>120,599M 09/02</td>
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<tr>
<td>VANGUARD GROUP</td>
<td>VANGUARD GROUP INC</td>
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<td>1.700</td>
<td>-63,839M 09/02</td>
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<td>IMELON BANK N A</td>
<td>IMELON BANK CORP</td>
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<td>1.601</td>
<td>957,489M 09/02</td>
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<td>PUTRAM INVEST</td>
<td>PUTRAM INVESTMENT TRUST</td>
<td>13F</td>
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<td>1.379</td>
<td>-11,468M 09/02</td>
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<tr>
<td>LORD ABBETT &amp; CO</td>
<td>LORD ABBETT &amp; CO</td>
<td>13F</td>
<td>24,514M</td>
<td>1.202</td>
<td>5,385M 09/02</td>
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<td>MONTAG CALDWELL</td>
<td>MONTAG &amp; CALDWELL IN</td>
<td>13F</td>
<td>24,466M</td>
<td>1.198</td>
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<td>DEUTSCHE BANK AG</td>
<td>13F</td>
<td>23,239M</td>
<td>1.138</td>
<td>-5,002M 09/02</td>
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<td>MORGAN STANLEY</td>
<td>MORGAN STANLEY</td>
<td>13F</td>
<td>19,655M</td>
<td>0.962</td>
<td>3,482M 09/02</td>
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<tr>
<td>HAPICE T ROWE</td>
<td>T ROWE PRICE ASSOCIATES</td>
<td>13F</td>
<td>19,133M</td>
<td>0.937</td>
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<td>PROXY</td>
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<td>17,547M</td>
<td>0.869</td>
<td>128,710M 12/01</td>
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<td>ALLIANCE CAPITAL MAN</td>
<td>13F</td>
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<td>0.699</td>
<td>69,353M 09/02</td>
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<td>JP MORGAN CHASE</td>
<td>JP MORGAN CHASE &amp; CO</td>
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<td>462,791M 09/02</td>
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Sub-totals for current page: 599,159M 25,340
Tata Chemical’s top stockholders in 2007

<table>
<thead>
<tr>
<th>Holder name</th>
<th>Portfolio Name</th>
<th>Source</th>
<th>Held</th>
<th>Percent</th>
<th>Latest Filing Date</th>
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<tbody>
<tr>
<td>TATA SONS LTD</td>
<td>n/a</td>
<td>Co File</td>
<td>33,174</td>
<td>15.423</td>
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<td>LIFE INS INDIA</td>
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<td>4,851M 12/06</td>
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<tr>
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<td>Co File</td>
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<td>7.671</td>
<td>300,000 12/06</td>
</tr>
<tr>
<td>TATA TEA LTD</td>
<td>n/a</td>
<td>Co File</td>
<td>15,386</td>
<td>7.153</td>
<td>12/06</td>
</tr>
<tr>
<td>NEW INDIA ASSURA</td>
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<td>Co File</td>
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<td>2.818</td>
<td>1,008M 12/06</td>
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<tr>
<td>INDUSTAN LEVER</td>
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<td>Co File</td>
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<td>2.572</td>
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<td>GEN INSURANCE</td>
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<td>Co File</td>
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<td>500,000 12/06</td>
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<tr>
<td>NATIONAL INSURANCE</td>
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<td>UNITED INDIA INS</td>
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<td>TEMPLETON ASSET</td>
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<td>UNIT TRUST</td>
<td>UTI MASTER EQUITY PL MF-IN</td>
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<td>0.930</td>
<td>07/07</td>
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<td>SUNDARAM NEWTON</td>
<td>SUNDARAM BNP PARIBAS MF-IN</td>
<td></td>
<td>1,510</td>
<td>0.702</td>
<td>06/07</td>
</tr>
<tr>
<td>HSBC INVESTMENT</td>
<td>HSBC INDIAN EQUITY MF-LX</td>
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<td>1,509</td>
<td>0.702</td>
<td>01/07</td>
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<tr>
<td>FRANKLIN TEMPLETON</td>
<td>FRANKLIN TEMPLETON B MF-LX</td>
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<tr>
<td>UNIT TRUST</td>
<td>UTI MASTERSHARE MF-IN</td>
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<td>UNIT TRUST</td>
<td>UTI DIVIDEND YIELD F MF-IN</td>
<td></td>
<td>1,064</td>
<td>0.495</td>
<td>07/07</td>
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<tr>
<td>DSP MERRILL</td>
<td>DSP MERRILL LYNCH EQ MF-IN</td>
<td></td>
<td>685,066</td>
<td>31.38</td>
<td>-817 06/07</td>
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</table>

Sub-totals for current page:
- Total Held: 129,394
- Total Percent: 60.155
When traditional corporate financial theory breaks down, the solution is:

- To choose a different mechanism for corporate governance
- To choose a different objective for the firm.
- To maximize stock price, but reduce the potential for conflict and breakdown:
  - Making managers (decision makers) and employees into stockholders
  - By providing information honestly and promptly to financial markets
An Alternative Corporate Governance System

- Germany and Japan developed a different mechanism for corporate governance, based upon corporate cross holdings.
  - In Germany, the banks form the core of this system.
  - In Japan, it is the keiretsus
  - Other Asian countries have modeled their system after Japan, with family companies forming the core of the new corporate families

- At their best, the most efficient firms in the group work at bringing the less efficient firms up to par. They provide a corporate welfare system that makes for a more stable corporate structure

- At their worst, the least efficient and the most poorly run firms in the group pull down the most efficient and best run firms. The nature of the cross holdings makes it very difficult for outsiders (including investors in these firms) to figure out how well or badly the group is doing.
Choose a Different Objective Function

- Firms can always focus on a different objective function. Examples would include
  - maximizing earnings
  - maximizing revenues
  - maximizing firm size
  - maximizing market share
  - maximizing EVA

- The key thing to remember is that these are intermediate objective functions.
  - To the degree that they are correlated with the long term health and value of the company, they work well.
  - To the degree that they do not, the firm can end up with a disaster
Maximize stock prices, subject to…
The self-correcting objective

STOCKHOLDERS

1. More activist investors
2. Hostile takeovers

Managers of poorly run firms are put on notice.

BONDHOLDERS

1. Covenants
2. New Types

Protect themselves

Managers

Firms are punished for misleading markets

Corporate Good Citizen Constraints

1. More laws
2. Investor/Customer Backlash

FINANCIAL MARKETS

Investors and analysts become more skeptical

SOCIETY

Managers

Aswath Damodaran
Picking the Right Projects: Investment Analysis

“Let us watch well our beginnings, and results will manage themselves”

Alexander Clark
First Principles

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

- 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 cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders’ characteristics.
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”. The Chinese symbols for risk, reproduced below, give a much better description of risk.

危機

- The first symbol is the symbol for “danger”, while the second is the symbol for “opportunity”, making risk a mix of danger and opportunity.
Risk and Return Models in Finance…

Step 1: Defining Risk

The risk in an investment can be measured by the variance in actual returns around an expected return.

- **Riskless Investment**
- **Low Risk Investment**
- **High Risk Investment**

Step 2: Differentiating between Rewarded and Unrewarded Risk

- **Risk that is specific to investment (Firm Specific)**
  - Can be diversified away in a diversified portfolio
  - The marginal investor is assumed to hold a “diversified” portfolio. Thus, only market risk will be rewarded and priced.

- **Risk that affects all investments (Market Risk)**
  - Cannot be diversified away since most assets are affected by it.

Step 3: Measuring Market Risk

<table>
<thead>
<tr>
<th>The CAPM</th>
<th>The APM</th>
<th>Multi-Factor Models</th>
<th>Proxy Models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>If there is</strong></td>
<td><strong>If there are no arbitrage opportunities</strong></td>
<td><strong>Since market risk affects most or all investments, it must come from macro economic factors.</strong></td>
<td><strong>In an efficient market, differences in returns across long periods must be due to market risk differences. Looking for variables correlated with returns should then give us proxies for this risk.</strong></td>
</tr>
<tr>
<td>1. no private information</td>
<td>then the market risk of any asset must be captured by betas relative to factors that affect all investments. Market Risk = Risk exposures of any asset to market factors</td>
<td><strong>Market Risk = Market Risk exposures of any asset to macro economic factors.</strong></td>
<td><strong>Market Risk = Captured by the Proxy Variable(s)</strong></td>
</tr>
<tr>
<td>2. no transactions cost the optimal diversified portfolio includes every traded asset. Everyone will hold the market portfolio.</td>
<td><strong>Market Risk = Risk added by any investment to the market portfolio:</strong></td>
<td><strong>Beta of assets relative to specified macroeconomic factors (from a factor analysis)</strong></td>
<td><strong>Equation relating returns to proxy variables (from a regression)</strong></td>
</tr>
<tr>
<td><strong>Market Risk = Risk added by any investment to the market portfolio:</strong></td>
<td><strong>Beta of asset relative to unspecified market factors (from a factor analysis)</strong></td>
<td><strong>Beta of assets relative to unspecified market factors (from a factor analysis)</strong></td>
<td><strong>Beta of asset relative to unspecified market factors (from a factor analysis)</strong></td>
</tr>
</tbody>
</table>
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.
Application Test: Who is the marginal investor in your firm?

The marginal investor in your firm is the investor who is affecting or setting your stock price at the margin. To be a marginal investor you need to

- Own a lot of stock
- Trade on that stock

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

a) An institutional investor
b) An individual investor
c) An insider

- Is this investor likely to be diversified?
Who are Disney’s marginal investors?
Tata Chemical’s investor breakdown in 2007

<table>
<thead>
<tr>
<th>Category</th>
<th>No. of Shares</th>
<th>Percentage</th>
<th>No. of Shareholders</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 500</td>
<td>2,25,07,207</td>
<td>10.46</td>
<td>1,75,703</td>
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<td>501 - 1000</td>
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<td>12,926</td>
<td>6.49</td>
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<td>1001 - 2000</td>
<td>87,86,211</td>
<td>4.09</td>
<td>6,155</td>
<td>3.09</td>
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<tr>
<td>2001 - 3000</td>
<td>46,01,699</td>
<td>2.14</td>
<td>1,855</td>
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<tr>
<td>3001 - 4000</td>
<td>27,70,825</td>
<td>1.29</td>
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<td>4001 - 5000</td>
<td>24,11,227</td>
<td>1.12</td>
<td>528</td>
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<tr>
<td>5001 - 10000</td>
<td>57,32,258</td>
<td>2.66</td>
<td>809</td>
<td>0.41</td>
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<tr>
<td>Greater than 10000</td>
<td>15,86,44,961</td>
<td>73.75</td>
<td>442</td>
<td>0.22</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>21,51,02,651</strong></td>
<td><strong>100.00</strong></td>
<td><strong>199,204</strong></td>
<td><strong>100.00</strong></td>
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</table>

Tata companies and trusts: 31.6%
Institutions & Funds: 34.68%
Foreign Funds: 5.91%
Inputs required to use the CAPM -

The capital asset pricing model yields the following expected return:

Expected Return = Riskfree Rate + Beta * (Expected Return on the Market Portfolio - Riskfree Rate)

To use the model we need three inputs:

(a) The current risk-free rate

(b) The expected market risk premium (the premium expected for investing in risky assets (market portfolio) over the riskless asset)

(c) The beta of the asset being analyzed.
The Riskfree Rate and Time Horizon

- On a riskfree asset, the actual return is equal to the expected return. Therefore, there is no variance around the expected return.
- For an investment to be riskfree, i.e., to have an actual return be 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 it is a zero coupon security with the same maturity as the cash flow being analyzed.
A Purist view of riskfree rates…

- 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 - the 1 year zero coupon rate for the cash flow in year 1, the 2-year zero coupon rate for the cash flow in year 2...
The Bottom Line on Riskfree Rates

- 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.
- For short term analysis, it is entirely appropriate to use a short term government security rate as the riskfree rate.
- The riskfree rate that you use in an analysis should be in the same currency that your cashflows are estimated in.
  - In other words, if your cashflows are in U.S. dollars, your riskfree rate has to be in U.S. dollars as well.
  - If your cash flows are in Euros, your riskfree rate should be a Euro riskfree rate.
- The conventional practice of estimating riskfree rates is to use the government bond rate, with the government being the one that is in control of issuing that currency. In US dollars, this has translated into using the US treasury rate as the riskfree rate. In September 2004, for instance, the ten-year US treasury bond rate was 4%.
What if there is no default-free entity?

- The conventional practice of using the government bond rate as the risk-free rate works only if the government is perceived to have no default risk.
- If the government is perceived to have default risk, the government bond rate will have a default spread component in it and not be riskfree. There are three choices we have, when this is the case.
  - Adjust the local currency government borrowing rate for default risk to get a riskless local currency rate. In September 2007, the Indian government rupee bond rate was 7.91%. India’s local currency rating from Moody’s was Baa2 and the typical default spread for a Baa2 rated country bond was 1.15%.
    Riskfree rate in rupees = 7.91% - 1.15% = 6.76%
  - Do the analysis in an alternate currency, where getting the riskfree rate is easier.
  - Do your analysis in real terms, in which case the riskfree rate has to be a real riskfree rate. The inflation-indexed treasury rate is a measure of a real riskfree rate.
Measurement of the risk premium

- The risk premium is the premium that investors demand for investing in an average risk investment, relative to the risk-free rate.
- As a general proposition, this premium should be
  - increase with the riskiness of the “average” risk investment
  - increase with the risk aversion of the investors in that market
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?

a) Less than 5%
b) Between 5 - 7%
c) Between 7 - 9%
d) Between 9 - 11%
e) Between 11- 13%
f) More than 13%

Check your premium against the survey premium on my web site.
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?

a) I would demand a larger premium
b) I would demand a smaller premium
c) I would demand the same premium
Estimating Risk Premiums in Practice

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

- Surveying all investors in a market place is impractical.
- However, you can survey a few individuals and use these results. In practice, this translates into surveys of the following:
  - Mutual fund managers about equity returns in the future
  - CFOs about a reasonable equity risk premium
  - Academics about a reasonable equity risk premium

- The limitations of this approach are:
  - there are no constraints on reasonability (the survey could produce negative risk premiums or risk premiums of 50%)
  - The survey results are extremely volatile
  - they tend to be short term; even the longest surveys do not go beyond one year.
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:
  - Defines a time period for the estimation (1928-Present, 1962-Present,...)
  - Calculates average returns on a stock index during the period.
  - Calculates average returns on a riskless security over the period.
  - Calculates the difference between the two averages and uses it as a premium looking forward.
- The limitations of this approach are:
  - It assumes that the risk aversion of investors has not changed in a systematic way across time. (The risk aversion may change from year to year, but it reverts back to historical averages)
  - It assumes that the riskiness of the “risky” portfolio (stock index) has not changed in a systematic way across time.
### Historical Average Premiums for the United States

<table>
<thead>
<tr>
<th></th>
<th>Arithmetic Average</th>
<th>Geometric Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stocks – T. Bills</td>
<td>Stocks – T. Bonds</td>
</tr>
<tr>
<td>1928-2008</td>
<td>7.30%</td>
<td>5.65%</td>
</tr>
<tr>
<td></td>
<td>(2.29%)</td>
<td>(2.40%)</td>
</tr>
<tr>
<td>1959-2008</td>
<td>5.14%</td>
<td>3.33%</td>
</tr>
<tr>
<td></td>
<td>(2.39%)</td>
<td>(2.63%)</td>
</tr>
<tr>
<td>1999-2008</td>
<td>-2.53%</td>
<td>-6.26%</td>
</tr>
<tr>
<td></td>
<td>(6.36%)</td>
<td>(8.85%)</td>
</tr>
</tbody>
</table>

#### What is the right premium?

- Go back as far as you can. Otherwise, the standard error in the estimate will be large.

\[
\text{Std Error in estimate} = \frac{\text{Annualized Std deviation in Stock prices}}{\sqrt{\text{Number of years of historical data}}}
\]

- Be consistent in your use of a riskfree rate.
- Use arithmetic premiums for one-year estimates of costs of equity and geometric premiums for estimates of long term costs of equity.

**Data Source:** Check out the returns by year and estimate your own historical premiums by going to [updated data on my web site](#).
What about historical premiums for other markets?

- Historical data for markets outside the United States is available for much shorter time periods. The problem is even greater in emerging markets.
- The historical premiums that emerge from this data reflects this and there is much greater error associated with the estimates of the premiums.
One solution: Look at a country’s bond rating and default spreads as a start

- Ratings agencies such as S&P and Moody’s assign ratings to countries that reflect their assessment of the default risk of these countries. These ratings reflect the political and economic stability of these countries and thus provide a useful measure of country risk. In September 2007, for instance, India had a country rating of Baa2.
- If a country issues bonds denominated in a different currency (say dollars or euros), you can also see how the bond market views the risk in that country. India does not have any such bonds but the typical normalized default spread for countries with the same rating as India is 1.15%.
- Many analysts add this default spread to the US risk premium to come up with a risk premium for a country. Using this approach would yield a risk premium of 6.06% for India, if we use 4.91% as the premium for the US (in 2007).
Beyond the default spread

- 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. If we can compute how much more risky the equity market is, relative to the bond market, we could use this information. For example,
  - Standard Deviation in Sensex (Equity) = 24%
  - Standard Deviation in Indian government bond = 16%
  - Default spread based upon rating = 1.15%
  - Country Risk Premium for India = 1.15% (24%/16%) = 1.72%

- Note that this is on top of the premium you estimate for a mature market. Thus, if you assume that the risk premium in the US is 4.91% (in 2007), the risk premium for India would be 6.63%.
An alternate view of ERP: Watch what I pay, not what I say..

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend Yield</th>
<th>Buybacks/Index</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1.37%</td>
<td>1.25%</td>
<td>2.62%</td>
</tr>
<tr>
<td>2002</td>
<td>1.81%</td>
<td>1.58%</td>
<td>3.39%</td>
</tr>
<tr>
<td>2003</td>
<td>1.61%</td>
<td>1.23%</td>
<td>2.84%</td>
</tr>
<tr>
<td>2004</td>
<td>1.57%</td>
<td>1.78%</td>
<td>3.35%</td>
</tr>
<tr>
<td>2005</td>
<td>1.79%</td>
<td>3.11%</td>
<td>4.90%</td>
</tr>
<tr>
<td>2006</td>
<td>1.77%</td>
<td>3.38%</td>
<td>5.15%</td>
</tr>
<tr>
<td>2007</td>
<td>1.89%</td>
<td>4.00%</td>
<td>5.89%</td>
</tr>
</tbody>
</table>

Average yield between 2001-2007 = 4.02%

Between 2001 and 2007 dividends and stock buybacks averaged 4.02% of the index each year.

Analysts expect earnings to grow 5% a year for the next 5 years. We will assume that dividends & buybacks will keep pace..
Last year’s cashflow (59.03) growing at 5% a year

After year 5, we will assume that earnings on the index will grow at 4.02%, the same rate as the entire economy (= riskfree rate).

