



FROM RISK & RETURN MODELS TO HURDLE RATES: ESTIMATION CHALLENGES

“The price of purity is purists...”

Anonymous

Inputs required to use the CAPM -

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- 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

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- 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.

Riskfree Rate in Practice

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- 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 ...
- Practically speaking, if there is substantial uncertainty about expected cash flows, the present value effect of using time varying riskfree rates is small enough that it may not be worth it.

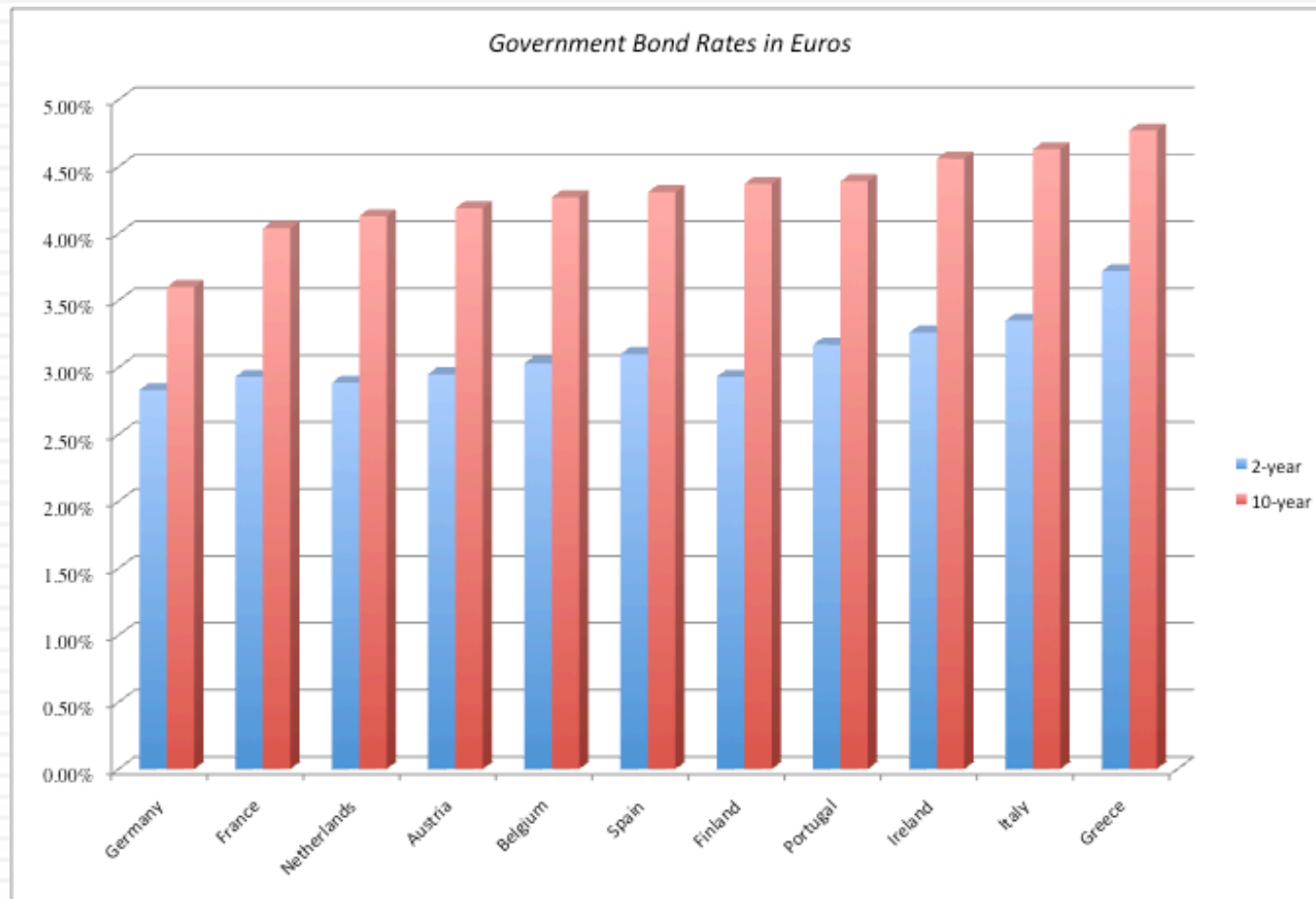
The Bottom Line on Riskfree Rates

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- 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 May 2009, for instance, the ten-year US treasury bond rate was 3.5%.

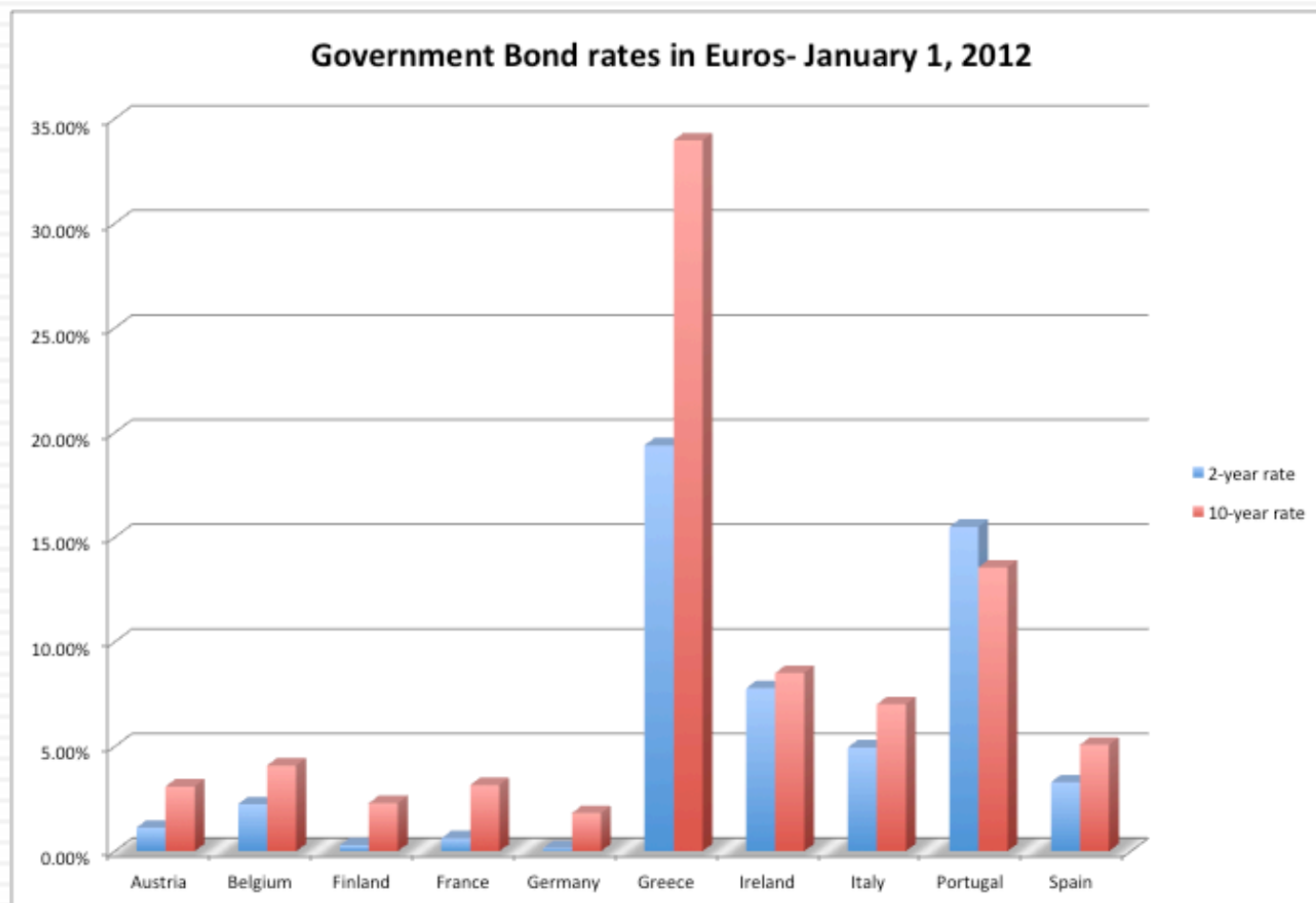
What is the Euro riskfree rate? An exercise in 2009

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The Euro rates: A 2012 update

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What if there is no default-free entity?

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- 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 May 2009, the Indian government rupee bond rate was 7%. the local currency rating from Moody's was Ba2 and the default spread for a Ba2 rated country bond was 3%.

$\text{Riskfree rate in Rupees} = 7\% - 3\% = 4\%$
 - In May 2009, the Brazilian government \$R bond rate was 11% and the local currency rating was Ba1, with a default spread of 2.5%.

$\text{Riskfree rate in \$R} = 11\% - 2.5\% = 8.5\%$
 - Do the analysis in an alternate currency, where getting the riskfree rate is easier. With Aracruz in 2009, we could chose to do the analysis in US dollars (rather than estimate a riskfree rate in R\$). The riskfree rate is then the US treasury bond rate.
 - 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

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

What is your risk premium?

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- 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 Aversion and Risk Premiums

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

Risk Premiums do change..

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- 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

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- 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

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- 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:

<i>Group Surveyed</i>	<i>Survey done by</i>	<i>Estimated ERP</i>	<i>Notes</i>
Individual Investors	Securities Industries Association	8.3% (2004)	One year premium
Institutional Investors	Merrill Lynch	4.8% (2013)	Monrthly updates
CFOs	Campbell Harvey & Graham	4.48% (2012)	5-8% response rate
Analysts	Pablo Fernandez	5.0% (2011)	Lowest standard deviation
Academics	Pablo Fernandez	5.7% (2011)	Higher for emerging markets

- 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 more reflective of the past than the future.
 - they tend to be short term; even the longest surveys do not go beyond one year.

The Historical Premium Approach

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- 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.

B. The Historical Risk Premium Evidence from the United States

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	Arithmetic Average		Geometric Average	
	Stocks - T. Bills	Stocks - T. Bonds	Stocks - T. Bills	Stocks - T. Bonds
1928-2012	7.65%	5.88%	5.74%	4.20%
	2.20%	2.33%		
1962-2012	5.93%	3.91%	4.60%	2.93%
	2.38%	2.66%		
2002-2012	7.06%	3.08%	5.38%	1.71%
	5.82%	8.11%		

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.

What about historical premiums for other markets?

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- 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 data problem 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

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- Ratings agencies 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 May 2009, the local currency rating, from Moody's, for Brazil was Ba1. If a country issues bonds denominated in a different currency (say dollars or euros), we can assess how the bond market views the risk in that country. In May 2009, Brazil had dollar denominated 10-year Bonds, trading at an interest rate of 6%. The US treasury bond rate that day was 3.5%, yielding a default spread of 2.50% for Brazil.
 - India has a rating of Ba2 from Moody's but has no dollar denominated bonds. The typical default spread for Ba2 rated sovereign bonds is 3%.
- Many analysts add this default spread to the US risk premium to come up with a risk premium for a country. This would yield a risk premium of 6.38% for Brazil and 6.88% for India, if we use 3.88% as the premium for the US (3.88% was the historical risk premium for the US from 1928-2008)

Beyond the default spread

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- While default risk spreads and equity risk premiums are highly correlated, one would expect equity spreads to be higher than debt spreads.
- Risk Premium for Brazil in 2009
 - ▣ Standard Deviation in Bovespa (Equity) = 34%
 - ▣ Standard Deviation in Brazil \$ denominated Bond = 21.5%
 - ▣ Default spread on \$ denominated Bond = 2.5%
 - ▣ Country Risk Premium (CRP) for Brazil = $2.5\% (34\%/21.5\%) = 3.95\%$
 - ▣ Total Risk Premium for Brazil = US risk premium (in '09) + CRP for Brazil
 $= 3.88\% + 3.95\% = 7.83\%$
- Risk Premium for India in May 2009
 - ▣ Standard Deviation in Sensex (Equity) = 32%
 - ▣ Standard Deviation in Indian government bond = 21.3%
 - ▣ Default spread based upon rating = 3%
 - ▣ Country Risk Premium for India = $3\% (32\%/21.3\%) = 4.51\%$
 - ▣ Total Risk Premium for India = US risk premium (in '09) + CRP for India
 $= 3.88\% + 4.51\% = 8.39\%$

An alternate view of ERP: Watch what I pay, not what I say.. January 2008

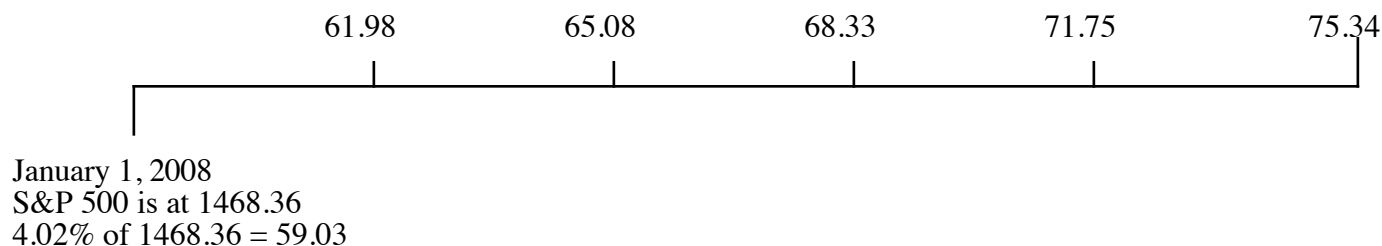
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Year	Dividend Yield	Buybacks/Index	Yield
2001	1.37%	1.25%	2.62%
2002	1.81%	1.58%	3.39%
2003	1.61%	1.23%	2.84%
2004	1.57%	1.78%	3.35%
2005	1.79%	3.11%	4.90%
2006	1.77%	3.38%	5.15%
2007	1.89%	4.00%	5.89%
Average yield between 2001-2007 =			4.02%

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).



