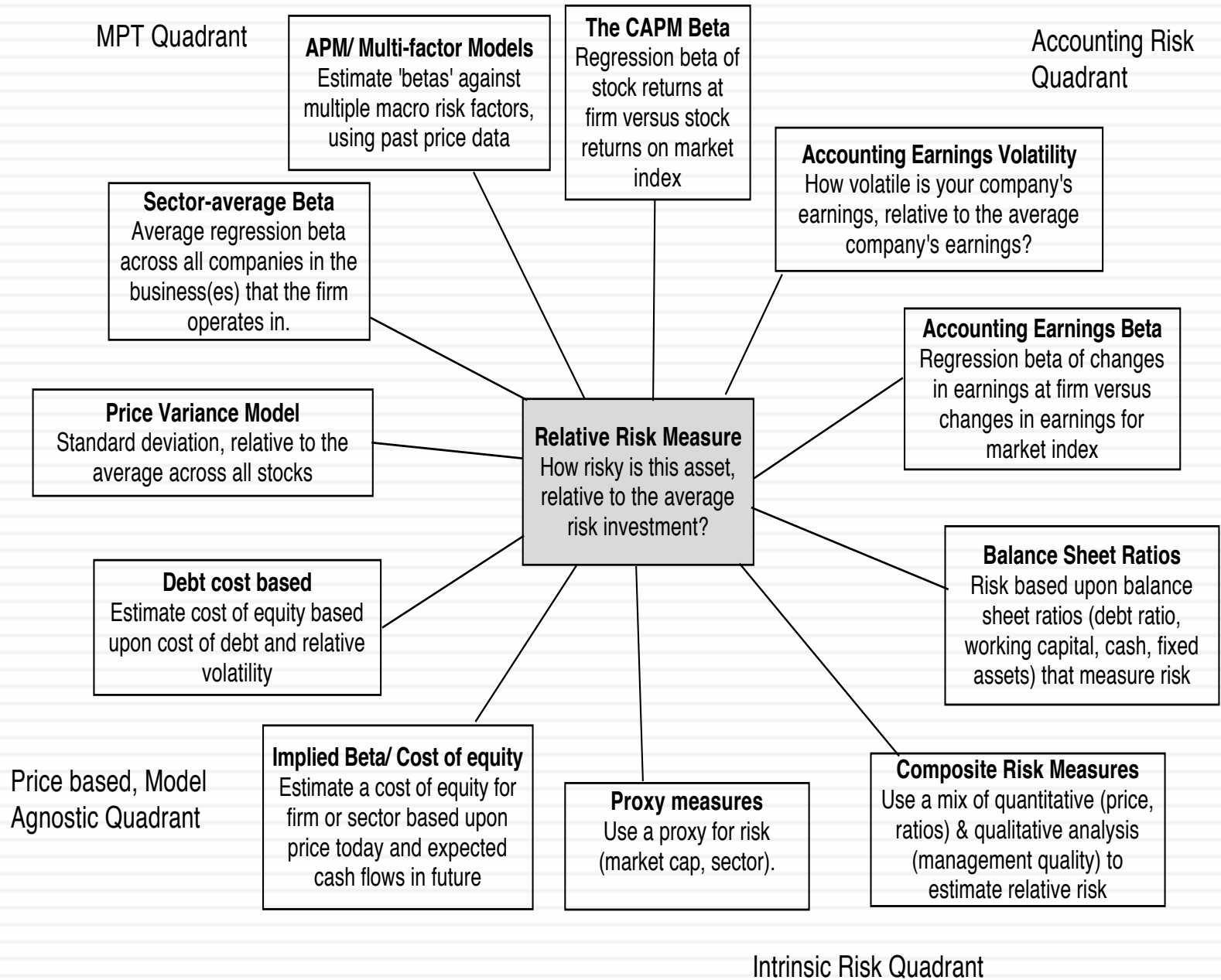




## SESSION 5: BETAS

<#>

Aswath Damodaran



# The Default: The CAPM Beta

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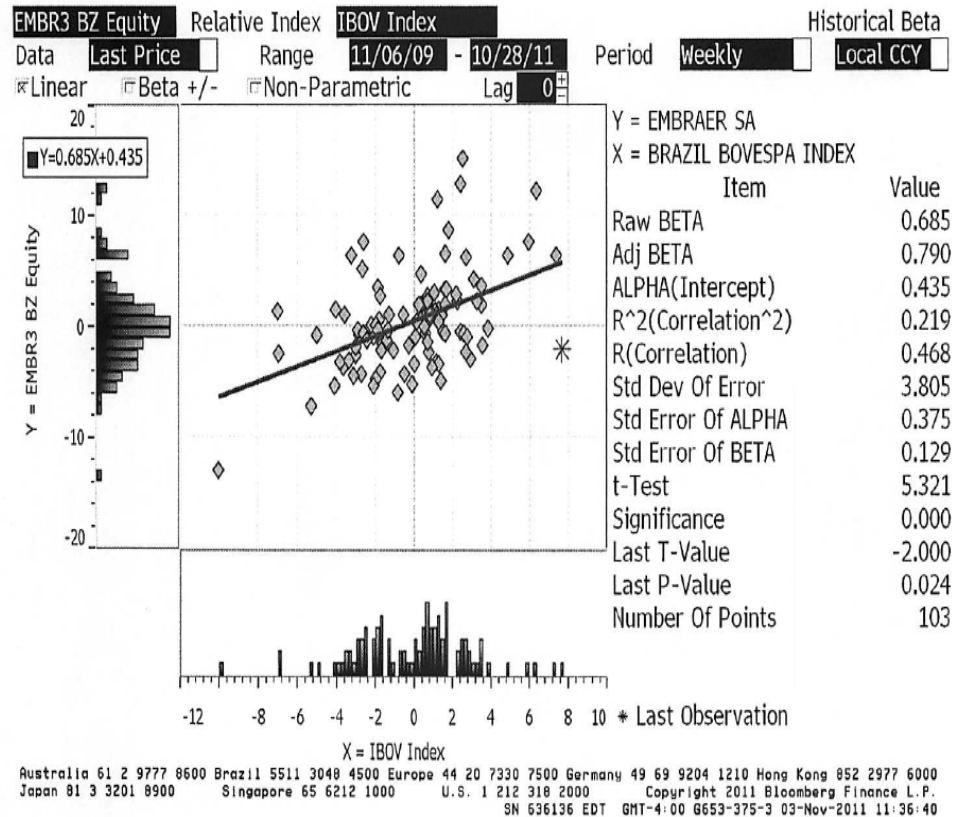
- The standard procedure for estimating betas is to regress stock returns ( $R_j$ ) against market returns ( $R_m$ ) -
- $R_j = a + b R_m$ 
  - ▣ where  $a$  is the intercept and  $b$  is the slope of the regression.
- The slope of the regression corresponds to the beta of the stock, and measures the riskiness of the stock.
- This beta has three problems:
  - ▣ It has high standard error
  - ▣ It reflects the firm's business mix over the period of the regression, not the current mix
  - ▣ It reflects the firm's average financial leverage over the period rather than the current leverage.

# Beta Estimation: Is this Embraer's beta?

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<HELP> for explanation, <MENU> for similar functions.