January 1, 2008
S&P 500 is at 1468.36
4.02% of 1468.36 = 59.03
Solving for the implied premium...

- If we know what investors paid for equities at the beginning of 2007 and we can estimate the expected cash flows from equities, we can solve for the rate of return that they expect to make (IRR):

\[
1468.36 = \frac{61.98}{(1 + r)} + \frac{65.08}{(1 + r)^2} + \frac{68.33}{(1 + r)^3} + \frac{71.75}{(1 + r)^4} + \frac{75.34}{(1 + r)^5} + \frac{75.35(1.0402)}{(r - .0402)(1 + r)^5}
\]

- Expected Return on Stocks = 8.39%
- Implied Equity Risk Premium = Expected Return on Stocks - T.Bond Rate
  = 8.39% - 4.02% = 4.37%
Implied Premiums in the US: 1960-2007
A year that made a difference.. The implied premium in January 2009

<table>
<thead>
<tr>
<th>Year</th>
<th>Market value of index</th>
<th>Dividends</th>
<th>Buybacks</th>
<th>Cash to equity</th>
<th>Dividend yield</th>
<th>Buyback yield</th>
<th>Total yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1148.09</td>
<td>15.74</td>
<td>14.34</td>
<td>30.08</td>
<td>1.37%</td>
<td>1.25%</td>
<td>2.62%</td>
</tr>
<tr>
<td>2002</td>
<td>879.82</td>
<td>15.96</td>
<td>13.87</td>
<td>29.83</td>
<td>1.81%</td>
<td>1.58%</td>
<td>3.39%</td>
</tr>
<tr>
<td>2003</td>
<td>1111.91</td>
<td>17.88</td>
<td>13.70</td>
<td>31.58</td>
<td>1.61%</td>
<td>1.23%</td>
<td>2.84%</td>
</tr>
<tr>
<td>2004</td>
<td>1211.92</td>
<td>19.01</td>
<td>21.59</td>
<td>40.60</td>
<td>1.57%</td>
<td>1.78%</td>
<td>3.35%</td>
</tr>
<tr>
<td>2005</td>
<td>1248.29</td>
<td>22.34</td>
<td>38.82</td>
<td>61.17</td>
<td>1.79%</td>
<td>3.11%</td>
<td>4.90%</td>
</tr>
<tr>
<td>2006</td>
<td>1418.30</td>
<td>25.04</td>
<td>48.12</td>
<td>73.16</td>
<td>1.77%</td>
<td>3.39%</td>
<td>5.16%</td>
</tr>
<tr>
<td>2007</td>
<td>1468.36</td>
<td>28.14</td>
<td>67.22</td>
<td>95.36</td>
<td>1.92%</td>
<td>4.58%</td>
<td>6.49%</td>
</tr>
<tr>
<td>2008</td>
<td>903.25</td>
<td>28.47</td>
<td>40.25</td>
<td>68.72</td>
<td>3.15%</td>
<td>4.61%</td>
<td>7.77%</td>
</tr>
<tr>
<td>Normalized</td>
<td>903.25</td>
<td>28.47</td>
<td>24.11</td>
<td>52.584</td>
<td>3.15%</td>
<td>2.67%</td>
<td>5.82%</td>
</tr>
</tbody>
</table>

In 2008, the actual cash returned to stockholders was 68.72. However, there was a 41% dropoff in buybacks in Q4. We reduced the total buybacks for the year by that amount.

Analysts expect earnings to grow 4% a year for the next 5 years. We will assume that dividends & buybacks will keep pace.

Last year’s cashflow (52.58) growing at 4% a year

54.69
56.87
59.15
61.52
63.98

\[
903.25 = \frac{54.69}{1+r} + \frac{56.87}{(1+r)^2} + \frac{59.15}{(1+r)^3} + \frac{61.52}{(1+r)^4} + \frac{63.98}{(1+r)^5} + \frac{63.98(1.0221)}{(1+r)^5}
\]

Expected Return on Stocks (1/1/09) = 8.64%
Equity Risk Premium = 8.64% - 2.21% = 6.43%

After year 5, we will assume that earnings on the index will grow at 2.21%, the same rate as the entire economy (= riskfree rate).

January 1, 2009
S&P 500 is at 903.25
Adjusted Dividends & Buybacks for 2008 = 52.58
The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009
Implied premium for the Sensex (September 2007)

- Inputs for the computation
  - Sensex on 9/5/07 = 15446
  - Dividend yield on index = 3.05%
  - Expected growth rate - next 5 years = 14%
  - Growth rate beyond year 5 = 6.76% (set equal to riskfree rate)
- Solving for the expected return:

\[
15446 = \frac{537.06}{1+r} + \frac{612.25}{(1+r)^2} + \frac{697.86}{(1+r)^3} + \frac{795.67}{(1+r)^4} + \frac{907.07}{(1+r)^5} + \frac{907.07(1.0676)}{(r - .0676)(1+r)^5}
\]

- Expected return on stocks = 11.18%
- Implied equity risk premium for India = 11.18% - 6.76% = 4.42%
Application Test: Estimating a Market Risk Premium

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

a) About 3.9%, which is the geometric average premium since 1928, for stocks over treasury bonds.
b) About 6.5%, which is the implied premium in the US market today.

What would you use for another developed market (say Germany or France)?

a) The historical risk premium for that market
b) The risk premium for the United States

What would you use for an emerging market?

a) The historical risk premium for that market
b) The risk premium for the United States
c) The risk premium for the United States + Country Risk premium
Estimating Beta

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.
Analyzing 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.
  \[ R_j = R_f + b (R_m - R_f) = R_f (1-b) + b R_m \]
  
  - Capital Asset Pricing Model
  
  - Regression Equation

- If
  
  - \( a > R_f (1-b) \) .... Stock did better than expected during regression period
  - \( a = R_f (1-b) \) .... Stock did as well as expected during regression period
  - \( a < R_f (1-b) \) .... Stock did worse than expected during regression period

- The difference between the intercept and \( R_f (1-b) \) is called **Jensen's alpha**. If it is positive, your stock did perform better than expected during the period of the regression.
Breaking down risk..

- 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

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

- **Decide on a return interval - daily, weekly, monthly**
  - Shorter intervals yield more observations, but suffer from more noise.
  - Noise is created by stocks not trading and biases all betas towards one.

- **Estimate returns (including dividends) on stock**
  - Return = \( \frac{\text{Price}_{\text{End}} - \text{Price}_{\text{Beginning}} + \text{Dividends}_{\text{Period}}}{\text{Price}_{\text{Beginning}}} \)
  - Included dividends only in ex-dividend month

- **Choose a market index, and estimate returns (inclusive of dividends) on the index for each interval for the period.**
Choosing the Parameters: Disney

- Period used: 5 years
- Return Interval = Monthly
- Market Index: S&P 500 Index.
- For instance, to calculate returns on Disney in December 1999,
  - Price for Disney at end of November 1999 = $27.88
  - Price for Disney at end of December 1999 = $29.25
  - Dividends during month = $0.21 (It was an ex-dividend month)
  - Return = ($29.25 - $27.88 + $0.21)/$27.88 = 5.69%
- To estimate returns on the index in the same month
  - Index level (including dividends) at end of November 1999 = 1388.91
  - Index level (including dividends) at end of December 1999 = 1469.25
  - Return = (1469.25 - 1388.91)/1388.91 = 5.78%
Disney’s Historical Beta

Figure 4.3: Disney versus S&P 500: 1999 - 2003

Regression line
The Regression Output

Using monthly returns from 1999 to 2003, we ran a regression of returns on Disney stock against the S&P 500. The output is below:

\[ \text{Returns}_{\text{Disney}} = 0.0467\% + 1.01 \ \text{Returns}_{\text{S & P 500}} \quad (R \ \text{squared} = 29\%) \]

\[ \text{(0.20)} \]

In this regression,

- Intercept = 0.0467\%
- Slope = 1.01 (with a standard error of 0.20)
- 29% of the variation in Disney returns, over this period, was explained by the market (S&P 500).
Analyzing Disney’s Performance

- **Intercept = 0.0467%. What does this tell us?**
  - This is an intercept based on monthly returns. Thus, it has to be compared to a **monthly riskfree rate over the period of your regression**.
  - Between 1999 and 2003,
    - Monthly Riskfree Rate = 0.313% (based upon average T.Bill rate: 99-03)
    - Riskfree Rate (1-Beta) = 0.313% (1-1.01) = -0.0032%

- The Comparison is then between
  - **What actually happened** versus **What we expected to happen (given the CAPM)**
  - Intercept 0.0467% versus Riskfree Rate (1 - Beta) 0.313%(1-1.01) = -0.0032%
  - Jensen’s Alpha = 0.0467% -(-0.0032%) = 0.05%

- Disney did 0.05% better than expected, per month, between 1999 and 2003.
  - Annualized, Disney’s annual excess return = (1.0005)\(^{12}\)-1= 0.60%
Estimating Disney’s Beta

- Slope of the Regression of 1.01 is the beta
- Regression parameters are always estimated with error. The error is captured in the standard error of the beta estimate, which in the case of Disney is 0.20.
- Assume that I asked you what Disney’s true beta is, after this regression.
  - What is your best point estimate?
  - What range would you give me, with 67% confidence?
  - What range would you give me, with 95% confidence?
Breaking down Disney’s Risk

- R Squared = 29%
- This implies that
  - 29% of the risk at Disney comes from market sources
  - 71%, therefore, comes from firm-specific sources
- The firm-specific risk is diversifiable and will not be rewarded. Beta captures the market risk in this investment and should be rewarded by a higher expected return.
HISTORICAL BETA

Number of points may be insufficient for an accurate beta.

DIS: US Equity SPX

Relative Index: SPX

Period: Monthly
Range: 1/29/95 to 12/31/03

Market: Trade

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADJ BETA</td>
<td>1.01</td>
</tr>
<tr>
<td>RAW BETA</td>
<td>1.01</td>
</tr>
<tr>
<td>Alpha (Intercept)</td>
<td>-0.03</td>
</tr>
<tr>
<td>R2 (Correlation)</td>
<td>0.29</td>
</tr>
<tr>
<td>Std Dev of Error</td>
<td>7.95</td>
</tr>
<tr>
<td>Std Error of Beta</td>
<td>0.21</td>
</tr>
<tr>
<td>Number of Points</td>
<td>59</td>
</tr>
</tbody>
</table>

\[
ADJ\ BETA = (0.67) \times RAW\ BETA + (0.33) \times 1.0
\]

Aswath Damodaran

Beta Estimation: Using a Service (Bloomberg)
Estimating Expected Returns for Disney in September 2004

- Inputs to the expected return calculation
  - Disney’s Beta = 1.01
  - Riskfree Rate = 4.00% (U.S. ten-year T.Bond rate)
  - Risk Premium = 4.82% (Approximate historical premium: 1928-2003)

- Expected Return = Riskfree Rate + Beta (Risk Premium)
  
  \[ = 4.00\% + 1.01(4.82\%) = 8.87\% \]
Use to a Potential Investor in Disney

As a potential investor in Disney, what does this expected return of 8.87% tell you?

a) 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,
b) This is the return that I need to make on Disney in the long term to break even on my investment in the stock

c) Both

Assume now that you are an active investor and that your research suggests that an investment in Disney will yield 12.5% a year for the next 5 years. Based upon the expected return of 8.87%, you would

a) Buy the stock
b) Sell the stock
How managers use this expected return

- Managers at Disney
  - need to make at least 8.87% 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 8.87%.
- What is the cost of not delivering this cost of equity?
Regression Diagnostics for Tata Chemicals

Jensen’s $\alpha$
\[= -0.22\% - \frac{6.00\%}{52} (1 - 0.88) = -0.23\%\]
Annualized = \((1 - 0.0023)^{52} - 1\) = -11.46%

Expected Return
\[= \text{Riskfree Rate} + \text{Beta} \times \text{Risk premium}\]
\[= 6.76\% + 0.88 (4.91\% + 1.72\%) = 12.59\%\]

Beta = 0.88
67% range
0.77 - 0.99

37% market risk
63% firm specific
Application Test: Analyzing the Risk Regression

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

- How well or badly did your stock do, relative to the market, during the period of the regression? (You can assume an annualized riskfree rate of 4% during the regression period)

  \[ \text{Intercept} - \left( \frac{4\%}{52} \right) (1 - \text{Beta}) = \text{Jensen’s Alpha} \]

  Your regressions are all weekly regressions.

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

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

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

  \[ \text{Riskless Rate} + \text{Beta} \times \text{Risk Premium} \]
You are advising a very risky software firm on the right cost of equity to use in project analysis. You estimate a beta of 3.0 for the firm and come up with a cost of equity of 27.5%. 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?

a) Yes
b) No
### Beta: Exploring Fundamentals

<table>
<thead>
<tr>
<th>Beta</th>
<th>Company</th>
<th>Beta Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 1</td>
<td>Real Networks</td>
<td>3.24</td>
</tr>
<tr>
<td></td>
<td>Qwest Communications</td>
<td>2.60</td>
</tr>
<tr>
<td>&gt; 1</td>
<td>Microsoft</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>General Electric</td>
<td>1.10</td>
</tr>
<tr>
<td>= 1</td>
<td><em>Enron</em></td>
<td>0.95</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>Philip Morris</td>
<td>0.65</td>
</tr>
<tr>
<td>&lt; 1</td>
<td>Exxon Mobil</td>
<td>0.40</td>
</tr>
<tr>
<td>= 0</td>
<td>Harmony Gold Mining</td>
<td>-0.10</td>
</tr>
</tbody>
</table>
Determinant 1: Product Type

- **Industry Effects**: 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.
  - Cyclical 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
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

Fixed Costs Measure = Fixed Costs / Variable Costs

- This measures the relationship between fixed and variable costs. The higher the proportion, the higher the operating leverage.

EBIT Variability Measure = % Change in EBIT / % Change in Revenues

- This measures how quickly the earnings before interest and taxes changes as revenue changes. The higher this number, the greater the operating leverage.
Disney’s Operating Leverage: 1987-2003

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Sales</th>
<th>% Change in Sales</th>
<th>EBIT</th>
<th>% Change in EBIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>2877</td>
<td></td>
<td>756</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>3438</td>
<td>19.50%</td>
<td>848</td>
<td>12.17%</td>
</tr>
<tr>
<td>1989</td>
<td>4594</td>
<td>33.62%</td>
<td>1177</td>
<td>38.80%</td>
</tr>
<tr>
<td>1990</td>
<td>5844</td>
<td>27.21%</td>
<td>1368</td>
<td>16.23%</td>
</tr>
<tr>
<td>1991</td>
<td>6182</td>
<td>5.78%</td>
<td>1124</td>
<td>-17.84%</td>
</tr>
<tr>
<td>1992</td>
<td>7504</td>
<td>21.38%</td>
<td>1287</td>
<td>14.50%</td>
</tr>
<tr>
<td>1993</td>
<td>8529</td>
<td>13.66%</td>
<td>1560</td>
<td>21.21%</td>
</tr>
<tr>
<td>1994</td>
<td>10055</td>
<td>17.89%</td>
<td>1804</td>
<td>15.64%</td>
</tr>
<tr>
<td>1995</td>
<td>12112</td>
<td>20.46%</td>
<td>2262</td>
<td>25.39%</td>
</tr>
<tr>
<td>1996</td>
<td>18739</td>
<td>54.71%</td>
<td>3024</td>
<td>33.69%</td>
</tr>
<tr>
<td>1997</td>
<td>22473</td>
<td>19.93%</td>
<td>3945</td>
<td>30.46%</td>
</tr>
<tr>
<td>1998</td>
<td>22976</td>
<td>2.24%</td>
<td>3843</td>
<td>-2.59%</td>
</tr>
<tr>
<td>1999</td>
<td>23435</td>
<td>2.00%</td>
<td>3580</td>
<td>-6.84%</td>
</tr>
<tr>
<td>2000</td>
<td>25418</td>
<td>8.46%</td>
<td>2525</td>
<td>-29.47%</td>
</tr>
<tr>
<td>2001</td>
<td>25172</td>
<td>-0.97%</td>
<td>2832</td>
<td>12.16%</td>
</tr>
<tr>
<td>2002</td>
<td>25329</td>
<td>0.62%</td>
<td>2384</td>
<td>-15.82%</td>
</tr>
<tr>
<td>2003</td>
<td>27061</td>
<td>6.84%</td>
<td>2713</td>
<td>13.80%</td>
</tr>
<tr>
<td>1987-2003</td>
<td>15.83%</td>
<td>15.83%</td>
<td>10.09%</td>
<td></td>
</tr>
<tr>
<td>1996-2003</td>
<td>11.73%</td>
<td>11.73%</td>
<td>4.42%</td>
<td></td>
</tr>
</tbody>
</table>

DOL = 10.09%/15.83% = 0.64
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
Equity Betas and Leverage

The beta of equity alone can be written as a function of the unlevered beta and the debt-equity ratio

\[ \beta_L = \beta_u (1 + ((1-t)D/E)) \]

where
- \( \beta_L \) = Levered or Equity Beta
- \( \beta_u \) = Unlevered Beta
- \( t \) = Corporate marginal tax rate
- \( D \) = Market Value of Debt
- \( E \) = Market Value of Equity
The regression beta for Disney is 1.01. 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 (1999 to 2003).

The average debt equity ratio during this period was 27.5%.

The unlevered beta for Disney can then be estimated (using a marginal tax rate of 37.3%)

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

\[
\text{Unlevered Beta} = \frac{1.01}{1 + (1 - 0.373) \times 0.275} = 0.8615
\]
## Disney: Beta and Leverage

<table>
<thead>
<tr>
<th>Debt to Capital</th>
<th>Debt/Equity Ratio</th>
<th>Beta</th>
<th>Effect of Leverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0.00%</td>
<td>0.86</td>
<td>0.00</td>
</tr>
<tr>
<td>10.00%</td>
<td>11.11%</td>
<td>0.92</td>
<td>0.06</td>
</tr>
<tr>
<td>20.00%</td>
<td>25.00%</td>
<td>1.00</td>
<td>0.14</td>
</tr>
<tr>
<td>30.00%</td>
<td>42.86%</td>
<td>1.09</td>
<td>0.23</td>
</tr>
<tr>
<td>40.00%</td>
<td>66.67%</td>
<td>1.22</td>
<td>0.36</td>
</tr>
<tr>
<td>50.00%</td>
<td>100.00%</td>
<td>1.40</td>
<td>0.54</td>
</tr>
<tr>
<td>60.00%</td>
<td>150.00%</td>
<td>1.67</td>
<td>0.81</td>
</tr>
<tr>
<td>70.00%</td>
<td>233.33%</td>
<td>2.12</td>
<td>1.26</td>
</tr>
<tr>
<td>80.00%</td>
<td>400.00%</td>
<td>3.02</td>
<td>2.16</td>
</tr>
<tr>
<td>90.00%</td>
<td>900.00%</td>
<td>5.72</td>
<td>4.86</td>
</tr>
</tbody>
</table>
The beta of a portfolio is always the market-value weighted average of the betas of the individual investments in that portfolio.