Solving for the implied premium...

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- 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%

A year that made a difference.. The implied premium in January 2009

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

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

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).

54.69 56.87 59.15 61.52 63.98

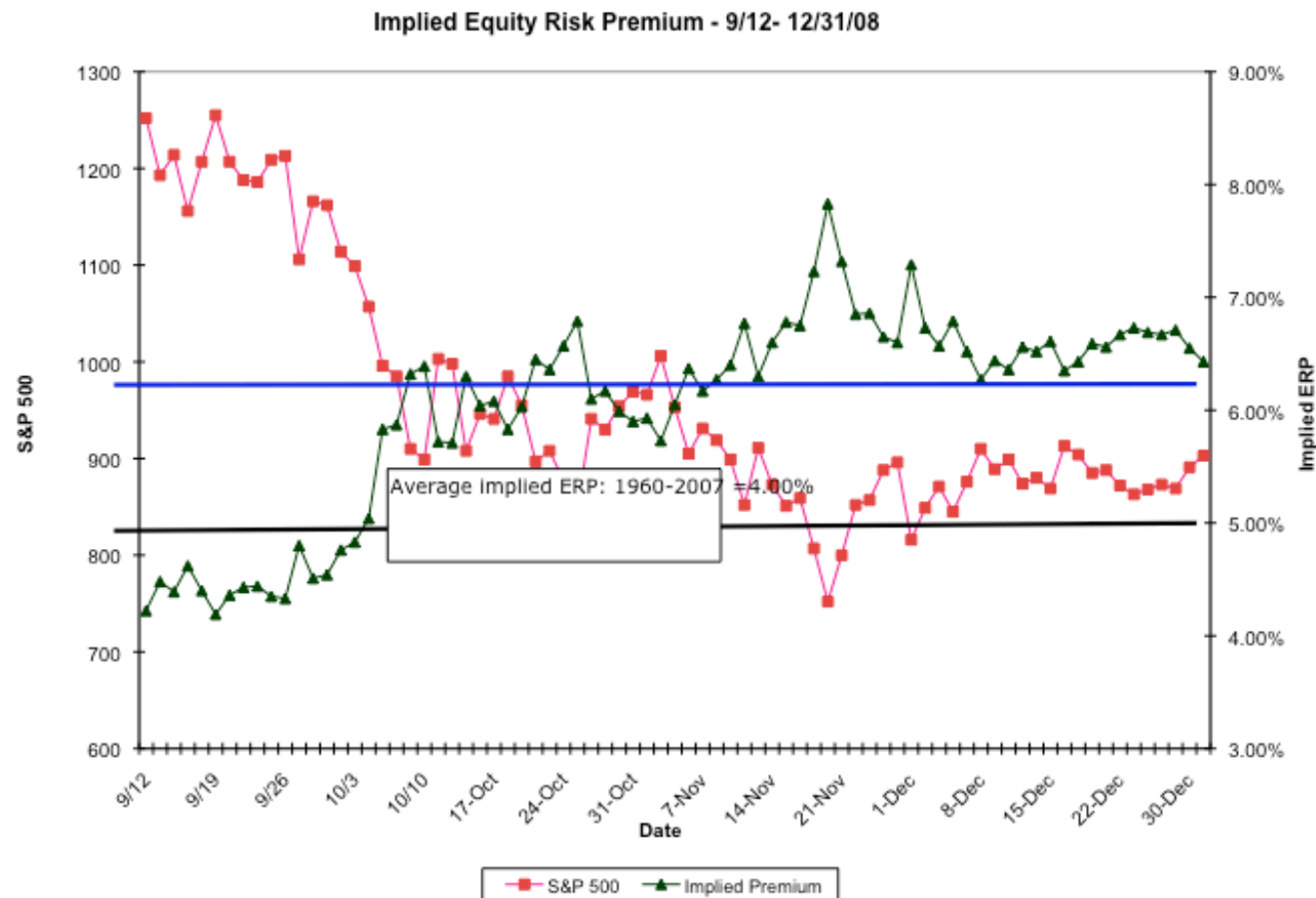
January 1, 2009
S&P 500 is at 903.25
Adjusted Dividends &
Buybacks for 2008 = 52.58
Aswath Damodaran

$$903.25 = \frac{54.69}{(1+r)} + \frac{56.87}{(1+r)^2} + \frac{59.15}{(1+r)^3} + \frac{61.52}{(1+r)^4} + \frac{63.98}{(1+r)^5} + \frac{63.98(1.0221)}{(r - .0221)(1+r)^5}$$

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

The Anatomy of a Crisis: Implied ERP from September 12, 2008 to January 1, 2009

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The bottom line on Equity Risk Premiums in early 2009

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- Mature Markets: In May 2009, the number that we chose to use as the equity risk premium for all mature markets was 6%. While lower than the implied premium at the start of the year 6.43%, it is still much higher than the historical risk premium of 3.88%. It reflected our beliefs then that while the crisis was abating, it would leave a longer term impact on risk premiums.
- For emerging markets, we will use the melded default spread approach (where default spreads are scaled up to reflect additional equity risk) to come up with the additional risk premium.
 - $\text{ERP for Brazil} = \text{Mature market premium} + \text{CRP for Brazil} = 6\% + 3.95\% = 9.95\%$
 - $\text{ERP for India} = \text{Mature market premium} + \text{CRP for India} = 6\% + 4.51\% = 10.51\%$

An Updated Equity Risk Premium:

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- On January 1, 2013, the S&P 500 was at 1426.19, essentially unchanged for the year. And it was a year of macro shocks – political upheaval in the Middle East and sovereign debt problems in Europe. The treasury bond rate dropped below 2% and buybacks/dividends surged.

In 2012, the actual cash returned to stockholders was 72.25. Using the average total yield for the last decade yields 69.46

Analysts expect earnings to grow 7.67% in 2013, 7.28% in 2014, scaling down to 1.76% in 2017, resulting in a compounded annual growth rate of 5.27% over the next 5 years. We will assume that dividends & buybacks will grow 5.27% a year for the next 5 years.

After year 5, we will assume that earnings on the index will grow at 1.76%, the same rate as the entire economy (= riskfree rate).

	73.12	76.97	81.03	85.30	89.80	
January 1, 2013	$1426.19 = \frac{73.12}{(1+r)} + \frac{76.97}{(1+r)^2} + \frac{81.03}{(1+r)^3} + \frac{85.30}{(1+r)^4} + \frac{89.80}{(1+r)^5} + \frac{89.80(1.0176)}{(r - .0176)(1+r)^5}$					
S&P 500 is at 1426.19						
Adjusted Dividends & Buybacks for base year = 69.46						
	Expected Return on Stocks (1/1/13)			= 7.54%		
	T.Bond rate on 1/1/13			= 1.76%		
	Equity Risk Premium = 7.54% - 1.76%			= 5.78%		

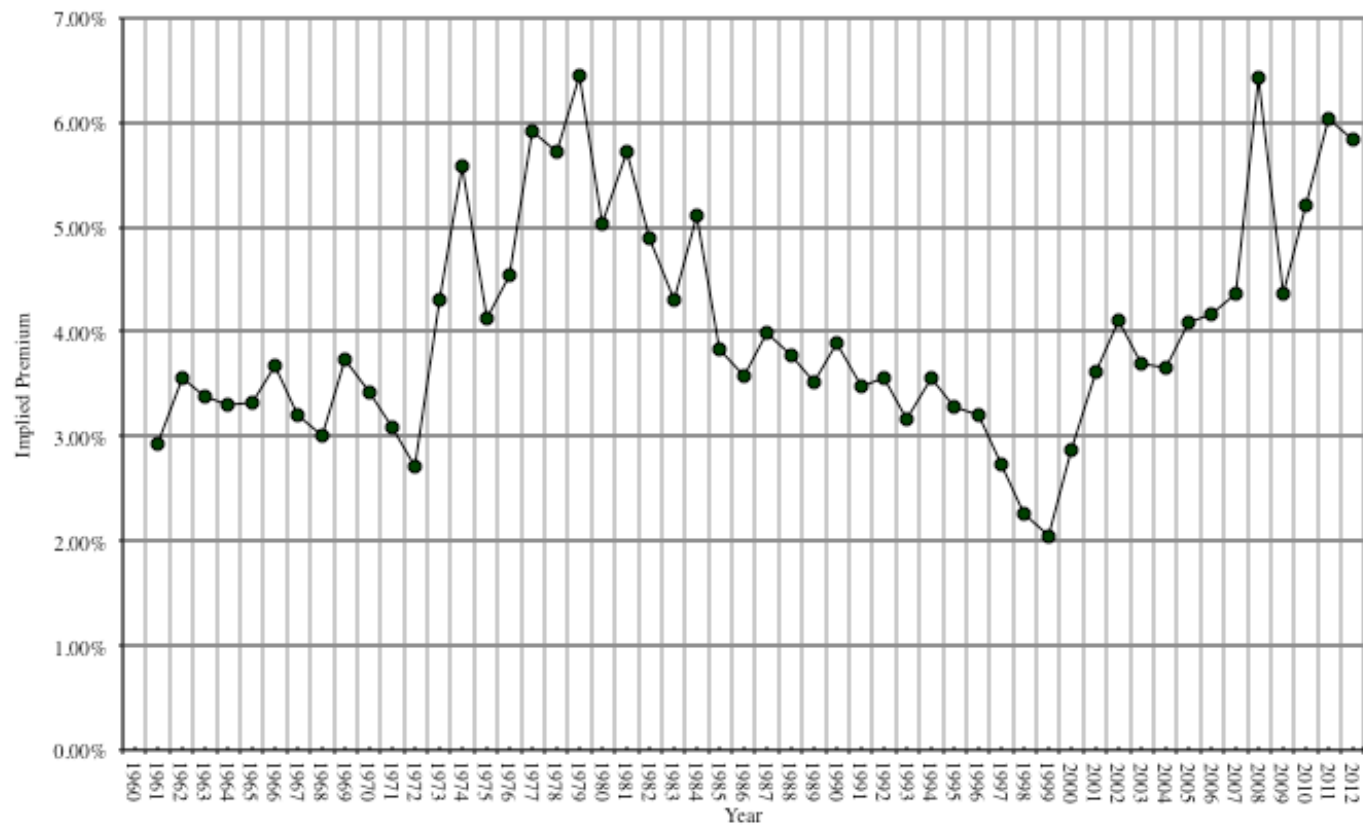
Data Sources:

Dividends and Buybacks last year: S&P
Expected growth rate: S&P, Media reports, Factset, Thomson-Reuters

Implied Premiums in the US: 1960-2012

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Implied Premium for US Equity Market



A Composite way of estimating ERP for countries

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- Step 1: Estimate an equity risk premium for a mature market. If your preference is for a forward looking, updated number, you can estimate an implied equity risk premium for the US (assuming that you buy into the contention that it is a mature market)
 - My estimate: In January 2013, my estimate for the implied premium in the US was 5.8%. That will also be my estimate for a mature market ERP.
- Step 2: Come up with a generic and measurable definition of a mature market.
 - My estimate: Any AAA rated country is mature.
- Step 3: Estimate the additional risk premium that you will charge for markets that are not mature. You have two choices:
 - The default spread for the country, estimated based either on sovereign ratings or the CDS market.
 - A scaled up default spread, where you adjust the default spread upwards for the additional risk in equity markets.