EquityBETA

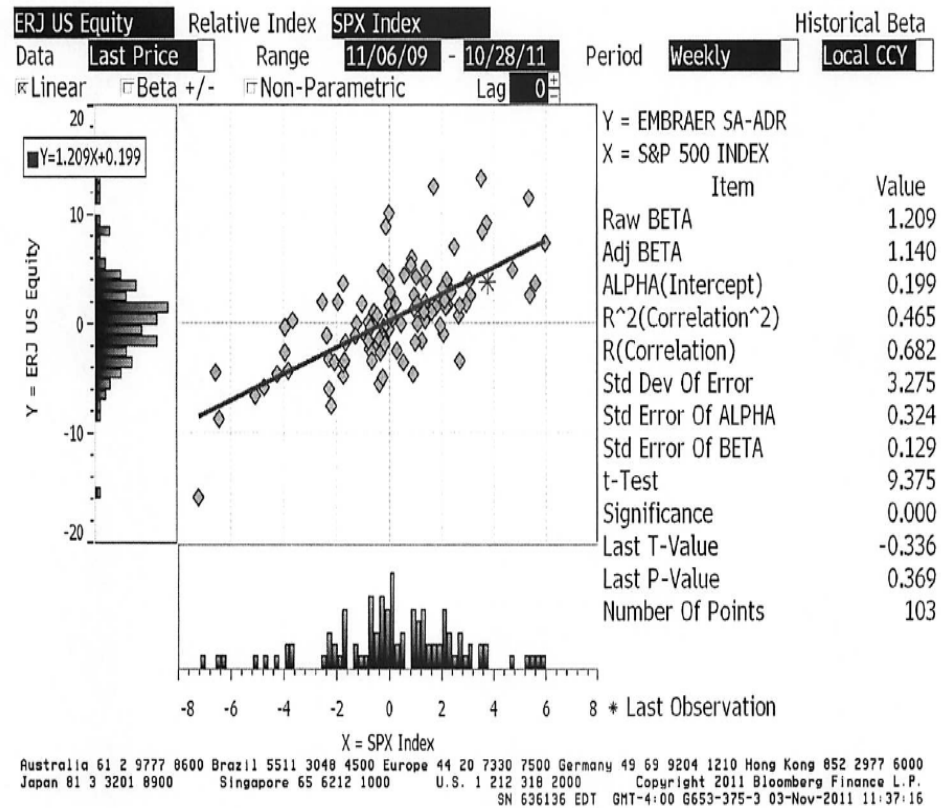


# Or is this it?

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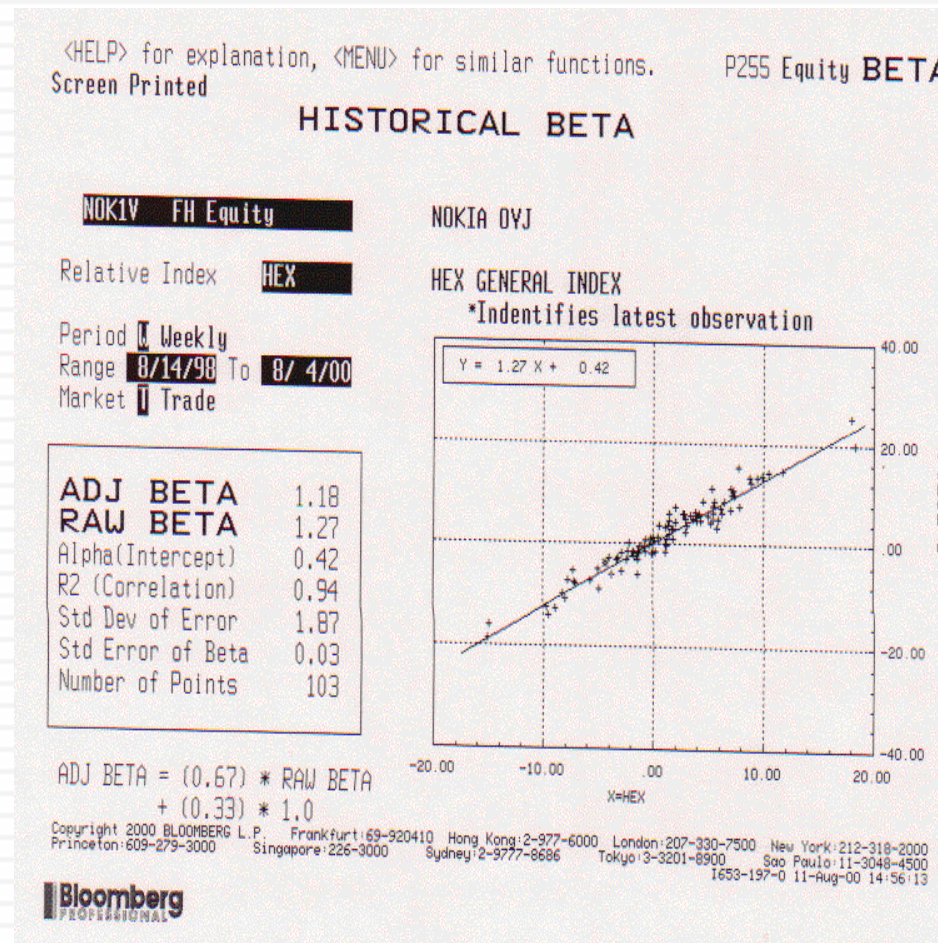
<HELP> for explanation, <MENU> for similar functions.