Thus,

- The beta of a mutual fund is the weighted average of the betas of the stocks and other investments in that portfolio.
- The beta of a firm after a merger is the market-value weighted average of the betas of the companies involved in the merger.
- The beta of a firm involved in multiple businesses should be a weighted average of the betas of the individual business, with the weights reflecting the value contributed by each business.
Bottom-up versus Top-down Beta

- The top-down beta for a firm comes from a regression.
- The bottom up beta can be estimated by doing the following:
  - Find out the businesses that a firm operates in.
  - Find the unlevered betas of other firms in these businesses.
  - Take a weighted (by sales or operating income) average of these unlevered betas.
  - Lever up using the firm’s debt/equity ratio.
- The bottom up beta will give you a better estimate of the true beta when:
  - the standard error of the beta from the regression is high (and) the beta for a firm is very different from the average for the business.
  - the firm has reorganized or restructured itself substantially during the period of the regression.
  - when a firm is not traded.
## Disney’s business breakdown

<table>
<thead>
<tr>
<th>Business</th>
<th>Comparable firms</th>
<th>Number of firm</th>
<th>Average levered beta</th>
<th>Median D/E</th>
<th>Unlevered beta</th>
<th>Cash/Firm Value</th>
<th>Unlevered beta corrected for cash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Networks</td>
<td>Radio and TV broadcasting companies</td>
<td>24</td>
<td>1.22</td>
<td>20.45%</td>
<td>1.0768</td>
<td>0.75%</td>
<td>1.0850</td>
</tr>
<tr>
<td>Parks and Resorts</td>
<td>Theme park &amp; Entertainment firms</td>
<td>9</td>
<td>1.58</td>
<td>120.76%</td>
<td>0.8853</td>
<td>2.77%</td>
<td>0.9105</td>
</tr>
<tr>
<td>Studio Entertainment</td>
<td>Movie companies</td>
<td>11</td>
<td>1.16</td>
<td>27.96%</td>
<td>0.9824</td>
<td>14.08%</td>
<td>1.1435</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>Toy and apparel retailers; Entertainment software</td>
<td>77</td>
<td>1.06</td>
<td>9.18%</td>
<td>0.9981</td>
<td>12.08%</td>
<td>1.1353</td>
</tr>
</tbody>
</table>
## Disney’s bottom up beta

The formula for EV/Sales is:

\[
\text{EV/Sales} = \frac{(\text{Market Value of Equity} + \text{Debt} - \text{Cash})}{\text{Sales}}
\]

### Sales from comparable firms

<table>
<thead>
<tr>
<th>Business</th>
<th>Disney's Revenues</th>
<th>EV/Sales</th>
<th>Estimated Value</th>
<th>Firm Value Proportion</th>
<th>Unlevered beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Networks</td>
<td>$10,941</td>
<td>3.41</td>
<td>$37,278.62</td>
<td>49.25%</td>
<td>1.0850</td>
</tr>
<tr>
<td>Parks and Resorts</td>
<td>$6,412</td>
<td>2.37</td>
<td>$15,208.37</td>
<td>20.09%</td>
<td>0.9105</td>
</tr>
<tr>
<td>Studio Entertainment</td>
<td>$7,934</td>
<td>2.63</td>
<td>$19,390.14</td>
<td>25.62%</td>
<td>1.1435</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>$2,344</td>
<td>1.63</td>
<td>$3,814.38</td>
<td>5.04%</td>
<td>1.1353</td>
</tr>
<tr>
<td>Disney</td>
<td>$27,061</td>
<td></td>
<td>$75,691.51</td>
<td>100.00%</td>
<td>1.0674</td>
</tr>
</tbody>
</table>
## Disney’s Cost of Equity

<table>
<thead>
<tr>
<th>Business</th>
<th>Unlevered Beta</th>
<th>D/E Ratio</th>
<th>Levered Beta</th>
<th>Cost of Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Networks</td>
<td>1.0850</td>
<td>26.62%</td>
<td>1.2661</td>
<td>10.10%</td>
</tr>
<tr>
<td>Parks and Resorts</td>
<td>0.9105</td>
<td>26.62%</td>
<td>1.0625</td>
<td>9.12%</td>
</tr>
<tr>
<td>Studio Entertainment</td>
<td>1.1435</td>
<td>26.62%</td>
<td>1.3344</td>
<td>10.43%</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>1.1353</td>
<td>26.62%</td>
<td>1.3248</td>
<td>10.39%</td>
</tr>
<tr>
<td>Disney</td>
<td>1.0674</td>
<td>26.62%</td>
<td>1.2456</td>
<td>10.00%</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?

a) The cost of equity for Disney as a company
b) The cost of equity for each of Disney’s divisions?
The bottom up beta for Tata Chemicals

- Tata Chemicals is in two businesses: chemicals and fertilizers, with the following breakdown of operating income and betas:

<table>
<thead>
<tr>
<th>Business</th>
<th>Revenues</th>
<th>EV/Sales</th>
<th>Value</th>
<th>Weight</th>
<th>Unlevered Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals(93)</td>
<td>$2,117</td>
<td>1.52</td>
<td>$3,217.54</td>
<td>43.35%</td>
<td>0.88</td>
</tr>
<tr>
<td>Fertilizers(94)</td>
<td>$1,836</td>
<td>2.29</td>
<td>$4,204.12</td>
<td>56.65%</td>
<td>0.96</td>
</tr>
<tr>
<td>Company</td>
<td>$7,421.66</td>
<td></td>
<td></td>
<td></td>
<td>0.93</td>
</tr>
</tbody>
</table>

(The unlevered betas across publicly traded companies in emerging markets in each of the businesses were used as estimates.)

- Using the current market debt to equity ratio for the company of 19.17%, we estimated a levered beta of 1.05 for the firm.

  Levered beta = 0.93 \times (1 + (1 - 0.3366) \times 0.1917) = 1.05
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 beta for Bookscape

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

<table>
<thead>
<tr>
<th>Firm</th>
<th>Beta</th>
<th>Debt</th>
<th>Equity</th>
<th>Cash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books-A-Million</td>
<td>0.532</td>
<td>$45</td>
<td>$45</td>
<td>$5</td>
</tr>
<tr>
<td>Borders Group</td>
<td>0.844</td>
<td>$182</td>
<td>$1,430</td>
<td>$269</td>
</tr>
<tr>
<td>Barnes &amp; Noble</td>
<td>0.885</td>
<td>$300</td>
<td>$1,606</td>
<td>$268</td>
</tr>
<tr>
<td>Courier Corp</td>
<td>0.815</td>
<td>$1</td>
<td>$285</td>
<td>$6</td>
</tr>
<tr>
<td>Info Holdings</td>
<td>0.883</td>
<td>$2</td>
<td>$371</td>
<td>$54</td>
</tr>
<tr>
<td>John Wiley &amp;Son</td>
<td>0.636</td>
<td>$235</td>
<td>$1,662</td>
<td>$33</td>
</tr>
<tr>
<td>Scholastic Corp</td>
<td>0.744</td>
<td>$549</td>
<td>$1,063</td>
<td>$11</td>
</tr>
<tr>
<td>Sector</td>
<td>0.7627</td>
<td>$1,314</td>
<td>$6,462</td>
<td>$645</td>
</tr>
</tbody>
</table>

Unlevered Beta = 0.7627/(1+(1-.35)(1314/6462)) = 0.6737
Corrected for Cash = 0.6737 / (1 – 645/(1314+6462)) = 0.7346
Estimating Bookscape Levered Beta and Cost of Equity

- Since the debt/equity ratios used are market debt equity ratios, and the only debt equity ratio we can compute for Bookscape is a book value debt equity ratio, we have assumed that Bookscape is close to the industry average debt to equity ratio of 20.33%.
- Using a marginal tax rate of 40% (based upon personal income tax rates) for Bookscape, we get a levered beta of 0.82.
  
  \[
  \text{Levered beta for Bookscape} = 0.7346 \times (1 + (1 - 0.40) \times 0.2033) = 0.82
  \]
- Using a riskfree rate of 4% (US treasury bond rate) and a historical risk premium of 4.82%:
  
  \[
  \text{Cost of Equity} = 4\% + 0.82 \times (4.82\%) = 7.95\%
  \]
Is Beta an Adequate Measure of Risk for a Private Firm?

- The owners of most private firms are not diversified. Beta measures the risk added on to a diversified portfolio. Therefore, using beta to arrive at a cost of equity for a private firm will
  a) Under estimate the cost of equity for the private firm
  b) Over estimate the cost of equity for the private firm
  c) Could under or over estimate the cost of equity for the private firm
Total Risk versus Market Risk

- Adjust the beta to reflect total risk rather than market risk. This adjustment is a relatively simple one, since the R squared of the regression measures the proportion of the risk that is market risk.
  
  Total Beta = Market Beta / Correlation of the sector with the market

- In the Bookscape example, where the market beta is 0.82 and the average R-squared of the comparable publicly traded firms is 16%,

  \[
  \frac{\text{Market Beta}}{\sqrt{\text{R squared}}} = \frac{0.82}{\sqrt{0.16}} = 2.06
  \]

  - Total Cost of Equity = 4% + 2.06 (4.82%) = 13.93%
Application Test: Estimating a Bottom-up Beta

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 web site by going to updated data.
The cost of capital is a composite cost to the firm of raising financing to fund its projects.

In addition to equity, firms can raise capital from debt.
What is debt?

- General Rule: Debt generally has the following characteristics:
  - Commitment to make fixed payments in the future
  - The fixed payments are tax deductible
  - Failure to make the payments can lead to either default or loss of control of the firm to the party to whom payments are due.

- As a consequence, debt should include
  - Any interest-bearing liability, whether short term or long term.
  - Any lease obligation, whether operating or capital.
Estimating the Cost of Debt

- If the firm has bonds outstanding, and the bonds are traded, the yield to maturity on a long-term, straight (no special features) bond can be used as the interest rate.
- If the firm is rated, use the rating and a typical default spread on bonds with that rating to estimate the cost of debt.
- If the firm is not rated,
  - and it has recently borrowed long term from a bank, use the interest rate on the borrowing or
  - estimate a synthetic rating for the company, and use the synthetic rating to arrive at a default spread and a 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.
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 from the interest coverage ratio:

\[
\text{Interest Coverage Ratio} = \frac{\text{EBIT}}{\text{Interest Expenses}}
\]

- In 2003, Disney had operating income of $2,805 million and interest & lease expenses of $758 million.
  
  \[
  \text{Interest Coverage Ratio} = \frac{2805}{758} = 3.70
  \]

- In 2007, Tata Chemicals had operating income of 5,855 million INR and interest expenses of 470 million INR
  
  \[
  \text{Interest Coverage Ratio} = \frac{5855}{470} = 12.46
  \]

- In 2003, Bookscape had operating income of $2 million and interest expenses of $500,000. The resulting interest coverage ratio is 4.00.
  - Interest coverage ratio = \(\frac{2,000,000}{500,000} = 4.00\)
## Interest Coverage Ratios, Ratings and Default Spreads: Small and Large Market Cap Companies

<table>
<thead>
<tr>
<th>Interest Coverage Ratio</th>
<th>Rating</th>
<th>Typical default spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>If small cap (2007)</td>
<td>If large cap (&gt;5 bil)</td>
<td></td>
</tr>
<tr>
<td>&gt; 12.5</td>
<td>&gt;8.50</td>
<td>AAA</td>
</tr>
<tr>
<td>9.50 - 12.50</td>
<td>6.50-8.50</td>
<td>AA</td>
</tr>
<tr>
<td>7.50 – 9.50</td>
<td>5.50-6.50</td>
<td>A+</td>
</tr>
<tr>
<td>6.00 – 7.50</td>
<td>4.25-5.50</td>
<td>A</td>
</tr>
<tr>
<td>4.50 – 6.00</td>
<td>3.00-4.25</td>
<td>A-</td>
</tr>
<tr>
<td>4.00 – 4.50</td>
<td>2.50-3.00</td>
<td>BBB</td>
</tr>
<tr>
<td>3.50 - 4.00</td>
<td>2.00-2.50</td>
<td>BB+</td>
</tr>
<tr>
<td>3.00 – 3.50</td>
<td>1.90-2.00</td>
<td>BB</td>
</tr>
<tr>
<td>2.50 – 3.00</td>
<td>1.75-1.90</td>
<td>B+</td>
</tr>
<tr>
<td>2.00 - 2.50</td>
<td>1.50-1.75</td>
<td>B</td>
</tr>
<tr>
<td>1.50 – 2.00</td>
<td>1.25-1.50</td>
<td>B-</td>
</tr>
<tr>
<td>1.25 – 1.50</td>
<td>0.80-1.25</td>
<td>CCC</td>
</tr>
<tr>
<td>0.80 – 1.25</td>
<td>0.65-0.80</td>
<td>CC</td>
</tr>
<tr>
<td>0.50 – 0.80</td>
<td>0.20-0.65</td>
<td>C</td>
</tr>
<tr>
<td>&lt; 0.65</td>
<td>&lt;0.20</td>
<td>D</td>
</tr>
</tbody>
</table>
Synthetic Ratings and Costs of Debt

- Disney (2003)
  - Synthetic rating = A-; Actual rating = BBB+
  - Pre-tax Cost of debt based on actual rating = 4% + 1.25% = 5.25%
  - After-tax Cost of debt = 5.25% (1-.373) = 3.29%

- Bookscape (2003)
  - Synthetic Rating = BBB
  - Pre-tax cost of debt = Riskfree Rate + Default Spread = 4% + 1.50% = 5.50%
  - After-tax cost of debt = Pre-tax cost of debt (1- tax rate) = 5.50% (1-.40) = 3.30%

- Tata Chemicals (2007)
  - Synthetic Rating = AA
  - Pre-tax cost of debt = Riskfree Rate + Country Spread + Company spread
    = 6.76% + 1.15% + 0.50% = 8.41%
  - After-tax cost of debt = Pre-tax cost of debt (1- tax rate) = 8.41% (1-.3366) = 5.58%
Default looms larger.. And spreads widen.. The effect of the market crisis – January 2009
Application Test: Estimating a Cost of Debt

Based upon your firm’s current earnings before interest and taxes, its interest expenses, estimate

- An interest coverage ratio for your firm
- A synthetic rating for your firm (use the interest coverage table)
- A pre-tax cost of debt for your firm
- An after-tax cost of debt for your firm
Weights for cost of capital calculation: Market values…

- 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 Debt is more difficult to estimate because few firms have only publicly traded debt. There are two solutions:
  - Assume book value of debt is equal to market value
  - Estimate the market value of debt from the book value
  - For Disney, with book value of 13,100 million, interest expenses of $666 million, a current cost of borrowing of 5.25% and an weighted average maturity of 11.53 years.

\[
\text{Estimated MV of Disney Debt} = 666 \left[ \frac{1}{(1 + 0.0525)^{11.53}} \right] + \frac{13,100}{(1 + 0.0525)^{11.53}} = \$12,915 \text{ million}
\]
Converting Operating Leases to Debt

- The “debt value” of operating leases is the present value of the lease payments, at a rate that reflects their risk.
- In general, this rate will be close to or equal to the rate at which the company can borrow.
Operating Leases at Disney

The pre-tax cost of debt at Disney is 5.25%

<table>
<thead>
<tr>
<th>Year</th>
<th>Commitment</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$271.00</td>
<td>$257.48</td>
</tr>
<tr>
<td>2</td>
<td>$242.00</td>
<td>$218.46</td>
</tr>
<tr>
<td>3</td>
<td>$221.00</td>
<td>$189.55</td>
</tr>
<tr>
<td>4</td>
<td>$208.00</td>
<td>$169.50</td>
</tr>
<tr>
<td>5</td>
<td>$275.00</td>
<td>$212.92</td>
</tr>
<tr>
<td>6–9</td>
<td>$258.25</td>
<td>$704.93</td>
</tr>
</tbody>
</table>

Debt Value of leases = $1,752.85

Debt outstanding at Disney = $12,915 + $1,753 = $14,668 million
Application Test: Estimating Market Value

- Estimate the
  - Market value of equity at your firm and Book Value of equity
  - Market value of debt and book value of debt (If you cannot find 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 market value of debt.

- Estimate the
  - Weights for equity and debt based upon market value
  - Weights for equity and debt based upon book value
Current Cost of Capital: Disney

- **Equity**
  - Cost of Equity = Riskfree rate + Beta * Risk Premium
    
    \[ = 4\% + 1.25 \times (4.82\%) = 10.00\% \]
  - Market Value of Equity = $55.101 Billion
  - Equity/(Debt+Equity) = 79%

- **Debt**
  - After-tax Cost of debt = (Riskfree rate + Default Spread) (1-t)
    
    \[ = (4\% + 1.25\%) \times (1-.373) = 3.29\% \]
  - Market Value of Debt = $14.668 Billion
  - Debt/(Debt + Equity) = 21%

- **Cost of Capital** = 10.00%(.79) + 3.29%(.21) = 8.59%

\[
\frac{55.101}{(55.101 + 14.668)}
\]
## Disney’s Divisional Costs of Capital

<table>
<thead>
<tr>
<th>Business</th>
<th>Cost of Equity</th>
<th>After-tax cost of debt</th>
<th>E/(D+E)</th>
<th>D/(D+E)</th>
<th>Cost of capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media Networks</td>
<td>10.10%</td>
<td>3.29%</td>
<td>78.98%</td>
<td>21.02%</td>
<td>8.67%</td>
</tr>
<tr>
<td>Parks and Resorts</td>
<td>9.12%</td>
<td>3.29%</td>
<td>78.98%</td>
<td>21.02%</td>
<td>7.90%</td>
</tr>
<tr>
<td>Studio Entertainment</td>
<td>10.43%</td>
<td>3.29%</td>
<td>78.98%</td>
<td>21.02%</td>
<td>8.93%</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>10.39%</td>
<td>3.29%</td>
<td>78.98%</td>
<td>21.02%</td>
<td>8.89%</td>
</tr>
<tr>
<td>Disney</td>
<td><strong>10.00%</strong></td>
<td><strong>3.29%</strong></td>
<td><strong>78.98%</strong></td>
<td><strong>21.02%</strong></td>
<td><strong>8.59%</strong></td>
</tr>
</tbody>
</table>
Tata Chemical’s Current Cost of Capital

- **Equity**
  - Cost of Equity = Riskfree rate + Beta * Risk Premium
    - \[ 6.76\% + 1.05(6.63\%) = 13.72\% \]
  - Market Value of Equity = Rs 54.21 Billion
  - Equity/(Debt+Equity) = 84%

- **Debt**
  - After-tax Cost of debt = (Riskfree rate + Default Spread) (1-t)
    - \[ (6.76\%+1.15\%+0.5\%) (1-.3366) = 5.58\% \]
  - Market Value of Debt = $10.39 Billion
  - Debt/(Debt+Equity) = 16%

  Market value of debt = Rs 470 m (PV of annuity, 4.25 years, 8.41%)
  + Rs 12,356 m / 1.0841^{4.25} = Rs 10,390 million

- **Cost of Capital for company** = 13.72%(.84) + 5.58%(.16) = 12.41%

<table>
<thead>
<tr>
<th>Business</th>
<th>Levered Beta</th>
<th>Cost of Equity</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals</td>
<td>0.99</td>
<td>13.32%</td>
<td>12.08%</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>1.08</td>
<td>13.92%</td>
<td>12.59%</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 (capital).
- If returns are measured to equity investors, the appropriate hurdle rate is the cost of equity.
- If returns are measured to capital (or the firm), the appropriate hurdle rate is the cost of capital.
Back to First Principles

- 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 (debt)
  - Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.
- 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 cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders’ characteristics.
Measuring Investment Returns

“Show me the money”

Jerry Maguire
First Principles

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

- 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 cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders’ characteristics.
Measures of return: earnings versus cash flows

- Principles Governing Accounting Earnings Measurement
  - **Accrual Accounting**: Show revenues when products and services are sold or provided, not when they are paid for. Show expenses associated with these revenues rather than cash expenses.
  - **Operating versus Capital Expenditures**: Only expenses associated with creating revenues in the current period should be treated as operating expenses. Expenses that create benefits over several periods are written off over multiple periods (as depreciation or amortization).