Country Risk Premiums January 2013

Canada	0.00%	5.80%
USA	0.00%	5.80%
N. America	0.00%	5.80%

Argentina	9.00%	14.80%
Belize	15.00%	20.80%
Bolivia	4.88%	10.68%
Brazil	2.63%	8.43%
Chile	1.05%	6.85%
Colombia	3.00%	8.80%
Costa Rica	3.00%	8.80%
Ecuador	10.50%	16.30%
El Salvador	4.88%	10.68%
Guatemala	3.60%	9.40%
Honduras	7.50%	13.30%
Mexico	2.25%	8.05%
Nicaragua	9.00%	14.80%
Panama	2.63%	8.43%
Paraguay	6.00%	11.80%
Peru	2.63%	8.43%
Uruguay	3.00%	8.80%
Venezuela	6.00%	11.80%
Latin America	3.38%	9.18%

Belgium	1.05%	6.85%
Germany	0.00%	5.80%
Portugal	4.88%	10.68%
Italy	2.63%	8.43%
Luxembourg	0.00%	5.80%
Austria	0.00%	5.80%
Denmark	0.00%	5.80%
France	0.38%	6.18%
Finland	0.00%	5.80%
Greece	10.50%	16.30%
Iceland	3.00%	8.80%
Ireland	3.60%	9.40%
Netherlands	0.00%	5.80%
Norway	0.00%	5.80%
Slovenia	2.63%	8.43%
Spain	3.00%	8.80%
Sweden	0.00%	5.80%
Switzerland	0.00%	5.80%
Turkey	3.60%	9.40%
UK	0.00%	5.80%
W. Europe	1.05%	6.85%

Angola	4.88%	10.68%
Botswana	1.50%	7.30%
Egypt	7.50%	13.30%
Kenya	6.00%	11.80%
Mauritius	2.25%	8.05%
Morocco	3.60%	9.40%
Namibia	3.00%	8.80%
Nigeria	4.88%	10.68%
Senegal	6.00%	11.80%
South Africa	2.25%	8.05%
Tunisia	3.00%	8.80%
Zambia	6.00%	11.80%
Africa	4.29%	10.09%

Albania	6.00%	11.80%
Armenia	4.13%	9.93%
Azerbaijan	3.00%	8.80%
Belarus	9.00%	14.80%
Bosnia & Herzegovina	9.00%	14.80%
Bulgaria	2.63%	8.43%
Croatia	3.00%	8.80%
Czech Republic	1.28%	7.08%
Estonia	1.28%	7.08%
Georgia	4.88%	10.68%
Hungary	3.60%	9.40%
Kazakhstan	2.63%	8.43%
Latvia	3.00%	8.80%
Lithuania	2.25%	8.05%
Moldova	9.00%	14.80%
Montenegro	4.88%	10.68%
Poland	1.50%	7.30%
Romania	3.00%	8.80%
Russia	2.25%	8.05%
Slovakia	1.50%	7.30%
Ukraine	9.00%	14.80%
E. Europe & Russia	2.68%	8.48%

Bahrain	2.25%	8.05%
Israel	1.28%	7.08%
Jordan	4.13%	9.93%
Kuwait	0.75%	6.55%
Lebanon	6.00%	11.80%
Oman	1.28%	7.08%
Qatar	0.75%	6.55%
Saudi Arabia	1.05%	6.85%
United Arab Emirates	0.75%	6.55%
Middle East	1.16%	6.96%

Bangladesh	4.88%	10.68%
Cambodia	7.50%	13.30%
China	1.05%	6.85%
Fiji Islands	6.00%	11.80%
Hong Kong	0.38%	6.18%
India	3.00%	8.80%
Indonesia	3.00%	8.80%
Japan	1.05%	6.85%
Korea	1.05%	6.85%
Macao	1.05%	6.85%
Malaysia	1.73%	7.53%
Mongolia	6.00%	11.80%
Pakistan	10.50%	16.30%
Papua New Guinea	6.00%	11.80%
Philippines	3.60%	9.40%
Singapore	0.00%	5.80%
Sri Lanka	6.00%	11.80%
Taiwan	1.05%	6.85%
Thailand	2.25%	8.05%
Vietnam	7.50%	13.30%
Asia	1.55%	7.35%

Australia	0.00%	5.80%
New Zealand	0.00%	5.80%
Australia & NZ	0.00%	5.80%

Black #: Total ERP
Red #: Country risk premium
AVG: GDP weighted average

Estimating ERP for a Company: Country of incorporation or countries of operation

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- Incorporation: The conventional practice on equity risk premiums is to estimate an ERP based upon where a company is incorporated. Thus, the cost of equity for Disney would be computed based on the US equity risk premium, because it is a US company, and the Brazilian ERP would be used for Aracruz, because it is a Brazilian company.
- Operation: The more sensible practice on equity risk premium is to estimate an ERP based upon where a company operates. For a company like Coca Cola, for instance, using its revenue breakdown in 2011 geographically, this would lead to:

<i>Region</i>	<i>Revenues</i>	<i>Total ERP</i>	<i>CRP</i>
Western Europe	19%	6.67%	0.67%
Eastern Europe & Russia	5%	8.60%	2.60%
Asia	15%	7.63%	1.63%
Latin America	15%	9.42%	3.42%
Australia	4%	6.00%	0.00%
Africa	4%	9.82%	3.82%
North America	40%	6.00%	0.00%
Coca Cola	100%	7.14%	1.14%

Application Test: Estimating a Market Risk Premium

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- For your company, get the geographical breakdown of revenues in the most recent year. Based upon this revenue breakdown and the most recent country risk premiums, estimate the equity risk premium that you would use for your company.
- This computation was based entirely on revenues. With your company, what concerns would you have about your estimate being too high or too low?

Estimating Beta

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- 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.

Estimating Performance

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

$$R_j = R_f + b (R_m - R_f)$$

$$= R_f (1-b) + b R_m \quad \text{..... Capital Asset Pricing Model}$$

$$R_j = a + b R_m \quad \text{..... Regression Equation}$$

- 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 Jensen's alpha. If it is positive, your stock did perform better than expected during the period of the regression.

Firm Specific and Market Risk

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- 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

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- 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
 - ▣ $\text{Return} = (\text{PriceEnd} - \text{PriceBeginning} + \text{DividendsPeriod}) / \text{PriceBeginning}$
 - ▣ 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.

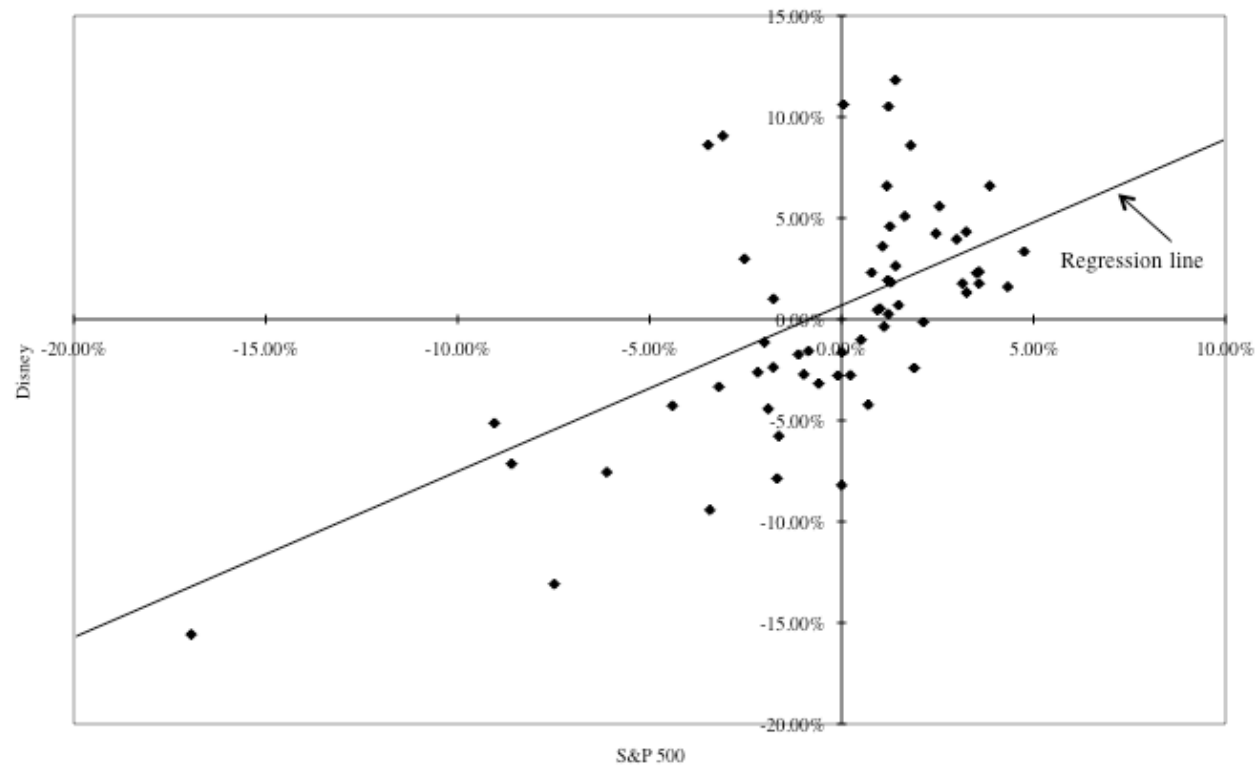
Choosing the Parameters: Disney

123

- Period used: 5 years
- Return Interval = Monthly
- Market Index: S&P 500 Index.
- For instance, to calculate returns on Disney in December 2004,
 - ▣ Price for Disney at end of November 2004 = \$ 26.52
 - ▣ Price for Disney at end of December 2004 = \$ 27.43
 - ▣ Dividends during month = \$0.237 (It was an ex-dividend month)
 - ▣ $\text{Return} = (\$27.43 - \$26.52 + \$0.237) / \$26.52 = 4.33\%$
- To estimate returns on the index in the same month
 - ▣ Index level at end of November 2004 = 1173.92
 - ▣ Index level at end of December 2004 = 1211.92
 - ▣ Dividends on index in December 2004 = 1.831
 - ▣ $\text{Return} = (1211.92 - 1173.92 + 1.831) / 1173.92 = 3.25\%$

Disney's Historical Beta

Figure 4.3: Disney versus S&P 500: 2004-2008



The Regression Output

125

- Using monthly returns from 2004 to 2008, we ran a regression of returns on Disney stock against the S&P 500.
- The output is below:
 - $\text{Returns}_{\text{Disney}} = 0.47\% + 0.95 \text{ Returns}_{\text{S \& P 500}} \quad (R^2=41\%)$
(0.16)

Analyzing Disney's Performance

126

- Intercept = 0.47%
 - This is an intercept based on monthly returns. Thus, it has to be compared to a monthly riskfree rate over the regression period (not today's numbers) .
 - Between 2004 and 2008
 - Average Annualized T.Bill rate = 3.27%
 - Monthly Riskfree Rate = 0.272% (=3.27%/12)
 - Riskfree Rate (1-Beta) = 0.272% (1-0.95) = 0.01%
- The Comparison is then between
 - What you expected to make What you actually made
 - Intercept versus Riskfree Rate (1 - Beta)
 - 0.47% versus 0.01%
 - Jensen's Alpha = 0.47% - 0.01% = 0.46%
- Disney did 0.46% better than expected, per month, between 2004 and 2008.
 - Annualized, Disney's annual excess return = $(1.0046)^{12} - 1 = 5.62\%$

More on Jensen's Alpha

127

- If you did this analysis on every stock listed on an exchange, what would the average Jensen's alpha be across all stocks?
 - ▣ Depend upon whether the market went up or down during the period
 - ▣ Should be zero
 - ▣ Should be greater than zero, because stocks tend to go up more often than down

A positive Jensen's alpha... Who is responsible?