EquityBETA



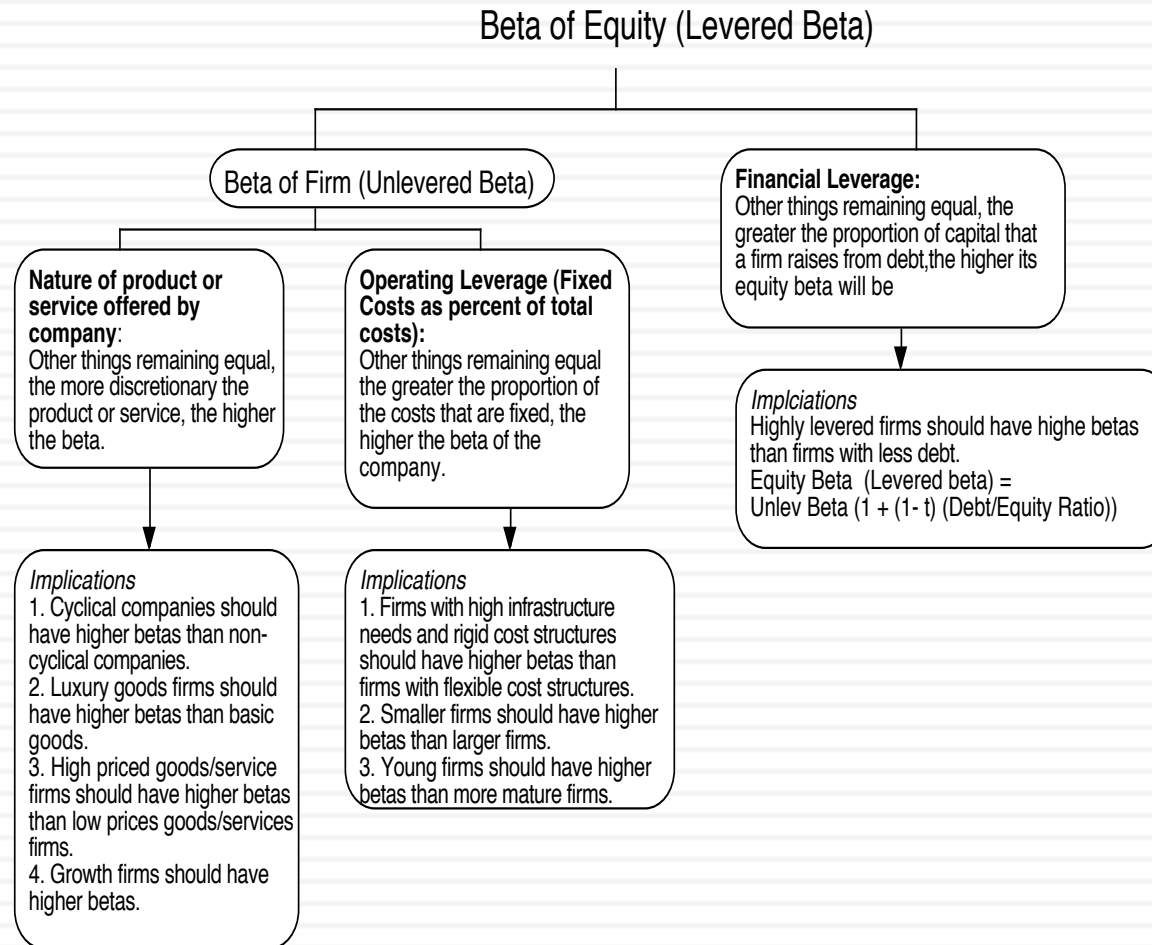
# And watch out if your regression looks too good...