- To get from accounting earnings to cash flows:
  - you have to add back non-cash expenses (like depreciation)
  - you have to subtract out cash outflows which are not expensed (such as capital expenditures)
  - you have to make accrual revenues and expenses into cash revenues and expenses (by considering changes in working capital).
Measuring Returns Right: The Basic Principles

- Use cash flows rather than earnings. You cannot spend earnings.
- Use “incremental” cash flows relating to the investment decision, i.e., cashflows that occur as a consequence of the decision, rather than total cash flows.
- Use “time weighted” returns, i.e., value cash flows that occur earlier more than cash flows that occur later.

Earnings versus Cash Flows: A Disney Theme Park

The theme parks to be built near Bangkok, modeled on Euro Disney in Paris, will include a “Magic Kingdom” to be constructed, beginning immediately, and becoming operational at the beginning of the second year, and a second theme park modeled on Epcot Center at Orlando to be constructed in the second and third year and becoming operational at the beginning of the fifth year.

The earnings and cash flows are estimated in nominal U.S. Dollars.
## Earnings on Project

<table>
<thead>
<tr>
<th></th>
<th>Now (0)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Magic Kingdom</strong></td>
<td>$0</td>
<td>$1,000</td>
<td>$1,400</td>
<td>$1,700</td>
<td>$2,000</td>
<td>$2,200</td>
<td>$2,420</td>
<td>$2,662</td>
<td>$2,928</td>
<td>$2,987</td>
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<td><strong>Second Theme Park</strong></td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$300</td>
<td>$500</td>
<td>$550</td>
<td>$605</td>
<td>$666</td>
<td>$732</td>
<td>$747</td>
</tr>
<tr>
<td><strong>Resort &amp; Properties</strong></td>
<td>$0</td>
<td>$250</td>
<td>$350</td>
<td>$500</td>
<td>$625</td>
<td>$688</td>
<td>$756</td>
<td>$832</td>
<td>$915</td>
<td>$933</td>
<td></td>
</tr>
<tr>
<td><strong>Total Revenues</strong></td>
<td></td>
<td>$1,250</td>
<td>$1,750</td>
<td>$2,500</td>
<td>$3,125</td>
<td>$3,438</td>
<td>$3,781</td>
<td>$4,159</td>
<td>$4,575</td>
<td>$4,667</td>
<td></td>
</tr>
<tr>
<td><strong>Magic Kingdom: Operating Expenses</strong></td>
<td>$0</td>
<td></td>
<td>$600</td>
<td>$840</td>
<td>$1,020</td>
<td>$1,200</td>
<td>$1,320</td>
<td>$1,452</td>
<td>$1,597</td>
<td>$1,757</td>
<td>$1,792</td>
</tr>
<tr>
<td><strong>Epcot II: Operating Expenses</strong></td>
<td>$0</td>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$180</td>
<td>$300</td>
<td>$330</td>
<td>$363</td>
<td>$399</td>
<td>$439</td>
<td>$448</td>
</tr>
<tr>
<td><strong>Resort &amp; Property: Operating Expenses</strong></td>
<td>$0</td>
<td></td>
<td>$188</td>
<td>$263</td>
<td>$375</td>
<td>$469</td>
<td>$516</td>
<td>$567</td>
<td>$624</td>
<td>$686</td>
<td>$700</td>
</tr>
<tr>
<td><strong>Depreciation &amp; Amortization</strong></td>
<td>$0</td>
<td></td>
<td>$537</td>
<td>$508</td>
<td>$430</td>
<td>$359</td>
<td>$357</td>
<td>$358</td>
<td>$361</td>
<td>$366</td>
<td>$369</td>
</tr>
<tr>
<td><strong>Allocated G&amp;A Costs</strong></td>
<td>$0</td>
<td></td>
<td>$188</td>
<td>$263</td>
<td>$375</td>
<td>$469</td>
<td>$516</td>
<td>$567</td>
<td>$624</td>
<td>$686</td>
<td>$700</td>
</tr>
<tr>
<td><strong>Operating Income</strong></td>
<td>$0</td>
<td>-$262</td>
<td>-$123</td>
<td>$120</td>
<td>$329</td>
<td>$399</td>
<td>$473</td>
<td>$554</td>
<td>$641</td>
<td>$657</td>
<td></td>
</tr>
<tr>
<td><strong>Taxes</strong></td>
<td>$0</td>
<td>-$98</td>
<td>-$46</td>
<td>$45</td>
<td>$123</td>
<td>$149</td>
<td>$177</td>
<td>$206</td>
<td>$239</td>
<td>$245</td>
<td></td>
</tr>
<tr>
<td><strong>Operating Income after Taxes</strong></td>
<td></td>
<td>-$164</td>
<td>-$77</td>
<td>$75</td>
<td>$206</td>
<td>$250</td>
<td>$297</td>
<td>$347</td>
<td>$402</td>
<td>$412</td>
<td></td>
</tr>
</tbody>
</table>
And the Accounting View of Return

<table>
<thead>
<tr>
<th>Year</th>
<th>After-tax Operating Income</th>
<th>BV of Capital: Beginning</th>
<th>BV of Capital: Ending</th>
<th>Average BV of Capital</th>
<th>ROC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$0</td>
<td>$2,500</td>
<td>$3,500</td>
<td>$3,000</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>-$165</td>
<td>$3,500</td>
<td>$4,294</td>
<td>$3,897</td>
<td>-4.22%</td>
</tr>
<tr>
<td>3</td>
<td>-$77</td>
<td>$4,294</td>
<td>$4,616</td>
<td>$4,455</td>
<td>-1.73%</td>
</tr>
<tr>
<td>4</td>
<td>$75</td>
<td>$4,616</td>
<td>$4,524</td>
<td>$4,570</td>
<td>1.65%</td>
</tr>
<tr>
<td>5</td>
<td>$206</td>
<td>$4,524</td>
<td>$4,484</td>
<td>$4,504</td>
<td>4.58%</td>
</tr>
<tr>
<td>6</td>
<td>$251</td>
<td>$4,484</td>
<td>$4,464</td>
<td>$4,474</td>
<td>5.60%</td>
</tr>
<tr>
<td>7</td>
<td>$297</td>
<td>$4,464</td>
<td>$4,481</td>
<td>$4,472</td>
<td>6.64%</td>
</tr>
<tr>
<td>8</td>
<td>$347</td>
<td>$4,481</td>
<td>$4,518</td>
<td>$4,499</td>
<td>7.72%</td>
</tr>
<tr>
<td>9</td>
<td>$402</td>
<td>$4,518</td>
<td>$4,575</td>
<td>$4,547</td>
<td>8.83%</td>
</tr>
<tr>
<td>10</td>
<td>$412</td>
<td>$4,575</td>
<td>$4,617</td>
<td>$4,596</td>
<td>8.97%</td>
</tr>
<tr>
<td></td>
<td>$175</td>
<td></td>
<td>$4,301</td>
<td></td>
<td>4.23%</td>
</tr>
</tbody>
</table>
Should there be a risk premium for foreign projects?

- The exchange rate risk should be diversifiable risk (and hence should not command a premium) if
  - the company has projects in a large number of countries (or)
  - the investors in the company are globally diversified.

For Disney, this risk should not affect the cost of capital used. Consequently, we would not adjust the cost of capital for Disney’s investments in other mature markets (Germany, UK, France)

- The same diversification argument can also be applied against political risk, which would mean that it too should not affect the discount rate. It may, however, affect the cash flows, by reducing the expected life or cash flows on the project.

For Disney, this is the risk that we are incorporating into the cost of capital when it invests in Thailand (or any other emerging market)
Estimating a hurdle rate for the theme park

- We did estimate a cost of equity of 9.12% for the Disney theme park business in the last chapter, using a bottom-up levered beta of 1.0625 for the business.
- This cost of equity may not adequately reflect the additional risk associated with the theme park being in an emerging market.
- To counter this risk, we compute the cost of equity for the theme park using a risk premium that includes a country risk premium for Thailand:
  - The rating for Thailand is Baa1 and the default spread for the country bond is 1.50%. Multiplying this by the relative volatility of 2.2 of the equity market in Thailand (standard deviation of equity/standard deviation of country bond) yields a country risk premium of 3.3%.
    - Cost of Equity in US $ = 4% + 1.0625 (4.82% + 3.30%) = 12.63%
    - Cost of Capital in US $ = 12.63% (.7898) + 3.29% (.2102) = 10.66%
Do not invest in this park. The return on capital of 4.23% is lower than the cost of capital for theme parks of 10.66%; This would suggest that the project should not be taken.

Given that we have computed the average over an arbitrary period of 10 years, while the theme park itself would have a life greater than 10 years, would you feel comfortable with this conclusion?

a) Yes
b) No
From Project to Firm Return on Capital: Disney in 2003

- Just as a comparison of project return on capital to the cost of capital yields a measure of whether the project is acceptable, a comparison can be made at the firm level, to judge whether the existing projects of the firm are adding or destroying value.

- Disney, in 2003, had earnings before interest and taxes of $2,713 million, had a book value of equity of $23,879 million and a book value of debt of 14,130 million. With a tax rate of 37.3%, we get
  
  Return on Capital = \( \frac{2713(1-.373)}{23879+14130} \) = 4.48%
  
  Cost of Capital for Disney= 8.59%
  
  Excess Return = 4.48%-8.59% = -4.11%

- This can be converted into a dollar figure by multiplying by the capital invested, in which case it is called economic value added
  
  EVA = (0.0448 - 0.0859) (23879+14130) = - $1,562 million
Application Test: Assessing Investment Quality

- For the most recent period for which you have data, compute the after-tax return on capital earned by your firm, where after-tax return on capital is computed to be

\[
\text{After-tax ROC} = \frac{\text{EBIT} \times (1 - \text{tax rate})}{(\text{BV of debt} + \text{BV of Equity})_{\text{previous year}}}
\]

- For the most recent period for which you have data, compute the return spread earned by your firm:

\[
\text{Return Spread} = \text{After-tax ROC} - \text{Cost of Capital}
\]

- For the most recent period, compute the EVA earned by your firm

\[
\text{EVA} = \text{Return Spread} \times ((\text{BV of debt} + \text{BV of Equity})_{\text{previous year}})
\]
The cash flow view of this project..

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Income</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>after Taxes</td>
<td>$2,500</td>
<td>$1,000</td>
<td>$1,269</td>
<td>$805</td>
<td>$301</td>
<td>$287</td>
<td>$321</td>
</tr>
<tr>
<td>+ Depreciation &amp;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amortization</td>
<td>$537</td>
<td>$508</td>
<td>$430</td>
<td>$359</td>
<td>$357</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Capital Expenditures</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2,500</td>
<td>$1,000</td>
<td>$1,269</td>
<td>$805</td>
<td>$301</td>
<td>$287</td>
<td>$321</td>
</tr>
<tr>
<td>- Change in Working Capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$0</td>
<td>$0</td>
<td>$63</td>
<td>$25</td>
<td>$38</td>
<td>$31</td>
<td>$16</td>
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<tr>
<td>Cashflow to Firm</td>
<td>-$2,500</td>
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<td>-$960</td>
<td>-$399</td>
<td>$166</td>
<td>$247</td>
<td>$271</td>
</tr>
</tbody>
</table>

To get from income to cash flow, we
- added back all non-cash charges such as depreciation
- subtracted out the capital expenditures
- subtracted out the change in non-cash working capital
The incremental cash flows on the project

$500 million has already been spent

<table>
<thead>
<tr>
<th></th>
<th>Now (0)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Income</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>after Taxes</td>
<td></td>
<td>-$165</td>
<td>-$77</td>
<td>$75</td>
<td>$206</td>
<td>$251</td>
<td>$297</td>
<td>$347</td>
<td>$402</td>
<td>$412</td>
<td></td>
</tr>
<tr>
<td>+ Depreciation &amp;</td>
<td></td>
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<td></td>
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<tr>
<td>Amortization</td>
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<td>$359</td>
<td>$357</td>
<td>$358</td>
<td>$361</td>
<td>$366</td>
<td>$369</td>
<td></td>
</tr>
<tr>
<td>- Capital Expenditure</td>
<td>$2,500</td>
<td>$1,000</td>
<td>$1,269</td>
<td>$805</td>
<td>$301</td>
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<td>$321</td>
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<td>$379</td>
<td>$403</td>
<td>$406</td>
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<td>$31</td>
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<td>$17</td>
<td>$19</td>
<td>$21</td>
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<td>Capital</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>+ Non-incremental</td>
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<td>$78</td>
<td>$110</td>
<td>$157</td>
<td>$196</td>
<td>$216</td>
<td>$237</td>
<td>$261</td>
<td>$287</td>
<td>$293</td>
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<td>Allocated Expense</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ Sunk Costs</td>
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<td></td>
<td></td>
<td></td>
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<td>$500</td>
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<tr>
<td>Cashflow to Firm</td>
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<td>-$1,000</td>
<td>-$880</td>
<td>-$289</td>
<td>$324</td>
<td>$443</td>
<td>$486</td>
<td>$517</td>
<td>$571</td>
<td>$631</td>
<td>$663</td>
</tr>
</tbody>
</table>

2/3rd of allocated G&A is fixed. Add back this amount (1-t)

To get from cash flow to incremental cash flows, we

- Taken out of the sunk costs from the initial investment
- Added back the non-incremental allocated costs (in after-tax terms)
## To Time-Weighted Cash Flows

<table>
<thead>
<tr>
<th>Cash Flow Type</th>
<th>Discounting Formula</th>
<th>Compounding Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Simple CF</td>
<td>$\frac{CF_n}{(1+r)^n}$</td>
<td>$CF_0(1+r)^n$</td>
</tr>
<tr>
<td>2. Annuity</td>
<td>$\frac{A}{r}$</td>
<td>$\frac{A((1+r)^n - 1)}{r}$</td>
</tr>
<tr>
<td>3. Growing Annuity</td>
<td>$\frac{A(1 + g)}{r - g}$</td>
<td></td>
</tr>
<tr>
<td>4. Perpetuity</td>
<td>$\frac{A}{r}$</td>
<td></td>
</tr>
<tr>
<td>5. Growing Perpetuity</td>
<td>Expected Cashflow next year/(r-g)</td>
<td></td>
</tr>
</tbody>
</table>
Discounted cash flow measures of return

- **Net Present Value (NPV):** The net present value is the sum of the present values of all cash flows from the project (including initial investment).
  
  \[ \text{NPV} = \text{Sum of the present values of all cash flows on the project, including the initial investment, with the cash flows being discounted at the appropriate hurdle rate (cost of capital, if cash flow is cash flow to the firm, and cost of equity, if cash flow is to equity investors)} \]
  
  - Decision Rule: Accept if \( \text{NPV} > 0 \)

- **Internal Rate of Return (IRR):** The internal rate of return is the discount rate that sets the net present value equal to zero. It is the percentage rate of return, based upon incremental time-weighted cash flows.
  
  - Decision Rule: Accept if \( \text{IRR} > \text{hurdle rate} \)
In a project with a finite and short life, you would need to compute a **salvage value**, which is the expected proceeds from selling all of the investment in the project at the end of the project life. It is usually set equal to book value of fixed assets and working capital.

In a project with an infinite or very long life, we compute cash flows for a reasonable period, and then compute a **terminal value** for this project, which is the present value of all cash flows that occur after the estimation period ends.

Assuming the project lasts forever, and that cash flows after year 10 grow 2% (the inflation rate) forever, the present value at the end of year 10 of cash flows after that can be written as:

- Terminal Value in year 10 = \( \frac{CF \text{ in year } 11}{\text{Cost of Capital} - \text{Growth Rate}} \)
  
  \[ = \frac{663 \times (1.02)}{(.1066 - .02)} = $7,810 \text{ million} \]
Which yields a NPV of..

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Cashflow</th>
<th>Terminal Value</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-$2,000</td>
<td></td>
<td>-$2,000</td>
</tr>
<tr>
<td>1</td>
<td>-$1,000</td>
<td></td>
<td>-$904</td>
</tr>
<tr>
<td>2</td>
<td>-$880</td>
<td></td>
<td>-$719</td>
</tr>
<tr>
<td>3</td>
<td>-$289</td>
<td></td>
<td>-$213</td>
</tr>
<tr>
<td>4</td>
<td>$324</td>
<td></td>
<td>$216</td>
</tr>
<tr>
<td>5</td>
<td>$443</td>
<td></td>
<td>$267</td>
</tr>
<tr>
<td>6</td>
<td>$486</td>
<td></td>
<td>$265</td>
</tr>
<tr>
<td>7</td>
<td>$517</td>
<td></td>
<td>$254</td>
</tr>
<tr>
<td>8</td>
<td>$571</td>
<td></td>
<td>$254</td>
</tr>
<tr>
<td>9</td>
<td>$631</td>
<td></td>
<td>$254</td>
</tr>
<tr>
<td>10</td>
<td>$663</td>
<td>$7,810</td>
<td>$3,076</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$749</td>
</tr>
</tbody>
</table>
Which makes the argument that..

- **The project should be accepted.** The positive net present value suggests that the project will add value to the firm, and earn a return in excess of the cost of capital.
- By taking the project, Disney will increase its value as a firm by $749 million.
The IRR of this project

Figure 5.5: NPV Profile for Disney Theme Park
The IRR suggests..