128

- Disney has a positive Jensen's alpha of 5.62% a year between 2004 and 2008. This can be viewed as a sign that management in the firm did a good job, managing the firm during the period.
 - ▣ True
 - ▣ False

Estimating Disney's Beta

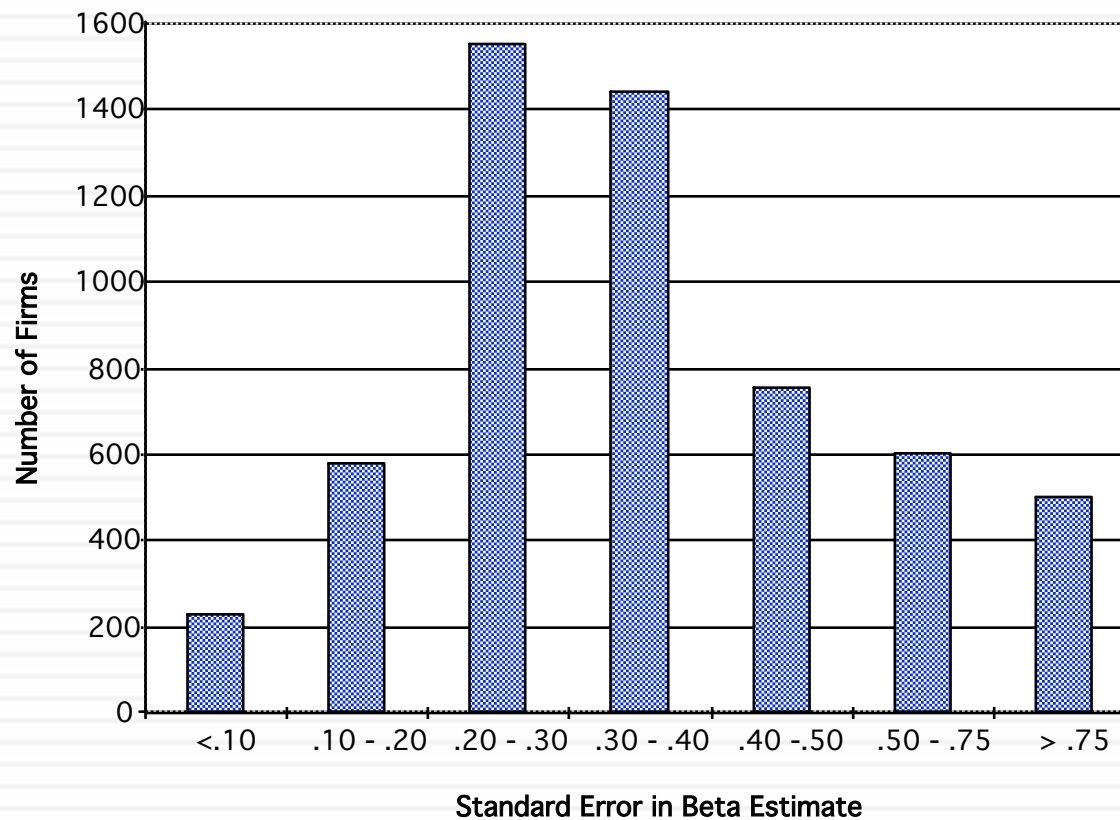
129

- Slope of the Regression of 0.95 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 0.16.
- 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?

The Dirty Secret of “Standard Error”

130

Distribution of Standard Errors: Beta Estimates for U.S. stocks



Breaking down Disney's Risk

131

- R Squared = 41%
- This implies that
 - ▣ 41% of the risk at Disney comes from market sources
 - ▣ 59%, therefore, comes from firm-specific sources
- The firm-specific risk is diversifiable and will not be rewarded

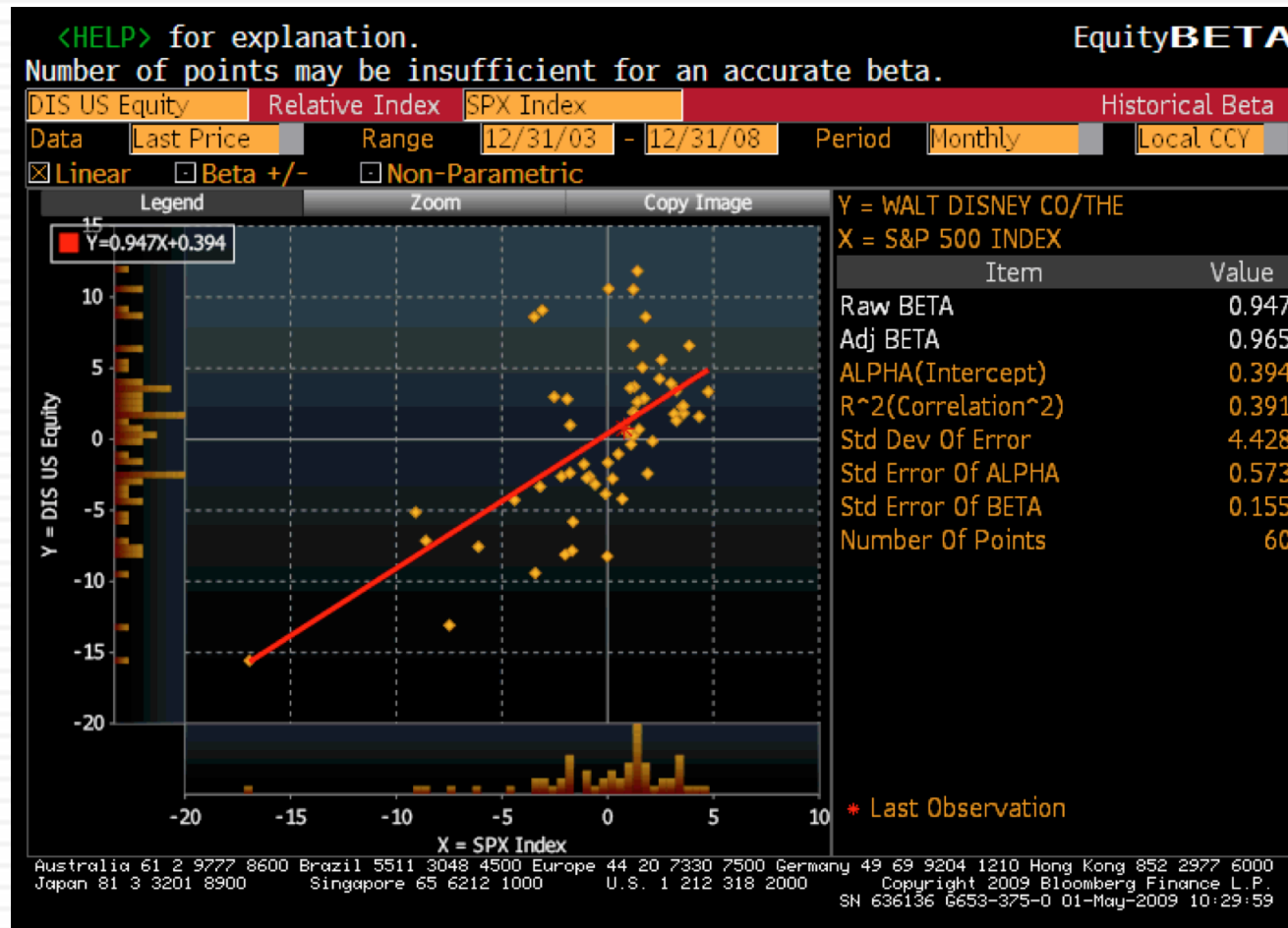
The Relevance of R Squared

132

- You are a diversified investor trying to decide whether you should invest in Disney or Amgen. They both have betas of 0.95, but Disney has an R Squared of 41% while Amgen's R squared of only 20.5%. Which one would you invest in?
 - ▣ Amgen, because it has the lower R squared
 - ▣ Disney, because it has the higher R squared
 - ▣ You would be indifferent
- Would your answer be different if you were an undiversified investor?

Beta Estimation: Using a Service (Bloomberg)

133



Estimating Expected Returns for Disney in May 2009

134

□ Inputs to the expected return calculation

- Disney's Beta = 0.95
- Riskfree Rate = 3.50% (U.S. ten-year T.Bond rate in May 2009)
- Risk Premium = 6% (Based on updated implied premium at the start of 2009)

$$\begin{aligned}\text{Expected Return} &= \text{Riskfree Rate} + \text{Beta} (\text{Risk Premium}) \\ &= 3.50\% + 0.95 (6.00\%) = 9.2\%\end{aligned}$$

Use to a Potential Investor in Disney

135

- As a potential investor in Disney, what does this expected return of 9.2% tell you?
 - ▣ This is the return that I can expect to make in the long term on Disney, if the stock is correctly priced and the CAPM is the right model for risk,
 - ▣ This is the return that I need to make on Disney in the long term to break even on my investment in the stock
 - ▣ 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 9.2%, you would
 - ▣ Buy the stock
 - ▣ Sell the stock

How managers use this expected return

136

- Managers at Disney
 - need to make at least 9.2% 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 9.2%.
- What is the cost of not delivering this cost of equity?

Application Test: Analyzing the Risk Regression

137

- 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?
 - ▣ $\text{Intercept} - (\text{Riskfree Rate}/n) (1 - \text{Beta}) = \text{Jensen's Alpha}$
 - where n is the number of return periods in a year (12 if monthly; 52 if weekly)
 - ▣ 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?
 - ▣ $\text{Riskless Rate} + \text{Beta} * \text{Risk Premium}$

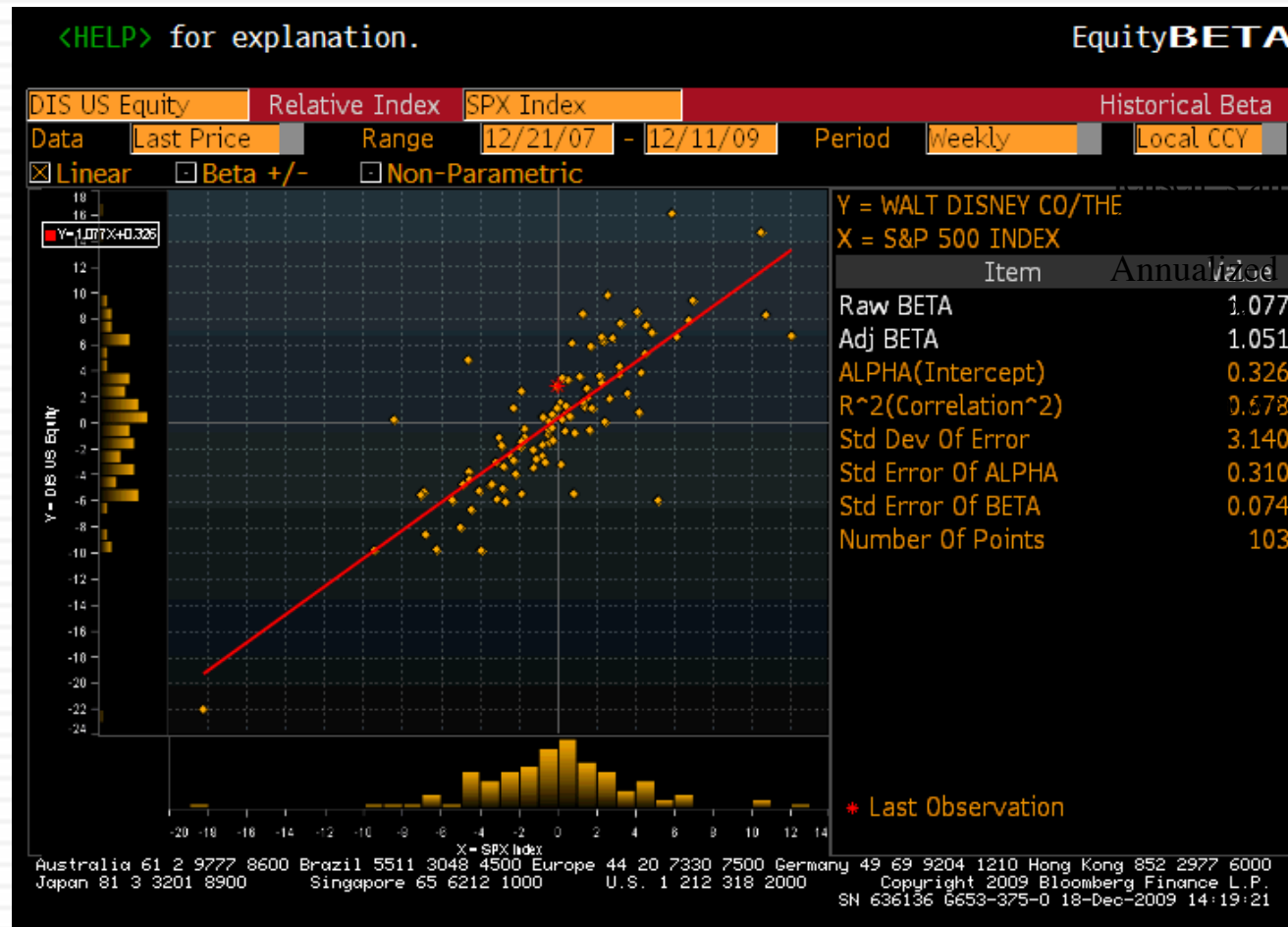
A Quick Test

138

- 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 21.5%. 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?
 - Yes
 - No

Disney's Beta Calculation: An Updated Value!!