6



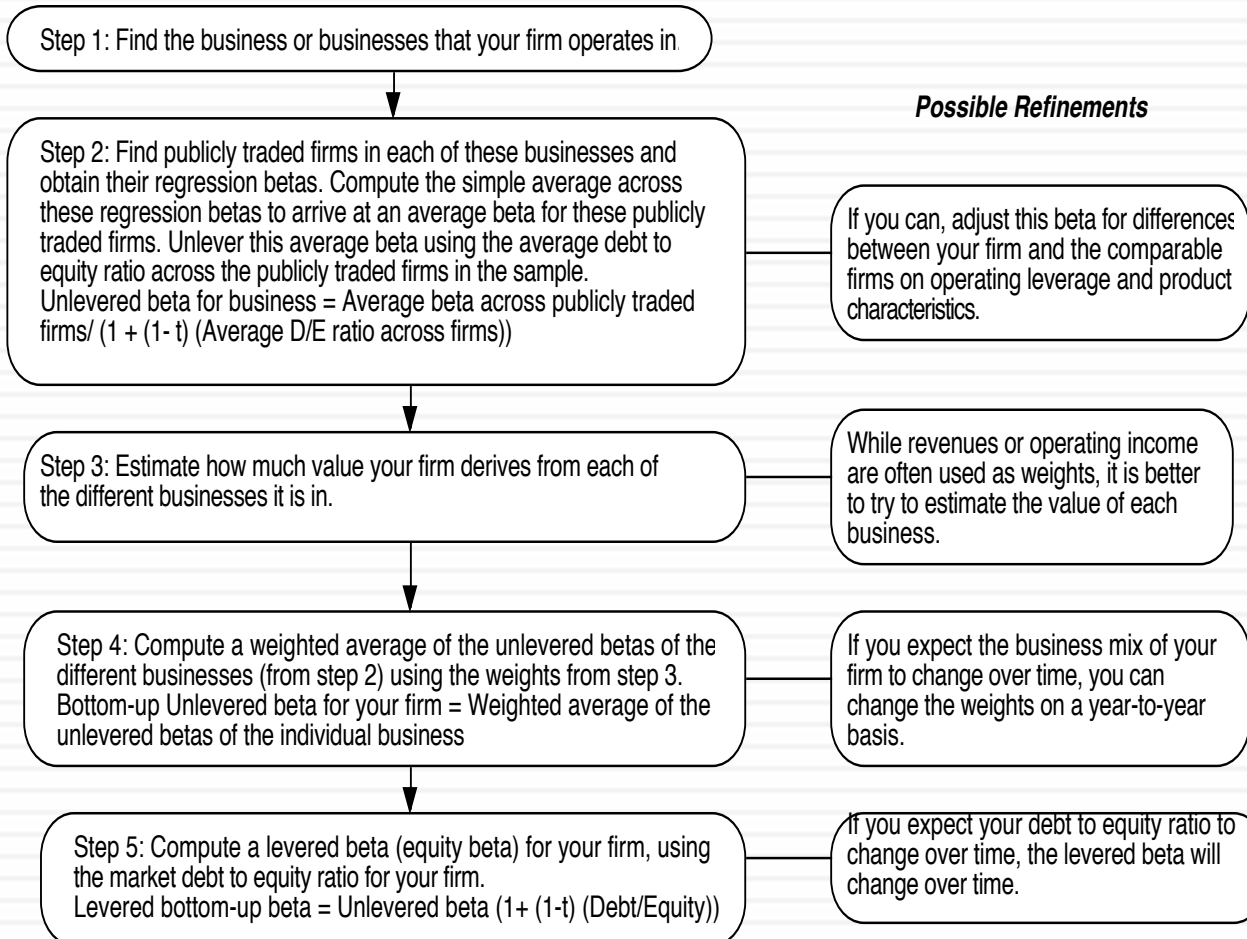
# Determinants of Betas

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# Bottom-up Betas

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# Why bottom-up betas?

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- The standard error in a bottom-up beta will be significantly lower than the standard error in a single regression beta. Roughly speaking, the standard error of a bottom-up beta estimate can be written as  $\frac{\text{Average Std Error across Betas}}{\sqrt{\text{Number of firms in sample}}}$
- The bottom-up beta can be adjusted to reflect changes in the firm's business mix and financial leverage. Regression betas reflect the past.
- You can estimate bottom-up betas even when you do not have historical stock prices. This is the case with initial public offerings, private businesses or divisions of companies.

# Estimating a bottom up beta for Embraer in 2004

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- Embraer is in a single business, aerospace, where there are no other listed firms in Latin America and very few in emerging markets. To estimate the bottom up beta, we therefore used all publicly listed companies in the aerospace business (globally), averaged their betas and estimated an average unlevered beta for the business of 0.95
- We then applied Embraer's gross debt to equity ratio of 18.95% and the Brazilian marginal tax rate of 34% to estimate a levered beta for the company.

Business	Unlevered Beta	D/E Ratio	Levered beta
Aerospace	0.95	18.95%	1.07
Levered Beta	= Unlevered Beta ( 1 + (1- tax rate) (D/E Ratio) ) = 0.95 ( 1 + (1-.34) (.1895) ) = 1.07		

- The fact that most of the other companies in this business are listed on developed markets is not a deal breaker, since betas average to one in every market. The fact that Brazil may be a riskier market is captured in the equity risk premium, not in the beta.