- **The project is a good one.** Using time-weighted, incremental cash flows, this project provides a return of 11.97%. This is greater than the cost of capital of 10.66%.

- The IRR and the NPV will yield similar results most of the time, though there are differences between the two approaches that may cause project rankings to vary depending upon the approach used.
Currency Choices and NPV

The analysis was done in dollars. Would the conclusions have been any different if we had done the analysis in Thai Baht?

a) Yes
b) No
### Disney Theme Park: Thai Baht NPV

<table>
<thead>
<tr>
<th>Year</th>
<th>Cashflow ($)</th>
<th>Bt/$</th>
<th>Cashflow (Bt)</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-2000</td>
<td>42.09</td>
<td>-84180</td>
<td>-84180</td>
</tr>
<tr>
<td>1</td>
<td>-1000</td>
<td>45.39</td>
<td>-45391</td>
<td>-38034</td>
</tr>
<tr>
<td>2</td>
<td>-880</td>
<td>48.95</td>
<td>-43075</td>
<td>-30243</td>
</tr>
<tr>
<td>3</td>
<td>-289</td>
<td>52.79</td>
<td>-15262</td>
<td>-8979</td>
</tr>
<tr>
<td>4</td>
<td>324</td>
<td>56.93</td>
<td>18420</td>
<td>9080</td>
</tr>
<tr>
<td>5</td>
<td>443</td>
<td>61.40</td>
<td>27172</td>
<td>11223</td>
</tr>
<tr>
<td>6</td>
<td>486</td>
<td>66.21</td>
<td>32187</td>
<td>11140</td>
</tr>
<tr>
<td>7</td>
<td>517</td>
<td>71.40</td>
<td>36920</td>
<td>10707</td>
</tr>
<tr>
<td>8</td>
<td>571</td>
<td>77.01</td>
<td>43979</td>
<td>10687</td>
</tr>
<tr>
<td>9</td>
<td>631</td>
<td>83.04</td>
<td>52412</td>
<td>10671</td>
</tr>
<tr>
<td>10</td>
<td>8474</td>
<td>89.56</td>
<td>758886</td>
<td>129470</td>
</tr>
</tbody>
</table>

\[
\text{NPV} = \frac{31,542\text{ Bt}}{42.09\text{ Bt}} = $749\text{ Million}
\]

NPV is equal to NPV in dollar terms.

Bt/$ in year 1 = 42.09 (1.10/1.02) = 45.39

Inflation rate in Thailand = 10%

Inflation rate in US = 2%

\[
\text{Baht Cost of capital} = \frac{(1.1066)(1.1/1.02)-1}{1} = 19.34\%
\]

NPV is equal to NPV in dollar terms.
The Role of Sensitivity Analysis

- Our conclusions on a project are clearly conditioned on a large number of assumptions about revenues, costs and other variables over very long time periods.
- To the degree that these assumptions are wrong, our conclusions can also be wrong.
- One way to gain confidence in the conclusions is to check to see how sensitive the decision measure (NPV, IRR..) is to changes in key assumptions.
Side Costs and Benefits

- Most projects considered by any business create side costs and benefits for that business.
- The side costs include the costs created by the use of resources that the business already owns (opportunity costs) and lost revenues for other projects that the firm may have.
- The benefits that may not be captured in the traditional capital budgeting analysis include project synergies (where cash flow benefits may accrue to other projects) and options embedded in projects (including the options to delay, expand or abandon a project).
- The returns on a project should incorporate these costs and benefits.
First Principles

- 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 (debt)
  - **Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.**
- 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 cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders’ characteristics.
Finding the Right Financing Mix: The Capital Structure Decision
First Principles

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

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

Objective: Maximize the Value of the Firm
Financing Choices across the life cycle

$ Revenues/ Earnings

<table>
<thead>
<tr>
<th>Stage</th>
<th>External funding needs</th>
<th>Internal financing</th>
<th>External Financing</th>
<th>Growth stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High, but constrained by infrastructure</td>
<td>High, relative to firm value.</td>
<td>Bank Debt</td>
<td>Start-up</td>
</tr>
<tr>
<td>2</td>
<td>High, relative to firm value.</td>
<td>Moderate, relative to firm value.</td>
<td>Venture Capital</td>
<td>Rapid Expansion</td>
</tr>
<tr>
<td>3</td>
<td>Declining, as a percent of firm value</td>
<td>Low, relative to funding needs</td>
<td>Common stock, Warrants, Convertibles</td>
<td>High Growth</td>
</tr>
<tr>
<td>4</td>
<td>Low, as projects dry up.</td>
<td>High, relative to funding needs</td>
<td>Debt</td>
<td>Mature Growth</td>
</tr>
<tr>
<td>5</td>
<td>High, relative to funding needs</td>
<td>More than funding needs</td>
<td>Retire debt, Repurchase stock</td>
<td>Decline</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financing Transitions</th>
<th>Accessing private equity</th>
<th>Initial Public offering</th>
<th>Seasoned equity issue</th>
<th>Bond issues</th>
</tr>
</thead>
</table>

Revenues
Earnings
Time
## Debt versus Equity: The Trade off

<table>
<thead>
<tr>
<th>Advantages of Debt</th>
<th>Disadvantages of debt</th>
</tr>
</thead>
</table>
| **1. Tax Benefit:** Interest expenses on debt are tax deductible but cash flows to equity are generally not.  
*Implication:* The higher the marginal tax rate, the greater the benefits of debt. | **1. Expected Bankruptcy Cost:** The expected cost of going bankrupt is a product of the probability of going bankrupt and the cost of going bankrupt. The latter includes both direct and indirect costs. The probability of going bankrupt will be higher in businesses with more volatile earnings and the cost of bankruptcy will also vary across businesses.  
*Implication:*
1. Firms with more stable earnings should borrow more, for any given level of earnings.  
2. Firms with lower bankruptcy costs should borrow more, for any given level of earnings. |
| **2. Added Discipline:** Borrowing money may force managers to think about the consequences of the investment decisions a little more carefully and reduce bad investments.  
*Implication:* As the separation between managers and stockholders increases, the benefits to using debt will go up. | **2. Agency Costs:** Actions that benefit equity investors may hurt lenders. The greater the potential for this conflict of interest, the greater the cost borne by the borrower (as higher interest rates or more covenants).  
*Implication:* Firms where lenders can monitor/control how their money is being used should be able to borrow more than firms where this is difficult to do. |
| **3. Loss of flexibility:** Using up available debt capacity today will mean that you cannot draw on it in the future. This loss of flexibility can be disastrous if funds are needed and access to capital is shut off.  
*Implication:*
1. Firms that can forecast future funding needs better should be able to borrow more.  
2. Firms with better access to capital markets should be more willing to borrow more today. |
A Hypothetical Scenario

(a) There are no taxes
(b) Managers have stockholder interests at heart and do what’s best for stockholders.
(c) No firm ever goes bankrupt
(d) Equity investors are honest with lenders; there is no subterfuge or attempt to find loopholes in loan agreements.
(e) Firms know their future financing needs with certainty

What happens to the trade off between debt and equity? How much should a firm borrow?
In the last quarter of 2008, we saw the following phenomena:
- A surge in risk premiums for both equity and debt
- A freeze in both short term debt and long term debt markets for even the largest corporations
- Banking failures and a drop off in bank loans to businesses
- Defaults and bankruptcies increased to historic highs
- A weakening in consumer demand and the global economy
- Tussles between debt and equity investors in several firms

Thinking in terms of the trade off between debt and equity, what are the consequences for debt capacity at firms?
The Miller-Modigliani Theorem

- In an environment, where there are no taxes, default risk or agency costs, capital structure is irrelevant.
- The value of a firm is independent of its debt ratio. Leverage is irrelevant. A firm's value will be determined by its cash flows.
- The cost of capital of the firm will not change with leverage. As a firm increases its leverage, the cost of equity will increase just enough to offset any gains to the leverage.
Pathways to the Optimal

- **The Cost of Capital Approach**: The optimal debt ratio is the one that minimizes the cost of capital for a firm.
- **The Sector Approach**: The optimal debt ratio is the one that brings the firm closest to its peer group in terms of financing mix.
I. The Cost of Capital Approach

- Value of a Firm = Present Value of Cash Flows to the Firm, discounted back at the cost of capital.
- If the cash flows to the firm are held constant, and the cost of capital is minimized, the value of the firm will be maximized.
## Applying Cost of Capital Approach: The Textbook Example

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Cost of equity</th>
<th>Cost of Debt</th>
<th>After-tax Cost of Debt</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>9.00%</td>
<td>6.00%</td>
<td>3.60%</td>
<td>9.00%</td>
</tr>
<tr>
<td>10.00%</td>
<td>9.50%</td>
<td>6.50%</td>
<td>3.90%</td>
<td>8.94%</td>
</tr>
<tr>
<td>20.00%</td>
<td>10.10%</td>
<td>6.75%</td>
<td>4.05%</td>
<td>8.89%</td>
</tr>
<tr>
<td>30.00%</td>
<td>10.80%</td>
<td>6.90%</td>
<td>4.14%</td>
<td>8.80%</td>
</tr>
<tr>
<td>40.00%</td>
<td>11.60%</td>
<td>7.90%</td>
<td>4.74%</td>
<td>8.86%</td>
</tr>
<tr>
<td>50.00%</td>
<td>12.50%</td>
<td>8.90%</td>
<td>5.34%</td>
<td>8.92%</td>
</tr>
<tr>
<td>60.00%</td>
<td>13.50%</td>
<td>9.90%</td>
<td>5.94%</td>
<td>8.96%</td>
</tr>
<tr>
<td>70.00%</td>
<td>14.60%</td>
<td>11.00%</td>
<td>6.60%</td>
<td>9.00%</td>
</tr>
<tr>
<td>80.00%</td>
<td>15.80%</td>
<td>12.25%</td>
<td>7.35%</td>
<td>9.04%</td>
</tr>
<tr>
<td>90.00%</td>
<td>17.10%</td>
<td>13.75%</td>
<td>8.25%</td>
<td>9.14%</td>
</tr>
<tr>
<td>100.00%</td>
<td>18.50%</td>
<td>15.25%</td>
<td>9.15%</td>
<td>9.15%</td>
</tr>
</tbody>
</table>
The U-shaped Cost of Capital Graph…
Current Cost of Capital: Disney

**Equity**
- Cost of Equity = Riskfree rate + Beta * Risk Premium
  = 4% + 1.25 (4.82%) = 10.00%
- Market Value of Equity = $55.101 Billion
- Equity/(Debt+Equity) = 79%

**Debt**
- After-tax Cost of debt = (Riskfree rate + Default Spread) (1-t)
  = (4%+1.25%) (1-.373) = 3.29%
- Market Value of Debt = $14.668 Billion
- Debt/(Debt+Equity) = 21%

**Cost of Capital** = 10.00% (.79) + 3.29% (.21) = 8.59%

\[
\frac{55.101}{55.101+14.668}
\]
Mechanics of Cost of Capital Estimation

1. Estimate the Cost of Equity at different levels of debt:
   - Equity will become riskier -> Beta will increase -> Cost of Equity will increase.
   - Estimation will use levered beta calculation

2. Estimate the Cost of Debt at different levels of debt:
   - Default risk will go up and bond ratings will go down as debt goes up -> Cost of Debt will increase.
   - To estimating bond ratings, we will use the interest coverage ratio (EBIT/Interest expense)

3. Estimate the Cost of Capital at different levels of debt
4. Calculate the effect on Firm Value and Stock Price.
## Estimating Cost of Equity

Unlevered Beta = 1.0674 (Bottom up beta based upon Disney’s businesses)

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>D/E Ratio</th>
<th>Levered Beta</th>
<th>Cost of Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0.00%</td>
<td>1.0674</td>
<td>9.15%</td>
</tr>
<tr>
<td>10.00%</td>
<td>11.11%</td>
<td>1.1418</td>
<td>9.50%</td>
</tr>
<tr>
<td>20.00%</td>
<td>25.00%</td>
<td>1.2348</td>
<td>9.95%</td>
</tr>
<tr>
<td>30.00%</td>
<td>42.86%</td>
<td>1.3543</td>
<td>10.53%</td>
</tr>
<tr>
<td>40.00%</td>
<td>66.67%</td>
<td>1.5136</td>
<td>11.30%</td>
</tr>
<tr>
<td>50.00%</td>
<td>100.00%</td>
<td>1.7367</td>
<td>12.37%</td>
</tr>
<tr>
<td>60.00%</td>
<td>150.00%</td>
<td>2.0714</td>
<td>13.98%</td>
</tr>
<tr>
<td>70.00%</td>
<td>233.33%</td>
<td>2.6291</td>
<td>16.67%</td>
</tr>
<tr>
<td>80.00%</td>
<td>400.00%</td>
<td>3.7446</td>
<td>22.05%</td>
</tr>
<tr>
<td>90.00%</td>
<td>900.00%</td>
<td>7.0911</td>
<td>38.18%</td>
</tr>
</tbody>
</table>

Market premium = 4.82%

T.Bond Rate = 4.00%

Tax rate = 37.3%
## Estimating Cost of Debt

Start with the current market value of the firm = 55,101 + 14,668 = $69,769 mil

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$D/(D+E)$</td>
<td>0.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>$D/E$</td>
<td>0.00%</td>
<td>11.11%</td>
</tr>
<tr>
<td>$Debt$</td>
<td>$0</td>
<td>$6,977</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EBITDA</td>
<td>$3,882</td>
<td>$3,882</td>
</tr>
<tr>
<td>Depreciation</td>
<td>$1,077</td>
<td>$1,077</td>
</tr>
<tr>
<td>EBIT</td>
<td>$2,805</td>
<td>$2,805</td>
</tr>
<tr>
<td>Interest</td>
<td>$0</td>
<td>$303</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-tax Int. cov</td>
<td>∞</td>
<td>9.24</td>
</tr>
<tr>
<td>Likely Rating</td>
<td>AAA</td>
<td>AAA</td>
</tr>
<tr>
<td>Pre-tax cost of debt</td>
<td>4.35%</td>
<td>4.35%</td>
</tr>
</tbody>
</table>
## The Ratings Table

<table>
<thead>
<tr>
<th>Interest Coverage Ratio</th>
<th>Rating</th>
<th>Typical Default Spread</th>
<th>Market Interest Rate on Debt</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 8.5</td>
<td>AAA</td>
<td>0.35%</td>
<td>4.35%</td>
</tr>
<tr>
<td>6.50 - 6.50</td>
<td>AA</td>
<td>0.50%</td>
<td>4.50%</td>
</tr>
<tr>
<td>5.50 - 6.50</td>
<td>A+</td>
<td>0.70%</td>
<td>4.70%</td>
</tr>
<tr>
<td>4.25 - 5.50</td>
<td>A</td>
<td>0.85%</td>
<td>4.85%</td>
</tr>
<tr>
<td>3.00 - 4.25</td>
<td>A-</td>
<td>1.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td>2.50 - 3.00</td>
<td>BBB</td>
<td>1.50%</td>
<td>5.50%</td>
</tr>
<tr>
<td>2.05 - 2.50</td>
<td>BB+</td>
<td>2.00%</td>
<td>6.00%</td>
</tr>
<tr>
<td>1.90 - 2.00</td>
<td>BB</td>
<td>2.50%</td>
<td>6.50%</td>
</tr>
<tr>
<td>1.75 - 1.90</td>
<td>B+</td>
<td>3.25%</td>
<td>7.25%</td>
</tr>
<tr>
<td>1.50 - 1.75</td>
<td>B</td>
<td>4.00%</td>
<td>8.00%</td>
</tr>
<tr>
<td>1.25 - 1.50</td>
<td>B-</td>
<td>6.00%</td>
<td>10.00%</td>
</tr>
<tr>
<td>0.80 - 1.25</td>
<td>CCC</td>
<td>8.00%</td>
<td>12.00%</td>
</tr>
<tr>
<td>0.65 - 0.80</td>
<td>CC</td>
<td>10.00%</td>
<td>14.00%</td>
</tr>
<tr>
<td>0.20 - 0.60</td>
<td>C</td>
<td>12.00%</td>
<td>16.00%</td>
</tr>
<tr>
<td>&lt; 0.20</td>
<td>D</td>
<td>20.00%</td>
<td>24.00%</td>
</tr>
</tbody>
</table>
A Test: Can you do the 20% level?

<table>
<thead>
<tr>
<th></th>
<th>0.00%</th>
<th>10.00%</th>
<th>20.00%</th>
<th>2nd Iteration</th>
<th>3rd?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$D/(D+E)$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D/E</td>
<td>0.00%</td>
<td>11.11%</td>
<td>25.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$ Debt</td>
<td>$0</td>
<td>$6,977</td>
<td>$13,954</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBITDA</td>
<td>$3,882</td>
<td>$3,882</td>
<td>$3,882</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>$1,077</td>
<td>$1,077</td>
<td>$1,077</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EBIT</td>
<td>$2,805</td>
<td>$2,805</td>
<td>$2,805</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>$0</td>
<td>$303</td>
<td>$606</td>
<td>.0485*13954=676</td>
<td></td>
</tr>
<tr>
<td>Pre-tax Int. cov</td>
<td>∞</td>
<td>9.24</td>
<td>4.62</td>
<td>2805/676=4.15</td>
<td></td>
</tr>
<tr>
<td>Likely Rating</td>
<td>AAA</td>
<td>AAA</td>
<td>A</td>
<td>A-</td>
<td></td>
</tr>
<tr>
<td>Cost of debt</td>
<td>4.35%</td>
<td>4.35%</td>
<td>4.85%</td>
<td>5.00%</td>
<td></td>
</tr>
</tbody>
</table>
## Bond Ratings, Cost of Debt and Debt Ratios

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Debt</th>
<th>Interest expense</th>
<th>Interest Coverage Ratio</th>
<th>Bond Rating</th>
<th>Interest rate on debt</th>
<th>Tax Rate</th>
<th>Cost of Debt (after-tax)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>$0</td>
<td>$0</td>
<td>?</td>
<td>AAA</td>
<td>4.35%</td>
<td>37.30%</td>
<td>2.73%</td>
</tr>
<tr>
<td>10%</td>
<td>$6,977</td>
<td>$303</td>
<td>9.24</td>
<td>AAA</td>
<td>4.35%</td>
<td>37.30%</td>
<td>2.73%</td>
</tr>
<tr>
<td>20%</td>
<td>$13,954</td>
<td>$698</td>
<td>4.02</td>
<td>A-</td>
<td>5.00%</td>
<td>37.30%</td>
<td>3.14%</td>
</tr>
<tr>
<td>30%</td>
<td>$20,931</td>
<td>$1,256</td>
<td>2.23</td>
<td>BB+</td>
<td>6.00%</td>
<td>37.30%</td>
<td>3.76%</td>
</tr>
<tr>
<td>40%</td>
<td>$27,908</td>
<td>$3,349</td>
<td>0.84</td>
<td>CCC</td>
<td>12.00%</td>
<td>31.24%</td>
<td>8.25%</td>
</tr>
<tr>
<td>50%</td>
<td>$34,885</td>
<td>$5,582</td>
<td>0.50</td>
<td>C</td>
<td>16.00%</td>
<td>18.75%</td>
<td>13.00%</td>
</tr>
<tr>
<td>60%</td>
<td>$41,861</td>
<td>$6,698</td>
<td>0.42</td>
<td>C</td>
<td>16.00%</td>
<td>15.62%</td>
<td>13.50%</td>
</tr>
<tr>
<td>70%</td>
<td>$48,838</td>
<td>$7,814</td>
<td>0.36</td>
<td>C</td>
<td>16.00%</td>
<td>13.39%</td>
<td>13.86%</td>
</tr>
<tr>
<td>80%</td>
<td>$55,815</td>
<td>$8,930</td>
<td>0.31</td>
<td>C</td>
<td>16.00%</td>
<td>11.72%</td>
<td>14.13%</td>
</tr>
<tr>
<td>90%</td>
<td>$62,792</td>
<td>$10,047</td>
<td>0.28</td>
<td>C</td>
<td>16.00%</td>
<td>10.41%</td>
<td>14.33%</td>
</tr>
</tbody>
</table>
You need taxable income for interest to provide a tax savings.