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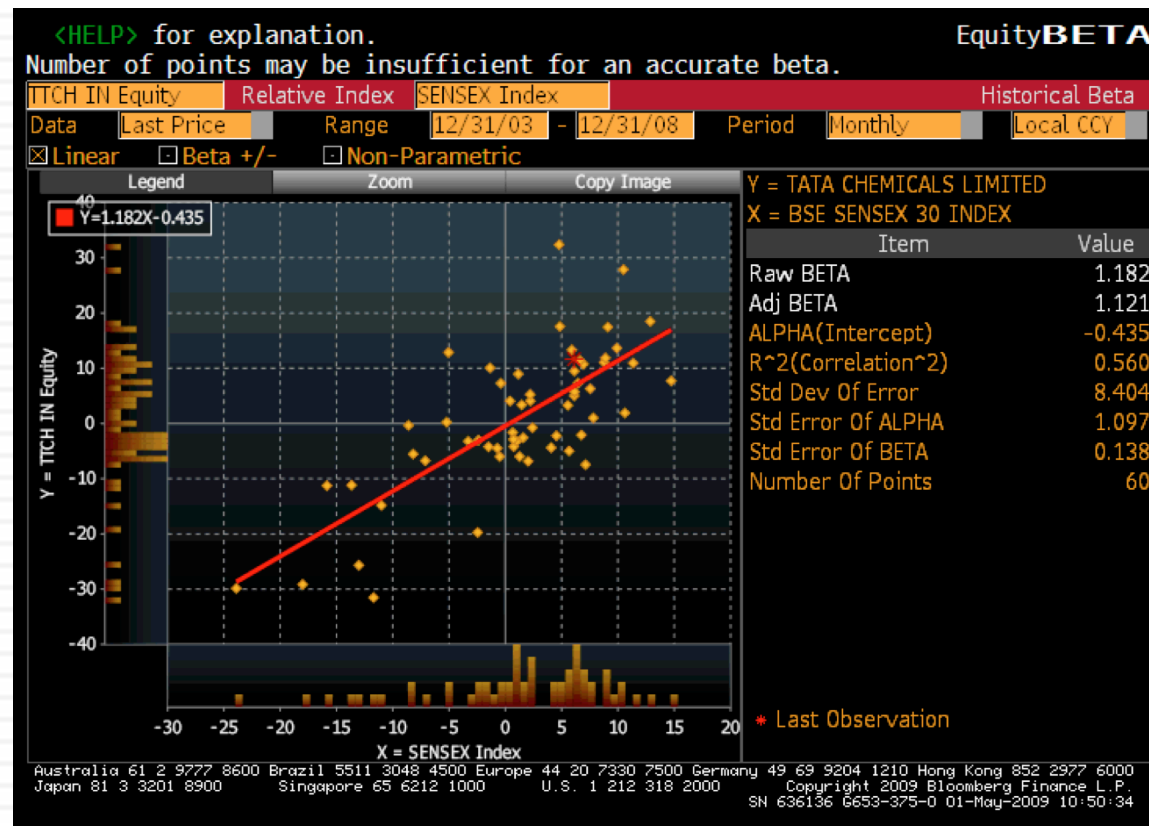
$\alpha = 0.33\% -$
 $(1.08) = 0.34\%$
 $(1+.0034)^{52}-1$

Weekly regression

Regression Diagnostics for Tata Chemicals

140

Jensen's α
 $= -0.44\% - 5\%/12$
 $(1-1.18) = -0.37\%$
 Annualized $= (1 - 0.0037)^{12} - 1 = -4.29\%$



Beta = 1.18
 67% range
 1.04-1.32
 56% market risk
 44% firm specific

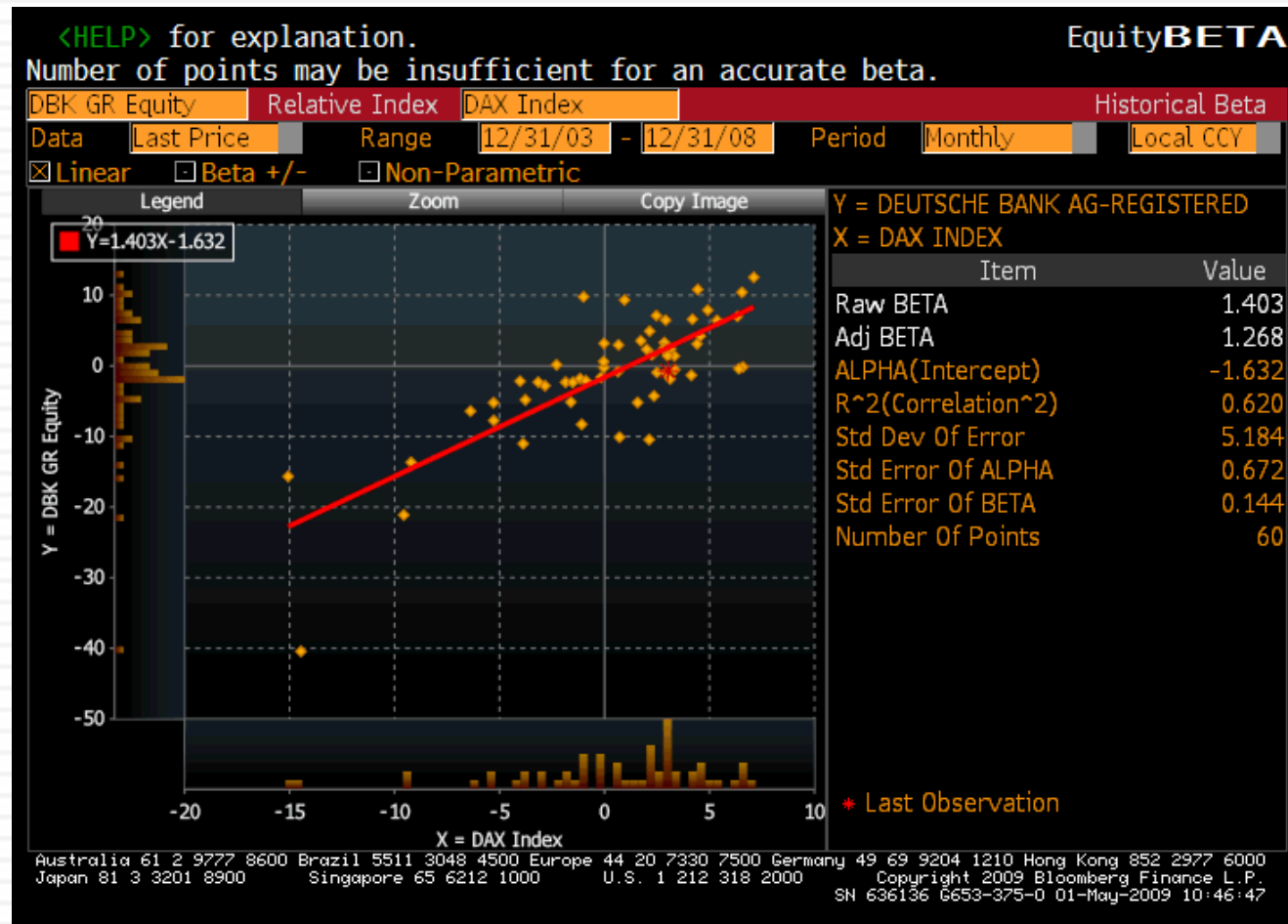
Aswath Damodaran

Expected Return
 $= \text{Riskfree Rate} + \text{Beta} * \text{Risk premium}$
 $= 4\% + 1.18 (6\% + 4.51\%) = 19.40\%$

140

Beta Estimation and Index Choice: Deutsche Bank

141



A Few Questions

142

- The R squared for Deutsche Bank is very high (67%). Why is that?
- The beta for Deutsche Bank is 1.69.
 - ▣ Is this an appropriate measure of risk?
 - ▣ If not, why not?
- If you were an investor in primarily U.S. stocks, would this be an appropriate measure of risk?

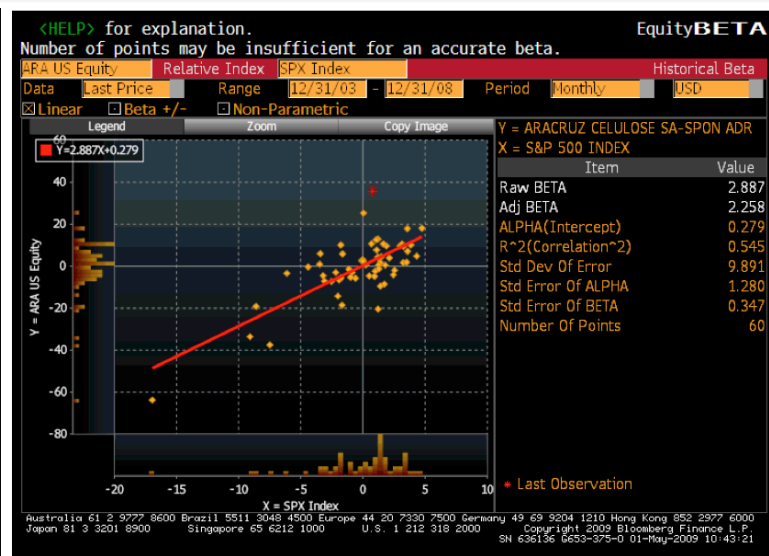
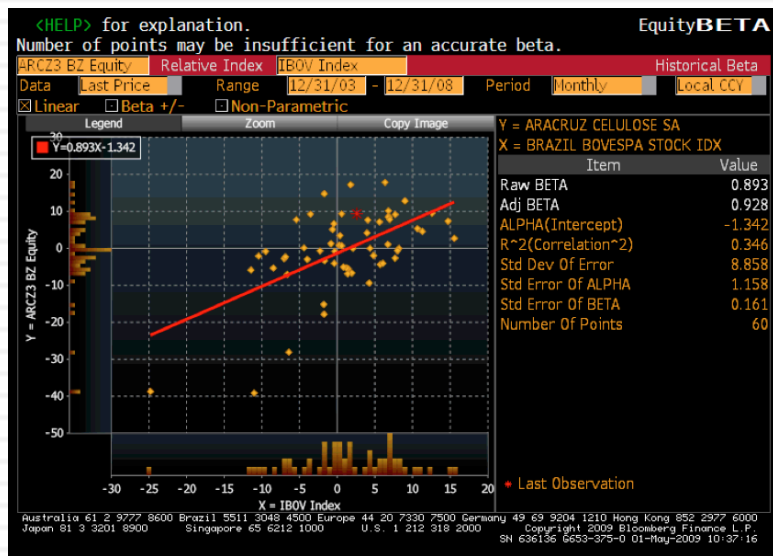
Deutsche Bank: Alternate views of Risk

143

	<i>DAX</i>	<i>FTSE Euro 300</i>	<i>MSCI</i>
Intercept	-1.63%	-1.05%	-0.48%
Beta	1.40	1.52	1.99
Std Error of beta	0.14	0.19	0.21
R^2	62%	54%	50%

Aracruz' s Beta?