# Bottom-up Beta: Firm in Multiple Businesses

## SAP in 2004

- When a company is in multiple businesses, its beta will be a weighted average of the unlevered betas of these businesses. The weights should be “value” weights, though you may have to estimate the values, based on revenues on operating income. The levered beta for the firm can then be estimated, using its tax rate and debt to equity ratio.
- SAP is in three business: software, consulting and training. We will aggregate the consulting and training businesses.

Business	Revenues	EV/Sales	Value	Weights	Unlevered Beta	
Software	\$ 5.3		3.25	17.23	80%	1.30
Consulting	\$ 2.2		2.00	4.40	20%	1.05
SAP	\$ 7.5			21.63		1.25

Levered Beta =  $1.25 (1 + (1 - .32)(.0141)) = 1.26$  (Tax rate =32%; D/E =1.41%)

# You don't like betas...

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- There are many investors who are inherently suspicious about beta as a measure of risk, though the reasons for the suspicion vary. If you don't like betas, use another measure of relative risk.
- Here is a simple guideline
  - If you don't like betas because they are different in different services: Use sector average or bottom up betas
  - If you don't like betas because you think you should be measuring total risk & not market risk: Use relative standard deviation.
  - If you don't like betas because they are based upon stock prices (and you care about intrinsic value): Use accounting measures (earnings or balance sheet) to get a measure of relative risk.
  - If you don't like betas because they don't bring in qualitative variables (such as the quality of management): Those variables are generally better reflected in your cash flows, but if you insist, use them to come up with qualitative measures of risk.