In the Disney case, consider the interest expense at 30% and 40%.

<table>
<thead>
<tr>
<th></th>
<th>30% Debt Ratio</th>
<th>40% Debt Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$ 2,805 m</td>
<td>$ 2,805 m</td>
</tr>
<tr>
<td>Interest Expense</td>
<td>$ 1,256 m</td>
<td>$ 3,349 m</td>
</tr>
<tr>
<td>Tax Savings</td>
<td>1,256*.373 = 468</td>
<td>2,805*.373 = 1,046</td>
</tr>
<tr>
<td>Tax Rate</td>
<td>37.30%</td>
<td>1,046/3,349 = 31.2%</td>
</tr>
<tr>
<td>Pre-tax interest rate</td>
<td>6.00%</td>
<td>12.00%</td>
</tr>
<tr>
<td>After-tax Interest Rate</td>
<td>3.76%</td>
<td>8.25%</td>
</tr>
</tbody>
</table>

You can deduct only $2,805 million of the $3,349 million of the interest expense at 40%. Therefore, only 37.3% of $2,805 million is considered as the tax savings.
## Disney’s Cost of Capital Schedule

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Cost of Equity</th>
<th>Cost of Debt (after-tax)</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>9.15%</td>
<td>2.73%</td>
<td>9.15%</td>
</tr>
<tr>
<td>10%</td>
<td>9.50%</td>
<td>2.73%</td>
<td>8.83%</td>
</tr>
<tr>
<td>20%</td>
<td>9.95%</td>
<td>3.14%</td>
<td>8.59%</td>
</tr>
<tr>
<td>30%</td>
<td>10.53%</td>
<td>3.76%</td>
<td>8.50%</td>
</tr>
<tr>
<td>40%</td>
<td>11.50%</td>
<td>8.25%</td>
<td>10.20%</td>
</tr>
<tr>
<td>50%</td>
<td>13.33%</td>
<td>13.00%</td>
<td>13.16%</td>
</tr>
<tr>
<td>60%</td>
<td>15.66%</td>
<td>13.50%</td>
<td>14.36%</td>
</tr>
<tr>
<td>70%</td>
<td>19.54%</td>
<td>13.86%</td>
<td>15.56%</td>
</tr>
<tr>
<td>80%</td>
<td>27.31%</td>
<td>14.13%</td>
<td>16.76%</td>
</tr>
<tr>
<td>90%</td>
<td>50.63%</td>
<td>14.33%</td>
<td>17.96%</td>
</tr>
</tbody>
</table>
Disney: Cost of Capital Chart

Figure 8.3: Disney Cost of Capital at different Debt Ratios

Optimal Debt ratio is at this point

Cost of equity climbs as levered beta increases

After-tax cost of debt increases as interest coverage ratio deteriorates and with it the synthetic rating.
Disney: Cost of Capital Chart: 1997
Effect on Firm Value

- Firm Value before the change = 55,101 + 14,668 = $69,769
  - WACC\(_b\) = 8.59%
  - Annual Cost = $69,769 \times 8.59\% = $5,993 million
  - WACC\(_a\) = 8.50%
  - Annual Cost = $69,769 \times 8.50\% = $5,930 million
  - \(\Delta\) WACC = 0.09%
  - Change in Annual Cost = $63 million

- If there is no growth in the firm value, (Conservative Estimate)
  - Increase in firm value = $63 / 0.0850 = $741 million
  - Change in Stock Price = $741 / 2047.6 = $0.36 per share

- If we assume a perpetual growth of 4% in firm value over time,
  - Increase in firm value = $63 / (0.0850 - 0.04) = $1,400 million
  - Change in Stock Price = $1,400 / 2,047.6 = $0.68 per share

*Implied Growth Rate obtained by*

\[
\text{Firm value Today} = \text{FCFF}(1+g)/(WACC-g): \text{Perpetual growth formula}
\]

\[
$69,769 = \$1,722(1+g)/(0.0859-g): \text{Solve for } g \text{ -> Implied growth} = 5.98\%$
\]
A Test: The Repurchase Price

Let us suppose that the CFO of Disney approached you about buying back stock. He wants to know the maximum price that he should be willing to pay on the stock buyback. (The current price is $26.91) Assuming that firm value will grow by 4% a year, estimate the maximum price.

What would happen to the stock price after the buyback if you were able to buy stock back at $26.91?
The Downside Risk

- Doing What-if analysis on Operating Income
  - A. Standard Deviation Approach
    - Standard Deviation In Past Operating Income
    - Standard Deviation In Earnings (If Operating Income Is Unavailable)
    - Reduce Base Case By One Standard Deviation (Or More)
  - B. Past Recession Approach
    - Look At What Happened To Operating Income During The Last Recession. (How Much Did It Drop In % Terms?)
    - Reduce Current Operating Income By Same Magnitude

- Constraints on Bond Ratings
## Disney’s Operating Income: History

<table>
<thead>
<tr>
<th>Year</th>
<th>EBIT</th>
<th>% Change in EBIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>756</td>
<td></td>
</tr>
<tr>
<td>1988</td>
<td>848</td>
<td>12.17%</td>
</tr>
<tr>
<td>1989</td>
<td>1177</td>
<td>38.80%</td>
</tr>
<tr>
<td>1990</td>
<td>1368</td>
<td>16.23%</td>
</tr>
<tr>
<td>1991</td>
<td>1124</td>
<td>-17.84%</td>
</tr>
<tr>
<td>1992</td>
<td>1287</td>
<td>14.50%</td>
</tr>
<tr>
<td>1993</td>
<td>1560</td>
<td>21.21%</td>
</tr>
<tr>
<td>1994</td>
<td>1804</td>
<td>15.64%</td>
</tr>
<tr>
<td>1995</td>
<td>2262</td>
<td>25.39%</td>
</tr>
<tr>
<td>1996</td>
<td>3024</td>
<td>33.69%</td>
</tr>
<tr>
<td>1997</td>
<td>3945</td>
<td>30.46%</td>
</tr>
<tr>
<td>1998</td>
<td>3843</td>
<td>-2.59%</td>
</tr>
<tr>
<td>1999</td>
<td>3580</td>
<td>-6.84%</td>
</tr>
<tr>
<td>2000</td>
<td>2525</td>
<td>-29.47%</td>
</tr>
<tr>
<td>2001</td>
<td>2832</td>
<td>12.16%</td>
</tr>
<tr>
<td>2002</td>
<td>2384</td>
<td>-15.82%</td>
</tr>
<tr>
<td>2003</td>
<td>2713</td>
<td>13.80%</td>
</tr>
</tbody>
</table>
### Disney: The Downside Scenario

<table>
<thead>
<tr>
<th>% Drop in EBITDA</th>
<th>EBIT</th>
<th>Optimal Debt Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>$2,805</td>
<td>30%</td>
</tr>
<tr>
<td>5%</td>
<td>$2,665</td>
<td>20%</td>
</tr>
<tr>
<td>10%</td>
<td>$2,524</td>
<td>20%</td>
</tr>
<tr>
<td>15%</td>
<td>$2,385</td>
<td>20%</td>
</tr>
<tr>
<td>20%</td>
<td>$2,245</td>
<td>20%</td>
</tr>
</tbody>
</table>
Constraints on Ratings

- Management often specifies a 'desired Rating' below which they do not want to fall.
- The rating constraint is driven by three factors
  - it is one way of protecting against downside risk in operating income (so do not do both)
  - a drop in ratings might affect operating income
  - there is an ego factor associated with high ratings
- Caveat: Every Rating Constraint Has A Cost.
  - Provide Management With A Clear Estimate Of How Much The Rating Constraint Costs By Calculating The Value Of The Firm Without The Rating Constraint And Comparing To The Value Of The Firm With The Rating Constraint.
Ratings Constraints for Disney

- At its optimal debt ratio of 30%, Disney has an estimated rating of BB+.
- Assume that Disney imposes a rating constraint of BBB or greater.
- The optimal debt ratio for Disney is then 25% (see next page)
- The cost of imposing this rating constraint can then be calculated as follows:

  Value at 30% Debt = $71,239 million
  - Value at 25% Debt = $70,300 million
  Cost of Rating Constraint = $939 million
## Effect of Ratings Constraints: Disney

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Rating</th>
<th>Firm Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>AAA</td>
<td>$62,279</td>
</tr>
<tr>
<td>10%</td>
<td>AAA</td>
<td>$66,397</td>
</tr>
<tr>
<td>20%</td>
<td>A-</td>
<td>$69,837</td>
</tr>
<tr>
<td>30%</td>
<td>BB+</td>
<td>$71,239</td>
</tr>
<tr>
<td>40%</td>
<td>CCC</td>
<td>$51,661</td>
</tr>
<tr>
<td>50%</td>
<td>C</td>
<td>$34,969</td>
</tr>
<tr>
<td>60%</td>
<td>C</td>
<td>$30,920</td>
</tr>
<tr>
<td>70%</td>
<td>C</td>
<td>$27,711</td>
</tr>
<tr>
<td>80%</td>
<td>C</td>
<td>$25,105</td>
</tr>
<tr>
<td>90%</td>
<td>C</td>
<td>$22,948</td>
</tr>
</tbody>
</table>
What if you do not buy back stock..

- The optimal debt ratio is ultimately a function of the underlying riskiness of the business in which you operate and your tax rate.
- Will the optimal be different if you invested in projects instead of buying back stock?
  - No. As long as the projects financed are in the same business mix that the company has always been in and your tax rate does not change significantly.
  - Yes, if the projects are in entirely different types of businesses or if the tax rate is significantly different.
# Tata Chemical’s Optimal Capital Structure

<table>
<thead>
<tr>
<th>Debt Ratio</th>
<th>Beta</th>
<th>Cost of Equity</th>
<th>Bond Rating</th>
<th>Interest rate on debt</th>
<th>Tax Rate</th>
<th>Cost of Debt (after-tax)</th>
<th>WACC</th>
<th>Firm Value (G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0.93</td>
<td>12.94%</td>
<td>AAA</td>
<td>8.26%</td>
<td>33.66%</td>
<td>5.48%</td>
<td>12.94%</td>
<td>INR 59,747</td>
</tr>
<tr>
<td>10%</td>
<td>1.00</td>
<td>13.39%</td>
<td>AA</td>
<td>8.41%</td>
<td>33.66%</td>
<td>5.58%</td>
<td>12.61%</td>
<td>INR 62,677</td>
</tr>
<tr>
<td>20%</td>
<td>1.09</td>
<td>13.96%</td>
<td>A-</td>
<td>8.91%</td>
<td>33.66%</td>
<td>5.91%</td>
<td>12.35%</td>
<td>INR 65,212</td>
</tr>
<tr>
<td>30%</td>
<td>1.20</td>
<td>14.69%</td>
<td>B+</td>
<td>11.16%</td>
<td>33.66%</td>
<td>7.40%</td>
<td>12.51%</td>
<td>INR 63,675</td>
</tr>
<tr>
<td>40%</td>
<td>1.34</td>
<td>15.67%</td>
<td>B-</td>
<td>13.91%</td>
<td>33.66%</td>
<td>9.23%</td>
<td>13.09%</td>
<td>INR 58,438</td>
</tr>
<tr>
<td>50%</td>
<td>1.55</td>
<td>17.03%</td>
<td>CC</td>
<td>17.91%</td>
<td>33.66%</td>
<td>11.88%</td>
<td>14.46%</td>
<td>INR 48,914</td>
</tr>
<tr>
<td>60%</td>
<td>1.93</td>
<td>19.57%</td>
<td>CC</td>
<td>17.91%</td>
<td>28.39%</td>
<td>12.83%</td>
<td>15.52%</td>
<td>INR 43,295</td>
</tr>
<tr>
<td>70%</td>
<td>2.63</td>
<td>24.19%</td>
<td>C</td>
<td>19.91%</td>
<td>21.89%</td>
<td>15.55%</td>
<td>18.14%</td>
<td>INR 33,528</td>
</tr>
<tr>
<td>80%</td>
<td>3.94</td>
<td>32.91%</td>
<td>C</td>
<td>19.91%</td>
<td>19.15%</td>
<td>16.10%</td>
<td>19.46%</td>
<td>INR 30,015</td>
</tr>
<tr>
<td>90%</td>
<td>7.89</td>
<td>59.06%</td>
<td>C</td>
<td>19.91%</td>
<td>17.03%</td>
<td>16.52%</td>
<td>20.77%</td>
<td>INR 27,110</td>
</tr>
</tbody>
</table>
Determinants of Optimal Debt Ratios

- **Firm Specific Factors**
  - 1. Tax Rate
  - Higher tax rates  - - > Higher Optimal Debt Ratio
  - Lower tax rates  - - > Lower Optimal Debt Ratio
  - 2. Pre-Tax CF on Firm = \( \frac{\text{EBITDA}}{\text{MV of Firm}} \)
  - Higher Pre-tax CF  - - > Higher Optimal Debt Ratio
  - Lower Pre-tax CF  - - > Lower Optimal Debt Ratio
  - 3. Variance in Earnings  [ Shows up when you do 'what if' analysis]
  - Higher Variance  - - > Lower Optimal Debt Ratio
  - Lower Variance  - - > Higher Optimal Debt Ratio

- **Macro-Economic Factors**
  - 1. Default Spreads
  - Higher  - - > Lower Optimal Debt Ratio
  - Lower  - - > Higher Optimal Debt Ratio
Application Test: Your firm’s optimal financing mix

- Using the optimal capital structure spreadsheet provided:
  - Estimate the optimal debt ratio for your firm
  - Estimate the new cost of capital at the optimal
  - Estimate the effect of the change in the cost of capital on firm value
  - Estimate the effect on the stock price

- In terms of the mechanics, what would you need to do to get to the optimal immediately?
II. Relative Analysis

I. Industry Average with Subjective Adjustments

- The “safest” place for any firm to be is close to the industry average
- Subjective adjustments can be made to these averages to arrive at the right debt ratio.
  - Higher tax rates -> Higher debt ratios (Tax benefits)
  - Lower insider ownership -> Higher debt ratios (Greater discipline)
  - More stable income -> Higher debt ratios (Lower bankruptcy costs)
  - More intangible assets -> Lower debt ratios (More agency problems)
Sector Comparisons

Company versus Sector

Disney

Tata Chemicals
A Framework for Getting to the Optimal Debt Ratio

Is the actual debt ratio greater than or lesser than the optimal debt ratio?

- **Actual > Optimal (Overlevered)**
  - Is the firm under bankruptcy threat?
    - Yes
      - Reduce Debt quickly
        1. Equity for Debt swap
        2. Sell Assets; use cash to pay off debt
        3. Renegotiate with lenders
      - Does the firm have good projects?
        - Yes
          - Take good projects with new equity or with retained earnings.
        - No
          - 1. Pay off debt with retained earnings.
           2. Reduce or eliminate dividends
           3. Issue new equity and pay off debt.
    - No

- **Actual < Optimal (Underlevered)**
  - Is the firm a takeover target?
    - Yes
      - Increase leverage quickly
        1. Debt/Equity swaps
        2. Borrow money & buy shares
    - No

- **Reduce Debt quickly**
  1. Equity for Debt swap
  2. Sell Assets; use cash to pay off debt
  3. Renegotiate with lenders

- **Take good projects with new equity or with retained earnings.**

- **Does the firm have good projects?**
  - Yes
    - Take good projects with debt.
  - No
    - 1. Pay off debt with retained earnings.
     2. Reduce or eliminate dividends
     3. Issue new equity and pay off debt.

- **Increase leverage quickly**
  1. Debt/Equity swaps
  2. Borrow money & buy shares.

- **Does the firm have good projects?**
  - Yes
    - Take good projects with debt.
  - No
    - Do your stockholders like dividends?
      - Yes
        - Pay Dividends
      - No
        - Buy back stock
Disney: Applying the Framework

Is the actual debt ratio greater than or lesser than the optimal debt ratio?

- Actual > Optimal
  - Overlevered
  - Is the firm under bankruptcy threat?
    - Yes
      - Reduce Debt quickly
        1. Equity for Debt swap
        2. Sell Assets; use cash to pay off debt
        3. Renegotiate with lenders
    - No
      - Does the firm have good projects?
        - Yes
          - Take good projects with new equity or with retained earnings.
        - No
          - Take good projects with new equity or with retained earnings.

- Actual < Optimal
  - Underlevered
  - Is the firm a takeover target?
    - Yes
      - Increase leverage quickly
        1. Debt/Equity swaps
        2. Borrow money & buy shares.
    - No
      - Does the firm have good projects?
        - Yes
          - Take good projects with debt.
        - No
          - Do your stockholders like dividends?
            - Yes
              - Pay Dividends
            - No
              - Buy back stock

Application Test: Getting to the Optimal

Based upon your analysis of both the firm’s capital structure and investment record, what path would you map out for the firm?