144



Beta: Exploring Fundamentals

145

Beta > 2	Bulgari: 2.45
Beta between 1 and 2	Qwest Communications: 1.85 Microsoft: 1.25 GE: 1.15
Beta < 1	Exxon Mobil: 0.70 Altria (Philip Morris): 0.60
Beta < 0	Harmony Gold Mining: -0.15

Determinant 1: Product Type

146

- 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

A Simple Test

147

- Phone service is close to being non-discretionary in the United States and Western Europe. However, in much of Asia and Latin America, there are large segments of the population for which phone service is a luxury.
- Given our discussion of discretionary and non-discretionary products, which of the following conclusions would you be willing to draw:
 - Emerging market telecom companies should have higher betas than developed market telecom companies.
 - Developed market telecom companies should have higher betas than emerging market telecom companies
 - The two groups of companies should have similar betas

Determinant 2: Operating Leverage Effects

148

- 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

149

- Fixed Costs Measure = $\text{Fixed Costs} / \text{Variable Costs}$
 - This measures the relationship between fixed and variable costs. The higher the proportion, the higher the operating leverage.
- EBIT Variability Measure = $\% \text{ Change in EBIT} / \% \text{ Change in Revenues}$
 - 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- 2008

150

Year	Net Sales	% Change in Sales	EBIT	% Change in EBIT
1987	\$2,877		\$756	
1988	\$3,438	19.50%	\$848	12.17%
1989	\$4,594	33.62%	\$1,177	38.80%
1990	\$5,844	27.21%	\$1,368	16.23%
1991	\$6,182	5.78%	\$1,124	-17.84%
1992	\$7,504	21.38%	\$1,287	14.50%
1993	\$8,529	13.66%	\$1,560	21.21%
1994	\$10,055	17.89%	\$1,804	15.64%
1995	\$12,112	20.46%	\$2,262	25.39%
1996	\$18,739	54.71%	\$3,024	33.69%
1997	\$22,473	19.93%	\$3,945	30.46%
1998	\$22,976	2.24%	\$3,843	-2.59%
1999	\$23,435	2.00%	\$3,580	-6.84%
2000	\$25,418	8.46%	\$2,525	-29.47%
2001	\$25,172	-0.97%	\$2,832	12.16%
2002	\$25,329	0.62%	\$2,384	-15.82%
2003	\$27,061	6.84%	\$2,713	13.80%
2004	\$30,752	13.64%	\$4,048	49.21%
2005	\$31,944	3.88%	\$4,107	1.46%
2006	\$33,747	5.64%	\$5,355	30.39%
2007	\$35,510	5.22%	\$6,829	27.53%
2008	\$37,843	6.57%	\$7,404	8.42%
Average: 87-08		13.73%		13.26%
Average: 96-08		9.91%		11.72%

Reading Disney's Operating Leverage

151

- Operating Leverage
 - = % Change in EBIT/ % Change in Sales
 - = 13.26% / 13.73% = 0.97
- This is lower than the operating leverage for other entertainment firms, which we computed to be 1.15. This would suggest that Disney has lower fixed costs than its competitors.
- The acquisition of Capital Cities by Disney in 1996 may be skewing the operating leverage. Looking at the changes since then:
 - Operating Leverage₁₉₉₆₋₀₈ = 11.72%/9.91% = 1.18
 - Looks like Disney's operating leverage has increased since 1996. In fact, it is higher than the average for the sector.

Determinant 3: Financial Leverage

152

- 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

153

- 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
 - ▣ β_L = Levered or Equity Beta
 - ▣ β_u = Unlevered or Asset Beta
 - ▣ t = Marginal tax rate
 - ▣ D = Market Value of Debt
 - ▣ E = Market Value of Equity

Effects of leverage on betas: Disney

154

- The regression beta for Disney is 0.95. 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 (2004 to 2008)
- The average debt equity ratio during this period was 24.64%.
- The unlevered beta for Disney can then be estimated (using a marginal tax rate of 38%)
 - = Current Beta / (1 + (1 - tax rate) (Average Debt/Equity))
 - = $0.95 / (1 + (1 - 0.38)(0.2464)) = 0.8241$

Disney : Beta and Leverage

155

Debt to Capital	Debt/Equity Ratio	Beta	Effect of Leverage
0.00%	0.00%	0.82	0.00
10.00%	11.11%	0.88	0.06
20.00%	25.00%	0.95	0.13
30.00%	42.86%	1.04	0.22
40.00%	66.67%	1.16	0.34
50.00%	100.00%	1.34	0.51
60.00%	150.00%	1.59	0.77
70.00%	233.33%	2.02	1.19
80.00%	400.00%	2.87	2.04
90.00%	900.00%	5.42	4.60

Betas are weighted Averages

156

- 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 investment 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 Disney/Cap Cities Merger: Pre-Merger

157

Disney: The Acquirer

Equity Beta
1.15

Debt = \$3,186 million
Market value of equity = \$31,100 million
Debt + Equity = Firm value = \$31,100
+ \$3,186 = \$34,286 million
D/E Ratio = $3186/31100 = 0.10$

+

Capital Cities: The Target

Equity Beta
0.95

Debt = \$ 615 million
Market value of equity = \$18, 500 million
Debt + Equity = Firm value = \$18,500 +
\$615 = \$19,115 million
D/E Ratio = $615/18500 = 0.03$

Disney Cap Cities Beta Estimation: Step 1

158

- Calculate the unlevered betas for both firms
 - Disney's unlevered beta = $1.15 / (1 + 0.64 * 0.10) = 1.08$
 - Cap Cities unlevered beta = $0.95 / (1 + 0.64 * 0.03) = 0.93$
- Calculate the unlevered beta for the combined firm
 - Unlevered Beta for combined firm
= $1.08 (34286 / 53401) + 0.93 (19115 / 53401)$
= 1.026
 - The weights used are the firm values (and not just the equity values) of the two firms, since these are unlevered betas and thus reflects the risks of the entire businesses and not just the equity]

Disney Cap Cities Beta Estimation: Step 2

159

- If Disney had used all equity to buy Cap Cities equity, while assuming Cap Cities debt, the consolidated numbers would have looked as follows:
 - ▣ Debt = \$ 3,186 + \$615 = \$ 3,801 million
 - ▣ Equity = \$ 31,100 + \$18,500 = \$ 49,600 m (Disney issues \$18.5 billion in equity)
 - ▣ D/E Ratio = $3,801/49,600 = 7.66\%$
 - ▣ New Beta = $1.026 (1 + 0.64 (.0766)) = 1.08$
- Since Disney borrowed \$ 10 billion to buy Cap Cities/ABC, funded the rest with new equity and assumed Cap Cities debt:
 - ▣ The market value of Cap Cities equity is \$18.5 billion. If \$ 10 billion comes from debt, the balance (\$8.5 billion) has to come from new equity.
 - ▣ Debt = \$ 3,186 + \$615 million + \$ 10,000 = \$ 13,801 million
 - ▣ Equity = \$ 31,100 + \$8,500 = \$39,600 million
 - ▣ D/E Ratio = $13,801/39,600 = 34.82\%$
 - ▣ New Beta = $1.026 (1 + 0.64 (.3482)) = 1.25$

Firm Betas versus divisional Betas

160

- Firm Betas as weighted averages: The beta of a firm is the weighted average of the betas of its individual projects.
- Firm Betas and Business betas: At a broader level of aggregation, the beta of a firm is the weighted average of the betas of its individual division.

Bottom-up versus Top-down Beta

161

- 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 is a better estimate than the top down beta for the following reasons
 - ▣ The standard error of the beta estimate will be much lower
 - ▣ The betas can reflect the current (and even expected future) mix of businesses that the firm is in rather than the historical mix

Disney's business breakdown

Unlevered Beta
(1 - Cash/ Firm Value)

162

<i>Business</i>	<i>Comparable firms</i>	<i>Number of firms</i>	<i>Median levered beta</i>	<i>Median D/E</i>	<i>Unlevered beta</i>	<i>Median Cash/ Firm Value</i>	<i>Unlevered beta corrected for cash</i>
Media Networks	Radio and TV broadcasting companies -US	19	0.83	38.71%	0.6735	4.54%	0.7056
Parks and Resorts	Theme park & Resort companies - Global	26	0.80	65.10%	0.5753	1.64%	0.5849
Studio Entertainment	Movie companies - US	19	1.57	53.89%	1.1864	8.93%	1.3027
Consumer Products	Toy companies- US	12	0.83	27.21%	0.7092	33.66%	1.0690

A closer look at the process...

Studio Entertainment Betas

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Short Name	Mkt Cap	Total Debt	D/E	Beta	Cash	Cash/Firm value	Enterprise Value	Revenues	EV/sales
RED ROCK PICTURE	\$621,902	\$100,000	16.08%	1.62	\$2,436	0.34%	\$719,466	\$600,000	1.20
TIX CORP	\$53,988,460	\$129,000	0.24%	1.59	\$9,192,000	16.99%	\$44,925,460	\$66,552,000	0.68
TM MEDIA GROUP I	\$224	\$265	118.52%	0.90	\$10	2.05%	\$479	\$1,250	0.38
CAMELOT ENTERTAI	\$815,505	\$464,329	56.94%	0.85	\$126	0.01%	\$1,279,708	\$750,000	1.71
AMER VANTAGE COS	\$5,385,361	\$523,000	9.71%	1.25	\$5,353,000	90.60%	\$555,361	\$313,000	1.77
VALCOM INC	\$1,126,042	\$1,114,673	98.99%	1.63	\$34,224	1.53%	\$2,206,491	\$689,521	3.20
ODYSSEY PICTURES	\$6,963,004	\$1,419,200	20.38%	2.24	\$0	0.00%	\$8,382,204	\$4,279,035	1.96
LEONIDAS FILMS I	\$2,342,000	\$1,873,000	79.97%	0.57	\$1,730,000	41.04%	\$2,485,000	\$1,077,000	2.31
BRILLIANT DIGITA	\$11,304,810	\$2,162,000	19.12%	1.36	\$433,000	3.22%	\$13,033,810	\$5,970,000	2.18
METRO GLOBAL MED	\$11,725	\$40,679	346.93%	2.93	\$4,514	8.61%	\$47,890	\$244,654	0.20
FAMILY ROOM ENT	\$265,104	\$77,491	29.23%	0.90	\$31,655	9.24%	\$310,940	\$348,850	0.89
POINT.360	\$13,292,890	\$9,420,000	70.86%	1.30	\$7,047,000	31.03%	\$15,665,890	\$45,913,000	0.34
IMAGE ENTERTAIN	\$22,511,390	\$32,394,002	143.90%	0.90	\$780,000	1.42%	\$54,125,392	\$130,086,000	0.42
UNAPIX ENTERTAIN	\$22,640	\$39,196	173.13%	1.86	\$0	0.00%	\$61,836	\$377,290	0.16
PEACH ARCH ENTER	\$2,631,945	\$605,205	22.99%	1.55	\$1,753,328	54.16%	\$1,483,821	\$7,113,049	0.21
DREAMWORKS ANI-A	\$2,367,548,000	\$70,059,000	2.96%	1.90	\$260,630,000	10.69%	\$2,176,977,000	\$755,660,976	2.88
KUSHNER-LOCKE CO	\$13,981	\$88,725	634.63%	2.99	\$72,900	70.98%	\$29,806	\$198,670	0.15
LIONS GATE	\$628,954,800	\$319,717,984	50.83%	2.36	\$130,713,000	13.78%	\$817,959,784	\$1,514,749,024	0.54
Average			105.30%	1.59		19.76%			1.18
Aggregate	\$3,117,799,782	\$440,227,749	14.12%	1.59	\$417,777,193	11.74%	\$3,140,250,338	2534923319	1.24
Median			53.89%	1.57		8.93%			0.78

Disney's bottom up beta

164

- Estimate the bottom up unlevered beta for Disney's operating assets.

Business	Revenues in 2008	EV/Sales	Estimated Value	Firm Value Proportion	Unlevered beta
Media Networks	\$16,116	2.13	\$34,327.78	58.92%	0.7056
Parks and Resorts	\$11,504	1.51	\$17,408.14	29.88%	0.5849
Studio Entertainment	\$7,348	0.78	\$5,754.86	9.88%	1.3027
Consumer Products	\$2,875	0.27	\$768.20	1.32%	1.0690
Disney	\$37,843		\$58,258.99	100.00%	0.7333

- Step 1: Start with Disney's revenues by business.
- Step 2: Estimate the value as a multiple of revenues by looking at what the market value of publicly traded firms in each business is, relative to revenues.

$$\text{EV/Sales} = \frac{\text{Mkt Equity} + \text{Debt} - \text{Cash}}{\text{Revenues}}$$

- Step 3: Multiply the revenues in step 1 by the industry average multiple in step 2.
- Disney has a cash balance of \$3,795 million. If we wanted a beta for all of Disney's assets (and not just the operating assets), we would compute a weighted average:

$$\text{Beta for Disney's assets} = 0.7333 \left(\frac{58,259}{(58,259 + 3,795)} \right) + 0 \left(\frac{3,795}{(58,259 + 3,795)} \right) = 0.6885$$

Disney's Cost of Equity

165

□ Step 1: Allocate debt across businesses

Business	Start with this(1) Estimated Value	From comparable firms(2) D/E Ratio of comps	Estimated debt	As % (3) Proportions	Adjust to Disney's debt (3)*16,682 Allocated Debt	EV - Allocated Debt Estimated Equity	Allocated Debt/ Estimated Equity D/E Ratio
Media Networks	\$34,328	38.71%	\$9,581	51.44%	\$8,582	\$25,746	33.33%
Parks and Resorts	\$17,408	65.10%	\$6,864	36.86%	\$6,148	\$11,260	54.61%
Studio Entertainment	\$5,755	53.89%	\$2,015	10.82%	\$1,805	\$3,950	45.70%
Consumer Products	\$768	27.21%	\$164	0.88%	\$147	\$621	23.70%
For example.			\$18,624	100.00%	\$16,682		
Media Networks	\$34,328	38.71%	$34,328 * (.3871 / 1.3871)$	$9581 / 18624$	$.5144 * 16,682$	$34328 - 8582$	$8582 / 25746$

□ Step 2a: Compute levered betas and costs of equity for Disney's operating businesses.