- Immediate change in leverage
- Gradual change in leverage
- No change in leverage

Would you recommend that the firm change its financing mix by

- Paying off debt/Buying back equity
- Take projects with equity/debt
The objective in designing debt is to make the cash flows on debt match up as closely as possible with the cash flows that the firm makes on its assets. By doing so, we reduce our risk of default, increase debt capacity and increase firm value.
Design the perfect financing instrument

The perfect financing instrument will
- Have all of the tax advantages of debt
- While preserving the flexibility offered by equity

Start with the Cash Flows on Assets/Projects

Define Debt Characteristics

Duration
Currency
Effect of Inflation Uncertainty about Future
Growth Patterns
Cyclicality & Other Effects

Duration/ Maturity
Currency Mix
Fixed vs. Floating Rate
- More floating rate
- if CF move with inflation
- with greater uncertainty on future

Straight versus Convertible
- Convertible if cash flows low now but high exp. growth

Special Features on Debt
- Options to make cash flows on debt match cash flows on assets

Design debt to have cash flows that match up to cash flows on the assets financed

Commodity Bonds Catastrophe Notes
Ensuring that you have not crossed the line drawn by the tax code

All of this design work is lost, however, if the security that you have designed does not deliver the tax benefits.

In addition, there may be a trade off between mismatching debt and getting greater tax benefits.
Ratings agencies want companies to issue equity, since it makes them safer. Equity research analysts want them not to issue equity because it dilutes earnings per share. Regulatory authorities want to ensure that you meet their requirements in terms of capital ratios (usually book value). Financing that leaves all three groups happy is nirvana.

Consider ratings agency & analyst concerns

- Analyst Concerns
  - Effect on EPS
  - Value relative to comparables

- Ratings Agency
  - Effect on Ratios
  - Ratios relative to comparables

- Regulatory Concerns
  - Measures used

Can securities be designed that can make these different entities happy?
Debt or Equity: The Strange Case of Trust Preferred

- Trust preferred stock has
  - A fixed dividend payment, specified at the time of the issue
  - That is tax deductible
  - And failing to make the payment can cause? (Can it cause default?)

- When trust preferred was first created, ratings agencies treated it as equity. As they have become more savvy, ratings agencies have started giving firms only partial equity credit for trust preferred.
Assuming that trust preferred stock gets treated as equity by ratings agencies, which of the following firms is the most appropriate firm to be issuing it?

- A firm that is under levered, but has a rating constraint that would be violated if it moved to its optimal
- A firm that is over levered that is unable to issue debt because of the rating agency concerns.
Soothe bondholder fears

- There are some firms that face skepticism from bondholders when they go out to raise debt, because
  - Of their past history of defaults or other actions
  - They are small firms without any borrowing history
- Bondholders tend to demand much higher interest rates from these firms to reflect these concerns.

<table>
<thead>
<tr>
<th>Factor in agency conflicts between stock and bond holders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observability of Cash Flows by Lenders</td>
</tr>
<tr>
<td>- Less observable cash flows lead to more conflicts</td>
</tr>
<tr>
<td>Type of Assets financed</td>
</tr>
<tr>
<td>- Tangible and liquid assets create less agency problems</td>
</tr>
<tr>
<td>Existing Debt covenants</td>
</tr>
<tr>
<td>- Restrictions on Financing</td>
</tr>
</tbody>
</table>

If agency problems are substantial, consider issuing convertible bonds.
And do not lock in market mistakes that work against you

- Ratings agencies can sometimes under rate a firm, and markets can under price a firm’s stock or bonds. If this occurs, firms should not lock in these mistakes by issuing securities for the long term. In particular,
  - Issuing equity or equity based products (including convertibles), when equity is under priced transfers wealth from existing stockholders to the new stockholders
  - Issuing long term debt when a firm is under rated locks in rates at levels that are far too high, given the firm’s default risk.

- What is the solution
  - If you need to use equity?
  - If you need to use debt?
The Right Debt for Disney

<table>
<thead>
<tr>
<th>Business</th>
<th>Project Cash Flow Characteristics</th>
<th>Type of Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Movies</strong></td>
<td>Projects are likely to&lt;br&gt;1. Be short term&lt;br&gt;2. Have cash outflows primarily in dollars (since Disney makes most of its movies in the U.S.) but cash inflows could have a substantial foreign currency component (because of overseas sales)&lt;br&gt;3. Have net cash flows that are heavily driven by whether the movie is a “hit”, which is often difficult to predict.</td>
<td>Debt should be&lt;br&gt;1. Short term&lt;br&gt;2. Primarily dollar debt.&lt;br&gt;3. If possible, tied to the success of movies. (Lion King or Nemo Bonds)</td>
</tr>
<tr>
<td><strong>Broadcasting</strong></td>
<td>Projects are likely to be&lt;br&gt;1. Short term&lt;br&gt;2. Primarily in dollars, though foreign component is growing&lt;br&gt;3. Driven by advertising revenues and show success</td>
<td>Debt should be&lt;br&gt;1. Short term&lt;br&gt;2. Primarily dollar debt&lt;br&gt;3. If possible, linked to network ratings.</td>
</tr>
<tr>
<td><strong>Theme Parks</strong></td>
<td>Projects are likely to be&lt;br&gt;1. Very long term&lt;br&gt;2. Primarily in dollars, but a significant proportion of revenues come from foreign tourists, who are likely to stay away if the dollar strengthens&lt;br&gt;3. Affected by success of movie and broadcasting divisions.</td>
<td>Debt should be&lt;br&gt;1. Long term&lt;br&gt;2. Mix of currencies, based upon tourist make up.</td>
</tr>
<tr>
<td><strong>Consumer Products</strong></td>
<td>Projects are likely to be short to medium term and linked to the success of the movie division. Most of Disney’s product offerings are derived from their movie productions.</td>
<td>Debt should be&lt;br&gt;a. Medium term&lt;br&gt;b. Dollar debt.</td>
</tr>
</tbody>
</table>
Analyzing Disney’s Current Debt

Disney has $13.1 billion in debt with an average maturity of 11.53 years. Even allowing for the fact that the maturity of debt is higher than the duration, this would indicate that Disney’s debt is far too long term for its existing business mix.

Of the debt, about 12% is Euro debt and no yen denominated debt. Based upon our analysis, a larger portion of Disney’s debt should be in foreign currencies.

Disney has about $1.3 billion in convertible debt and some floating rate debt, though no information is provided on its magnitude. If floating rate debt is a relatively small portion of existing debt, our analysis would indicate that Disney should be using more of it.
Returning Cash to the Owners: Dividend Policy
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 (debt)
- Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.

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 cash to stockholders.

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

Objective: Maximize the Value of the Firm
I. Dividends are sticky
The last quarter of 2008 put stickiness to the test. Number of S&P 500 companies that…

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Dividend Increase</th>
<th>Dividend initiated</th>
<th>Dividend decrease</th>
<th>Dividend suspensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 2007</td>
<td>102</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Q2 2007</td>
<td>63</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Q3 2007</td>
<td>59</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Q4 2007</td>
<td>63</td>
<td>7</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Q1 2008</td>
<td>93</td>
<td>3</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Q2 2008</td>
<td>65</td>
<td>0</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>Q3 2008</td>
<td>45</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Q4 2008</td>
<td>32</td>
<td>0</td>
<td>17</td>
<td>10</td>
</tr>
</tbody>
</table>
II. Dividends tend to follow earnings


Diagram showing the trend of dividends and earnings from 1960 to 2008.
Next year will be interesting…

- The precipitous drop in earnings that we saw in 2007 and 2008 have not manifested itself in big dividend drops (at least in the aggregate). However, if history is any guide, which of the following do you see happening in 2009?

  a) Dividends will remain flat
  b) Dividends will increase
  c) Dividends will decrease

- What external factor will determine the likely outcome the most?
III. More and more firms are buying back stock, rather than pay dividends...
Buybacks: The big question for 2009

Stock buybacks did drop off in 2008. The big question for the next year and beyond is whether this is the beginning of the reversal of a trend that started 20 years ago or a blip that will go away if the economy recovers. What do you think?

a) This is a temporary phenomenon. Stock buybacks will bounce when the economy recovers.

b) This is the start of a reversal of a trend. Now that companies know that capital markets can shut down, they will value cash more and be less willing to return it to stockholders (especially if they have to borrow money to fund the buybacks).

c) Buybacks will dominate dividends even more in the future. Earnings have become even less predictable than they used to be, and buybacks are a more flexible way of returning cash.
Measures of Dividend Policy

- **Dividend Payout:**
  - measures the percentage of earnings that the company pays in dividends
  - \( \frac{\text{Dividends}}{\text{Earnings}} \)

- **Dividend Yield:**
  - measures the return that an investor can make from dividends alone
  - \( \frac{\text{Dividends}}{\text{Stock Price}} \)
Dividend Payout Ratios: January 2009
Dividend Yields in the United States: January 2009

Dividend yields: 2008 versus 2009

Aswath Damodaran
Three Schools Of Thought On Dividends

1. If
   ● (a) there are no tax disadvantages associated with dividends
   ● (b) companies can issue stock, at no cost, to raise equity, whenever needed
   ● Dividends do not matter, and dividend policy does not affect value.

2. If dividends have a tax disadvantage,
   ● Dividends are bad, and increasing dividends will reduce value

3. If stockholders like dividends, or dividends operate as a signal of future prospects,
   ● Dividends are good, and increasing dividends will increase value
The balanced viewpoint

- If a company has excess cash, and few good investment opportunities (NPV>0), returning money to stockholders (dividends or stock repurchases) is good.
- If a company does not have excess cash, and/or has several good investment opportunities (NPV>0), returning money to stockholders (dividends or stock repurchases) is bad.
Assessing Dividend Policy

- Step 1: How much could the company have paid out during the period under question?
- Step 2: How much did the company actually pay out during the period in question?
- Step 3: How much do I trust the management of this company with excess cash?
  - How well did they make investments during the period in question?
  - How well has my stock performed during the period in question?
A Measure of How Much a Company Could have Afforded to Pay out: FCFE

The Free Cashflow to Equity (FCFE) is a measure of how much cash is left in the business after non-equity claimholders (debt and preferred stock) have been paid, and after any reinvestment needed to sustain the firm’s assets and future growth.

Net Income
+ Depreciation & Amortization
= Cash flows from Operations to Equity Investors
- Preferred Dividends
- Capital Expenditures
- Working Capital Needs
- Principal Repayments
+ Proceeds from New Debt Issues
= Free Cash flow to Equity
Estimating FCFE when Leverage is Stable

Net Income
- (1 - δ) (Capital Expenditures - Depreciation)
- (1 - δ) Working Capital Needs
= Free Cash flow to Equity

δ = Debt/Capital Ratio

For this firm,
- Proceeds from new debt issues = Principal Repayments + δ (Capital Expenditures - Depreciation + Working Capital Needs)
An Example: FCFE Calculation

- Consider the following inputs for Microsoft in 1996. In 1996, Microsoft’s FCFE was:
  - Net Income = $2,176 Million
  - Capital Expenditures = $494 Million
  - Depreciation = $480 Million
  - Change in Non-Cash Working Capital = $35 Million
  - Debt Ratio = 0%

- FCFE = Net Income - (Cap ex - Depr) (1-DR) - Chg WC (!-DR)
  = $2,176 - (494 - 480) (1-0) - $35 (1-0)
  = $2,127 Million

- By this estimation, Microsoft could have paid $2,127 Million in dividends/stock buybacks in 1996. They paid no dividends and bought back no stock. Where will the $2,127 million show up in Microsoft’s balance sheet?
Companies are not created equal: The consequences of large cash balances…

### Chrysler: FCFE, Dividends and Cash Balance

<table>
<thead>
<tr>
<th>Year</th>
<th>Cash Flow</th>
<th>Cash Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>1986</td>
<td>1,000</td>
<td>1,500</td>
</tr>
<tr>
<td>1987</td>
<td>1,500</td>
<td>3,000</td>
</tr>
<tr>
<td>1988</td>
<td>2,000</td>
<td>4,500</td>
</tr>
<tr>
<td>1989</td>
<td>2,500</td>
<td>7,000</td>
</tr>
<tr>
<td>1990</td>
<td>3,000</td>
<td>10,000</td>
</tr>
<tr>
<td>1991</td>
<td>3,500</td>
<td>13,000</td>
</tr>
<tr>
<td>1992</td>
<td>4,000</td>
<td>16,000</td>
</tr>
<tr>
<td>1993</td>
<td>4,500</td>
<td>20,000</td>
</tr>
<tr>
<td>1994</td>
<td>5,000</td>
<td>25,000</td>
</tr>
</tbody>
</table>

- 📊 = Free CF to Equity
- 💰 = Cash to Stockholders
- 🔴 = Cumulated Cash
Application Test: Estimating your firm’s FCFE

In General,

\[
\begin{align*}
\text{Net Income} & \quad + \text{Depreciation & Amortization} \\
\text{+ Capital Expenditures} & \quad - \text{Change in Non-Cash Working Capital} \\
\text{+ Preferred Dividend} & \quad - \text{Preferred Dividend} \\
\text{+ New Debt Issued} & \quad - \text{Principal Repaid} \\
\text{+ Change in ST Borrowing} & = \text{FCFE}
\end{align*}
\]

Compare to

\[
\begin{align*}
\text{Dividends (Common)} & \quad - \text{Common Dividend} \\
\text{+ Stock Buybacks} & \quad - \text{Decrease in Capital Stock} \\
\text{+ Increase in Capital Stock} &
\end{align*}
\]

If cash flow statement used

\[
\begin{align*}
\text{Net Income} & \quad + \text{Depreciation & Amortization} \\
\text{+ Capital Expenditures} & \quad + \text{Changes in Non-cash WC} \\
\text{+ Preferred Dividend} & \quad + \text{Preferred Dividend} \\
\text{+ Increase in LT Borrowing} & \quad + \text{Decrease in LT Borrowing} \\
\text{+ New Debt Issued} & = \text{FCFE}
\end{align*}
\]
A Practical Framework for Analyzing Dividend Policy

How much did the firm pay out? How much could it have afforded to pay out?

\[
\begin{align*}
\text{Net Income} & - (\text{Cap Ex} - \text{Depr}'n) (1-\text{DR}) \quad \text{What it could have paid out} \\
& - \text{Chg Working Capital} (1-\text{DR}) \quad \text{What it actually paid out} \\
& = \text{FCFE}
\end{align*}
\]

Firm pays out too little

- FCFE > Dividends

Do you trust managers in the company with your cash?

- Look at past project choice:
  - Compare ROE to Cost of Equity
  - ROC to WACC

Firm has history of good project choice and good projects in the future

- Give managers the flexibility to keep cash and set dividends

Firm has history of poor project choice

- Force managers to justify holding cash or return cash to stockholders

Firm pays out too much

- FCFE < Dividends

What investment opportunities does the firm have?

- Look at past project choice:
  - Compare ROE to Cost of Equity
  - ROC to WACC

Firm has good projects

- Firm should cut dividends and reinvest more

Firm has poor projects

- Firm should deal with its investment problem first and then cut dividends
Case 1: Disney

- FCFE versus Dividends
  - Between 1994 and 2003, Disney generated $969 million in FCFE each year.
  - Between 1994 and 2003, Disney paid out $639 million in dividends and stock buybacks each year.

- Cash Balance
  - Disney had a cash balance in excess of $4 billion at the end of 2003.

- Performance measures
  - Between 1994 and 2003, Disney has generated a return on equity, on its projects, about 2% less than the cost of equity, on average each year.
  - Between 1994 and 2003, Disney’s stock has delivered about 3% less than the cost of equity, on average each year.
  - The underperformance has been primarily post 1996 (after the Capital Cities acquisition).
Dividend Flexibility at Disney

- Given Disney’s track record over the last 10 years, if you were a Disney stockholder, would you be comfortable with Disney’s dividend policy?
  - Yes
  - No

- Disney could have afforded to pay more in dividends during the period of the analysis.
- It chose not to, and used the cash for acquisitions (Capital Cities/ABC) and ill-fated expansion plans (Go.com).
- While the company may have flexibility to set its dividend policy a decade ago, its actions over that decade have frittered away this flexibility.
- **Bottom line:** Large cash balances will not be tolerated in this company. Expect to face relentless pressure to pay out more dividends.
Case 2: Aracruz Celulose - A Paper & Pulp company

- **FCFE versus Dividends**
  - Between 1999 and 2003, Aracruz generated $37 million in FCFE each year.
  - Between 1999 and 2003, Aracruz paid out $80 million in dividends and stock buybacks each year.

- **Performance measures**
  - Between 1999 and 2003, Aracruz has generated a return on equity, on it’s projects, about 1.5% more than the cost of equity, on average each year.
  - Between 1999 and 2003, Aracruz’s stock has delivered about 2% more than the cost of equity, on average each year.
The Control Story

- Aracruz’s managers have asked you for permission to cut dividends (to more manageable levels). Are you likely to go along?
  - Yes
  - No

- The reasons for Aracruz’s dividend problem lie in its equity structure. Like most Brazilian companies, Aracruz has two classes of shares - common shares with voting rights and preferred shares without voting rights. However, Aracruz has committed to paying out 35% of its earnings as dividends to the preferred stockholders. If they fail to meet this threshold, the preferred shares get voting rights. If you own the preferred shares, would your answer to the question above change?
  - Yes
  - No
### Summary of calculations

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free CF to Equity</td>
<td>$571.10</td>
<td>$1,382.29</td>
<td>$3,764.00</td>
<td>($612.50)</td>
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<tr>
<td>Dividends</td>
<td>$1,496.30</td>
<td>$448.77</td>
<td>$2,112.00</td>
<td>$831.00</td>
</tr>
<tr>
<td>Dividends+Repurchases</td>
<td>$1,496.30</td>
<td>$448.77</td>
<td>$2,112.00</td>
<td>$831.00</td>
</tr>
<tr>
<td>Dividend Payout Ratio</td>
<td>84.77%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash Paid as % of FCFE</td>
<td>262.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROE - Required return</td>
<td>-1.67%</td>
<td>11.49%</td>
<td>20.90%</td>
<td>-21.59%</td>
</tr>
</tbody>
</table>
BP: Just Desserts!

B.P.’s Shares Plummet After Dividend Is Slashed

By MATTHEW L. WALD

British Petroleum said yesterday that it would cut its dividend by 15 percent, reflecting a charge of $12 billion for the second quarter and lay off 12,000 employees, or 10 percent of its worldwide work force. The moves came five weeks after Robert B. Wise, B.P.’s chairman, resigned under pressure from the company’s outside directors.

Analysts anticipated a dividend cut by the oil company, the world’s third largest, but the size announced was at the low end of their expectations. In response, shares of the company’s American depositary rights, each of which represents 11 shares of the London-based company, dropped $3.13, or 7.5 percent, to $38.50. It closed on the New York Stock Exchange, with 26.8 million shares traded.

The Royal Dutch/Shell group also reported a disappointing quarter yesterday, with earnings on a replaced-cost basis—excluding gains or losses on inventory holdings—of $116 million, down 32 percent.

Quick Recovery Seems Unlikely

Adding to the gloom at B.P., the new chairman, Sir Paul U. Bowker, also revealed that the company’s cash flow was being squeezed, particularly for the downstream oil and gas business, with growth prospects for the worldwide economy remaining uncertain, he said in a statement. Downstream oil is an industry term for refining and marketing operations, as distinct from oil production.