Business	Unlevered Beta	D/E Ratio	Levered Beta	Cost of Equity
Media Networks	0.7056	33.33%	0.8514	8.61%
Parks and Resorts	0.5849	54.61%	0.7829	8.20%
Studio Entertainment	1.3027	45.70%	1.6718	13.53%
Consumer Products	1.0690	23.70%	1.2261	10.86%
Disney	0.7333	36.91%	0.9011	8.91%

□ Step 2b: Compute the cost of equity for all of Disney's assets:

■ $\text{Equity Beta}_{\text{Disney as company}} = 0.6885 (1 + (1 - 0.38)(0.3691)) = 0.8460$

Aswath Damodaran

Riskfree Rate = 3.5%

Risk Premium = 6% 165

Discussion Issue

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- Assume now that you are the CFO of Disney. The head of the movie business has come to you with a new big budget movie that he would like you to fund. He claims that his analysis of the movie indicates that it will generate a return on equity of 12%. Would you fund it?
 - Yes. It is higher than the cost of equity for Disney as a company
 - No. It is lower than the cost of equity for the movie business.
 - What are the broader implications of your choice?

Estimating Aracruz' s Bottom Up Beta

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Bottom up Betas for Paper & Pulp

	<i>Number of firms</i>	<i>Median Beta</i>	<i>Median D/E</i>	<i>Median Unlevered Beta</i>	<i>Cash/Value</i>	<i>Unlevered Beta Corrected for Cash</i>
Emerging Markets	46	1.03	4.47%	1.00	0.74%	1.01
US	13	1.16	92.29%	0.75	2.87%	0.77
Global	111	0.91	9.82%	0.86	1.24%	0.87

- The beta for emerging market paper and pulp companies of 1.01 was used as the unlevered beta for Aracruz.
- When computing the levered beta for Aracruz' s paper and pulp business, we used the gross debt outstanding of 9,805 million BR and the market value of equity of 8907 million BR, in conjunction with the marginal tax rate of 34% for Brazil:
 - Gross Debt to Equity ratio = Debt/Equity = $9805/8907 = 110.08\%$
 - Levered Beta for Aracruz Paper business = $1.01 (1+(1-.34)(1.1008)) = 1.74$

Aracruz: Cost of Equity Calculation

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- We will use a risk premium of 9.95% in computing the cost of equity, composed of the mature market equity risk premium (6%) and the Brazil country risk premium of 3.95% (estimated earlier).
- U.S. \$ Cost of Equity
 - ▣ Cost of Equity = 10-yr T.Bond rate + Beta * Risk Premium
 - ▣ = 3.5% + 1.74 (9.95%) = 20.82%
- To convert to a Nominal \$R Cost of Equity
 - ▣ Cost of Equity = $(1 + \$ \text{ Cost of Equity}) \frac{(1 + \text{Inflation Rate}_{\text{Brazil}})}{(1 + \text{Inflation Rate}_{\text{US}})} - 1$
 $= 1.2082 (1.07/1.02) - 1 = .2675 \text{ or } 26.75\%$
 - ▣ Alternatively, you could just replace the riskfree rate with a nominal \$R riskfree rate, but you would then be keeping risk premiums which were computed in dollar terms fixed while moving to a higher inflation currency.

The bottom up beta for Tata Chemicals

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□ Unlevered betas for Tata Chemical's Businesses

- Based upon betas of emerging market companies,

Business(# of comparables)	Revenues (millions)	EV/Sales (from comparable firms)	Estimated Value (millions)	Weights	Unlevered Beta	D/E Ratio	Levered Beta
Fertilizers (105)	INR 2,506	1.28	INR 3,208	62.18%	0.72	51.56%	0.965
Chemicals (31)	INR 1,586	1.23	INR 1,951	37.82%	0.68	51.56%	0.911
Tata Chemicals			INR 5,158		0.70		0.945

□ Cost of Equity

- Rupee Riskfree rate =4%; Indian ERP = 6% + 4.51%

Business	Beta	Cost of equity
Fertilizers	0.965	4% + 0.965 (10.51%) = 14.14%
Chemicals	0.911	4% + 0.911 (10.51%) = 13.58%
Tata Chemicals	0.945	4% + 0.945 (10.51%) = 13.93%

Estimating Bottom-up Beta: Deutsche Bank

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- Deutsche Bank is in two different segments of business - commercial banking and investment banking.
 - ▣ To estimate its commercial banking beta, we will use the average beta of European commercial banks.
 - ▣ To estimate the investment banking beta, we will use the average beta of investment banks (primarily US and UK based).
 - ▣ The weights are based on revenues in each division.

Business	Comparable firms	Number	Average Beta	Weights
Commercial banking	Diversified European Banks	90	1.05	65%
Investment Banking	US investment banks	32	1.37	35%
Deutsche Bank			1.162	

- To estimate the cost of equity in Euros, we will use the German 10-year bond rate of 3.6% as the riskfree rate and the 6% as the mature market premium.

Business	Beta	Cost of Equity
Commercial banking	1.05	$3.6\% + 1.05(6\%) = 9.90\%$
Investment Banking	1.37	$3.6\% + 1.37(6\%) = 11.82\%$
Deutsche Bank	1.162	$3.6\% + 1.162(6\%) = 10.55\%$

Estimating Betas for Non-Traded Assets

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- The conventional approaches of estimating betas from regressions do not work for assets that are not traded. There are no stock prices or historical returns that can be used to compute regression betas.
- 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

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Company Name	Industry Name	Beta	D/E Ratio	Unlevered Beta	Cash/Firm Value	Unlevered beta corrected for cash
Courier Corp.	Publishing	0.98	12.33%	0.91	0.46%	0.92
Educational Devel.	Publishing	0.57	0.00%	0.57	15.38%	0.67
McGraw-Hill Ryerson Ltd.	Publishing	0.26	0.00%	0.26	46.97%	0.49
Meredith Corp.	Publishing	1.37	66.85%	0.98	3.11%	1.01
Presstek Inc.	Publishing	1.68	41.09%	1.35	10.83%	1.51
PRIMEDIA Inc	Publishing	1.65	340.84%	0.54	9.20%	0.60
Scholastic Corp.	Publishing	1.13	84.49%	0.75	13.36%	0.87
Torstar 'B'	Publishing	0.48	54.21%	0.36	4.93%	0.38
Wiley (John) & Sons	Publishing	1.03	52.73%	0.78	1.93%	0.80
Barnes & Noble	Retail (Special Lines)	1.34	0.00%	1.34	48.46%	2.60
Books-A-Million	Retail (Special Lines)	1.98	97.49%	1.25	7.90%	1.36
Borders Group	Retail (Special Lines)	2.44	240.87%	1.00	7.78%	1.08
Median		1.235	53.47%	0.94	8.55%	1.02

Estimating Bookscape Levered Beta and Cost of Equity

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- Because the debt/equity ratios used in computing levered betas 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 book industry median debt to equity ratio of 53.47 percent.
- Using a marginal tax rate of 40 percent for Bookscape, we get a levered beta of 1.35.
 - Levered beta for Bookscape = $1.02 [1 + (1 - 0.40) (0.5347)] = 1.35$
- Using a riskfree rate of 3.5% (US treasury bond rate) and an equity risk premium of 6%:
 - Cost of Equity = $3.5\% + 1.35 (6\%) = 11.60\%$

Using Accounting Earnings to Estimate Beta

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Year	S&P 500	Bookscape	Year	S&P 500	Bookscape
1980	3.01%	3.55%	1995	18.74%	11.55%
1981	1.31%	4.05%	1996	7.77%	19.88%
1982	-8.95%	-14.33%	1997	8.52%	16.55%
1983	-3.84%	47.55%	1998	0.41%	7.10%
1984	26.69%	65.00%	1999	16.74%	14.40%
1985	-6.91%	5.05%	2000	8.61%	10.50%
1986	-7.93%	8.50%	2001	-30.79%	-8.15%
1987	11.10%	37.00%	2002	18.51%	4.05%
1988	50.42%	45.17%	2003	18.79%	12.56%
1989	0.83%	3.50%	2004	23.75%	14.50%
1990	-6.87%	-10.50%	2005	12.96%	8.35%
1991	-14.79%	-32.00%	2006	14.74%	16.74%
1992	8.13%	55.00%	2007	-5.91%	2.50%
1993	28.89%	31.00%	2008	-20.78%	-12.20%
1994	18.03%	21.06%			

The Accounting Beta for Bookscape

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- Regressing the changes in equity earnings at Bookscape against changes in equity earnings for the S&P 500 yields the following:
 - ▣ Bookscape Earnings Change = $0.08 + 0.8211 (\text{S\&P 500 Earnings Change})$
 - ▣ Based upon this regression, the beta for Bookscape's equity is 0.82.
 - ▣ Using changes in operating earnings for both the firm and the S&P 500 should yield the equivalent of an unlevered beta.
- The cost of equity based upon the accounting beta is:
 - ▣ Cost of equity = $3.5\% + 0.82 (6\%) = 8.42\%$

Is Beta an Adequate Measure of Risk for a Private Firm?

176

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

Total Risk versus Market Risk

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- 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 1.35 and the average R-squared of the comparable publicly traded firms is 21.58%; the correlation with the market is 46.45%.

$$\frac{\text{Market Beta}}{\sqrt{\text{R squared}}} = \frac{1.35}{.4645} = 2.91$$

- Total Cost of Equity = 3.5% + 2.91 (6%) = 20.94%

Application Test: Estimating a Bottom-up Beta

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- 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.

From Cost of Equity to Cost of Capital

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- 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?

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- 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

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- 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

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- The rating for a firm can be estimated using the financial characteristics of the firm. In its simplest form, we can use just the interest coverage ratio:

$$\text{Interest Coverage Ratio} = \text{EBIT} / \text{Interest Expenses}$$

- For the four non-financial service companies, we obtain the following:

Company	Operating income	Interest Expense	Interest coverage ratio
Disney	\$6,819	\$821	8.31
Aracruz	R\$ 574	R\$ 155	3.70
Tata Chemicals	INR 6,263	INR 1,215	5.15
Bookscape	\$3,575	\$575	6.22

Interest Coverage Ratios, Ratings and Default Spreads- Early 2009

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<i>Interest Coverage Ratio: Small market cap (<\$5 billion)</i>	<i>Interest Coverage Ratio: Large market cap (>US \$ 5 billion)</i>	<i>Rating</i>	<i>Typical Default</i>
> 12.5	>8.5	AAA	1.25%
9.50–12.50	6.5–8.5	AA	1.75%
7.50–9.50	5.5–6.5	A+	2.25%
6.00–7.50	4.25– 5.5	A	2.50%
4.50–6.00	3– 4.25	A–	3.00%
4.00–4.50	2.5–3.0	BBB	3.50%
3.50–4.00	2.25–2.5	BB+	4.25%
3.00–3.50	2.0–2.25	BB	5.00%
2.50–3.00	1.75–2.0	B+	6.00%
2.00–2.50	1.5–1.75	B	7.25%
1.50–2.00	1.25–1.5	B–	8.50%
1.25–1.50	0.8–1.25	CCC	10.00%
0.80–1.25	0.65–0.8	CC	12.00%
0.50–0.80	0.2–0.65	C	15.00%
< 0.65	<0.2	D	20.00%

Disney, Market Cap > \$ 5 billion:	8.31	→	AA
Aracruz: Market Cap< \$5 billion:	3.70	→	BB+
Tata: Market Cap< \$ 5 billion:	5.15	→	A–
Bookscape: Market Cap<\$5 billion:	6.22	→	A

Synthetic versus Actual Ratings: Disney and Aracruz

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- Disney and Aracruz are rated companies and their actual ratings are different from the synthetic rating.
- Disney's synthetic rating is AA, whereas its actual rating is A. The difference can be attributed to any of the following:
 - Synthetic ratings reflect only the interest coverage ratio whereas actual ratings incorporate all of the other ratios and qualitative factors
 - Synthetic ratings do not allow for sector-wide biases in ratings
 - Synthetic rating was based on 2008 operating income whereas actual rating reflects normalized earnings
- Aracruz's synthetic rating is BB+, but the actual rating for dollar debt is BB. The biggest factor behind the difference is the presence of country risk but the derivatives losses at the firm in 2008 may also be playing a role.
- Deutsche Bank had an A+ rating. We will not try to estimate a synthetic rating for the bank. Defining interest expenses on debt for a bank is difficult...