Downstream margins in the United States could fall later this year, he predicted, when clean air rules take effect and gasoline must be reformulated to reduce emissions. “As Europe, recovery will depend upon seasonal heating oil and diesel,” Mr. Bowker said.

With oil markets, he predicted, would remain balanced unless Saudi Arabia, whose output has been curtailed, increased its production. The company said it was well positioned “to take advantage of any increase in oil prices, but the company’s oil production in the United States is declining. B.P. is the largest producer in Alaska.

The market for petrochemicals is Europe remains weak.

B.P.’s second quarter profits, before one-time transactions, declined to $121 million from $115 million, valuing inventories on a replacement-cost basis.

James A. Marchion, an analyst at Standard & Poor’s, estimated that after abnormal costs, B.P.’s profits declined 15 percent in the second quarter, compared with 1.5 percent a year earlier.

Analysts attributed B.P.’s problems to the company’s acquisition in the last few years, and heavy capital expenditures. Speaking up for the company’s record history, Frank P. Brandon of Prudential Securities Research said,”“Oil rows, interest expenditures, and profits have grown.”

Mr. Marchion, who worked for Standard of Oils in Ohio, himself B.P. after B.P. acquired Standard, said, “What you’ve got is a company that’s Old and Meade, the same terms, if not the same standards, as the industry average. He said, that the company has been spending enough to replace 128 percent in the past year, and profits have grown.”

In addition, he said, the company had been spending twice as much on its refining and marketing operations as it was recording in depreciation.

Another analyst at a large Wall Street brokerage house, who spoke on the condition of anonymity, said, “They took all the old Standard stations and turned them into modern B.P. stations; they took all the B.P. stations and turned them into, um, modern stations. The analyst said that’s why some of the cuts were obvious, some people didn’t think so.”

Continued on Page B10.

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Maximum</th>
<th>Minimum</th>
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<td>($34.20)</td>
<td>$109.74</td>
<td>$96.89</td>
<td>($242.17)</td>
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<td>$32.79</td>
<td>$101.36</td>
<td>$5.97</td>
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<td>Dividends+Repurchases</td>
<td>$40.87</td>
<td>$32.79</td>
<td>$101.36</td>
<td>$5.97</td>
</tr>
<tr>
<td>Dividend Payout Ratio</td>
<td>18.59%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash Paid as % of FCFE</td>
<td>-119.52%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROE - Required return</td>
<td>1.69%</td>
<td>19.07%</td>
<td>29.26%</td>
<td>-19.84%</td>
</tr>
</tbody>
</table>
Growth Firms and Dividends

- High growth firms are sometimes advised to initiate dividends because it increases the potential stockholder base for the company (since there are some investors - like pension funds - that cannot buy stocks that do not pay dividends) and, by extension, the stock price. Do you agree with this argument?

- Yes
- No

Why?
Tata Chemicals: The Cross Holding Effect

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Standard Deviation</th>
<th>Maximum</th>
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</thead>
<tbody>
<tr>
<td><strong>Free CF to Equity</strong></td>
<td>INR 4,634.28</td>
<td>INR 4,732.30</td>
<td>INR 11,175.90</td>
</tr>
<tr>
<td><strong>Dividends</strong></td>
<td>INR 1,487.43</td>
<td>INR 197.90</td>
<td>INR 1,715.70</td>
</tr>
<tr>
<td><strong>Dividends+Repurchases</strong></td>
<td>INR 1,487.43</td>
<td>INR 197.90</td>
<td>INR 1,715.70</td>
</tr>
<tr>
<td><strong>Dividend Payout Ratio</strong></td>
<td>INR 0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cash Paid as % of FCFE</strong></td>
<td>INR 0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ROE</strong></td>
<td>INR 0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Return on Stock</strong></td>
<td>INR 0.19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Much of the cash held back was invested in long term investments and financial assets (funds and bonds).
Valuation
First Principles

- 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 (debt)
  - Returns on projects should be measured based on cash flows generated and the timing of these cash flows; they should also consider both positive and negative side effects of these projects.
- 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 cash to stockholders.
  - The form of returns - dividends and stock buybacks - will depend upon the stockholders’ characteristics.

Objective: Maximize the Value of the Firm
Generic DCF Valuation Model

**DISCOUNTED CASHFLOW VALUATION**

- **Cash flows**
  - Firm: Pre-debt cash flow
  - Equity: After debt cash flows

- **Expected Growth**
  - Firm: Growth in Operating Earnings
  - Equity: Growth in Net Income/EPS

- **Terminal Value**
  - Firm is in stable growth: Grows at constant rate forever

- **Discount Rate**
  - Firm: Cost of Capital
  - Equity: Cost of Equity

- **Value**
  - Firm: Value of Firm
  - Equity: Value of Equity

- **Length of Period of High Growth**
  - CF₁, CF₂, CF₃, CF₄, CF₅, …., CFₙ
  - Forever
I. Estimating Cash Flows

Cash Flows

To Equity

The Strict View
Dividends + Stock Buybacks

The Broader View
Net Income
- Net Cap Ex (1-Debt Ratio)
- Chg WC (1 - Debt Ratio)
= Free Cashflow to Equity

To Firm

EBIT (1-t)
- (Cap Ex - Depreciation)
- Change in Working Capital
= Free Cashflow to Firm
Estimating FCFF in 2003: Disney

- EBIT = $2,805 Million  Tax rate = 37.30%
- Capital spending = $1,735 Million
- Depreciation = $1,254 Million
- Increase in Non-cash Working capital = $454 Million

Estimating FCFF

\[
\text{EBIT} \times (1 - \text{tax rate}) = 2805 \times (1 - 0.373)
\]

- Net Capital Expenditures $481 = (1735 - 1254)
- Change in Working Capital $454
- Free Cashflow to Firm $824

- Total Reinvestment = Net Cap Ex + Change in WC = 481 + 454 = 935
- Reinvestment Rate = 935/1759 = 53.18%
II. The Discount Rate
Disney’s Current Cost of Capital

- **Equity**
  - Cost of Equity = Riskfree rate + Beta * Risk Premium
    \[ = 4\% + 1.25 \times (4.82\%) = 10.00\% \]
  - Market Value of Equity = $55.101 Billion
  - Equity/(Debt+Equity) = 79\%

- **Debt**
  - After-tax Cost of debt = (Riskfree rate + Default Spread) (1-t)
    \[ = (4\%+1.25\%) \times (1-.373) = 3.29\% \]
  - Market Value of Debt = $14.668 Billion
  - Debt/(Debt+Equity) = 21\%

- **Cost of Capital** = 10.00\%\times0.79+3.29\%\times0.21 = 8.59\%
  \[ 55.101(55.101+14.668) \]
But costs of capital can and should change over time…

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Growth</th>
<th>Beta</th>
<th>Debt Ratio</th>
<th>Cost of Debt</th>
<th>Tax Rate</th>
<th>Cost of Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.38%</td>
<td>1.25</td>
<td>21.02%</td>
<td>5.25%</td>
<td>37.30%</td>
<td>8.59%</td>
</tr>
<tr>
<td>2</td>
<td>6.38%</td>
<td>1.25</td>
<td>21.02%</td>
<td>5.25%</td>
<td>37.30%</td>
<td>8.59%</td>
</tr>
<tr>
<td>3</td>
<td>6.38%</td>
<td>1.25</td>
<td>21.02%</td>
<td>5.25%</td>
<td>37.30%</td>
<td>8.59%</td>
</tr>
<tr>
<td>4</td>
<td>6.38%</td>
<td>1.25</td>
<td>21.02%</td>
<td>5.25%</td>
<td>37.30%</td>
<td>8.59%</td>
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<tr>
<td>5</td>
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<td>21.02%</td>
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<td>37.30%</td>
<td>8.59%</td>
</tr>
<tr>
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<td>1.20</td>
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</tr>
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<td>1.15</td>
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<tr>
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<td>4.95%</td>
<td>1.10</td>
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<tr>
<td>9</td>
<td>4.48%</td>
<td>1.05</td>
<td>28.20%</td>
<td>5.25%</td>
<td>37.30%</td>
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</tr>
<tr>
<td>10</td>
<td>4.00%</td>
<td>1.00</td>
<td>30.00%</td>
<td>5.25%</td>
<td>37.30%</td>
<td>7.16%</td>
</tr>
<tr>
<td>After yr 10</td>
<td>4.00%</td>
<td>1.00</td>
<td>30.00%</td>
<td>5.25%</td>
<td>37.30%</td>
<td>7.16%</td>
</tr>
</tbody>
</table>
III. Expected Growth

- Net Income
  - Retention Ratio = 1 - Dividends/Net Income
  - Return on Equity = Net Income/Book Value of Equity

- Operating Income
  - Reinvestment Rate = (Net Cap Ex + Chg in WC/EBIT(1-t))
  - Return on Capital = EBIT(1-t)/Book Value of Capital
We begin by estimating the reinvestment rate and return on capital for Disney in 2003, using the numbers from the latest financial statements. We did convert operating leases into debt and adjusted the operating income and capital expenditure accordingly.

- Reinvestment Rate\textsubscript{2003} = \frac{(\text{Cap Ex} - \text{Depreciation} + \text{Chg in non-cash WC})}{\text{EBIT} (1-t)} = \frac{(1735 - 1253 + 454)}{2805(1-.373)} = 53.18\%

- Return on capital\textsubscript{2003} = \frac{\text{EBIT} (1-t)}{\text{BV of Debt}\textsubscript{2002} + \text{BV of Equity}\textsubscript{2002}} = \frac{2805 (1-.373)}{15,883+23,879} = 4.42\%

- Expected Growth Rate from existing fundamentals = 53.18\% \times 4.42\% = 2.35\%

We will assume that Disney will be able to earn a return on capital of 12\% on its new investments and that the reinvestment rate will be 53.18\% for the immediate future.

- Expected Growth Rate in operating income = Return on capital \times Reinvestment Rate = 12\% \times .5318 = 6.38\%
IV. Getting Closure in Valuation

Since we cannot estimate cash flows forever, we estimate cash flows for a “growth period” and then estimate a terminal value, to capture the value at the end of the period:

\[
\text{Value} = \sum_{t=1}^{N} \frac{CF_t}{(1+r)^t} + \frac{\text{Terminal Value}}{(1+r)^N}
\]

When a firm’s cash flows grow at a “constant” rate forever, the present value of those cash flows can be written as:

\[
\text{Value} = \frac{\text{Expected Cash Flow Next Period}}{(r - g)}
\]

where,

- \( r \) = Discount rate (Cost of Equity or Cost of Capital)
- \( g \) = Expected growth rate forever.

This “constant” growth rate is called a stable growth rate and cannot be higher than the growth rate of the economy in which the firm operates.
Estimating Stable Period Inputs: Disney

1. **Respect the cap**: The growth rate forever is assumed to be 4%

2. **Stable period excess returns**: The return on capital for Disney will drop from its high growth period level of 12% to a stable growth return of 10%. This is still higher than the cost of capital of 7.16% but the competitive advantages that Disney has are unlikely to dissipate completely by the end of the 10th year.

3. **Reinvest to grow**: The expected growth rate in stable growth will be 4%. In conjunction with the return on capital of 10%, this yields a stable period reinvestment rate of 40%:

   Reinvestment Rate = Growth Rate / Return on Capital = 4% / 10% = 40

4. **Adjust risk and cost of capital**: The beta for the stock will drop to one, reflecting Disney’s status as a mature company.

   Cost of Equity = Riskfree Rate + Beta * Risk Premium = 4% + 4.82% = 8.82%

   The debt ratio for Disney will rise to 30%. Since we assume that the cost of debt remains unchanged at 5.25%, this will result in a cost of capital of 7.16%

   Cost of capital = 8.82% (.70) + 5.25% (1-.373) (.30) = 7.16%
Disney: Valuation

Current Cashflow to Firm

EBIT(1-t) : 1,759
- Nt CpX 481
- Chg WC 454
= FCFF $ 824
Reinvestment Rate=(481+454)/1759 = 53.18%

Expected Growth in EBIT (1-t)
.5318*.12=.0638
6.38%

Reinvestment Rate 53.18%

Expected Growth
in EBIT (1-t)
.5318*.12=.0638
6.38%

EBIT (1-t) $1,871 $1,990 $2,117 $2,252 $2,396 $2,538 $2,675 $2,808 $2,934 $3,051
- Reinvestment $995 $1,058 $1,126 $1,198 $1,274 $1,283 $1,282 $1,271 $1,251 $1,220
FCFF $876 $932 $991 $1,055 $1,122 $1,255 $1,394 $1,537 $1,683 $1,831

Stable Growth
g = 4%; Beta = 1.00;
Cost of capital = 7.16%
ROC= 10%
Reinvestment Rate=g/ROC =4/ 10= 40%

Terminal Value10= 1,904/(.0716-.04) = 60,219

Discount at Cost of Capital (WACC) = 10.00% (.79) + 3.29% (0.21) = 8.59

Cost of Equity 10%

Cost of Debt
(4.00%+1.25%)(1-.373) = 3.29%

Weights
E = 79% D = 21%

Riskfree Rate:
Riskfree Rate= 4%

Beta 1.2456

Mature market premium 4%

Unlevered Beta for Sectors: 1.0674
Firm’s D/E Ratio: 24.77%

Disney was trading at about $26 at the time of this valuation.
Aswath Damodaran

The Investment Decision
Invest in projects that earn a return greater than a minimum acceptable hurdle rate.

The Dividend Decision
If you cannot find investments that earn more than the hurdle rate, return the cash to the owners of the business.

The Financing Decision
Choose a financing mix that minimizes the hurdle rate and match your financing to your assets.

Current EBIT (1-t) $1,759

Return on Capital 12%

Expected Growth Rate = 12% × 53.18% = 6.38%

Reinvestment Rate 53.18%

Cost of capital = 10% (.79) + 3.29% (.21) = 8.59%

Existing Investments
ROC = 4.22%

New Investments

Investment decision affects risk of assets being financed and financing decision affects hurdle rate.

Return on Capital

Expected Growth Rate = 12% × 53.18% = 6.38%

Reinvestment Rate 53.18%

Cost of capital = 10% (.79) + 3.29% (.21) = 8.59%

Disney: Corporate Financing Decisions and Firm Value

<table>
<thead>
<tr>
<th>Year</th>
<th>Expected Growth</th>
<th>EBIT</th>
<th>EBIT (1-t)</th>
<th>Reinvestment Rate</th>
<th>Reinvestment</th>
<th>FCFF</th>
<th>Cost of capital</th>
<th>PV of FCFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>$2,805</td>
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<td></td>
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<tr>
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<td>6.38%</td>
<td>$2,984</td>
<td>$1,871</td>
<td>53.18%</td>
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<td>$876.06</td>
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<td>$774.22</td>
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<td>$1,197.79</td>
<td>$1,054.70</td>
<td>8.59%</td>
<td>$758.45</td>
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<td>$3,822</td>
<td>$2,396</td>
<td>53.18%</td>
<td>$1,274.23</td>
<td>$1,122.00</td>
<td>8.59%</td>
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<td>$1,393.77</td>
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<td>$4,478</td>
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<td>$1,536.80</td>
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<td>$807.43</td>
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<td>$4,679</td>
<td>$2,934</td>
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<td>$1,250.78</td>
<td>$1,682.90</td>
<td>7.45%</td>
<td>$822.90</td>
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<td>4.00%</td>
<td>$4,866</td>
<td>$3,051</td>
<td>40.00%</td>
<td>$1,220.41</td>
<td>$1,830.62</td>
<td>7.16%</td>
<td>$835.31</td>
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<tr>
<td>Terminal Value</td>
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<td></td>
<td></td>
<td>$60,219.11</td>
<td></td>
<td>$27,477.93</td>
</tr>
</tbody>
</table>

Value of Operating Assets = $35,372.62
+ Cash & Non-op Assets = $3,432.00
Value of firm = $38,804.62
- Debt = $14,668.22
- Options = $1,334.67
Value of equity in stock = $22,801.73
Value per share = $11.14
### Investment Decision

Invest in projects that earn a return greater than a minimum acceptable hurdle rate.

### Dividend Decision

If you cannot find investments that earn more than the hurdle rate, return the cash to the owners of the business.

### Financing Decision

Choose a financing mix that minimizes the hurdle rate and match your financing to your assets.

---

#### Expected Growth Rate

\[
\text{Expected Growth Rate} = 15\% \times 53.18\% = 7.98\%
\]

#### Financing Mix

- Debt (D): 30%
- Equity (E): 70%

---

**Year** | **Expected Growth (EBIT)** | **EBIT (1-t)** | **Reinvestment Rate** | **Reinvestment FCFF** | **Cost of capital** | **PV of FCFF** |
---|---|---|---|---|---|---|
Current | | | | | | |
1 | 7.98% | $5,327 | - | - | - | - |
2 | 7.98% | 5,752 | 3.894 | 3.894 | 3,606 | 2,071 | 1,688 | 8.40% | $1,558 |
3 | 7.98% | 6,211 | 4,205 | 53.18% | 2,236 | 1,969 | 8.40% | 8.40% | $1,551 |
4 | 7.98% | 6,706 | 4,540 | 53.18% | 2,414 | 2,126 | 8.40% | 8.40% | $1,553 |
5 | 7.98% | 7,241 | 4,902 | 53.18% | 2,607 | 2,295 | 8.40% | 8.40% | $1,533 |
6 | 7.98% | 7,819 | 5,254 | 53.18% | 2,799 | 2,503 | 8.40% | 8.40% | $1,593 |
7 | 6.39% | 8,915 | 5,500 | 47.81% | 2,678 | 3,230 | 7.91% | 10.67% | $1,667 |
8 | 5.59% | 9,414 | 5,902 | 45.27% | 2,672 | 3,230 | 7.91% | 10.67% | $1,717 |
9 | 4.80% | 9,865 | 6,185 | 42.64% | 2,637 | 3,548 | 7.41% | 10.67% | $1,756 |
10 | 4.00% | 10,260 | 6,433 | 55.00% | 2,573 | 3,860 | 7.16% | 10.67% | $1,783 |

**Terminal Value**

- Value of Operating Assets = $74,900
- + Cash & Non-op Assets = $3,432
- Value of firm = $78,332
- - Debt = $14,649
- - Options = $1,335
- Value of equity in stock = $62,349
- Value per share = $30.45
Current Cashflow to Firm
EBIT(1-t) : 3884
- Nt CpX   : -309
- Chg WC   : 2404
= FCFF     : 1789
Reinvestment Rate = (2404-309)/38844 = 54%

Expected Growth in EBIT (1-t)
.70*.091=.0637
6.37%

Terminal value = 3462/(.1161-.04) = 45,523

Discount at Cost of Capital (WACC) = 13.72%(.84) + 5.58%(0.16) = 12.41%

Tata Chemicals was trading at RS 252/share in Sept 2007
First Principles

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

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