Estimating Cost of Debt

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- For Bookscape, we will use the synthetic rating (A) to estimate the cost of debt:
 - ▣ Default Spread based upon A rating = 2.50%
 - ▣ Pre-tax cost of debt = Riskfree Rate + Default Spread = 3.5% + 2.50% = 6.00%
 - ▣ After-tax cost of debt = Pre-tax cost of debt (1- tax rate) = 6.00% (1-.40) = 3.60%
- For the three publicly traded firms that are rated in our sample, we will use the actual bond ratings to estimate the costs of debt:

Company	S&P Rating	Risk-Free Rate	Default Spread	Cost of Debt	Tax Rate	After-Tax Cost of Debt
Disney	A	3.50% (US \$)	2.50%	6.00%	38%	3.72%
Deutsche Bank	A+	3.60% (Euros)	2.25%	5.85%	29.50%	4.12%
Aracruz	BB	3.50% (US \$)	5%	8.50%	34%	5.61%

- For Tata Chemicals, we will use the synthetic rating of A-, but we also consider the fact that India faces default risk (and a spread of 3%).

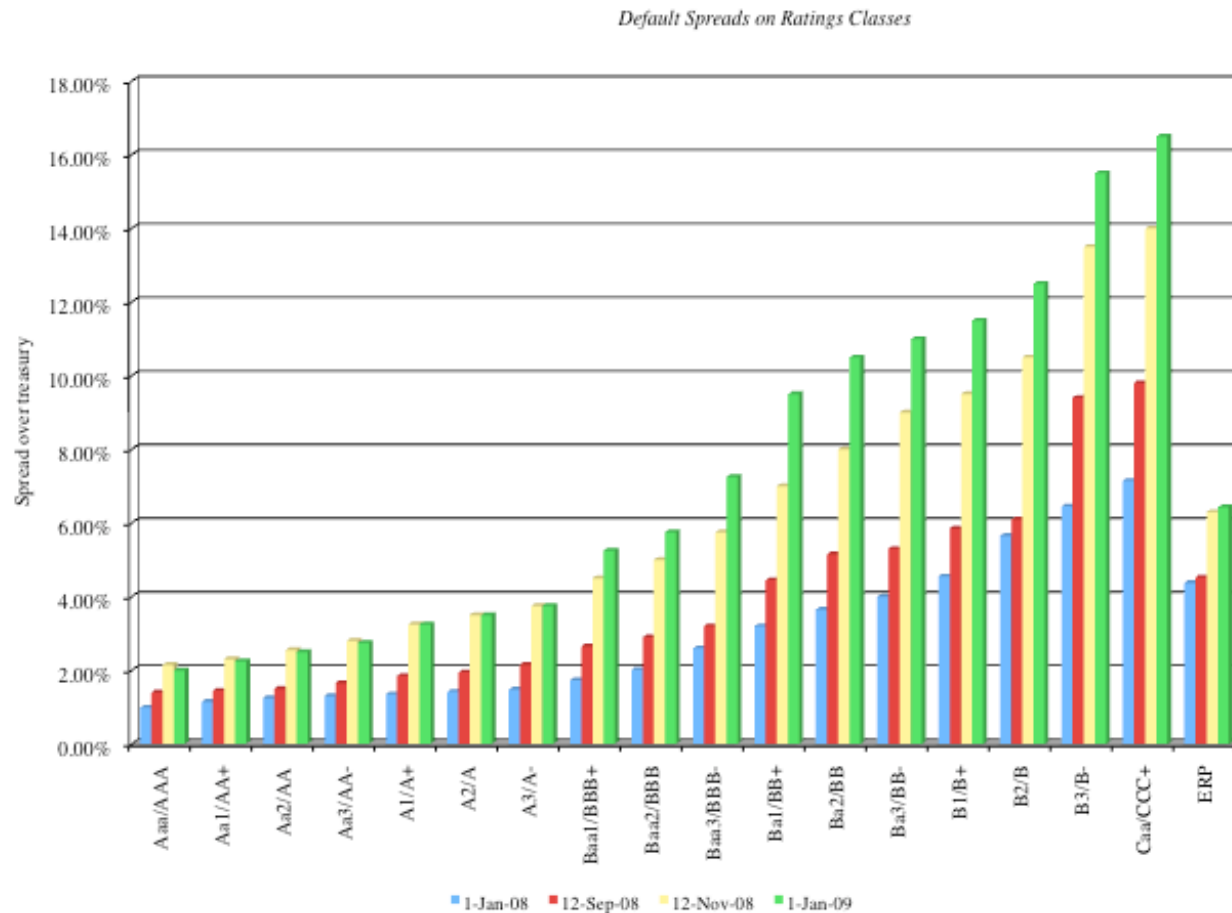
Pre-tax cost of debt = Riskfree Rate(Rs) + Country Default Spread + Company Default spread

= 4% + 3% + 3% = 10%

After-tax cost of debt = Pre-tax cost of debt (1- tax rate) = 10% (1-.34) = 6.6%

Default looms larger.. And spreads widen.. The market crisis – January 2008 to January 2009

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Updated Default Spreads – January 2013

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<i>Rating</i>	<i>1 year</i>	<i>5 year</i>	<i>10 year</i>	<i>30 year</i>
Aaa/AAA	0.04%	0.16%	0.41%	0.65%
Aa1/AA+	0.07%	0.35%	0.57%	0.84%
Aa2/AA	0.09%	0.53%	0.73%	1.03%
Aa3/AA-	0.12%	0.58%	0.78%	1.09%
A1/A+	0.15%	0.62%	0.82%	1.15%
A2/A	0.36%	0.77%	0.95%	1.23%
A3/A-	0.41%	1.04%	1.31%	1.74%
Baa1/BBB+	0.63%	1.28%	1.55%	1.99%
Baa2/BBB	0.81%	1.53%	1.84%	2.33%
Baa3/BBB-	1.29%	1.98%	2.28%	2.74%
Ba1/BB+	2.07%	2.78%	3.12%	3.56%
Ba2/BB	2.85%	3.58%	3.97%	4.39%
Ba3/BB-	3.63%	4.38%	4.81%	5.21%
B1/B+	4.41%	5.18%	5.65%	6.03%
B2/B	5.19%	5.98%	6.49%	6.85%
B3/B-	5.97%	6.78%	7.34%	7.68%
Caa/CCC+	6.75%	7.57%	8.18%	8.50%

Aswath Damodaran

Application Test: Estimating a Cost of Debt

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- 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 tables from prior pages)
 - ▣ A pre-tax cost of debt for your firm
 - ▣ An after-tax cost of debt for your firm

Costs of Hybrids

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- Preferred stock shares some of the characteristics of debt - the preferred dividend is pre-specified at the time of the issue and is paid out before common dividend -- and some of the characteristics of equity - the payments of preferred dividend are not tax deductible. If preferred stock is viewed as perpetual, the cost of preferred stock can be written as follows:
 - $k_{ps} = \text{Preferred Dividend per share} / \text{Market Price per preferred share}$
- Convertible debt is part debt (the bond part) and part equity (the conversion option). It is best to break it up into its component parts and eliminate it from the mix altogether.

Weights for Cost of Capital Calculation

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- The weights used in the cost of capital computation should be market values.
- There are three specious arguments used against market value
 - Book value is more reliable than market value because it is not as volatile: While it is true that book value does not change as much as market value, this is more a reflection of weakness than strength
 - Using book value rather than market value is a more conservative approach to estimating debt ratios: For most companies, using book values will yield a lower cost of capital than using market value weights.
 - Since accounting returns are computed based upon book value, consistency requires the use of book value in computing cost of capital: While it may seem consistent to use book values for both accounting return and cost of capital calculations, it does not make economic sense.

Disney: From book value to market value for debt...

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- In Disney's 2008 financial statements, the debt due over time was footnoted.

Due in	Maturity	Amount due	% due
2009	1	\$3,513	24.33%
2010	2	\$1,074	7.44%
2011	3	\$1,205	8.35%
2012	4	\$1,479	10.24%
2013	5	\$1,842	12.76%
Thereafter	10	\$5,324	36.88%
Weighted Average	5.38 years	\$14,437	

No maturity was given for debt due after 5 years. I assumed 10 years.

- Disney's total debt due, in book value terms, on the balance sheet is \$16,003 million and the total interest expense for the year was \$728 million. Assuming that the maturity that we computed above still holds and using 6% as the pre-tax cost of debt:

- Estimated MV of Disney Debt =
$$728 \left[\frac{1 - \frac{1}{(1.06)^{5.38}}}{.06} \right] + \frac{16,003}{(1.06)^{5.38}} = \$14,962 \text{ million}$$

And operating leases...

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- The pre-tax cost of debt at Disney is 6%.

Year	Commitment	Present Value
1	\$392.00	\$369.81
2	\$351.00	\$312.39
3	\$305.00	\$256.08
4	\$265.00	\$209.90
5	\$198.00	\$147.96
6 & 7	\$309.50	\$424.02
Debt Value of leases =		\$1,720.17

Disney reported \$619 million in commitments after year 5. Given that their average commitment over the first 5 years of \$302 million, we assumed two years @ \$309.5 million each.

- Debt outstanding at Disney
= MV of Interest bearing Debt + PV of Operating Leases
= \$14,962 + \$ 1,720= \$16,682 million

Application Test: Estimating Market Value

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- 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

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□ Equity

- Cost of Equity = Riskfree rate + Beta * Risk Premium
= 3.5% + 0.9011 (6%) = 8.91%
- Market Value of Equity = \$45.193 Billion
- Equity/(Debt+Equity) = 73.04%

□ Debt

- After-tax Cost of debt = (Riskfree rate + Default Spread) (1-t)
= (3.5%+2.5%) (1-.38) = 3.72%
- Market Value of Debt = \$ 16.682 Billion
- Debt/(Debt +Equity) = 26.96%

□ Cost of Capital = $8.91\%(.7304) + 3.72\%(.2696) = 7.51\%$

45.193/ (45.193+16.682)

Divisional Costs of Capital: Disney and Tata Chemicals

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□ Disney

Business	Cost of Equity	After-tax cost of debt	E/(D+E)	D/(D+E)	Cost of capital
Media Networks	8.61%	3.72%	75.00%	25.00%	7.39%
Parks and Resorts	8.20%	3.72%	64.68%	35.32%	6.62%
Studio Entertainment	13.53%	3.72%	68.64%	31.36%	10.45%
Consumer Products	10.86%	3.72%	80.84%	19.16%	9.49%
Disney	8.91%	3.72%	73.04%	26.96%	7.51%

□ Tata Chemicals

Business	Cost of equity	Pre-tax cost of debt	After-tax cost of debt	D/(D+E)	Cost of capital
Fertilizers	14.14%	10.0%	6.60%	34.02%	11.58%
Chemicals	13.58%	10.0%	6.60%	34.02%	11.21%
Tata Chemicals	13.93%	10.0%	6.60%	34.02%	11.44%

Aracruz : Currency effects.. And a side bar on Deutsche Bank..

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□ Aracruz

	Cost of equity	Pre-tax Cost o	After-tax cost	D/(D+E)	Cost of capital
US dollars	20.82%	8.50%	5.61%	52.47%	12.84%
Nominal \$R	26.75%	13.82%	10.79%	52.47%	18.37%
Real	18.45%	6.37%	3.54%	52.47%	10.63%

□ Cost of capital in \$R = $1.1284 \frac{(1.07)}{(1.02)} - 1 = 18.37\%$

Inflation rate in US \$ = 2%
Inflation rate in \$R = 7%

□ Real Cost of capital = $1.1284 \frac{(1)}{(1.02)} - 1 = 10.63\%$

- Earlier we computed a cost of equity of 10.55% for Deutsche Bank. We won't even try to estimate the cost of capital. Why?

Bookscape's Cost of Capital

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- Earlier, we noted that the cost of equity would be much higher for an undiversified investor than a diversified one and use a contrast between total and market beta to illustrate the point.
- The cost of capital illustrates the divide:

	Cost of equity	Pre-tax Cost of debt	After-tax cost of debt	D/(D+E)	Cost of capital
Market Beta	11.60%	6.00%	3.60%	34.84%	8.81%
Total Beta	20.94%	6.00%	3.60%	34.84%	14.90%

Application Test: Estimating Cost of Capital

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- 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

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- 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

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Chapters 3 & 4: Risk, Financing Mix and Hurdle Rates

